ORGANIZATIONAL TECHNOLOGY, STRUCTURE AND ENVIRONMENT: THE PULP AND PAPER LOGGING INDUSTRY OF QUEBEC

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ABSTRACT

ORGANIZATIONAL TECHNOLOGY, STRUCTURE AND ENVIRONMENT:
THE PULP AND PAPER LOGGING INDUSTRY OF QUEBEC

By

Camille Georges Legendre

The proposition that production technology constitutes a major determinant of the structure of organizations has been the object of much debate in organizational circles in the recent years. Yet, empirical studies focusing on this topic have often contributed to cloud the issue rather than clarify it. A large number of these studies ignored the impact of the environment, in particular the physical environment, on organizational structure and on the relationship between technology and organization. Almost all these studies have neglected to simultaneously consider the three levels of organization (the individual, the work group and the organizational structure) in their analysis. The dearth of longitudinal studies is seen as another factor which has prevented further progress on that issue.

This dissertation is the longitudinal study of the technological, organizational and environmental changes which, in the last thirty years, have transformed pulpwood logging in Quebec from a pre-industrial agrarian harvesting activity into an industrial production system. This study of four large pulpwood logging organizations is based on interviews with management officers and a wealth of information gathered through an intensive search of written material. The results of the study confirm the determinant influence of technology on the structure

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of organization. The extensive mechanization of logging operations has been associated with the bureaucratization of logging organizations. However, the particular social (labor supply characteristics) and physical environment (raw material, climate, etc.) in which these organizations operate has contributed strongly, because of the large amount of uncertainty which it creates, to limit the effects of the "rationalization" process undertaken by logging companies. As a result, logging organizations do not show the degree of bureaucratization (for instance, forms of control and degree of centralization) which is expected from organizations involved in the mass production of a simple product.

The author concludes that more attention should be given to longitudinal studies and to the analysis of the effects of the physical environment on organizational structure in other "harvesting" industries such as mining, fishing and farming.

ORGANIZATIONAL TECHNOLOGY, STRUCTURE AND ENVIRONMENT: THE PULP AND PAPER LOGGING INDUSTRY OF QUEBEC

Volume I

By

Camille Georges Legendre

A DISSERTATION

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Department of Sociology

1977

To my wife Parvin for her love, her patience and
her constant support since the beginning.
Without her, this would not have been possible.

To Homan, Navid and Céline who wondered
about this "paper" that would never end.

To my parents.

ACKNOWLEDGEMENTS

I would like to thank the authorities of Price Company Limited, Consolidated-Bathurst Limited, Domtar Woodlands Limited and Quebec North Shore Paper Company. Without their consent to cooperate, this study would not have seen the day. My thanks go also to the following organizations for their cooperation: the Canadian Pulp and Paper Association (Woodlands Section), the Council of Pulp and Paper Producers of Quebec, the Quebec Forest Industries Association, the "Fédération canadienne des travailleurs des pâtes, papiers et de la forêt" (C.S.N.), the "Union Catholique des Cultivateurs" (now "Union des Producteurs Agricoles"), the Pulp and Paper Research Institute of Canada (Logging Research Division), the "Syndicat international des travailleurs unis du papier," and various departments of the Federal Government and the Government of Quebec. ARDA Canada and the Canada Council provided me with the financial assistance which made it possible for me to undertake doctoral studies and to carry them to their conclusion. While at Michigan State, I also received some very welcomed financial assistance from the university's graduate assistantship program.

My thanks go also to the members of my Ph.D. committee, Dr. Philip M. Marcus, my advisor, Dr. William A. Faunce, Dr. Christopher Vanderpool and Dr. Frederick Buttel. The patient and confident support given to me by Dr. Marcus in particular has been invaluable. I would like also to express my debt to two sociologists who have initiated and greatly contributed to the development of my interest for the sociology of work and industry, Dr. Gérald Fortin, formerly of Laval University, Quebec, and Dr. William H. Form, my first mentor at Michigan State. I owe much to Dr. Faunce, Dr. Form, Dr. Fortin and Dr. Marcus for their intellectual influence and their sociological commitment, but I am alone responsible for the shortcomings of this study.

Finally, my acknowledgements extend also to the directions of the Administrative Science Quarterly and of Sociology for their permission to quote material published in various articles, and to Drs. David F. Gillespie and Sil D. Kim of the Department of Sociology at the University of Washington for their permission to use material from an unpublished paper.

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INTRODUCTION

The major focus of this dissertation is the problematical relationship between technology and organization, that is here, between the technology of the production system and the structure (and its characteristics) of industrial organizations. This relationship, however, is examined within the set of conditions created by the total environment of these organizations, a dimension of research which has been relatively ignored in the past studies. The influence of production technology on the organizational structure is studied in the case of the woodlands divisions of four major Canadian pulp and paper companies having their headquarters located and major logging and manufacturing activities concentrated in the province of Quebec (Canada). In the past three decades, the system of production and the organization of their logging activities have been radically modified by major technological and organizational changes. They went in fact through delayed processes of industrialization and bureaucratization which transformed their agrarian type of harvesting operations into truly industrial production systems. This evolution provides a very good opportunity to study the impact of technology on organization.

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Industrialization and Bureaucratization of the Logging Industry[1]

Until the late 1940's, logging was still generally at a pre-industrial stage characterized by its "complémentarité" with agriculture (reverse seasonality -- see Chapter 7, section I-B for details about "complémentarité"). The mass production of a simple and standardized semi-finished product, it was done with a relatively primitive technology requiring skills and equipment which were traditionally used on the farm. Being an extensive mode of production plagued by low productivity, it required a large number of men during the short period of four or five months of the winter during which it was scheduled. This large labor force was basically recruited among farmers and their sons who used logging employment during the low period of agricultural activities of the winter to add a cash supplement to their basic farm income. Under these conditions,[2] logging companies relied on a system of local "entrepreneurs" (or "jobbers") who contracted for a fixed price the production of a small amount of pulpwood every year (usually around 5,000 cords) and recruited their labor force from the area surrounding their place of residence.

After World War II, several changes in the environment of the industry[3] resulted in a labor shortage which forced logging companies

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[1]The emergence and development of these industrial bureaucracies need only to be briefly summarized here to introduce the topic of the dissertation. It is treated at length in Chapters 4 and following.

[2]That is, spatial inaccessibility and dispersion over large areas, labor recruitment problems, etc.

[3]These environmental changes included structural transformations in agriculture (due to the mechanization of production, changes in the demand for farm products and a general fall in prices), increasing industrial developments and sources of employment, rapid urbanization and a greater demand for pulp and paper products.

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first to extend the period of their operations and later to increase their productivity by mechanizing their system of production. The traditional "complémentarité" between logging and farming progressively disappeared in favor of a greater differentiation between the two economic activities. This, and a host of other interrelated factors such as labor unionization and rural-urban migrations, created important shortcomings in the traditional entrepreneurship system and progressively pulp and paper companies took over all the logging activities through their woodlands divisions and replaced the "jobbers" by company men, general foremen or superintendents.

This double process of mechanization and bureaucratization implied many other changes[4] of which the following examples constitute only a few illustrations:[5] (a) a sustained raise in productivity (70% over the period 1954-55 to 1965-66); (b) an almost twofold increase in wages between 1957 and 1965 (raising the cost of labor per unit of output despite the gains in productivity); (c) extensive occupational changes (for instance, elimination of certain occupations and large increases in the proportion of maintenance and service occupations); (d) an extension of the annual period of operations (from the traditional four or five fall and winter months to the present nine to ten month yearly period); (e) an increase in the volume of production and the size of the logging camps respectively from 5,000 cords to well over 100,000 cords per year and from about 60 men up to 300 and more men; (f) a

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[4]They are the object of detailed analysis in Chapters 3 and following.

[5]See Duncan R. Campbell and Edward B. Power, Manpower Implications of Prospective Technological Changes in the Eastern Canadian Pulpwood Logging Industry (Ottawa: Research Branch, Department of Manpower and Immigration, Research Monograph No. 1, June 1966), pp. 20-40.

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significant decrease in the labor force requirements (for instance, from 35,000 workers in 1956-57 to 17,500 in 1969-70) despite a much larger annual volume of production; (g) a lower rate of labor mobility and turnover (although, as the analysis of the labor supply shows in Chapter 7, this problem is far from having been satisfactorily solved).

According to the literature on organizations, since logging activities consist in the mass production of a simple and standardized product, logging organizations should have developed a fully bureaucratized structure following the mechanization and reorganization of their production technology. Superficially, this seems to be the case as we will see later. However, a close study indicates that logging operations have come short of being completely routinized and logging organizations of becoming fully bureaucratized. The former can be briefly illustrated here by the fact that the work-flow is frequently disturbed and interrupted for short periods of a few minutes as well as for long ones lasting several days and even weeks. The lack of bureaucratization is demonstrated for instance by the failure to implement systematic control at the production level on the work situation (high variations in productivity, high rate of absenteeism and turnover, absence of disciplinary measures, piece-work system of remuneration, etc.) and the maintenance of recruiting and hiring practices which have remained particularly traditional in their reliance upon personal ties.

The explanation of this situation must be found in the nature of the physical and socio-economic environment within which these organizations operate. Accordingly, logging organizations have been unable so far to reach the degree of precision in the planning and forecasting of their achievements which would lead to complete bureaucratization because of the unce

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because of the uncertainty created by their environment. These organizations are still dominated: (a) by the great amount of variations encountered in the timber resource, the terrain, the weather and the climate; (b) by the particular nature and attitudinal characteristics of their labor force (lack of training, education and qualifications, instability and occupational mobility, independence and low social status of logging occupations in general but especially production ones); and (c) by some of the social characteristics of the technology of the system of production (medium to high control of the workers over most of the equipment and phases of the production process).

Despite the persistence of the above mentioned behavioral and organizational "anachronisms" up to this day, it is possible to argue that it is simply a matter of time and more sophisticated technology before everything gets straightened out and that logging organizations become fully bureaucratized as they are expected to be according to recognized organization theory.

No doubt, further progress will be (are actually) made in this respect. However, it is my contention in this study that the present conditions will not be completely modified, at least not in a foreseeable future, and that the persistence of some of them, for instance, spatial dispersion, physical environmental conditions, social isolation and workers' job control, will prevent logging organizations from becoming fully bureaucratized. In the meantime, they will have to avoid the mistake of a "premature rationalization"[6], the negative

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[6]Charles Perrow, Organizational Analysis: A Sociological View (Belmont, Cal.: Wadsworth Publishing Co., 1970), pp. 47-48.

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consequences of which have been well documented by previous studies of the mining industry.[7]

Sociological Relevance of the Study

The historical study of these recent technological and organizational changes in the logging industry constitute a unique opportunity to explore some empirical evidence which will hopefully contribute toward a more satisfactory theoretical as well as methodological understanding of the role of production technology in the structuring and functioning of complex organizations. It should also provide us with greater evidence on the impact of the environment of organizations and the means developed by organizations to cope with it, especially the physical or ecological environment which has been much neglected in the past. This is much needed. Indeed, since technology, following Woodward's pioneering study, became the focus of much attention in the literature on organizations, the discussion and the evidence brought to bear on it have not led yet to a totally clear understanding of the relationships between these two elements and such others like size and environment. If the existence of these relationships has been well documented, their nature and texture have been much less well demonstrated. As a result, Woodward's question is still of actuality: "How far does technology influence the formulation of social organizational structure inside an industrial setting?"[8] If technology alone cannot

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[7] E. L. Trist and K. W. Bamforth, "Some Social and Psychological Consequences of the Longwall Method of Coal-getting", Human Relations, 4, 1 (February, 1951): 1-38; A. W. Gouldner, Patterns of Industrial Bureaucracy (New York: The Free Press, 1954).

[8] Joan Woodward, "Automation and Technical Change: The Implications for the Management Process", in Charles R. Walker (ed.), Technology,

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explain the structural characteristics of industrial organizations as should be expected, how should the other factors such as the environment, which should be taken into consideration, be incorporated into acceptable theoretical schemes for use by researchers?

These are the basic theoretical objectives of this research. There are also some methodological and empirical objectives. The study should contribute to examine some of the empirical findings found in other works which concern more particularly large batch and mass production organizations. It constitutes also an evaluation of the utility of some of the concepts, categories and operational definitions which have been used previously by other students of industrial organizations. Its major methodological originality, however, is the use of an historical approach which permits the analysis of organizational change and can lead to the inference of causal relationships between the variables under study.[9]

Industry, and Man. The Age of Acceleration (New York: McGraw-Hill, 1968), Ch. 7, "The New Technologies and Management", pp. 176-189: p. 185.

[9]Allen H. Barton, "Organizations: Methods of Research", in David L. Sills (ed.), International Encyclopedia of the Social Sciences (New York: The Macmillan Company and The Free Press, 1968), Vol. 11, pp. 334-343: p. 336.

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CHAPTER 1

TECHNOLOGY AND ORGANIZATION: THEORETICAL AND METHODOLOGICAL CONSIDERATIONS

"A society's solutions to its technological problems tend to function as a set of prior conditions that limit the range of possible solutions to its organizational and ideological problems."

(G. Lenski)

The proposition that material technology (by opposition to social technology) constitutes a major source of influence on organizations has become the topic of a relatively large number of studies and essays in the last three decades. Most of them have described the influence of the technology of the system of production on various aspects of organizational life at one of three levels of focus: (a) the <u>individual</u> level, workers' job satisfaction, motivation and morale, workers' alienation, individual organizational behavior in general and life out of work; (b) the <u>work group</u> level, personal interaction, work group behavior and supervision, etc.; and, finally, (c) the <u>organizational</u> level at large, structural characteristics, inter-organizational relationships, etc. This last level of concern is more recent and there have been "few attempts to measure technology as an organizational or systemic variable."[10] However, recent developments have led to a good deal of progress and also controversy.

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[10]John Child and Roger Mansfield, "Technology, Size, and Organization Structure," <u>Sociology</u>, 6, 3 (September, 1972): 369-393, p. 373; see also D. Hickson, D. S. Pugh and D. C. Pheysey, "Operations Technology and Organization Structure: An Empirical Reappraisal," <u>Administrative Science Quarterly</u>, 14, 3 (September, 1969): 378-397.

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Some writers have referred to it as the technological debate and identified several opposing schools. The "technological school" tenant of a "technological imperative" is confronted by the "size school" and the "environmental school," both equally supporting respectively their own imperative.[11] The debate is not over yet, since, as this chapter should indicate, there are strong indications that the nature of the relationship between technology and organization needs further systematic formulation and exploration.

The objective of the present chapter is to present my interpretation of the debate and to propose this research as a contribution to it. I see this contribution as severalfold. Firstly, as a review of the literature shows, previous studies have approached the problem from limited perspectives. The multifaceted impacts of technology on organization have not been considered together, thus ignoring the wholeness of reality and artificially limiting the possibilities of understanding the underlying dimensions of the relationship. In this study, I suggest to analyze the impact of technology simultaneously at the individual, work group and organizational levels as an essential part of our understanding of the relationship.

Secondly, so far, participants in the debate have been arguing on the basis of cross-sectional studies alone, some of them lamenting that the establishment of causal relationships would require historical

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[11] See Hickson et al., op cit.; Child and Mansfield, op. cit.; J. Child, "Organizational Structure, Environment and Performance: The Role of Strategic Choice," Sociology, 6, 1 (January, 1972): 2-22; W. V. Heydebrand (ed.), Comparative Organizations (Englewood Cliffs, N.J.: Prentice-Hall Inc., 1973), p. 22.

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studies, but they had no such studies to proceed with further in their discussions. I present such a study here and, in Chapter 2, will discuss the original contribution of historical studies to the analysis of causal relationships.

Thirdly, previous studies have very often ignored the intervening influence of the environment (particularly the social and ecological (physical) environments of organizations) on the relationship between technology and organizational structure. This study will demonstrate that this is an important oversight which may have contributed to increase the confusion in the discussion of the problem.

The perspective taken in this study is a comprehensive one in which an attempt is made to analyze and understand the reality in its totality, its wholeness. As Heydebrand suggests,

> ...an understanding of organizational structure cannot be obtained from the correlation of any two characteristics alone. While the relationships between size, complexity, division of labor, professionalization, bureaucratization, and other variables have been studied before, it is the complex pattern of their interrelations which constitute the "new reality" of organizational studies.[12]

It is this "new reality" which I am pursuing in this study.

As will become readily apparent from the review of the literature, a good deal of confusion stems from the lack of uniformity in previous studies concerning the definition, operationalization and measurement of key variables like technology, size, environment, etc. This confusion, no doubt, has added fuel to the present debate on the "technological imperative." In the second part of the chapter, I will elaborate on my

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[12]Heydebrand, op. cit., p. 41.

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In summary, the following discussion of the literature should indicate the major sources of influence on the approach that I am taking and the choice of variables and dimensions of the framework which I use in the study.

I. Technology-Organization: Findings

An exhaustive review of the research done so far would, no doubt, offer some interest, but does not appear warranted for the purpose of this study.[13] Rather, a selective review of some of the better known works which seem particularly relevant here will suffice to illustrate the different approaches mentioned above, their major findings, some of the problems which remain to be solved, and what has been learned from them for the present study. The relevant literature will be briefly examined by focusing successively on the three levels of organizational life previously mentioned: individual, group and structure.

A. Technology and the Worker

The research done on the impact of technology on workers is mostly interesting here for its implications about workers' job control, technological constraints on working conditions, supervision and managerial control and coordination.

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[13] See, for instance, Charles Perrow, "A Framework for the Comparative Analysis of Organizations," American Sociological Review, 32, 2 (April, 1967): 194-208, for a good review of the literature before 1967. Also James C. Taylor, "Some Effects of Technology in Organizational Change," Human Relations, 24, 2 (April, 1971): 105-123, and R. G. Hunt, "Technology and Organization," Academy of Management Journal, 13, 3 (September, 1970): 235-252.

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p. 105.

Walker and Guest[14] are among the pioneers who studied the influence of production technology on workers' behavior and "the social structure of in-plant society." Their analysis of assembly-line work in an automobile plant showed that it contributes to deprive workers of job satisfaction, to encourage absenteeism and occupational mobility (turnover), and the development of an instrumental attitude toward work. Assembly work further impedes the development of strong social relationships, resulting at best in the creation of loose groups of five or six operators working in adjacent stations.

> Assembly-line technology...is repetitious, machine-paced, involves a minimum of skill, the use of pre-determined techniques, a minute sub-division of the product and calls for only a limited degree of attention so that the work can be done "automatically." Moreover, social interaction between assembly-line workers is limited by the noise, which makes talking difficult, by the need to keep up with the line and to remain in one place to do so and by the individual nature of each man's work. Workers do not work in groups or teams but each performs an individual task, taking on the average, one and a quarter minutes per operation.[15]

More relevant to my concern here, this situation indicates the lack of control of workers on their jobs and affects also authority relations. Thus, foremen cannot initiate any interaction to change working conditions since these conditions depend on the basic technology of this industry and work organization can be modified only by the experts who designed it in the first place. Since men do not develop much group cohesion because of their isolation at different work stations, supervisors do not get any group support in their attempt to

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[14] Charles R. Walker and Robert H. Guest, The Man on the Assembly Line (Cambridge, Mass.: Harvard University Press, 1952).

[15] D. Silverman, The Theory of Organizations (London: Heinemann, 1970), p. 105.

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[16]Robert Bla
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[17]Idem., p.

change working conditions. Walker and Guest's study is remarkable for its analysis of the various technological constraints (noise, attention requirements, spatial confinement, etc.) and their immediate effects on workers' morale and social interaction. But unfortunately, it is adversely affected by the narrow perspective of plant sociology and does not go beyond the supervisory level in its analysis of the implications of technology on the organization.

In a much different comparative study of four industries (printing, textile, automobile, and chemical), characterized by four different production technologies (craft, machine-tending, assembly-line, and continuous-process), Blauner[16] established a relationship between the type of production technology and different forms of alienation (powerlessness, meaninglessness, self-estrangement, and social isolation) and their intensity. His research was based on the belief that

> variations in technology are of critical interest to students of the human meaning of work because technology, more than any other factor, determines the nature of the job tasks performed by blue-collar employees and has an important effect on a number of aspects of alienation. It is primarily the technological setting that influences the worker's powerlessness, limiting or expanding the amount of freedom and control he exercise in his immediate work environment. Technological factors are paramount also in their impact on self-estrangement, since the machine system largely decides whether the worker can become directly engrossed in the activity of work or whether detachment and monotony more commonly result.[17]

However, Blauner's study is not especially interesting here for the relationship which it established between technology and various dimensions of alienation, but for other characteristics of his approach.

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[16] Robert Blauner, Alienation and Freedom: The Factory Worker and His Industry (Chicago: The University of Chicago Press, 1964).

[17] Idem., p. 8.

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In particular, technology is seen as determining also the degree of cohesion among workers by its influence on the size of industrial plant and by its structural impact on "the existence and form of work groups." Thus,

> Even the nature of discipline and supervision to some extent depends on technological factors. And technology largely determines the occupational structure and skill distribution within an enterprise, the basic factors in advancement opportunities, and normative integration.[18]

Focusing on the man-machine relationship, Blauner referred to technology as the system of tools and mechanical equipment on the one hand, and of technical "know-how" and mechanical skills involved in their use in the production operations on the other hand.[19]

He considered three factors influencing the type of technology employed by a firm: (a) "the over-all state of the industrial arts"; (b) "the economic and engineering resources of individual firms"; and (c) "the nature of the product manufactured" (its exclusivity or diversity, and its structure). However, as it will become evident later, his indirect measure of mechanization based on the three following indicators could not be used in this study for its lack of refinement. These indicators are: (a) "capital investment per production worker," (b) "value added by manufacturing per production worker," and (c) "proportion of maintenance costs of total payroll."[20] Of more interest for

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[18] Ibidem.

[19] Leading to the four types of technology mentioned above (craft, machine-tending, assembly-line, and process-production) which closely parallel Alain Touraine's classification in L'évolution du travail ouvrier aux usines Renault (Paris: Centre National de la Recherche Scientifique, 1955).

[20] Martin Meissner, Technology and the Worker (San Francisco: Chandler Publishing Co., 1969), p. 247.

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the present study is his consideration of the characteristics of the environment as they affect each industry. Blauner considered three dimensions of the environment: the division of labor, the industrial social organization, and the economic structure. With few exceptions (for instance, Gouldner's study of a mining organization),[21] environmental variables were neglected in the past and their consideration is certainly necessary as I will argue later.

In a different comparative study of job satisfaction by Turner and Lawrence,[22] the technology and environment of industrial organizations were found to be important factors of variation. The objective of these writers was to analyze the responses of workers (in terms of attendance to work and job satisfaction) "to technologically determined variations in the nature of their work."[23] Their central hypothesis was that there is a positive relationship between the complexity of the job and the attendance to work and job satisfaction. This hypothesis was partially confirmed. The relationship held true for attendance but failed to materialize in the case of job satisfaction. Control tests were made for several supplementary variables: situational factors (pay and satisfaction with the company, the foreman, the work group, and the union); individual characteristics (age, education, seniority in the company, and an F-scale personality measurement of 'authoritarianism'); and, finally, perceived task attributes (the amount of variety, autonomy,

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[21] Alvin W. Gouldner, op. cit.

[22] A. N. Turner and Paul Lawrence, Industrial Jobs and the Worker: An Investigation of Response to Task Attributes (Boston: Harvard University Press, 1965).

[23] They developed a scheme to classify and measure relevant task attributes and applied it to 47 different jobs in 11 companies. For each job, they had 10 workers answer a questionnaire focusing on job satisfaction and related matters.

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[26] Idem., p.

interaction, responsibility, knowledge and skill required by the task as perceived by the workers).[24]

Theirs was a concern with the human factor in the tradition of the Hawthorne school. According to them, studies in this tradition showed that "social and interpersonal factors (were) more relevant in understanding worker's behavior than many of the economic and technological 'logics'" usually relied upon by job designers. Implicit in their research objective was "the idea that workers' response to task attributes could and should become a more important factor in job design."[25] Indeed, technological progress increases the frequency with which jobs are redesigned and creates a greater need to understand workers' response to variations in task attributes determined by technology.

However, if they wanted to study the influence of technologically determined task attributes on workers' response, they recognized at the same time the intervention of several important social and interpersonal variables in the relationship.

> We realized that others had tried unsuccessfully to make this leap from 'determinants' of behavior to final response, without studying how the determinants were mediated through social organization at work. Nevertheless, we believed the attempt worthwhile because, as explained below, the particular manner in which we planned to study task attributes had not been attempted before, and because we hoped to design our study so as to control most of the other influences on worker responses.[26]

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[24]The nature of the task attributes which they considered constituted a progress over previous studies. They used six attributes which they combined in an index (the "requisite task attributes index"): variety (object and motor), autonomy, required interaction (on and off the job), knowledge, skill and responsibility. For some of the problems which they had with their index, see Meissner, op. cit., pp. 251-252.

[25]Turner and Lawrence, op. cit., p. 2.

[26]*Idem.*, p. 11.

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[27]Idem., p.

Finally, they found that an external variable, community size (small town versus city), was the key variable to account for the relationship between task attributes and workers' satisfaction. Workers from cities had a significant tendency to be satisfied with lower rated or less demanding jobs.

That an environmental factor (a subcultural variable) became the key explanatory variable constitutes a major conclusion of their study which should be retained here. However, this variable was discovered and added to their scheme just before completing the study[27] and their original model suffered the same shortcoming found in the human relations school approach: a premature closure of the system under scrutiny excluding socio-cultural elements of the larger society in which the industrial sub-system is operating. This indicates that environmental variables should be included in the theoretical framework of studies dealing with organizations whenever possible.

B. Technology and the Work Group

From studies of the influence of technology on individual workers' attitudes and behavior, we thus can learn a good deal about the concept of technology itself, the consequences for the organization of the impact of technology at the worker level, and the role of such factors as the environment of the organization. Similar conclusions can be obtained from studies focusing on the influence of technology on work groups.

Sayles for one, used an approach similar to the one adopted by Walker and Guest to analyze the behavior of industrial work groups in

[27] *Idem.*, p. 14.

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[28]L. R. Sayl
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[29]Gouldner,

relation to the organization of work and technology. He considered that the behavior of work groups, contrary to accepted beliefs, is more different than similar because "the technology and organization of the plant are the architects of the work group, constructing with the materials of human interaction a variety of types of groups."[28] Once groups have been identified on this basis, it is possible to predict their behavior toward the enterprise and the union and to identify their different strategies.

Thus, in his analysis of workers' behavior in thirty plants (mostly processing and a third of them in the automobile industry), Sayles used four technical characteristics: task differentiation, workflow and dependence, machine pacing, and required interaction. On this basis, and according to work groups' grievance behavior (for instance, the amount of grievance, consistency, concertedness and intensity of protest activities), he identified four types of groups: apathetic, erratic, strategic, and conservative.

Similar, if more limited, conclusions were found by Gouldner in his study of the mining and plasterboard manufacturing operations of a gypsum firm.[29] His study clearly demonstrated the influence of technology on the structure and the degree of cohesion of work groups, work groups' strategies vis-à-vis management, and the impact of these factors on the organization. Thus, in contrast to the lack of group cohesion, control and autonomy of the conveyor-paced workers of the board mill, a

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[28] L. R. Sayles, Behavior of Industrial Work Groups (New York: John Wiley, 1958), p. 3.

[29] Gouldner, op. cit.

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high degree of work group cohesion was observed in the mine where workers had a large measure of autonomy and control on their jobs and where a greater amount of interaction was technologically required. As a consequence, Gouldner observed a "greater permissiveness in relation to infraction of rules" and a "lesser influence of the supervisor's authority"[30] in the mine than in the mill, and more generally two different structures of organization: the organization of the mine being much less bureaucratic and "bureaucratizable" than the organization of the mill.

Gouldner's study showed also that it was a mistake to modify the structure of organization (and style of management) without recognizing the demands created by the socio-technical conditions of production. Gouldner went further in suggesting the necessity to consider the "larger institutional forces" which underlie the various types of organizations.[31]

Studies of coal mining operations in England led to similar results.[32] Under the hand-got system, workers were grouped in pairs or trios in various locations along the coal face. This system was replaced by the much more mechanically advanced longwall system in which

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[30] Frank Jones, "Structural Determinants of Consensus and Cohesion in Complex Organizations," Canadian Review of Sociology and Anthropology, 5, 4 (November, 1968): 219-240, p. 223.

[31] He found that "renewed postwar competition for gypsum customers exerted pressure to 'tighten the plant up,' and to produce more efficiently," and that increased competition for jobs due to loss of job opportunities in local defense plants which had been closed down enabled management to utilize "punishment-centered bureaucracy" (p. 243).

[32] E. L. Trist and K. W. Bamforth, op. cit.; E. L. Trist and G. W. Higgin, H. Murray, and A. B. Pollock, Organizational Choice: Capabilities of Groups at the Coal Face Under Changing Technologies (New York: Humanities Press, 1963).

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"miners were strung out in individual positions along the coal face."[33] The change from the former to the latter meant a sharp decrease in the level of required and possible interaction and in the degree of work group cohesion and job control. The change received considerable opposition by the workers who, among other things, saw the new system as substantially reducing security at work. Finally, a compromise system had to be adopted by the employer in which customs and values of the former system of work were transplanted: responsibility, autonomy and polyvalence.

This study is interesting because it points to the need to consider the mutual influence between the technical system and the socio-psychological organization and to the existence of a certain flexibility of the organization of work vis-à-vis its technological conditions.[34]

C. Technology and the Organizational Structure

The research reviewed so far was focused on workers and/or work groups as the unit of analysis to the exclusion of the structure of the whole organization.[35] Woodward's comparative study of one hundred industrial firms in England was one of the first to direct attention on this dimension.[36] Woodward set out to evaluate the utility of classical management theory principles and found that firms' success did not

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[33] Trist and Bamforth, op. cit.

[34] Claude Durand, Book Review of Trist, Higgin, Murray and Pollock, Organizational Choice..., op. cit., in Sociologie du Travail, 6, 3 (Juillet-Sept., 1964), pp. 309-310.

[35] With the possible exception of Gouldner's study.

[36] Joan Woodward, Management and Technology (London: H.M.S.O., 1958) and Industrial Organization: Theory and Practice (London: Oxford University Press, 1965).

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depend on them but on the firms' adaptation to their technical system in line with their objectives (that is, the nature of the product and the type of customers). As she put it hereself:

> Many of the variations found in the organizational structure of the firms did, however, appear to be closely linked with differences in manufacturing techniques. Different technologies imposed different kinds of demands on individuals and organizations, and these demands had to be met through an appropriate structure. Commercially successful firms seemed to be those in which function and form were complementary.[37]

She grouped the firms on a scale of technical complexity based on three empirical aspects. The first one was a distinction between unit and mass production (or custom and standardized production) based on size and continuity. The second one pertained to integral versus dimensional products and the third one to the degree of continuity of production (intermittent versus continuous). She obtained three basic types of technology which she ordered in a sequence of historical development and on a scale of increasing complexity: (a) unit and small batch production, (b) large batch and mass production, and (c) process production (see Table 1 for detailed list of each type). Her definition of technology was based on two dimension of the production process, tools and control, with an emphasis on the last one. Thus, in terms of control, her study showed that as one proceeds from the oldest and less complex system (unit production) to the most recent and most complex system (process production), it becomes easier to control manufacturing operations, the locus of control shifting from men to machines.

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[37]Woodward, Industrial Organization: Theory and Practice, p. vi

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TABLE 1

Production Systems According to Woodward and Further Operationalization of Woodward's Classification by the Aston Group

	Woodward Classification	Scale of Production Continuity* (Aston Group)
Unit and Small Batch Production	1. Production of simple units to customers' requirements.	Simple units = units basically single-piece, not assemblies, produced one by one.
	2. Production of technically complex units (prototypes).	Complex units = assemblies, produced one by one.
	3. Fabrication of large equipment in stages	Fabrication one by one, in which work-people come to the unit of output (which moves about very infrequently) rather than the unit moves around to different work-people.
	4. Production of small batches to customers' orders.	Small batches = equipment reset every week or, more often, for outputs measured in items.
Large Batch and Mass Production	5. Production of components in large batches subsequently assembled diversely (production of large batches).	Large batches = equipment reset at intervals longer than a week for outputs measured in items: BUT items assembled diversely (i.e., variety of assembly sequences, including assembly by unit and/or small batch methods).
	6. Production of large batches, assembly line type.	Large batches, as no. 5, but with large batch assembly.
	7. Mass production.	Mass = batch size, measured in items, is indefinite (i.e., a change of batch requires decisions on (a) design modification, (b) retooling, which are beyond the normal authority of the line production management and production planning to vary production programmes).

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Process Production	8. Process production combined with the preparation of a product for sale by large-batch or mass-production methods (production system number 11 in Woodward).	Process = throughputs measured by weight or volume: BUT outputs become items at finishing stage
	9. Process production of chemicals in batches (production system number 8 in Woodward).	Process, but ingredients (i.e., recipies) of the throughputs change periodically.
	10. Continuous flow production of liquids, gases, and crystalline substances.	Process, but constant ingredients (i.e., recipe change is beyond the normal authority of the line production management and production planning to vary production programmes).

*The predominant technology of an organization assessed mostly on the basis of its highest degree of "continuity."

SOURCE: Adapted from J. Woodward, op. cit., p. 39; and D. Hickson, D. Pugh and D. Pheysey, "Organization: Is Technology the Key?," Personnel Management, February 1970, pp. 21-26: p. 23.

Considering several organizational characteristics, she was led to three sets of findings. Firstly, she observed a linear relationship between technology and the following organizational variables: "the length of the line of command; the span of control of the chief executive; the percentage of total turnover allocated to the payment of wages and salaries; and the ratios of managers to total personnel, of clerical and administrative staff to manual workers, of direct to indirect labor, and of graduate to non-graduate supervision in production departments";[38] advancement policies (hiring from outside), and finally,

[38] Woodward, Industrial Organization: Theory and Practice, p. 51.

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Secondly, her analysis revealed "a U-shaped curvilinear relationship between technology and certain dimensions of the social structure of organization, such as the tendency to break down the labor force into small primary groups, and, in general, the tendency toward organic -- flexible, participative, informal -- as opposed to mechanistic -- hierarchic, formal -- systems of management (Woodward, 1965: 60-64)."[39] Thirdly, more successful performances were associated with organizations which structures conform to their production technologies, "as suggested by the above relationships," than with organizations which structures do not conform. Thus mass production firms were found more successful with mechanistic rather than with organic systems of management.[40]

Woodward's work is remarkable here for its operationalization of the various technological systems of production, her comparative approach which she combined with few intensive case studies, and her successful attempt to break down in details the various aspects of the structure of organization which are determined by technology.

The extensive work of Woodward was soon followed by probably one of the most ambitious studies of organization undertaken in 1961 by a group of researchers under the direction of Derek Pugh. The work of the original group led to a good number of publications and spinoff studies

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[39] Lawrence B. Mohr, "Organizational Technology and Organizational Structure," Administrative Science Quarterly, 16, 4 (December, 1971): 444-459, p. 445.

[40] Ibidem.; Woodward, Industrial Organization: Theory and Practice, pp. 69-71. Similar findings were reported for a group of American firms of the Middle-West by W. L. Zwerman, New Perspectives on Organization Theory (Westport, Conn.: Greenwood Publishing Co., 1970).

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by members of the team and other researchers as well. The work of the original Aston group comprised three empirical studies:[41] (a) a study of various types of organizations in the English Midlands;[42] (b) a replication of the above study with a smaller sample by Hinings and Lee;[43] and (c) replication studies by Inkson _et al_[44] and Hickson _et al_.[45] but this time using an abbreviated range of measures.

The original study had two major aims: (a) to devise more accurate and reliable means of analyzing and comparing organizations and their structural features and (b) to examine the interrelationships between these organizational variables.[46] The first years of work were devoted to the first objective. It led to the development of a standard schedule of information about each organization, from which a numerical

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[41]John Child, "Organization Structure and Strategies of Control: A Replication of the Aston Study," _Administrative Science Quarterly_, 17, 2 (June, 1972): 163-177, p. 164.

[42]D. S. Pugh, D. J. Hickson, C. R. Hinings, and C. Turner, "Dimensions of Organization Structure," _Administrative Science Quarterly,_ 13, 1, (March, 1968): 65-105, and "The Context of Organization Structures," _Administrative Science Quarterly_, 14, 1 (March, 1969): 91-114; D.S. Pugh, D. J. Hickson and C. R. Hinings, "An Empierical Taxonomy of Structure of Work Organizations," _Administrative Science Quarterly_, 14, 1 (March, 1969): 115-126.

[43]C. R. Hinings and Gloria Lee, "Dimensions of Organization Structure and their Context: A Replication," _Sociology_, 5, 1 (January, 1971): 83-93.

[44]J.H.K. Inkson, D.S. Pugh and D.J. Hickson, "Organization Context and Structure: An Abbreviated Replication," _Administrative Science Quarterly_, 15, 3 (September, 1970): 318-329.

[45]D. J. Hickson, C. R. Hinings, C. J. McMillan and J. P. Schwitter, "The Culture-free Context of Organization Structure: A Tri-national Comparison," _Sociology_, 8, 1 (January, 1974): 59-80.

[46]Kerr Inkson, Roy Payne and D. S. Pugh, "Extending the Occupational Environment: The Measurement of Organizations," _Occupational Psychology_, 41 (1967): 33-47, p. 39.

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score could be assigned to the organization for each variable and subvariable.[47]

In the first empirical study, a sample of 52 organizations in the Birmingham area was designed (including 31 manufacturing establishments). The sample was as thoroughly comparative as possible and included such manufacturing activities as strip-steel, toys, double decker buses, chocolate bars, injection system and beer, and such services as chain stores, municipal departments, transport companies, insurance companies and savings banks.[48] "Data were gathered by means of a comprehensive interview schedule[49] designed to elicit factual organizational data from discussions with the chief of the organization and the head of various functional activities (Pugh et al., 1968)."[50] They were obtained also from other sources such as public records.[51] The structural concepts of the study were drawn mostly from the theory of bureaucracy and management writings and were "conceptualized as a means of characterizing the administrative structure of organizations."[52] The following organizational variables were successfully measured: origin and history, ownership and control, size, charter (purpose),

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[47] Inkson et al., "Organization Context and Structure: An Abbreviated...", p. 319.

[48] Inkson et al., "Extending the Occupational Environment...", p. 39.

[49] The original interview schedule was subsequently the object of modifications: (a) it was developed and revised, and this new version was used in other studies; (b) a shorter version was developed and validated in order to simplify the work involved in gathering and processing the data in subsequent studies. See Inkson et al., "Organizational Context...", p. 319.

[50] Inkson et al., "Extending the Occupational Environment...", p. 39

[51] Ibidem.

[52] Child, "Organization Structure and Strategies of Control...", p. 164.

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technology, location, and interdependence -- all contextual variables -- and specialization (of functions and roles), standardization (of procedures), formalization (of routines), centralization (of authority), and configuration (of roles) -- all characteristics of the structure.

Following a factorial and multivariate correlation analysis, Pugh and his associates came to several major conclusions. First, they found four distinctive underlying dimensions of structure which are mutually independent:

1- "structuring of activities" which includes specialization, standardization, formalization and the hierarchical levels in the line chain of command (vertical span);

2- "concentration of authority" which includes centralization, reference of decisions to wider organization group (a lack of autonomy), percentage of line managers to total employees (percentage of workflow superordinates), and standardization of procedures for selection and advancement (absence of standard procedures for controlling workflows);

3- "line control of workflow" which includes subordinate ratio, formalization of role performance recording, and standardization of procedures for selection and advancement.

4- "relative size of supportive component" as indicated by the percentage of clerks, the vertical span, and the percentage of non-workflow personnel.

One important consequence of this multifactor solution was the conclusion that "organizations may be bureaucratic in any of a number of ways."[53] The ideal-type approach to organization developed by Weber

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[53]Pugh <u>et al</u>., "Dimensions of Organization Structure," p. 88.

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was declared no more useful and it was suggested that a classification of several broad types of organization structure was more appropriate.[54] Moreover, Weber's proposition on bureaucratic control was rejected following the findings that the first two dimensions of structure, structuring of activities and concentration of authority, were independent from each other. As Pugh put it himself:

> Thus it must be presumed that there are a number of distinctive underlying dimensions of structure -- this particular trial produces four. Since these are mutually independent, an organization's structure may display all these characteristics to a pronounced degree, or virtually none at all, or display some but not others. In so far as the original primary dimensions of structure, specialization, standardization, formalization, centralization, and configuration were drawn from a literature saturated with the Weberian view of bureaucracy, this multifactor result has immediate implications for what we have elsewhere called the Weberian stereotype.[55] It is demonstrated here that bureaucracy is <u>not</u> unitary, but that organizations may be bureaucratic in any of a number of ways. The force of Blau's criticism of the 'ideal type' can now be appreciated: "If we modify the type in accordance with empirical reality, it is no longer a pure type; and if we do not, it would become a meaningless construct."[56] The concept of <u>the</u> bureaucratic type is no longer useful.[57]

Their analysis of the relationships between the structural characteristics and the contextual variables led to further interesting conclusions. Thus, size was found to be related to the structuring of activities but not with the line control of workflow. The variability

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[54] Pugh *et al.*, "An Empirical Taxonomy of Structure...".

[55] C.R. Hinings, D.S. Pugh, D.J. Hickson and C. Turner, "An Approach to the Study of Bureaucracy," *Sociology*, 1, 1 (January, 1967): 61-72.

[56] P. M. Blau, "Critical Remarks on Weber's Theory of Authority," *American Political Science Review*, 57 (June, 1963): 305-316.

[57] Pugh *et al.*, "Dimensions of Organization Structure," pp. 87-88

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and diversity of operations ("charter") was related positively with the structuring of activities and negatively with the concentration of authority and the line control of workflow. Location ("number of operating sites") was related positively with the structuring of activities and the line control of workflow but negatively with the concentration of authority. When considering technology ("workflow integration"), their results became particularly worthy of attention. While technology did not appear to be related in any significant or clear way with size, origin and history, and concentration of ownership with control, it was related with operating variability and diversity. More importantly, technology was related with the three major structural dimensions of their analysis: positively with the structuring of activities and the line control of workflow, but negatively with the concentration of authority. Thus, the more integrated the production system is, the more structured the activities and procedures, the greater the reliance on impersonal control, and the more decentralized the decisions (because decisions tend to become more routine in a system where increasing control results directly from the workflow itself).

Pursuing further their investigation of the role of technology, Pugh and his associates claimed to have found a synthesis concerning the divergence between the technological determinists (among which they include Woodward) and the non-determinists (which would comprise such writers as Goldthorpe and Blau).[58] This synthesis was based on a

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[58] Pugh et al., "The Context of Organization Structures"; D.H. Hickson, D. S. Pugh and D. P. Pheysey, "Operations Technology and Organization Structure: An Empirical Reappraisal," Administrative Science Quarterly, 14, 3 (September, 1969): 378-397.

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special analysis which relied on a measure of technology specifically designed for manufacturing industries that was applied to the thirty-one manufacturing organizations of their original sample. It showed that technology is related only to seven structural variables, all "job-counts" variables: subordinate-supervisor personnel ratio, proportion in inspection, in maintenance, in workflow control, in transport and dispatch, in employment specialization, and finally, proportion in buying and stocks specialization.

When the total sample of forty-six organizations was considered, technology contributed to "a small proportion of the total variance in structural features" and they rejected "the hypothesis that operations technology is of primary importance to structure." A comparison with Woodward's study revealed contradictory results and a less imperative technology. They concluded that the intervention of size may offer a solution. Accordingly, small organizations would depend heavily upon workflow technology whereas large organizations would be slightly influenced.

> This result, together with a detailed comparison with Woodward's findings in southeast Essex, leads to a reinterpretation of the role of technology. Operations technology is shown to affect only those structural variables immediately impinged on by the workflow. Thus the smaller the organization the more completely its structure is pervaded by the immediate effects of this technology; the larger the organization the more these effects are confined to variables such as the proportions employed in activities that are specifically linked with workflow, and technology is not related to the wider administrative and hierarchical structure. This interpretation, it is suggested, offers a synthesis for the long-standing divergence in organization theory between statements by classical management writers of management principles irrespective of

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> technology, and the stress by behavioral scientists on the relevance of technology.[59]

A replication study carried out using abbreviated measures of the original variables on a sample of 40 organizations in the English Midlands supported the previous findings.[60] "Structuring of activities was found to be primarily related to organization size and to a lesser extent to technology", although the size of the correlation between work-flow integration and structuring of activities increased substantially (casting some doubts on the _à propos_ of categorical statements regarding the respective influence of size and technology). A restudy on a sub-sample of 14 organizations 4 or 5 years later led to the conclusion that "forms of workflow bureaucracy show a trend over time in the direction of increased structuring of activities coupled with decreased concentration of authority."[61]

In a replication study carried out on a national sample of eighty-two British organizations, Child[62] found that the Aston study results were generally supported. His replication confirmed "the tight nexus between specialization, standardization of procedures, paperwork, and vertical span expressed by the concept 'structuring of activities'." However, contrary to the previous study, centralization of decision making was found to be negatively related to structuring "in a way that conforms closely to Weber's description of the bureaucratic mode of

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[59] Hickson _et al._, "Operations Technology and Organization Structure...", p. 378.

[60] Inkson _et al._, "Organization Context and Structure...".

[61] _Idem._, p. 318.

[62] Child, "Organization Structure and Strategies of Control...".

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[65a] Idem., p

administrative control."[63] On that basis, he concluded that Weber's conceptualization had been rejected too soon by the Aston group.

His examination of the relationships between size, technology and structural characteristics supported other findings of the Aston group.[64] Size had a much higher relationship with structural feature of organization than technology. The only exception to the dominance of size concerned the dimensions of configuration (except vertical span) where technology predicted better than size or where both failed to predict at all.[65] Thus Hickson _et al_. was right in suggesting that small organizations are being more influenced by technology than large ones.[65a] However, Child concluded that his results would indicate that "the dispute between technology and size theorists derives largely from the fact that they have been studying different facets of organizations." Technology theorists (like Woodward) studied variables describing the "shape" of organizations while size theorists (like Blau) focused on variables describing the bureaucratic strategy of control (for instance, roles, definition of tasks, and level of decision-making).

Although the works of the Aston school contributed very much to revive the debate on the structural impact of technology and other major

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[63] _Idem_., p. 163.

[64] Child and Mansfield, "Technology, Size, and Organization Structure."

[65] _Idem_., p. 383. These were the well-known job-counts variables. His own analysis "from the Aston data of technology and size in relation to the degree of role specialization in different organizational functions also indicated that the relative "effect" of technology was strongest with workflow-centred functions such as maintenance and production control." See John Child, "More Myths of Management Organization?", _Journal of Management Studies_, 7 (1970): 376-390, p. 383.

[65a] _Idem_., pp. 383-384.

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variables such as size, many other empirical studies of technology and organization were completed since the publication of Woodward's study in 1965. These studies have been reviewed by several other writers and it would not serve the purpose of my discussion to analyze them again in detail here. It remains important, however, to indicate their place in and contribution to the literature on the topic. To this effect, major empirical studies on organizational technology published since 1965 have been listed in Table 2. Each study is characterized by the following informations: definition of technology used, level of measurement (individual and/or system), type and number of organizations studied, methods of data collection on the technological variable, and major findings. These studies stand out for the variations in their definition, operationalization and measurement of technology, the great diversity of research designs which were used, the absence of historical studies, and the weight of evidence found in favor of a positive relationship between technology and organization.

D. Some Relevant Criticisms and Issues

In the above review of the literature, a good deal of attention was paid to the Aston study for a number of reasons. The work of Pugh and his associates represents one of the most rigorous and comprehensive attempts of its kind in organizational analysis to clarify concepts and to devise research techniques and measures which can be standardized and repeated in different settings.[66] This is particularly true of their

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[66]D.J. Hickson, "A Convergence in Organization Theory," Administrative Science Quarterly, 11, 3 (September, 1966): 225-237; Inkson et al., "Extending the Occupational Environment..."; Child and Mansfield, "Technology, Size, and Organization Structure"; C.R. Hinings and B.D. Foster, "The Organization Structure of Churches: A Preliminary Model," Sociology, 7, 1 (January, 1973): 93-105.

TABLE 2

Major Empirical Studies on Organizational Technology Published Since 1965

Author	Definition of	Level of	Type and number of organizations	Methods of data collection on the technology variable	Major findings

TABLE 2

Major Empirical Studies on Organizational Technology Published Since 1965

Author and date published	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
Woodward 1965	Theoretical: Technical complexity Operational: Classification of firms according to type of production system: unit and small batch, large batch and mass, continuous process. Dimension of technology measured: production process.	System	Manufacturing firms, N=100	Observations and interviews with managers	Some organizational characteristics (mostly "job-count" characteristics) are direct functions of the technology of the production process.
Lawrence and Lorsch 1967	Theoretical: Certainty of the task environment. Operational: Clarity of information, certainty of cause and effect relationships, time span of feedback. Dimension of technology measured: knowledge.	System	Industrial firms, N=10	Interviews with senior executives; questionnaires to managers.	Degree of certainty of the task environment (rapid rates of technological and market change) affects the level of differentiation and integration in organizations.
Bell 1967	Theoretical: Job complexity. Operational: Predictability of work demands, number of difficult tasks performed, discretion and extent of responsibility.	Individual	Departments in one community hospital, N=30	Observation, interviews, and a questionnaire to all full-time day staff, N=171	Technological characteristics of the work processes are key determinants of variation in the size of the span of control.

TABLE 2 (cont'd.)

Author and date	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings

TABLE 2 (cont'd.)

Author and date published	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
Rushing 1968	Theoretical: Hardness of material. Operational: "Ease with which a substance can be pierced, penetrated or broken." Dimension of technology measured: raw materials.	System	Classification of manufacturing industries on the basis of census data.		Materials technology influences the division of labor in organizations. The harder the product, the greater the structural differentiation and the dispersion.
Meissner 1969	Theoretical: Technical conditions of work. Operational: Production processes of conversion and transfer. Dimension of technology measured: production processes.	System	The author analyzed 32 previously published case studies of work in industrial settings.		Variations in the technical conditions of work are associated with differences in workers' behavior (cooperation, communication and influence).
Aston group (reported in Hickson et al.) 1969	Theoretical: Techniques the organization uses in its workflow. Operational: Automation of equipment, rigidity of workflow sequences, interdependence of workflow segments, and specificity of evaluation. Dimension of technology measured: operations and production processes.	System	Manufacturing firms, N=31 Service organizations, N=15	Interviews with chief executives and department heads.	Operations technology associated with structural variables immediately related to the workflow.

TABLE 2 (cont'd.)

Author and date	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings

TABLE 2 (cont'd.)

Author and date published	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
Hage and Aiken 1969	Theoretical: Routineness of work based on Perrow's model. Operational: "Routineness" factor composed of five questions. Dimension of technology measured: overall routineness.	Individual	Social welfare and health agencies, N=16	Structured interviews with a stratified sample of all professional staff.	Relation between the technology and the social structure of organizations. Social structure of organizations with more routine work found to be more centralized, etc.
Fullan 1970	Theoretical: "Manual and machine operations performed on an object in the process of turning out a final product." Operational: Classification of firms according to production system: craft, mass production, and continuous process. Dimension of technology measured: production processes.	System	Manufacturing firms, N=12	Author classified firms into the three categories of technology.	Integration in organization varies with production technology. Oil workers (continuous process) much more integrated in the system than auto workers (mass production) with printers (craft technology) falling in between but closer to oil workers.

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Author and date	Definition of	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings

TABLE 2 (cont'd.)

Author and date published	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
Zwerman 1970	Theoretical: Technical complexity (designed to replicate Woodward, 1965). Operational: Classification of firms according to Woodward's scheme. Dimension of technology measured: production processes.	System	Manufacturing firms, N=55	Interviews with managers.	Generally confirm Woodward's findings.
Morse 1970	Theoretical: Certainty of the task environment based on Lawrence and Lorsch, 1967. Operational: Routineness predictability, certainty of unit's work. Dimension of technology measured: raw materials and knowledge.	System	Industrial firms, N=2	Interviews and a questionnaire to top executives.	When formal organizational practices and climate fit the requirements of its task, functional unit is effective and members more motivated.
Perrow (reported in Magnusen) 1970	Theoretical: Exceptional cases encountered in the work and the required search behavior. Operational: "Non-routineness" factor composed of four questions. Dimension of technology measured: raw materials and knowledge.	Individual	Manufacturing firms, N=14	Self-administered questionnaire to all employees above the rank of foreman, N=2633	

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Author and date	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
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Author and date published	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
Grimes and Klein 1970	Theoretical: Task variability. Operational: Classification of departments according to degree of work variability into routine, engineered, craft and heuristic. Dimension of technology measured: knowledge.	Individual	Departments in nine electronics firms, N=829	Interviews with managers; data based on job specification and work qualifications described in each firm's job classification code.	Technology influences the autonomy of work groups. The less routine the technological system, the more autonomaus from the administrative system the task units (work groups) are.
Blau and Schoenherr 1971	Theoretical: Technological innovation. Operational: Automation of equipment: number of computers and input/output units, number of electric typewriters. Dimension of technology measured: operations.	System	State employment security agencies, N=53	Documents: rental invoices of data-processing facilities and inventories of other technical equipment.	Automation related to decentralization, indirect forms of control, and greater scope of responsibility of division heads
Mohr 1971	Theoretical: Manageability of tasks and materials. Operational: Uniformity, complexity, and analyzability of material, routineness of tasks, task interdependence, noise level. Dimension of technology measured: raw materials operations, production processes.	Individual	Work groups in thirteen local health departments, N=144	Author assigned the work groups to eight categories based on level of routineness; experts rated work groups on basis of written task descriptions; questionnaires to supervisors and subordinates.	Findings do not support the effect of technology on the social structure of organizations (participativeness of the supervisory style).

TABLE 2 (cont'd.)

Author and date published	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
[illegible]	Theoretical: Techniques the	System	82 business	Interviews with	Generally confirm Aston group's findings.

TABLE 2 (cont'd.)

Author and date published	Definition of technology	Level of measurement	Type and number of organizations	Methods of data collection on the technology variable	Major findings
Child 1972	Theoretical: Techniques the organization uses in its workflow Operational: Automation of equipment, rigidity of workflow sequences, interdependence of workflow segments, and specificity of evaluation. Dimension of technology measured: operations and production processes.	System	82 business organizations (40 manufacturing and 42 service).	Interviews with chief executives and department heads.	Generally confirm Aston group's findings. Technology related to structure, but less than size, and especially to specialization of functions and roles.
Hrebiniak 1974	Theoretical: Task variability. Operational: Technological level, task predictability interdependence and manageability. Dimension of technology measured: operations, materials and knowledge technology.	Individual	Departments or work groups in a general hospital (210 supervisors and subordinates).	Questionnaire to subjects (three dimensions of technology) and investigator's research (one dimension).	Work group structure is related to job technology (after eliminating supervisory style effects).

SOURCE: Adapted with my own additions from Beverly P. Lynch, "An Empirical Assessment of Perrow's Technology Construct," Administrative Science Quarterly, 19, 3 (September, 1974): 338-356.

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definition and operationalization of the various dimensions and characteristics of organizational structure and technology. Their discussion of the different meanings of technology goes a long way to clarify this often confusing concept.[67] Moreover, they have simplified the measurement procedures[68] and made use of a large number of resource variables with clear operationalization.[69] Their approach must be commended also for making a clear distinction between the formal structure of the organization and the perception that its members have of it. This essential distinction which has not always been made and less often taken into account in most studies of organizations will receive more attention later on in the chapter. Finally, their approach has also the advantage of being multivariate which makes it much more suited to empirical studies. It contributed to free organizational research from its tendency to stereotype structural variations and "to present the choice of structural features in terms of absolute alternatives."[70]

On the negative side, there are some conceptual and methodological problems which, however, are not important enough to offset the overall value of their framework. One major shortcoming is that their cross-sectional approach does not in itself lead to any clear-cut theory of

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[67] Koya Azumi and Jerald Hage, Organizational Systems (Toronto: D.C. Heath and Company, 1972), p. 104.

[68] Child and Mansfield, op. cit.

[69] Azumi and Hage, op. cit., p. 109.

[70] Child, "More Myths of Management Organization?", p. 377. One assumption behind the stereotypical approach which Child objected to is "that the structural components of the stereotype will in practice vary together proportionately" (p.377). The questions will be further discussed later in Chapter 2.

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organizational growth and development despite the "causal imagery" in which their analysis is at times formulated.[71] Aldrich, for one, formulated a number of other criticisms. He suggested that "in many cases their data analysis tends to obscure important relationships" (especially their handling of zero-order correlations), and questioned their strategy of doing multivariate analysis (the problem of high correlations between the predictors).[72] He also raised the problem of the variable called workflow integration which, it was found, gives an almost perfect dichotomy between manufacturing and service

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[71] H.E. Aldrich, "Technology and Organization Structure: A Reexamination of the Findings of the Aston Group," Administrative Science Quarterly, 17, 1 (March, 1972): 26-43, p. 27. Aldrich's claim that path analysis can solve the problem is rejected by Pugh and Hickson who indicated that their data were not longitudinal as were those collected by Blau and Duncan on occupational mobility even if they were collected cross-sectionally. See D.S. Pugh and D.J. Hickson, "Causal Inference and the Aston Studies," Administrative Science Quarterly, 17, 2 (June, 1972): 273-276; P.M. Blau and O.D. Duncan, The American Occupational Structure (New York: John Wiley, 1967). See also the distinction made by Child and Mansfield between the two meanings of cross-sectional data: (a) "collected within a time period which is assured to be short compared to the time that the variables measured would typically take to change significantly" and (b) referring "to the simultaneously occuring values of different variables." Blau and Duncan's data were cross-sectional only in the first sense (Child and Mansfield, op. cit., pp. 370-371).

[72] Aldrich, op. cit., p. 28. Pugh and Levy themselves raised objections to the use of factor analysis. Results are difficult to interpret and linear equations present theoretical problems. "If we adopt the technique we necessarily adopt the equations as a theory about the behaviour of organizations; otherwise, how do we attempt to interpret the 'solution'? The linear equation allows two or more organizations to achieve the same score on a factor by different combinations of scale scores." Finally, the linear equations of the factor analytic 'model' "may usually be extended without clearly defined substantive limits to achieve a better fit." (See Philip Levy and Derek S.Pugh, "Scaling and Multivariate Analyses in the Study of Organizational Variables," Sociology, 3, 2 (May, 1969): 193-213, p. 209.

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organizations.[73] Finally, Aldrich had reservations about "accepting the concepts and operational definitions of the Aston group at face value." He wondered if the operational versions of the concepts (which include very complex indicators) were really valid indicators of what they purport to measure and if they could be used in other contexts than the context of the 52 organizations of the original empirical study.[74] Other mentioned problems were related to the possible confusion regarding authority and control, the lack of uniformity in sampling concerning the definition of the unit of study (branch, plant, whole organization, etc.), inadequate measure of traditionalism (which could score almost *ad infinitum*), and tautology (for instance, in the relation between autonomy and centralization.)[75] Finally, one could point out that their measure of technology ignores the important level of task attributes which is certainly not completely absent in the system attributes but is not completely reflected in them either.

Over a decade ago, Pugh and his colleagues had reason to write that "the study of work organizations and behavior...[had] been primarily processual as opposed to factorial," and that"there [had] been a great concentration on the one-case study and little systematic attempt to relate behavior to contextual and organizational settings."[76]

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[73] *Ibidem*. See also Lynch, *op. cit*. p. 339. According to her, workflow integration is inadequate to understand certain organizations (that is, service organizations).

[74] Aldrich, *op. cit*., p. 29.

[75] Child, "Organization Structure and Strategies of Control...", pp. 170 and following.

[76] D.S. Pugh, D.J. Hickson, C.R. Hinings, K.M. McDonald, C. Turner and T. Lupton, "A Conceptual Scheme for Organizational Analysis," *Administrative Science Quarterly*, 8, 2 (September, 1963): 289-315, p. 289.

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However, this description does not correspond anymore to the present situation in the field. A good number of comparative factorial studies have been done since (see for instance, Table 2 above) and a large degree of unanimity achieved. The preceding review of some of the most representative works[77] should be enough to form the background of an assessment of the present state of knowledge and approaches in the field in relation to the specific problems raised earlier. It leaves the student with the final impression that there has been real progress made in the conceptual, methodological, designing and analytical dimensions of the relationships between technology, organization and other variables.[78]

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[77]As well as the list of other references in Table 2 and the footnotes.

[78]As Hinings and Foster put it: "Over the past decade a particular approach to the analysis of the formal structure of organizations has developed, the central principle of which has been Weber's (1947) idea of bureaucracy. A remarkable degree of unanimity has been achieved on the basic ideas for dealing with formal organization structure, as can be seen in the work of Pugh _et al_. (1963, 1968), Hinings _et al_. (1967), Hall (1963), Hall and Tittle (1966), Hage and Aiken (1967, 1970), Blau _et al_. (1966), Blau and Schoenherr (1971), and Perrow (1970). All have worked with a similar stock of concepts, examining the division of labour (specialization), the extent of procedural regularity (standardization), the use of documents for job definition and communication (formalization), the locus of authority (centralization); and all have deployed various ideas relating to the shape of the organization, such as span of control, height of the hierarchy, etc. (configuration). The approach of these organization theorists has also shown general methodological similarities. All have been concerned to conceptualize bureaucracy and formal structure as a set of dimensions which may or may not vary together. The concepts mentioned above have been subjected to a variety of kinds of scale analysis in order to form empirically reliable dimensions. All have used similar techniques of analysis, notably factor analysis and correlation and regression methods" (Hinings and Foster, _op cit_., p. 93).

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However, there are still major questions which have remained unsolved, avenues of research unexplored, and conceptual confusions unclarified.[79]

One question which the more recent studies have not succeeded in answering and which continues to agitate people in the field is the pro-eminence as a determinant factor of organizational structure of technology over other factors such as size, environment, and socio-cultural elements. Both Woodward and Perrow[80] considered technology as

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[79] As an example of conceptual problems, Mohr mentioned the fact that technology is defined either by reference to the individual or to the production sub-system. He also pointed out confusions in the concept measured and sampling problems (samples of large size organizations being pitted against samples of small size organizations). See Mohr, op. cit. Other writers indicated also that technology remains an unclear concept in its definition and operationalization. See for example Lynch, op. cit., p. 338: "The current studies in technology have remained exploratory since the boundaries of the construct, technology, are still unclear (Hage and Aiken, 1969) and since there are so many operational variables used to measure it that it is difficult to decide which variables do indeed measure technology." See also Child, "Organizational Structure, Environment and Performance...", pp. 5 and 6, and "More Myths of Management Organization?"; Lawrence C. Hrebiniak, "Job Technology, Supervision, and Work-Group Structure", Administrative Science Quarterly, 19, 3 (September, 1974): 395-410, p. 408. Hrebiniak suggested in conclusion to his study that because of the multidimensionality of technology and structure, "when dealing only with general or crude cumulative categories of either concepts, it might be unreasonable to assume clear relationships or empirical trends. Rather, it appears that the various elements of technology and structure must be stipulated and separate effects ascertained, especially when controlling for the effects of an additional class of variables, such as those related to supervision."

[80] Woodward, Industrial Organization: Theory and Practice; Perrow, "A Framework for the Comparative...". The latter stated that his perspective is based on four considerations, one of them being that "technology is considered the defining characteristic of organizations" (p. 194). However, later on, he cautioned his readers that he is using technology as a critical variable among several others and that he is not using causality in terms of temporal priorities but in terms of congruence. His argument "says that structure and goals must adjust to technology or the organization will be subject to strong strains. For a radical change in goals to be a successful one, it

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[83] *Idem.*, pp.

the most important factor in the design of effective organizational structure. As Child put it, "their arguments, taken together, imply that a high structuring of activities (task specialization and high role definition by rules and paperwork) is likely to be most effective under conditions of standardized mass production."[81]

Against this position, Child argued that the focus should be upon the work itself rather than "upon the technological adjuncts of executing tasks, and on the technical logic whereby such tasks are linked."[82] Indeed, according to him, "the planning and ordering of work, together with its meaning to those involved, is likely to be more contingent with observed behavior within organizations, with the structural manifestation of managerial control, and with factors such as uncertainty about the environment."[83] Under his theoretical reorientation, "the prevailing technology is now seen as a product of decisions on work-plans, resources, and equipment which were made in the light of certain evaluation of the organization's position in its environment. A given technological configuration (equipment, knowledge of techniques, etc.) may exhibit certain short-term rigidities and perhaps indivisibilities,

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may require a change in technology, and thus in structure, or else there will be a large price paid for the lack of fit between these variables. Furthermore, as one proceeds, analytically, from technology through the two kinds of structure to goals, increasingly the prior variable only sets limits upon the range of possible variations in the next variable. Thus, technology may predict task structure quite well in a large number of organizations, but these two predict social structure less well, and these three only set broad limits upon the range of possible goals" (p. 203).

[81] Child, "Organizational Structure, Environment and Performance", p. 5.

[82] Ibidem.

[83] Idem., pp. 5-6.

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and will to that extent act as a constraint upon the adoption of new workplans. However, rather than the technology possessing "implications" for effective modes of organizational structure, any association between the two may be more accurately viewed as a derivative of decisions made by those in control of the organization regarding the tasks to be carried out in relation to the resources available to perform them."[84] But before examining Child's argument any further, let us consider the position of the theorists of size.

It appears necessary to me to consider the argument for size here, if only briefly, for two reasons: size is the factor most often offered as an answer to technologism and it should be examined in the case of the logging industry since, over the period studied, logging organizations' size changed significantly in more than one dimension.

The dominance of size to predict the bureaucratic dimensions of organizational structure has been mostly put forward by Pugh and his colleagues[85] on the basis of the result of their empirical study. However, Blau, before them,[86] had been focusing on this factor which, he suggested, generates structural differentiation which in turn increases the absolute (though not the relative) size of the administrative components. Child summarized very well the two main causal processes which are established by size theorists.

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[84] Idem., p. 6. He mentioned the findings of the Tavistock Institute researchers and the "job enrichment" approach to support his position.

[85] Pugh et al., "The Context of Organization Structure."

[86] P.M. Blau, W.V. Hydebrand and R.E. Stauffer, "The Structure of Small Bureaucracies," American Sociological Review, 31, 2 (April, 1966): 179-191, P.M. Blau, "A Formal Theory of Differentiation in Organizations," American Sociological Review, 35, 2 (April, 1970): 201-218.

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> The first argues that increasing size offers more opportunities to reap the benefits of increased specialization. Increased specialization is likely to manifest itself in the form of greater structural differentiation which exhibits higher heterogeneity among a larger number of organizational sub-units, but which may exhibit a greater homogeneity of role within each sub-unit. This increasing complexity will render the managerial co-ordination of sub-unit activities more difficult, especially as strains towards functional autonomy may well appear, and for this reason pressure will be placed upon senior management to impose a system of impersonal controls through the use of formal procedures, the recording of information in writing and the like. The second argument reaches much the same conclusion by pointing out how the problem of directing larger numbers of people makes it impossible to continue employing a personalized, centralized style of management. Instead, a more decentralized system, using impersonal mechanisms of control, has to be adopted. The operation of such system requires higher number of administrative and clerical personnel.[87]

Child did not accept this deterministic point of view either and pointed out that "at least two important avenues of choice remain open," specifically the influence of size may be modified by breaking down large units into smaller quasi-independent ones and by adopting different techniques or technologies[88] to modify the nature of the functional activities affected by size. In trying to explain why there is such a "considerable debate as to the type of constraints which size and technology may each and both imply for organizational structure,"[89] he raised four possible explanations. The first one concerns the

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[87] Child, "Organizational Structure, Environment and Performance," p. 7.

[88] For instance, the computerization of accounting systems. This was, in fact, one means to cope with this kind of problem that the logging companies adopted. See Chapter 6.

[89] <u>Ibidem</u>.

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association of size of plant or operating unit with operations technology because of the presence of indivisibilities. The second one could be the lack of association between total organizational size (by contrast with plant size) and technology. The last two explanations would reside in the likely lack of association betwen total size and materials technology and the variation in the relative degree of constraint imposed by size and technology on different areas of organizational activity.[90] This last possibility raises an important distinction which was neglected in the past.[91] Child rightly underlined that, on that basis, considerations of technological economies most particularly related to the activities directly concerned with production may modify the implications of size. He referred more precisely to Thompson's "technological core"[92] and indicated that:

> In this core area, the prevailing technological logic may militate against a high degree of functional and role complexity even in a large organization, while under conditions where uncertainty is experienced about the environment, the consequent desire to preserve a measure of flexibility may operate to the same structural effect. In contrast, the nature of work within certain supporting functions is not likely to vary greatly, even with rapid changes in core activities. Such functions include accounting, legal, personnel and welfare. In their case increasing scale may well be reflected in a progressive functional complexity: first with such activities being differentiated away from central workflow functions, and

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[90] Ibidem.

[91] Hickson et al., "Operations Technology and Organization Structure..."; Child, "More Myths of Management Organization?".

[92] J.D. Thompson, Organizations in Action (New York: McGraw-Hill, 1967).

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> secondly with a progressive differentiation between specialized support units carrying our different tasks.[93]

As well formulated as Child's analysis of the problem might be, it leaves one important consideration aside. Work organizations are unlikely to have growth in the number of employees as a goal[94] and, in fact, the opposite is most often the case: to reduce personnel for obvious economic reasons. Thus, very often we may have to deal with situations where the size of the organization as measured by the number of employees is declining. What would then be the impact of this reduction on the structure of the organization? We do not know very well because "size theorists" have not paid much attention to it.[95]

In this study, size will not be the focus of attention and will be considered a dependent variable. This is similar to the treatment given to size by Aldrich in his path analysis. In his model, "technology is seen as causally prior to structuring of activities, the rigidity and automation in mass production technologies forcing organizations to introduce specialists and at the same time standardize their activities.

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[93] Child, "Organizational Structure, Environment...", p. 8. Thus the divergence between "technology theorists" and "size theorists" would be understood by the fact that the first ones focused their attention on core activities while the latter concentrated their attention on the organization of non-core roles.

[94] Aldrich, op. cit., pp. 32-33.

[95] This may well be related to the absence of longitudinal studies of organizations. In the past, cross-sectional analysts of the impact of size have been assuming that organizations naturally grow without distinguishing the type of growth and without accepting the possibility that organization may also decline after a more or less extended period of growth. This is one question which will be examined later since logging companies have declined in size in terms of the number of employees but have increased in terms of output (see Chapters 6 and 7).

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Further, Aldrich argued, structuring of activities has a causal impact on size because increased specialization, standardization, and formalization imply the need for a larger work force."[96] That structuring of activities implies the need for a larger work force remains an empirical matter. It may very well be that the adoption of new techniques or technologies will change these requirements as mentioned earlier.

As to Child's earlier argument against technologism,[97] it is not completely satisfactory. Nobody seems to question the fact that "the prevailing technology is...seen as a product of decisions on work plans, resources, and equipment which were made in the light of certain evaluations of the organization's position in its environment."[98] The point is that, once the decision is made to adopt a given technology or to buy certain equipment, the organization has committed itself to satisfy the structural requirements of this technology in order to be efficient.

Obviously, this does not take place in a vacuum, especially when, as it is the case in logging, technology is changed in an already

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[96]Hinings and Foster, op cit., p. 97.

[97]Child, "Technology, Size, and Organization Structure," and "Organizational Structure, Environment and Performance...".

[98]See also Richard H. Hall, Organizations: Structure and Process (Englewood Cliffs, N.J.: Prentice-Hall, 1972), p. 124. "While size and technology have been shown to be closely related to the nature of an organization's structure, it would be wrong to attribute direct causality to either factor (assuming, of course, that strong relationships can be interpolated into causal statements). As noted above in the citation by Hall et al., it is the decision to increase the number of activities or scope of operations that leads to changes in size and thus to structural alterations. These decisions would be greatly influenced by the size and nature of the environment into which the organization's output flows. If the organization perceives additional markets for its products or services, it will expand. If it is operating in a system of rapid technological change, it will adapt to, incorporate, and participate in those changes."

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existing organization. Then, as mentioned by Hall, historical and environmental factors are likely to interfere in the fit between technology and structure. I accept with him that "technology is in interaction with organizational structure, group structure, individual factors, and so on," that "the technical system of an organization interacts with the ongoing social system," and that "from this standpoint, technology will be a major determinant of the nature of organizations, but not the determinant."[99] However, I reject his claim that technology "cannot be given a primary position in the analysis" because of the above interaction.[100] True, the quest for the factor or the variable which would explain everything is long gone.[101] But one is certainly justified in his strategy to uncover and understand a situation and the relationships between a set of factors to single out one of the major determinants of the nature of the situation, make it an independent factor for the time being, and then observe what happens.

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[99] *Idem.*, pp. 33-34. In one of her last text, Woodward indicated that her position did not "mean that the sole function of the social system is the furthering of the goals and purposes of the technical system; but merely that some aspects of organizational structure and behaviour can be explained by reference to the nature of the production task. It is this belief...that provides the justification for asking the questions: what, at any point in time, does the technical system require the social system to do, and how will changes in the technical system affect what is required of the social system" (J. Woodward and J. Rackham, "The Measurement of Technical Variables", in J. Woodward (ed.), *Industrial Organizations: Behaviour and Control* (London: Oxford University Press, 1970), p.34).

[100] *Ibidem.*

[101] Although one may have serious doubt about it when reading certain pieces in the literature, Child is probably right in his claim that, in the present state of research on organization, there is "an over concentration on single factors in an organization's operating situation as determinants of which management structures are the most effective" (Child, "More Myths of Management Organization?", p. 377).

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Obviously, it is in the varying value or nature of that major determinant that one can best find out about its relationships with other determinants and its impact on the observed reality.[102] Consequently, in this study, I will not take a deterministic position concerning the role of technology. However, technology will be the priviliged variable because it is its impact which is the object of the study.

Hickson and his colleagues rightly underlined the fact that, in the past studies of the influence of technology at the individual and group levels, the organization as the unit of analysis and its formal structural features were practically ignored.[103] Their suggestion that technology has been neglected at the level of the organization is also supported by their review of the few studies which focus on this variable. There is little doubt that, on this basis alone, more work is needed to properly understand the relationship between technology and organization.[104] However, to focus on the organization as the unit of analysis and ignore the individual and group levels is to fall into another difficulty. Workers' and work groups' behavior as directly influenced or conditioned by the technology of the production system (as revealed in the preceding review of the literature) creates demands on the organization in terms of coordination and control, working conditions, communication, system of remuneration, etc. It is very difficult for instance to adequately explain certain structural features of the

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[102] This does not mean, by any means, that one is oblivious of the feedback effects which are taking place or of the intervention of other variables explicitly or implicitly integrated to the model of analysis.

[103] Hickson et al., "Operations Technology and Organization...", p. 378.

[104] Child mentioned "the considerable confusion in the literature...as to what aspects of organizational structure technology may influence" (Child, "Organizational Structure, Environment and Performance...", p. 5).

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organization such as the degree of centralization or of impersonal control without knowing and understanding the individual and group task attributes which are characteristic of the production technology.[105] In his concluding remarks on Woodward, Meissner suggested that this had been neglected in the past[106] and I know of no study since which has used this more comprehensive approach. As illustrated in Figure 1, this position of the problem implies that the influence of technology on the organization as a whole (i.e., its structure and structural characteristics) is at the same time direct and indirect through workers' and work groups' task attributes and cannot be fully understood without both dimensions of the relationship being documented.[107]

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[105] In this study, the measurement of the individual and group task attributes of the technological system are based on models of analysis developed by Meissner, Form, Goldthorpe _et al._, and Turner and Lawrence. See Meissner, _op. cit._; W.H. Form, "Technology and Social Behavior of Workers in Four Countries: A Sociotechnical Perspective," _American Sociological Review_, 37, 12 (December, 1972): 727-738; John Goldthorpe, D. Lockwood, F. Bechhofer, and J. Platt, _The Affluent Worker: Industrial Attitudes and Behavior_ (Cambridge, Mass.: Cambridge University Press, 1968); Turner and Lawrence, _op. cit_. The detail of the dimensions used is given later in this chapter.

[106] "Our comparison so far would suggest that no clear inferences can be drawn from these studies about the relations of management structure to workers' behavior systems in different technical environments. To begin with, attention will have to be paid to the technological constraints of supervisors' jobs, and a small beginning has been made. The empirical and theoretical link between the dimensions of technology at the man-machine level and the organizational level would require investigation" (Meissner, _op. cit._, p. 246).

[107] Pugh and his associates seem to have understood that from the beginning of their research since they included this in their original objective (see their article of 1963) but they did not manage to realize it. This weakens their analysis by limiting it to hypothetical suggestions in the interpretation of their results. See Inkson, _et al._, "Organization Context and Structure...", p. 318.

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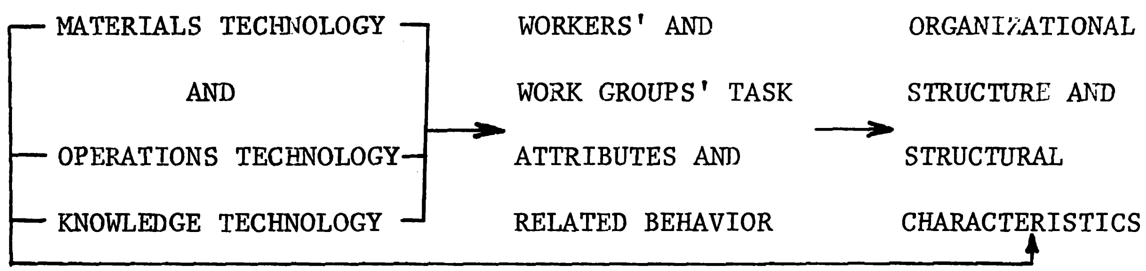

Obviously, this is an ambitious approach which could constitute in itself a program of research for several years. However, such a holistic approach is needed at one point to attempt to reflect and reconstitute the totality of reality. It may even prove to be particularly rewarding if used in the historical study of a small group of organizations or the case study of a single industry such as the pulpwood logging industry.

Thus, despite the recent abundance of research and the progress made in conceptualizing technological variables and dimensions,[108] and "although there is convincing evidence of a link between technological organization and various aspects of complex organizational structure and functioning and considerable agreement on the nature of the critical variables,"[109] any firm conclusion is impossible to reach and the need remains for further analysis of this problem. Indeed, the significance of technological elements as independent variables still

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[108] Hunt, op cit., p. 243.

[109] Jones, op. cit., p. 224.

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requires more precise statement than can be found in the literature[110] for the analysis of its precise dimensions and variations has been little developed.[111] Until this is done, the nature, degree and conditions of its effects remain controversial.[112]

"It is not clear, for example," wrote Jones, "which technological elements determine which aspects of structure and functioning, which simply sets limits on variation, and which are only regarded as associated with organizational variation." [113] According to him, the solution to these questions could not be found "in research restricted to documenting the existence of a relationship between technological organization and other aspects of complex organizations but through the development of a systematic formulation of the relationship."[114]

E. Guiding Hypotheses

At the outset of this study, I envisaged the possibility of testing hypotheses grounded on the position that production technology constitutes the primary determinant factor of organizational structure. As it evolved later on, the study did not constitute properly speaking a test of hypotheses and I do not claim to have accomplished that now. However, I would like to state in the following paragraphs some of the

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[110] Ibidem.

[111] H. Hage and M. Aiken, Social Change in Complex Organizations (New York: Random House, 1970): especially Chapter 5.

[112] Hunt, op. cit., p. 243.

[113] Jones, op. cit., p. 224.

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working hypotheses and expected findings which guided me throughout the field work and the analysis.

Since I have been dealing with four organizations belonging to the same industry and operating within a generally similar environment, I expected all along that these organizations would use a very similar production technology (operations and materials technology) and would be similar also in their organizational structure. More importantly, the study being historical, I expected these organizations to go through similar structural changes as they modified their production technology. And it is in so far as these organizations went through similar organizational changes that the influence of technology could be observed.

From the beginning, I had obviously some ideas concerning two important dimensions of the relationship between technology and organization, the direction taken by the changes in both dimensions and their characteristics. For one, the change in production technology involved the shift from a very poorly mechanized system of production to one which is now highly mechanized and still becoming increasingly more so. As for the logging system of production, it has always consisted in the mass production of a simple and standardized product ("routine technology"). In numerous studies, such a system of production has been generally associated with a bureaucratic organizational structure, the bureaucratic character increasing with the level of mechanization.[115]

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[115] I could quote a considerable number of studies to support this statement. Let me mention a few of them: P. Naville, _Vers l'automatisme social_ (Paris: Gallimard, 1963); Woodward, _Industrial Organization: Theory and Practice_; A. Touraine, _op. cit._; Tom Burns and G.N. Stalker, _The Management of Innovation_ (London: Tavistock Institute 1961); Pugh _et al._, "An Empirical Taxonomy of Structures...";

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On the basis of these previous findings and of preliminary observations which I had made of the industry, I thus expected to find a higher degree of specialization, a greater degree of standardization, formalization and centralization, a higher ratio of non-productive to productive personnel and a greater number of levels in the hierarchy as the technology of production was changed.[116]

As suggested and substantiated by many writers before (Scott et al., Woodward, Harvey, Zwerman and others),[117] a key dimension of the organizational structure which is closely related to and influenced by the technology of production is the occupational structure of the organization or what Hickson et al. calls "job-counts" features and Child the "shape" related features of the organization.[118] Following these writers, I expected that the mechanization of logging operation would lead to:

Child and Mansfield, "Technology, Size, and Organization Structure"; Hickson et al., "Operations Technology and Organization Structure..."; Hall, op cit.; Zwerman, op. cit.

[116] Or, to use Pugh et al.'s conceptual formulation, high scores on the structuring of activities, on concentration of authority, on work-flow integration, on standardization of procedures for selection and advancement, and on formalization of role definition (their "nascent full bureaucracy") but a low score on line control of work-flow (see "An Empirical Taxonomy of Structures...").

[117] W.H. Scott, A.H. Halsey, J.A. Banks and T. Lupton, Technical Change and Industrial Relations (Liverpool, England: Liverpool University Press, 1956); Woodward, op cit.; Edward Harvey, "Technology and the Structure of Organization," American Sociological Review, 33, 2 (April, 1968): 247-259; Zerman, op. cit.

[118] Hickson et al., "Operations technology and Organization Structure..." and Child and Mansfield, "Technology, Size, and Organization Structure."

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(3) an increase in the span of control of first-line supervisors (horizontal span of control);

(4) a diminution in the ratio of non-supervisory to supervisory personnel;

(5) a diminution in the ratio of direct to indirect labor;

(6) a diminution in the ratio of production to maintenance workers;

(7) an increase in labor costs (in excess of the annual regular increase);

(8) an increase in the level of education required by hiring policies;

(9) an increase in hiring outside of the organization as part of promotion policies.

In most of the studies referred to above, only one dimension of technology, namely operations technology, was considered. The influence of materials technology was ignored. In many cases, this approach may make sense but to ignore it systematically may lead to poor results. Certainly one cannot ignore the impact of materials technology on logging organizations. Following Perrow's discussion of this question and Thompson's similar ideas expressed on the subject at about the same time,[119] we should expect logging organizations to be mostly affected in the following dimensions of their structure: concentration of authority, line control of workflow, and spatial dispersion of operations. To use Perrow's concepts, logging raw materials is non-uniform,

[119] Perrow, "A Framework for the Comparative..."; Thompson, op. cit.

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widely dispersed and well understood and as such can be the object of analyzable search. Accordingly, logging falls somewhere in the non-routine but analyzable group of activities. The type of organization corresponding to this situation should be, in Perrow's model, flexible and relatively centralized. He would probably describe this type as one where the middle management level (or technical level) enjoys a high degree of power because it controls the supervisory level on the basis both of routine reports and advanced planning. Coordination within this level as well as the lower level (supervision) of management is through feedback and planning, but with planning giving further power to the technical level because events can be foreseen. The interdependence of the two groups should be relatively low. That is, the supervisors of production do not "work closely with the technical people in the administration of production since the latter [can] call the shots for the former on the basis of routine information sent upstairs."[120] Finally, the level of discretion and power of the lower management group should be relatively low.

However, this picture is likely to be distorted in some of its features by the following considerations. Firstly, because of the wide dispersion of the raw materials and its low density, and for some other reasons related to fire hazards, to the preference for stable costs of production, and to transportation requirements, logging operations must be fragmented in several locations which are usually not only far from each other but also from the divisional (or middle management)

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[120] Perrow, Organizational Analysis: A Sociological View, pp. 80-82.

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headquarters. The effects of this spatial dispersion are likely to be, according to Hall's review of the literature, to (a) increase the administrative component; (b) decrease the structuring of activities; (c) increase the concentration of authority; and (d) increase the line control of workflow.[121]

These tendencies, especially the last three, are further accentuated by the greater uncertainty introduced in the production process by the wide and largely unpredictable variations in the characteristics of the physical environment (terrain conditions and climatic conditions).

Under these more comprehensive conditions, the lower management level is likely to have more discretion and power because of the considerable differences (partly unpredictable) in local conditions. Thus this favors a relatively high level of line control of workflow. To counteract this situation, middle management is likely to emphasize feedback coordination and increase the frequency and details of feedback reports in order to maintain its control and be able to intervene in the local situation soon enough before anything goes wrong. This means a greater interdependence between the technical level and the supervisory level. At the same time, since the range of variations in both the raw materials and the physical environment is relatively well-known, broad rules and procedures can be established by the middle and upper management levels. For all these reasons, one should expect a relatively high concentration of authority, especially at the middle level of management.

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[121] Hall, op. cit., pp. 161-163.

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In its assessment of the influence of technology, the Aston group mentioned that this influence appears to be much more determinant for small organizations. In other words, change in operations technology would affect the entire structure of small organizations whereas its effects in large organizations would be limited mostly to the production system (and probably to parts of it). I suggested before that size is not in itself the cause of such a phenomenon but rather the variations in functional differentiation which are usually directly related to size. An increasing functional differentiation creates an increasing autonomy of the sub-system of the organization ("functional autonomy") which contributes to isolate them from the impact of change in other sub-systems.[122]

If this line of reasoning is correct, it would suggest that as the logging organizations become more functionally differentiated and bureaucratized, the overall impact of further changes in operations technology on the structure of the organization as a whole is likely to decrease and to be limited to the functions which are more closely related to production (such as maintenance and repair, supply, and inspection).

These are some of the ideas which guided the research and the organization of this report. In sum, I will describe and analyze the economic (Chapter 3), organizational (Chapter 4) and social

[122]As mentioned by many students of organization, the sub-units of an organization have different technologies and different organizational requirements which often result in conflict among them. See, for instance, E. Litwak, "Models of Organizations Which Permit Conflict," American Journal of Sociology, 67, 2 (September, 1961): 177-184; Child and Mansfield, "Technology, Size and Organization Structure"; Hickson, et al., "Operations Technology and Organization Structure..."; Hall, op. cit.; Lynch, op. cit., pp. 350-351.

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(Chapters 4 and 7) context or environment within which technological change in the form of greater mechnization of the production process (Chapter 5) took place in the pulpwood logging industry. During the same period, there has been a parallel change in the organizational structure, an increase in its bureaucratization (Chapter 6), which was necessitated by the change in technology (Chapters 6 and 8). However, the process of bureaucratization was halted in its progression by the conditions created by the physical and social environment (Chapters 4, 5, 6 and 7).

Before starting with the description and analysis of these realities, there are two more tasks awaiting me: to discuss the conceptual and operational framework used in the study in the remaining part of this chapter and, in the next chapter, to clarify and justify my methodological approach.

II. Conceptual Framework

My purpose in this section is to discuss the major theoretical concepts which constitute the basis of the study. I will consider, in order, organization and structure, technology, technological change, environment, performance, and organizational change.

A. Organization and Structure

In this study, organizations are conceived as open systems involving "the rational coordination of the activities of a number of people for the achievement of some common explicit purpose or goal, through a hierarchy of authority and responsibility."[123] The concept of "system"

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[123]Edgar Schein, Organizational Psychology (Englewood Cliffs, N.J.: Prentice-Hall, 1965), p. 8. The system approach is used here by

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accounts for "the interactions and mutual dependencies of internal organizational and environmental variables."[124] This conception of organizations is particularly useful in the analysis of the effects of change.[125] The organization then constitutes a more or less open system[126] characterized by a constant process of exchange with its environment where both are mutually influenced in a ceaseless input-throughput-output cycle. The organization cannot be understood nor survive in isolation.[127] Consequently, "no single final state or

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opposition to other approaches such as the cluster approach which do not apply as well. See W.V. Heydebrand, "The Study of Organizations," in same (ed.), Comparative Organizations, pp. 51-52.

[124] Ibidem. Emery and Trist wrote: "in a general way it may be said that to think in terms of systems seems the most appropriate conceptual response so far available when the phenomena under study -- at any level and in any domain -- display the character of being organized, and when understanding the nature of the interdependencies constitutes the research task" (F.E. Emery and E.L. Trist, "The Causal Texture of Organizational Environments," Human Relations, 18, 1 (February, 1965): 21-32, p. 21).

[125] Zwerman, op. cit.

[126] Thompson, op. cit. Thompson tried to reconcile the mechanistic and closed system approach of the classical school with the open system tradition of the modern theory. Following the "problem-solving" approach of March and Simon, Thompson saw complex organizations "as open systems, hence indeterminate and faced with uncertainty, but at the same time as subject to criteria of rationality and hence needing determinateness and certainty" (p. 10). Technology and environment are the two main sources of uncertainty, the first one being a variable (thus controllable) and the second one being a constraint or a contingency. They both jeopardize the instrumental rationality of the organization, hence the certitude of its performance. The organization tries to assure its technical rationality by isolating the most technical part of the system (its production system) from influences external to the system.

[127] J.E. Haas and T.E. Drabek, Complex Organizations: A Sociological Perspective (New York: The Macmillan Co., 1973), pp. 83 and following.

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structure is assumed to be best for all organizations, as the qualities of their environments are different."[128] Variations in environment thus require variations in organizational structure. In this process of adaptation, the composition of the system tends to remain constant while subject to a quasi-continuous increase in complexity and differentiation. In other words, the system is viewed as "ultra-stable," that is capable of maintaining "its identity through a series of structural and organizational changes undergone in the process of adaptation to changing situations."[129] As Child put it:

> The notion of organizations as systems acknowledges that they are characterized by feedback loops, thus any simple uni-directional model of causality...will be ruled out on theoretical grounds. The idea of organizations as open systems further implies that they are characterized by equifinality (von Bertalanffy, 1969). This characteristic means that the same system state may be reached by different routes. In terms of the consideration of the relationships between technology, size, and structure, equifinality means that an organization can be moved to a particular system state from a previous system state no matter whether technology, size, or structure is changed first. Whereas closed systems tend towards a time-independent equilibrium state, an "open system _may_ attain a time-independent state where the system remains constant as a whole and in its phases, though there is a continuous flow of the component materials. This is called a steady state" (von Bertalanffy, 1969:71). The system may then be represented by a series of simultaneous equations relating the various system parameters and the inputs from and outputs to the environment.[130]

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[128] _Idem._, p. 86.

[129] Renate Mayntz, "The Study of Organizations. A Trend Report and Bibliography," _Current Sociology_, 13 3 (1964): 95-119, pp. 101-102.

[130] Child and Mansfield, "Technology, Size and Organization Structure," p. 371; L. von Bertalanffy, "The Theory of Open Systems in Physics and Biology" (1950), reprinted in F.E. Emery (ed.), _Systems Thinking_ (Harmondsworth, England: Penguin, 1969).

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Other features of this model indicate that the focus of analysis is rather upon observable patterns of activity than upon individual actors.[131] Organizational boundaries, which are somewhat difficult to conceptualize, change, are permeable and are determined according to the problem at hand.[132] The system of interaction, outside as well as inside the organization, reflects differences in power, control and autonomy which are continually subject to renegotiation between the layers or groups involved.[133]

Organizations as systems are thus composed of many sub-systems (groups, departments, shops, etc.) in dynamic interaction with one another and in mutual dependency. However, one should not exaggerate this important feature of the model. Gouldner, for one, has suggested

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[131] Haas and Drabek, op. cit., p. 88. For some research implications of the use of a system perspective, see the same, pp. 306-308.

[132] Idem., pp. 88-89.

[133] Idem., p. 90. The adoption of the system model in this study is for its heuristic value and its relevance to the problem at hand. Although various criticism have been formulated against it, I believe that its shortcomings do not destroy its usefulness for the present study. Some of these criticisms do not apply in the present case while others have been taken into account. For instance, I fully integrate technology within the model here. Moreover, I take into account the fact that its handling of change is generally too exclusively focused on the external influence of the environment neglecting the internal sources of change. Organizations, as emphasized by Blau and Scott, are constantly facing internal "dilemmas" which contribute largely to structural change (see P.M. Blau and W.R. Scott, Formal Organizations (San Francisco: Chandler Publishing Co., 1962), Ch. 9). For further elaboration of the open system model, see D. Katz and R.L. Kahn, The Social Psychology of Organizations (New York: Wiley, 1966); W. Buckley, Sociology and Modern Systems Theory (Englewood Cliffs, N.J.: Prentice-Hall, 1967) and (ed.), Modern Systems Research for the Behavioral Scientist (Chicago: Aldine Publishing, 1968). For a further evaluation of this model, see Silverman, op. cit.

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how this interaction involves relative autonomy as well as interdependence.[134] The various departments or specialized sub-units embody the main functions of the organization. Functions are defined here as systems "of actions (or activities), centered around the use of a technique, which contribute to the realization of the goal of the firm or of one of its sub-goals."[135] These functions are not at the same level and the distinction made by Woodward[136] between "task-functions" (basic activities) and "element-functions" (service activities) can be usefully referred to here. The first ones are directed toward specific, identified and coordinated results and are independent from each other (i.e., they can be performed separately in time and space). On the contrary, the second ones are seldom oriented toward specific results, cannot be separated in time and space without difficulties and appear usually as soon as the task-functions are established.

Finally, the structure of the organization refers to the differentiated network of activities and groups of activities and functions,

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[134] A.W. Gouldner, "Reciprocity and Autonomy in Functional Theory," in Llevellyn Gross (ed.), Symposium on Sociological Theory (New York: Harper and Row, 1959), Ch. 8, pp. 241-271. This is a good example of internal "dilemma". Both characteristics are essential for the existence of the system, its maintenance and its satisfactory functioning. On the one hand, too much dependency or interdependency creates rigidities and the inability of the parts of the system to innovate enough to survive. On the other hand, too much autonomy contributes in the end to a loss of power and control by the system over its components and eventually leads to its complete disintegration. For Gouldner, variations in dependence and autonomy between components constitute a critical index of the nature and importance of the function performed by these parts for the system and of their position in it.

[135] Jacques Lobstein, "Structure et organisation de l'entreprise 1", in G. Friedmann and P. Naville (eds.), Traité de sociologie du travail (Paris: Armand Collin, 1961), Tome 2, p. 46. My translation.

[136] Woodward, Industrial Organization: Theory and Practice, Ch. 7.

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and the patterns of coordinated relationships which bind them together. In this study, I am concerned only with the formal structure (the explicit and official patterns) and the occupational structure (the division of the personnel "into categories on the basis of differences of functions and skill").[137] As mentioned earlier in this chapter, the characteristics of the formal structure constitute the central focus of the study. It is, indeed, mostly through the variations in these characteristics that the impact of technology is felt and revealed by the organization. I have used, with minor adaptations, five familiar structural characteristics defined and operationalized by the Aston group: specialization, standardization, formalization, centralization and configuration, as well as the composite dimensions which they obtained from their factorial analysis: the structuring of activities, the concentration of authority, the line control of workflow, and the size of the supportive component.[138] Child summarized well the meaning of the main structural characteristics.

> Functional specialization indicates the number of functional specializations from a list of sixteen which are performed in an organization by a specialist -- that is, a person whose fulltime job involves solely the function in question. Role specialization summarizes the extent to which a variety of roles within each of the sixteen functions are performed by specialists. Standardization indicates the number of rules and procedures from a given list which are extant in an organization. Formalization indicates the extent to which paperwork is used to

[137] Scott _et al._, _op. cit._ In the present study, occupations are classified according to their functions in the logging operations. See Chapters 5 and 7.

[138] Pugh _et al._, "Dimensions of Organization Structure."

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> execute procedures and to pass information. Role performance recording is a subscale of formalization and refers to paperwork relevant to recording role performance. Centralization indicates the average locus of decision-making over a list of repeated decisions along a hierarchical scale running from operative level up to decisions taken above the chief executive. The term 'configuration' refers to a number of measures of the shape of the organization structure such as 'vertical span' (number of hierarchical levels) and 'subordinate ratio' (average number of direct workers per first-line supervisor).[139]

As for the meaning of the composite structural dimensions, it is well summarized by the following quotations from the Aston group.

> In summary, structuring of activities refers to the degree of formal regulation of the intended activities of employees (a bureaucratic dimension); concentration of authority is the degree to which authority for decisions rests in controlling units outside the organization and is centralized at the higher hierarchical levels within it; line control of workflow refers to control of operations on the throughputs being exercised directly by line management, as against impersonal control through records and procedures by staff departments;[140] [and] relative size of supportive component is concerned with the amount of auxiliary activities of a non-control kind.[141]

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[139] Child and Mansfield, "Technology, Size, and Organization Structure." pp. 376-366.

[140] Hickson et al., "Operations Technology and Organization Structure...", p. 385.

[141] Pugh et al., "Dimensions of Organization Structure," p. 87. These dimensions are constituted of the following variables.

(a) Structuring of activities:
- Overall role specialization
- Functional specialization
- Overall standardization of procedures
- Overall formalization (documentation)

(b) Concentration of authority:
- Overall centralization of decisions
- Percentage of workflow superordinates
- Autonomy of the organization
- Standardization of procedures for selection and advancement, etc.

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This procedure is, in my view, justified since Pugh and his associates have synthesized most of the literature on the subject and elaborated a detailed and very extensive instrument of measurement. As Levy and Pugh put it themselves,

> 'the concept of structuring of organizational activities', for instance, 'has the advantage over the Weberian concept of bureaucracy in that it applies without difficulty to any or all parts of the organization; whereas it is a source of contention whether the concept of bureaucracy can or cannot be applied outside the administrative hierarchy, to the overflow operatives. Both clerical activities and shop floor activities can be more or less structured; whether they can both be bureaucratized is open to question. Structuring therefore includes and goes beyond the usage of the term bureaucracy. It has the further advantage of being conceived and defined as an operationalized dimension and not as an abstract ideal type (Pugh et al., 1968)'.[142]

Structural change is obviously identified and measured in terms of the observed modifications to the structural elements and their characteristics. This means, for instance: variations in the degree

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(c) Line-control of workflow (vs. impersonal control):
- Subordinate-supervisor ratio (negative)
- Formalization of role performance recording (negative)
- Standardization of procedures for selection and advancement, etc.
- Percentage of workflow superordinates

(d) Relative size of supportive components
- Percentage of clerks
- Vertical span
- Percentage of non-workflow personnel

(See Pugh et al., "Dimensions of Organization Structure," pp. 456-461). See Appendix A for the detailed scale items and the operational definitions of the major scales.

[142] Levy and Pugh, "Scaling and Multivariate Analyses in the Study of Organizational Variables," pp. 208-209.

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of formalization, centralization, etc.; changes in the chart of the organization; and changes in the occupational structure (quantitative as well as qualitative): distribution of the labor force by occupation, description of occupations (job description), and academic and professional qualification and training for each occupation.[143]

B. Technology

A review of several definitions of technology used by a variety of writers from different disciplines show that these definitions vary somewhat mostly according to the purpose of each researcher's study. For instance, more interested by the man-machine relationships, Faunce[144] considered the degree of mechanization of the production system components (power source, processing procedures, material handling procedures, and control procedures) as the key element to distinguish three types of production systems: craft, mechanized and automated productions. However, the mere presence of the machine should not lead one to conclude at the existence of a given type of production system. Thus the computer does not necessarily equal to automation. As Faunce remarked, the latter involves also "the automatic control of an integrated production system."[145]

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[143]According to Scott *et al.*, the occupational structure seems to be the aspect of the social structure most closely related to and influenced by the technology of production (Scott *et al.*, *op cit.*, p. 16).

[144]W.A. Faunce, *Problems of an Industrial Society* (New York: McGraw-Hill, 1968), Ch. 2, "Automation and Industrial Society."

[145]One finds a similar distinction between the man-machine level and the organizational level of technology in Meissner, *op. cit.*, and Thurley and Hamblin who wrote that "mechanization is related to factor (degree of planned variation in the operations), but is distinct from it, since it is possible to have, on the one hand, highly

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One finds a similar approach in Woodward who borrowed from Dubin the distinction between the tool level (essentially the mechanical equipment) and the control level (pertaining to "the goals of the work, its functional importance, and the rationale of the methods employed").[146] These last elements are all dimensions present in the works of other students under the concepts of knowledge and know-how.[147] Another element which has been also included in technology by some theorists is the raw materials involved in the production process.[148] Indeed, certain characteristics of the materials such as uniformity and stability (or lack of)[149] and hardness[150] determine to a significant extent the nature of the tools and mechanical equipment used and the sequencing of the workflow operations. Thus, adapting a definition

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mechanized batch production, and on the other, mass production which uses mainly human labour" (in Meisnner, op. cit., p. 7).

[146]In this respect, as shown by Woodward, the intended goals will determine much which tools, machines and technical processes will be used in the operations technology.

[147]Charles Perrow, "Hospitals: Technology, Structure and Goals," in J.G. March (ed.), Handbook of Organizations (Chicago: Rand McNally, 1965), Ch. 22, pp. 910-971; R.S. Merrill, "The Study of Technology" and "Technology" in David L. Sills (ed.), International Encyclopedia of the Social Sciences (New York: The Macmillan Co. and The Free Press, 1968), pp. 581 and following; Meissner, op. cit.; Charles R. Walker (ed.), Modern Technology and Civilization (New York: McGraw-Hill, 1962); Blauner, op. cit.; Hickson et al., "Operations Technology and Organization Structure..."; Thompson, op cit.; R.M. Cyert and J.G. March, A Behavioral Theory of the Firm (Englewood Cliffs, N.J.: Prentice-Hall, 1963).

[148]Perrow, "A Framework for the Comparative..."; Walker, op. cit.; Meissner, op cit.; W.A. Rushing, "Hardness of Material as Related to Division of Labor in Manufacturing Industries," Administrative Science Quarterly, 13, 3 (September, 1968): 229-245.

[149]Perrow, op. cit.

[150]Rushing, op. cit.

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given by Perrow,[151] technology may be identified as a group of integrated means, that is, (1) raw materials; (2) tools and machinery; (3) sources of energy; (4) techniques and procedures involving skills and know-how; and (5) knowledge; applied to realize a particular end which is to "alter 'materials' (human or non-human, mental or physical) in an anticipated manner."[152]

While "before 1965 the most fequently used variables in the technology studies were the 'degree of mechanization, flexibility, operationality of sub-goals and the amount of technical knowledge required by the job'," [153] more recent studies have used a classification more or less similar to the one established by the Aston group. Hickson et al., grouped the various elements of technology into three categories of "types" of technology: operations technology, materials technology, and knowledge technology. He defined them respectively as (a) "the equipping and sequencing of activities in the workflow" (i.e., producing and distributing the output), (b) the "characteristics of the materials used in the workflow," and (c) the "characteristics of the knowledge used in the workflow."[154] While all these aspects of

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[151] Perrow, "Hospitals: Technology, Structure and Goals," pp. 915-916.

[152] Perrow's conceptualization as explicitated later in his "A Framework for the Comparative..." represented a step ahead in extending the theoretical perspective of Woodward to organizations other than the industrial ones studied by Woodward. See Lynch, op. cit.

[153] Stanley Udy, "The Comparative Analysis of Organizations," in J.G. March, op. cit., Ch. 16, pp. 678-709, p. 700. Quoted in Lynch, op cit., p. 338.

[154] Unless otherwise indicated, these quotations and the following ones are from Hickson et al., "Operations Technology and Organization Structure...". Operations technology is somewhat defined more explicitly by Form when he distinguished (a) the tools and machinery (designed for certain operations) from (b) the specific routines

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technology are dealt with in this study, the focus is mostly on the first two, operations and materials technologies.

The measurement of operations technology is made by using the five scales and other characteristics proposed by the Aston group. This is currently the most precise and most complete instrument available. The five scales are: (a) the "level of workflow rigidity"; (b) the "level of automation (or mechanization) of equipment" (two scales); (c) the "level of continuity of the units of throughput"; and (d) the "level of specificity of evaluation of operations."[155] The other characteristics suggested by Pugh and his colleagues are: (a) "operating continuity" (week days only, twenty-four hours a day, etc.); (b) "variety of sequences" (for instance, the different sequences of activities of the three logging systems in Chapter 5); (c) "uniformity of equipment" (range of types used and their special features); (d) "throughput cycles" (the time to produce a unit of output); and (e) "throughput rate" (output per unit of time). Pugh and his associates did not use the last five characteristics because of difficulties either in conceptualization, operationalization, data collection, or effective discrimination. However, because I study organizations belonging to the same industry, I do not face the same difficulties

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required to operate those machines and (c) the design of the workflow itself. See his "Technology and Social Behavior: A Comparative...".

155 Including mode as well as range of inspection measurements (see Child and Mansfield, "Technology, Size, and Organization Structure," p. 386). In this study, these scales are used for their operational value only and no attempt is made to use them as statistical instruments since the number of cases is very small.

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and the use of these characteristics is likely to make the instrument more sensitive to possible differences between companies.

The scale of workflow rigidity operationalizes some aspects of the definition of the adaptability of technology borrowed from Thompson and Bates.[156] It includes "eight biserial items concerned with the adaptability in the patterns of operations." Here is the list of these items:

- No waiting time possible (versus waiting time)
- Single-purpose equipment (versus multi-purpose)
- Production or service line (versus no set line)
- No buffer stocks and no delays possible (versus buffer stocks and delays possible)
- Single-source input (versus multiple source)
- No rerouting of work possible (versus rerouting of work possible)
- Breakdown stops all workflow immediately (versus not all workflow stops)
- Breakdown stops some or all workflow immediately (versus no workflow stops).[157]

The two scales developed by Pugh _et al_. to measure the level of automation (or mechanization) were too general to be used alone and have been completed by a detailed inventory of the mechanical equipment

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[156] J.D. Thompson and F.E. Bates, "Technology, Organization and Administration," _Administrative Science Quarterly_, 2, 3 (September, 1957): 323-343.

[157] Thus, "a highly workflow integrated technology is signified by:
(a) automatic repeat-cycle equipment, self-adjusting;
(b) single-purpose equipment;
(c) fixed 'line' or sequence of operations;
(d) single input point at commencement of 'line';
(e) no waiting time between operations;
(f) no 'buffer stocks' between operations;
(g) breakdown anywhere stops workflow immediately;
(h) outputs of workflow (production) segments/departments become inputs of others, i.e., flow from department to department throughout;
(i) operations evaluated by measurement techniques against precise specifications" (Hickson _et al_., "Organization: Is Technology the Key?", p. 25).

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used by the logging companies throughout the period under study. These two scales are the "automaticity mode" indicating "the level of automaticity of the bulk of the equipment of the organization" and the "automaticity range" which shows "the highest-scoring piece of equipment the organization uses, since every organization also score(s) the lowest possible by using hand tools and manual machines."

The interdependence of workflow segments constitutes the fourth scale and measures "the degree of linkage between the segments of an organization." Segments are defined as "those parts into which the workflow hierarchy [is] divided at the first point of division beneath the chief executive."[158] In this study, the chief executive refers to the vice-president woodlands or its equivalent. There are three points on the scale:

- Segments duplicated in different locations, all having the same final outputs;
- Segments having different final outputs, which are not inputs of other segments;
- Segments having outputs which becomes inputs of other segments.

The fifth scale, the specificity of criteria of quality evaluation, refers to "the precision with which the output [is] compared to an acceptable standard," Again, it is a three point scale:

- Personal evaluation only;
- Partial measurements of some aspects(s) of the output(s);
- Measurements used over virtually the whole output, to compare against precise specification (the "blueprint" concept).

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[158] As well as at lower levels in the workflow hierarchy, I distinguish also vertical segments from horizontal segments. See Chapter 5 for further details.

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As to the second type of technology, materials technology, I will consider the following characteristics: hardness, uniformity, size, stability, weight, and slipperiness. The variations in these characteristics may have several consequences. They may slow down the pace of work, increase the risk of accident, affect the overall productivity of workers and equipment, increase the time and the cost of maintenance, make obsolete certain types of equipments and necessitate a reorganization of the workflow and the work teams. Knowledge technology is described on the basis of Perrow's distinction between the degree of understanding of the raw materials possessed by the personnel of the logging companies and the nature of the search procedure undertaken when the unfamiliar situations arise.[159]

In order to measure the constraints created by operations technology for workers and work groups, a model of analysis adapted from Form, Meissner and Goldthorpe is used. In his analysis, Meissner[160] focused on the variations in the characteristics of cooperation, influence and communication created by (1) spatial constraints, (2) functional constraints, and (3) temporal and perceptual constraints (attention requirements) which led him to distinguish between technically required and technically possible behaviors. Goldthorpe *et al.* considered how the technical arrangements or the type of productive technology may impose constraints which affect the structuring of social relations at work among workers and between them and their

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[159] Perrow, "A Framework for the Comparative..." and *Organizatinnal Analysis: A Sociological View*, pp. 75 and following.

[160] Meissner, *op. cit.*, pp. 21-38.

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supervisors. The constitution of work groups and the maintenance of their solidarity was seen "as being primarily dependent upon technology." In their description of the technological environments of the various occupational groups in the automobile industry, they divided technological factors in two groups, the positive or facilitating ones and the negative or impeding ones. The former included the degree of interdependence with others in the same occupational group, the degree of control over the work process, and the degree of freedom of movement. The latter comprised spatial constraints on informal group relations, other environmental constraints such as noise, and the frequency of deployment involving changes in work location.[161] In studying technological constraints on the social interaction of automobile workers, Form referred to similar distinctions although he developed the classification and considered the technical, ecological, and social dimensions of the technological environment. According to his model, each major logging occupation of the production process will be described in terms of the following dimensions: (a) _control dimensions_ (tools and machines, workflow and amount of control, pace of work and control, and operation cycle), (b) task differentiation, (c) work attention requirements, (d) technological interdependence, (e) technically permitted interaction, (f) technically permitted cooperation, (g) spatial constraints and type of spatial boundaries, (h) source of influence, and (i) communication (duration and type).[162]

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[161] Goldthorpe _et al_., _op cit_., pp. 43-68.

[162] Form, "Technology and Social Behavior: A Comparative...", p. 730. See also Turner and Lawrence, _op. cit_.

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C. Technological change

There was no way of defining a priori the changes which were important enough for this analysis without taking the risk of excluding meaningful changes.[163] Every change in operations technology was noted, described and assessed in terms of the equipment, the task(s) and the phase(s) of the workflow which were affected by it. I paid attention, in particular, to distinctions made by Merrill between "invention," "innovation," "imitation" (the diffusion of innovations), and "improvement" for possible differences in impact on the structure of the organization.[164]

Three classical indices were also used to assess the importance of the changes: variations in productivity, ratio of capital invested to work force, and modifications in the occupational structure as well as in the distribution of the labor force by occupation.

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[163] This carefulness is not an exaggeration. Indeed, in some cases, technical change means the fundamental reorganization of the system of production and radical changes in the management process, while in others it has little effect on both. Furthermore, the scale of change does not necessarily indicate the extent of its effects and the nature of the change is not necessarily an indication of its effect on the production system. See Joan Woodward (presented by J.J. Rackham), "Automation and Technical Change: The Implications for the Management Process," in G.W. Dalton and P. Lawrence (eds.), Organizational Structure and Design (Homewood, Ill.: R.D. Irwin and The Dorsey Press, 1970), pp. 297-309. In a broader context, one can point out to the "container" revolution of the transportation industry and, at a much earlier period, to the revolution created by the adoption of the stirrup by the Franks in the ninth century (see L. White, Medieval Technology and Social Change (Cambridge, Mass.: Oxford University Press, 1962)).

[164] Merrill, "The Study of Technology." Generally speaking, technological innovations have a greater impact than technological improvements. Logging companies which have been innovating rather than imitating may display, for instance, a greater degree of specialization than the other companies.

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D. Environment

The environment of organizations has received increasing attention from researchers in the field in recent years.[165] This is in marked contrast with the lack of concern for this factor in the past.[166] However, if recent studies have shown, without any doubt, the necessity of considering the environment as a major variable in the analysis of organizational behavior and structure, there is no consensus regarding the conceptualization of the environment and its relationships with the organization.[167] Critics mention the use of "platitudinous" definitions (such as "everything external to the organization") and the unsystematic nature of the research done by scholars working from a variety of perspectives which leads to controversy about the dimensions of the environment and its relationships with

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[165] See, for instance, S. Terreberry, "The Evaluation of Organizational Environments," Administrative Science Quarterly, 12, 4 (December, 1968): 590-613; Harvey, op. cit.; Paul Lawrence and Jay Lorsch, Organization and Environment (Boston: Graduate School of Business Administration, Harvard University, 1967); Burns and Stalker, op. cit.; A.K. Rice, The Enterprise and its Environment (London: Tavistock Institute, 1963); Thompson, op. cit.; Alfred Chandler, Strategy and Structure (Cambridge, Mass.: The M.I.T. Press, 1962).

[166] David F. Gillespie and Sil D. Kim, "An Integrated Framework for Interpreting Organization-Environment Relationships," unpublished paper read at the 69th Annual Meeting of the American Sociological Association, Montreal, 1974, p. 1.

[167] For recent evaluations of the organization-environment theory and research, see Raymond E. Miles, Charles C. Snow, and Jeffrey Pfeffer, "Organization-Environment: Concepts and Issues," Industrial Relations, 13, 3 (October, 1974): 244-264; Gillespie and Kim, op. cit.; Henry Tosi, Ramon Aldag, and Ronald Storey, "On the Measurement of the Environment: An Assessment of the Lawrence and Lorsch Environmental Uncertainty Subscale," Administrative Science Quarterly, 18, 1 (March, 1973): 27-36; R.N. Osborn and James L. Hunt, "Environment and Organizational Effectiveness," Administrative Science Quarterly, 19, 2 (June, 1974): 231-246.

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organization.[168] Others indicate that only limited aspects of the environment are dealt with at any one time, that most studies have been descriptive of the relationships between organization and environment without specifying how these were achieved, and that most studies did not focus on the relationships over time.[169]

In this study, the focus is on two specific dimensions of the environment which have particular relevance for the logging organizations: the physical and social environments. The first dimension has been neglected in previous studies and it is the intention of this writer to show how important it can be in certain industrial activities such as logging, mining, etc.[170] The relevance of the socio-economic environment to understand the evolution of logging organizations will become apparent also especially in Chapters 3 and 7. In this respect, one could possibly draw a parallel between the evolution of the textile industry in England as depicted by Smelser[171] and that of the logging

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[168] Gillespie and Kim, op. cit., p. 1.

[169] Miles et al., p. 246. Other problems include, for instance, limited focus on the "objective" or "hard" environment and ignorance of the "perceived" environment, and difficulties in identifying the boundaries between organization and environment. While I am aware of these difficulties, it is not the purpose of this study to try to solve them but to take them into account.

[170] Blau and Scott devoted few pages to discuss the impact of ecological conditions on organization, but mostly the effect of physical distance on control and supervision (see Formal Organizations, pp. 170-172). One can find also few comments on the effect of geographical dispersion in Heydebrand (see Comparative Organizations, pp. 17-18). Hall remained even less explicit and found only half a page to deal with ecological conditions (see Organizations: Structure and Process, p. 304).

[171] Neil J. Smelser, Social Change in the Industrial Revolution (Chicago: University of Chicago Press, 1959).

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industry in Quebec. If the latter industry's evolution was not as significant and important for the larger society as that of the textile industry in England, it was as much related to and influenced by changes in other economic activities and societal institutions (such as agriculture, the family, the educational system, the labor movement, etc.). In return, its influence was important in Quebec's rural society, as I will indicate in Chapter 7.

For a definition of the environment, I use the formulation of Gillespie and Kim which reads as follows:

> A set of material and social conditions, comprised of numerous, discontinuously, nonrandom varying elements which may be observed to produce or receive an effect from the existence of an organization. Conceiving the environment as a set of conditions recognizes that the things outside of an organization are of various natures which cannot be realistically represented as "everything external." That these conditions are made up of numerous discontinuously varying elements recognizes that the various things outside of an organization do not necessarily vary together or carry uniform effects to or from a particular organization. Finally, that these elements must be observed to change or be changed by the presence of an organization indicates that only those things that are measurable and have an effect are relevant.[172]

However, there is a major weakness in their definition. Random elements are excluded. This exclusion is, to say the least, premature. One of the most important findings of this study is that the existence of random elements in the physical environment have had a determinant influence on the structure of logging organizations. Consequently, I include them in the modified definition. Based on the operationalization of the environment of Thompson ("task-environment") and

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[172]Gillespie and Kim, op. cit., pp. 10-11.

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Pugh et al. ("contextual variables"), and the distinction made by Child,[173] I consider the following dimensions of the environment:

1-The larger environment of logging organizations:
  (a) product and supply markets;
  (b) political, socio-cultural and socio-economic environment (including human resources);
  (c) the field of relevant technical knowledge.
2-The immediate organizational environment:
  (a) origin and history of the logging organizations;
  (b) structure of ownership and control;
  (c) size;
  (d) charter;
  (e) location;
  (f) degree of dependence;
  (g) characteristics of the physical environment within which logging organizations operate.

The environment of logging organizations has the particularity of being mostly limited to the input end of the organization since logging organizations are totally integrated with their parent companies at the output end.[174] The larger environment still influences their output activities but in a limited way: directly through governmental regulations concerning the quantities of pulpwood and chips which must be bought from independent producers, and indirectly through its impact on the manufacturing activities of the parent company.[175]

Several writers make a major distinction between the "objective" and the "perceived" environment[176] and contend that the environment influences the organization mostly (if not only) as it is perceived by

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[173] Child, "Organizational Structure, Environment and Performance...".

[174] Parent companies are considered part of the environment of their logging divisions because of the large degree of autonomy and administrative independence which the latter enjoys (see Chapters 4 and 6).

[175] See Chapters 3 and 4.

[176] For instance, Miles et al., op cit., pp. 249 and following; Child, "Organizational Structure, Environment and Performance...".

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the management personnel and other members of the organizations.[177] I certainly agree with the fact that the "perceived" environment has been neglected in the past but the importance of the "objective" environment should certainly not be minimized. The emphasis is on the latter one in this study and there should not be any ill consequence. For one thing, the physical environment has been so overwhelming in the life of these organizations that its objective characteristics have been fully perceived a long time ago to the point of almost perfect similarity between objective and perceived environments.[178]

The situation is different, however, when the social environment is considered. As it will become apparent in Chapters 4, 6 and 7, the perception of the social environment held by logging companies changed substantially through the period studied. A good deal of this change in perception took place not only because of pressures from the environment itself (for instance, the labor movement), but also because of the greater differentiation in the structure of logging organizations which brought in new blood.[179] Thus, whereby the traditional perception of the "human factor" had been molded by forest engineers and self-made administrators and entrepreneurs, the new perception was largely influenced by specialists in industrial relations and personnel administrators hired from outside.

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[177] This is supported by the often quoted study of Chandler, op. cit. See also Child, "Organizational Structure, Environment and Performance...", pp. 8-10 for a similar view.

[178] Although there has been a major shift in that perception from a totally dominating physical environment to a partially dominated one (see Chapters 5 and 6).

[179] See, for instance, Miles, et al., op cit., p. 250.

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In analyzing the reaction of logging organizations to their environment, I will refer to distinctions made by Miles et al. and based on well-known works done previously.[180] He identified four basic strategies to cope with the environment: (a) "working directly with the groups or organizations concerned, using such means as long-term contracts, joint ventures, cooptation, or merger"; (b) working "indirectly to influence or regulate interdependence, using third parties such as trade associations, coordinating groups, or government agencies"; (c) "in oligopolistic industries," such as logging and pulp and paper, acting as if the firms "were in a small group, conforming to group norms and implicitly or explicitly coordinating their activities"; and (d) diversifying firms' activities or choosing another domain of involvement. As I will indicate later, logging companies used these various means at different periods but especially the first three groups of strategies.[181]

There seems to be a good deal of confusion in the literature regarding the characteristics of the environment which are relevant for study and their definitions. These include such features as complexity (versus simplicity), heterogeneity (versus homogeneity), uniformity (versus variability), predictability (versus uncertainty), instability (versus stability), randomization (versus clustering).[182] There is less

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[180] Idem., pp. 251-252.

[181] See Chapters 3, 4, 6 and 7. In another classification, Heydebrand suggests nine forms of relations: functional interdependence, cooperation, bargaining and exchange, competition, opposition and conflict, coalition formation, cooptation, integration and simple coexistence (Heydebrand, "The Study of Organizations", in the same, op. cit.).

[182] See Emery and Trist, op. cit.; Perrow, Organizational Analysis: A Sociological Perspective; Lawrence and Lorsch, op. cit.; Thompson, op. cit.

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confusion, however, if one makes a basic distinction between static characteristics, that is, those perceived at any point in time (such as simplicity or complexity) and dynamic characteristics, that is, those perceived through time and related to the environment as a changing reality (such as instability or predictability). Some characteristics can also be identified as consequences of other characteristics. Thus a complex environment may be relatively easy to deal with because it is stable thus predictable, while a simple environment may be difficult to handle because it is unstable and thus uncertain and unpredictable.

Nevertheless, there remains a number of problems with the operationalization and the measurement of these characteristics. For instance, the length of the period of observation may make a good deal of difference between these characteristics and it is very difficult to measure many of them and determine where the boundaries lie between a given characteristic and its opposite. Despite these and other problems, special attention will be paid to a set of characteristics developed by Emery and Trist and later considered by Burns and Terreberry[183] which seems to be particularly useful to describe the physical environment of logging activities. These characteristics are placidity and randomization which lead to four major types of environments: placid-randomized, placid-clustered, turbulent, and disturbed-clustered.

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[183] Tom Burns, "The Comparative Study of Organizations," in V. Vroom (ed.), Methods of Organizational Research (Pittsburg: University of Pittsburg Press, 1967); Terreberry, op. cit.

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As an illustration of the usefulness of this categorization, we may consider briefly two major elements of the physical environment: the climate and the topography of the terrain. On the one hand, the climate appears to be a disturbed-clustered environment. Indeed, variations in temperature, wind and precipitation are wide and unpredictable but clustered within broad periods of the year (rain mostly during fall and spring, snow in winter) while the specific occurrence and amount remain uncertain especially in the short run. On the other hand, variations in topography belong to the placid-clustered environment: they are stable and distributed by types and as such well known and mapped by zone.[184] In order to cope with these two types of environment, the strategy of the organization varies and adaptation must be made at both levels, technological and structural. Thus, particular mechanical equipments and production techniques are selected to fit mountainous terrains, different schedules of work and different types of work teams are organized to adapt to the variations in climate. Generally, logging organizations must remain flexible in order to adapt quickly to the variations in climatic conditions and largely decentralized at the local and regional levels to adapt to variations in local and regional conditions.[185]

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[184] Although the knowledge of these variations in topography remains at a certain level of generality which prevents total predictability at the level of production. See Chapter 5.

[185] See Chapters 5, 6 and 7.

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E. Performance

At the beginning of this study, performance was intended to be used as a measure of the congruence between technology and structure assuming that the better adapted the structure to the technology, the more successful the organization would be. This procedure followed similar ones used by Woodward and Lawrence and Lorsch.[186] Thus logging organizations which would have shown good performance would have modified their structure in a direction congruent with the changes in technology. However, it could not lead to the conclusion that the organization which showed the best performance was completely adapted in all respects to its technology.[187] Indeed, this organization could need some important adjustments. But it was possible to say that it was the one which had the best adapted and that this indicated the direction that the other organizations had to take to be more successful. A clear conclusion was possible if and only if a clear pattern emerged from the analysis of the data. If there was no clear pattern, that is, if successful organizations were found which had the same structural characteristics as non-successful ones, many questions had to be raised: was it due to the sample? Was there a possibility

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[186] Woodward, Industrial Organization: Theory and Practice; Lawrence and Lorsch, op. cit.; Tosi et al. calls it the "contingency school" ("On the Measurement of the Environment...", p. 27).

[187] Child cautioned researchers of the fact that "in practice, there does appear to be some variation in the structures of otherwise comparable organizations, a variation which is sustained over periods of time without much apparent effect on success or failure." He mentioned the fact that 40 per cent and more of the structural variance is unaccounted for in studies such as the Aston group's study. See Child, "Organizational Structure, Environment and Performance...", pp. 10-13).

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that other factors disturbed the relationship between technology and structure? Were they environmental variables, individual or small group variables? Was it possible that, after all, the impact of technology had been overemphasized in this and previous studies?

Performance was to be measured on the basis of the following dimensions: productivity, volume of production, profits (before tax profits and return on investment before taxes), labor-management problems (grievances, strikes, wildcats, turnover, absenteeism,[188] etc.), and salaries and working conditions as revealed by the collective agreement and field observation. Other possible indices such as change in the sale volume in the last five years and new products introduced (Lawrence and Lorsch) and job satisfaction and cost (Likert)[189] could not be used either because they could not apply to logging activities in the first two cases, or because it was not possible to obtain the relevant information in the last two cases.

The result of the field work was soon to indicate to me that even with the selected indicators, performance could not be systematically evaluated. As a result, it has not been possible to follow Woodward's and Lawrence and Lorsch's models in a satisfactory way. My evaluation of the performance of the four logging companies remains tentative at best, and my experience cast doubts on the value of previous measurements. There are several reasons to explain this

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[188] There already existed a good deal of information on turnover and absenteeism due to the fact that the companies had sponsored several studies on this topic.

[189] R. Likert, The Human Organization (New York: McGraw-Hill, 1967).

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situation. As expected, organizations are very reluctant to share information related to their performance, especially cost and productivity figures. They are worried that this information can find its way to their competitors and the labor unions. They believe also that outsiders are not knowledgeable enough about the inner functioning of their organizations to be able to read the information properly and interpret it correctly.

Other problems are related to the nature of the information itself. Cost figures, for instance, are usually not comparable and their interpretation cannot be done adequately without a good deal of inside knowledge and experience with the organizations concerned.[190] Most often than not, companies use different accounting procedures which are not easy to standardize after the fact. However, even if this was done, other factors in logging would prevent complete comparability. Logging operations take place in so different sets of conditions that efficient organizations in unfavorable conditions may end up with lower productivity and higher costs than inefficient organizations operating in favorable conditions.[191]

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[190] This, obviously, takes a good deal of time, patience, and social ability to achieve.

[191] Such as terrain, timber stand, distance, etc. For a distinction between efficiency and effectiveness, see Miles _et al._, _op. cit._, p. 263; "In sum, it appears that the price of excess adjustment capability is inefficiency, while the price of insufficient coping capacity is ineffectiveness. That is, an organization which adopts a flexible, highly adaptable structure and process in a stable environment may not minimize its costs (inefficiency), while an organization which maintains a bureaucratized structure and process in a highly turbulent environment runs the risk of major losses and even failure (ineffectiveness)."

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F. Organizational Change

One cannot reasonably write about organizational change without saying something about his conception of change. In this study, change is not defined primarily as a quantitative phenomenon but as a qualitative one. Consequently, I do not accept Starbuck's definitions of organizational growth (change in the size of the organization measured by the number of members) and development (change in the age of the organization measured in the number of years since its creation).[192] This study is focusing on qualitative change, that is, to use Teulings' words, "a specific configuration of the fundamental dimensions and characteristics which can distinguish different types of organizations."[193] Following his analysis of the qualitative model of change, I can state that my conception is an eclectic one. I borrow various elements to the three basic models which he distinguished: growth, adaptation and development. From the growth model, represented by most of the classic writers in organization, I borrow the fundamental processes of growth such as differentiation and functionalization (expressed in specialization and professionalization) and integration and coordination (expressed in hierarchization and the establishment of rules).[194] However, I do not completely accept a basic assumption of this model which states that change in a social system is analysed

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[192] W.H. Starbuck, "Organizational Growth and Development," in J.G. March, op. cit., p. 451.

[193] A.W.M. Teulings, "Modèle de croissance et de développement des organisations," Revue Française de Sociologie, 14, 3 (Juil-Sept., 1973): 352-370, p. 363. My translation.

[194] Teulings, op. cit., pp. 356-357.

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[195] Idem.,

[196] Idem.,

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as a process of transformation from an embryonic form to a mature state or state of decadence. Such assumptions might be valid and useful but only in the very long term perspective of the existence of natural trends. In most cases, such as this one, these processes should be considered as reversible and as being caused by specific factors and situations.

From the second model, I borrow the basic notion that organizations do not change only because of internal processes but because of the need to adapt to the environment which surrounds them and which affects their internal processes.[195] Finally, the development model emphasizes that social change can be analyzed as the creation of new qualitative forms which are totally "gestalthaft".[196] This approach relies very much on the use of typologies. It also suggests that, concerning the causal relation between the organizational entity and its constituting parts, change in the organizational whole is due to and a function of change in the relations between its parts[197] or, I might add, in one of its parts with effects in some or all the other parts. Thus, in the case of logging organizations, one can trace the overall change to transformations in the production subsystem of the organization.

Moreover, in the position taken in this study, I try to avoid some of the problems created by one or several of these qualitative

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[195] Idem., p. 360.

[196] Idem., p. 361.

[197] Idem., p. 364.

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models. First, change is not explained only by internal processes but also in reference to external factors and the organization is seen in the larger context of the society in which it plays an active role and which itself goes through major transformations which affect the organization.[198] Second, the conception of the action of change processes as having a homogeneous and uniform influence on the organization as a whole is avoided. In practice, these processes evolve in an unequal fashion in the different parts of the organization.[199] As a consequence, one should not necessarily consider a less closely integrated organizational form as less mature by opposition to a much more closely integrated bureaucratic form. It might be only a matter of different patterns of growth. One should accept also that underdevelopment in one direction may generate a compensatory reaction of over-development in another direction.[200]

This conception of change takes also into account the principle of dialectical opposition described by Blau and Scott and several other students of organization between major processes such as between differentiation and integration, differentiation and coordination, specialization and hierarchization, and professionalization and organizational rule.[201]

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[198] In this respect, the "imprinting" process described by Stinchcombe is certainly useful to identify the influence of the society at the origin of the organization on its technology, structure, etc. (see A.L. Stichcombe, "Social Structure and Organizations," in J.G. March, op. cit., Ch. 4, pp. 192-293).

[199] This can be well expressed by the principle of "functional autonomy" analyzed by Gouldner (see the above section on Organization and Structure).

[200] Teulings, op. cit., p. 360.

[201] Blau and Scott, op. cit.; Lawrence and Lorsch, op. cit.

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Of some importance is also the consideration that the qualitative nature of change can be affected by, among other factors, the intensity with which its necessity is perceived. Any change may be seen as originating from a situation which is more or less unsatisfactory for the organization, or from a relative state of crisis.[202] According to this view, we should expect that the more acute the crisis, the more likely it is that the change will originate from the top of the organization and be far-ranging and far-reaching because the perception of its consequences as well as the necessity to accept and implement them are likely to be sharpened and difficult to ignore. Indeed, the more important and irresistible a change appears to be, the more ready to accept all its consequences the system will be because of the incoherences likely to be created by the coexistence of elements of the old and of the new systems and also because of the difficulties of reinterpreting the new elements in terms of the old ones.

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[202] L.B. Barnes, "Organizational Change and Field Experiment Methods," in V. Vroom, op. cit., Ch. 2, pp. 57-111; Smelser, op. cit.; Michel Crozier, "De la bureaucratie comme système d'organisation," Archives Européenne de Sociologie, 11 (1961): 18-50.

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CHAPTER 2

METHODOLOGICAL APPROACH AND TECHNIQUES

The methodological approaches used in the study of organizations have received much critical attention in the last two decades, especially in the 1960's. This critical effort has been devoted in part to point out the shortcomings of the empirical studies done before that period which were typically case studies generally using a historical (or processual) and typological approach.[203] Some critics claim that the case study had made its contribution[204] and needed to be replaced by comparative studies involving large numbers of different types of organizations. They pointed out also that the typological approach inherited from Weber was outdated, especially with regard to the study of the relationships between the different characteristics of the bureaucratic type and had to be replaced by a multi-variate or factorial approach if empirical and theoretical progress were to be realized. Finally, as a consequence of the adoption of this new orientation, they implicitly, if not explicitly, eliminated the use of the historical method in favor of the cross-sectional method.[205] Their claims were

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[203] For instance, Gouldner, Patterns of Industrial Bureaucracy and P. Selznick, TVA and the Grass Roots (Berkeley, Cal.: University of California Press, 1949).

[204] P. Blau, The Dynamics of Bureaucracy (Chicago: University of Chicago Press, 1963), especially Ch. XV.

[205] Pugh et al. "A Conceptual Scheme for Organizational Analysis"; P. Blau, "The Comparative Study of Organizations," Industrial and Labor Relations Review, 18, 3 (April, 1965): 323-338; Blau and Scott, op cit.; A. Etzioni, Complex Organizations (New York: The Free Press, 1961); R.H. Hall, "The Concept of Bureaucracy: An Empirical Assessment," American Journal of Sociology, 69, 1 (July, 1963): 32-40; R.H. Hall and C.R. Title, "A Note on Bureaucracy and its Correlates," American Journal of Sociology, 72, 3 (November, 1966): 267-272; Eugene Litwak, op. cit.; G. Benguigui, "L'évaluation de la bureaucratisation des entreprises," Sociologie du Travail, 12, 2 (avril-juin, 1970): 140-151.

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generally heard and the recent period has been dominated by cross-sectional, comparative and factorial studies.

Against such a background, it becomes imperative to explain, if not to justify, the methodological strategy which has been chosen in the present study. Indeed, it is a historical case study making use of the typological approach. If nothing else, this might be seen as a step backward. In the following paragraphs, I will argue that this is not the case. These two opposite approaches have their respective strengths and weaknesses and should co-exist rather than be mutually excluding. The choice of one or the other should depend on the nature of the research subject, the aims of the researcher and the particular conditions under which the research is carried. Following this discussion, I will describe the techniques used for the field work of the present study and comment on some of their advantages and shortcomings.

I. Methods

A. The Historical Approach

It is probably true to suggest that the historical approach has been generally as neglected in the sociology of organizations as in the other sociological fields.[206] This is an unfortunate state of affairs, for it is difficult to imagine the advantages derived from making such little use of this fundamental approach to the study of social reality. Indeed, the historical approach finds its major advantage in the

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[206] John C. McKinney, "Methodology, Procedures, and Techniques in Sociology," in H. Becker and A. Boskoff (eds.), Modern Sociological Theory in Continuity and Change (New York: Holt, Rinehart and Winston, 1957), Ch. 7, pp. 186-235: pp. 229 and following; C.W. Mills, The Sociological Imagination (New York: Oxford University Press, 1959).

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establishment of causal relationships between social phenomena. It is generally assumed that time antecedence points to the causal factors(s). What precedes is usually the cause of what follows[207] and, as Riley pointed out, "the understanding of causal relationships often depends upon knowledge of the time sequence of variables." This can be ascertained only through the observation of "not just one or two fluctuations or oscillations but a long sequence of fluctuations."[208]

In the field of the sociology of organizations, many writers have expressed a similar point of view and underlined the need to do historical (or longitudinal) studies to establish causal relationships between organizational variables such as technology, size, structure, environment, etc.[209] Child, for one, made it clear in one of his recent articles. Present research establishes the presence of associations

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[207]Although one must be careful not to ignore the opposite possibility: what follows sometimes causes what antecedates because of the intervening effect of anticipations and/or aspirations. Thus the anticipations related to Christmas cause a rise of wholesale demand for toys in November. Oftentimes, it is also difficult to make a practical determination of which event happens first. When "two variables are repetitive, and one does not _already_ know which causes which, he does not know which events in the repetitive series are relevant for dating." See Julian L. Simon, _Basic Research Methods in Social Science_ (New York: Random House, 1969), pp. 458-459.

[208]Mathilda White Riley, _Sociological Research I_ (New York: Harcourt, Brace and World, Inc., 1963), p. 552. She was then discussing the role of education in industrialization. Moore suggests similarly that, in order to establish a causal order, a before-after is not sufficient but that a timing of trends is necessary. See W.E.Moore, _The Impact of Industry_ (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965), p. 20.

[209]See, for instance, J. Hage and M. Aiken, "Relationship of Centralization to other Structural Properties," _Administrative Science Quarterly_, 12, 2 (June, 1967): 72-92, pp. 91-92; D.S. Pugh and D.J. Hickson, "Causal Inference and the Aston Studies," _Administrative Science Quarterly_, 17, 2 (June, 1972): 272-276; Azumi and Hage, _op. cit._, p. 108; Hall, _Organizations: Structures and Process_; Barton, _op. cit._, pp. 336, 340 and 341; Heydebrand, _op. cit._, p. 55;

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between organizational characteristics but:

> usually leaves underlying processes to be inferred. An example is the attempt by Pugh and his colleagues to construct from factorial data a causal sequence of organization development (Pugh et al., 1969b). The difficulty here is that adequate explanation derives from an understanding of process, and in this regard the 'fact' of a statistically established relationship does not 'speak for itself'. At the very least, it may mask a more complex set of direct and indirect relationships as Blalock (1969) points out. In addition, little understanding is afforded as to how the relationship was established and whether it is a necessary condition for the presence of other, perhaps desirable, phenomena. For these reasons, not only is research into organization of a processual and change-oriented type still required but so equally is an attempt to offer more adequate theoretical schemes in step with the advance of empirical research. At the present time, some of the most influential models of organization explicate little more than positively established associations between dimensions of organizational structure and 'contextual' (i.e. situational) factors such as environment, technology or scale of operation. These models proceed to the simplest theoretical solution which is that the contextual factors determine structural variables because of certain, primarily economic, constrains the former are assumed to impose.[210]

Historical analysis constitutes the only way to study organizational change and processes,[211] especially the mechanisms through which change and processes occur and processes interact with each other.[212]

Charles Perrow, "Departmental Power and Perspective in Industrial Firms," in M. Zald (ed.), Power in Organizations (Nashville, Tenn.: Vanderbilt University Press, 1970), p. 76; Aldrich, op. cit., p. 40; Miles et al., op. cit.

[210] John Child, "Organizational Structure, Environment and Performance...", pp. 1-2.

[211] Riley, op. cit., p. 21 and pp. 551-552; Barton, op. cit., pp. 336-341.

[212] W.A. Faunce and W.H. Form (eds.), Comparative Perspective on Industrial Society (Boston: Little, Brown and Co., 1969).

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For one, change can be identified, observed and measured by reference to the anterior situation and if the prior social system or structure is known.[213] And the impact of any one process on the others cannot but be influenced and partly determined by the anterior situation. Thus, the determinant influence of technology on the organizational structure as revealed by the process of technological change is bound to be effected by the anterior situation of the organization (its structure, its system of production, its labor force, etc.).

Generalizations and hypotheses about the functions of various parts of the system and relationships between organizational variables must stand the test of time to be accepted[214] and eliminate errors of interpretation. As Aldrich suggests, this is particularly important in models of organizational development and change which contain feedback loops and reciprocal causation[215] in which the chances of making errors of interpretation are particularly high. Thus Likert,[216] showed that cross-sectional or short-term studies induced many specialists in productivity and employee morale as well as many managers to believe that cost-reduction policies were the best way to increase productivity where, in fact, long term observations proved that they can be catastrophic for the organization. He demonstrated clearly how information gathered at several points in time indicated that organizational variables such as

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[213] Scott _et al._, _op. cit._, pp. 17-18.

[214] McKinney, _op. cit._, p. 229; Barton, _op. cit._, p. 338.

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productivity, style of supervision, etc. were variously related through the period of time selected for observation. Repeated measurements and observations as well as a long enough span of time during which change is observed eliminate these pitfalls.

Cross-sectional studies such as Woodward's study often concludes that a certain type of organization must be adopted by companies involved in a certain type of production if they want to be successful. But there is no historical support that is marshalled for this and there is no way to explain why exceptions to this kind of findings can be successful and will be so as long as they remain exceptions.

Obviously, the historical approach has also its disadvantages compared to the cross-sectional approach. The latter is particularly useful in defining the state of a system and in describing its structure ("the patterns of system properties and the arrangement of system parts").[217] The resulting studies can be "important as bench marks to which subsequent studies of process and change may be referred."[218]

A great empirical advantage of cross-sectional studies is that they are easier to conduct and that data are often easier to obtain.[219] This may go a long way in explaining why comparative studies, with few exceptions,[220] are cross-sectional rather than historical studies.

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[217] Riley, op. cit., p. 567.

[218] Idem., p. 21.

[219] I will describe later in the chapter some of the problems which I faced in this respect by using the historical method.

[220] For instance, Chandler, op. cit.

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In cross-sectional studies, it is also easier to control for extraneous variables. Since observations are made at the same time, the researcher does not face the problem of effect of changes in external conditions which affects all historical studies.

Despite the problems existing with the historical approach, I decided to proceed with it because its theoretical and methodological strengths clearly made it the best choice for studying the central problem of this research. As I indicated above, there has been a growing expression of the need for longitudinal studies to further our knowledge concerning the impact of such variables as technology, size and environment on structure. It may help answer such questions as the one raised by Child concerning the usefulness, as a theoretical strategy, of directing attention on to technology in the first place.[221]

Moreover, we know a good deal about the historical process of bureaucratization on a large scale[222] but we know little about the process at the level of specific industries or specific organizations.[223]

The particular form that my historical approach takes combines panel and trend studies, to use Riley's terms.[224] In such a "combined

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[221] Child, "Organizational Structure, Environment and Performance...".

[222] For instance, through the works of Weber and Bendix.

[223] Gouldner's study of a gypsum plant constitutes one of the few exceptions. However, his study was limited to one plant of a single company and covered only a very short period of time in the life of that organization (although a significant one).

[224] Riley, op. cit., pp. 566-568. She defines these types of study as following: (a) panel study: it "uses a single cross-section study as its base or starting point for subsequent cross-section studies of the same system, proceeding then to trace the changes and departures from its initial structure; (b) trend study: "is made, not at a few isolated points in time, but continually over time" and focuses "chiefly on certain selected processes, rather than on the structure within which these processes occur" (p. 567).

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225 Idem

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approach," "the investigator starts with the cross-section study, and only then attempts to observe the trends which develop out of the social structure and, in turn, react upon the structure. Such a combined approach might be defined as follows: 1. It combines cross-section studies at isolated points in time with certain continuous observations over time. 2. Like the panel study, it focuses on shifts in structure, but also, like the trend study, it focuses on the processes intervening. Thus it succeeds in tying process into its social-structural base."[225]

Thus, in the present study, I am not only interested in why and to which extent the organizational structure of logging companies became bureaucratized (that is, changed from the jobber system to the foreman system) but also how this change progressively took place, the steps it went through, etc.

B. The Case Study Approach

More than a decade ago, in reviewing the historical contribution of the case study to the field of organizational analysis, Blau concluded his rather positive assessment by suggesting that "the case study of bureaucratic organization" had "made its contribution" and would "increasingly yield to other methods."[226] His prediction proved correct since the last fifteen years have been characterized by a wealth of comparative studies including the most influential and probably the best studies in the field.

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[225] Idem., pp. 567-568.

[226] Blau, The Dynamics of Bureaucracy, p. 305.

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[227] Idem

[228] Bart

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[230] Idem

However, I disagree with Blau's first statement and I would like to underline the fact that the case study approach possesses certain theoretical and methodological possibilities that should ensure it an important contribution to the field, although probably not the dominant one. This role will most likely continue to belong to the comparative approach for obvious reasons. The study of large numbers of organizations is needed to test hypotheses and discriminate "between promising and misleading insights." Or, as Blau puts it, a comparison of the managerial hierarchies in fifty organizations would reveal differences and stimulate insights that never crossed my mind, and the quantitative analysis of the interrelations between their characteristics would supply still other data to challenge the imagination of the theoretically oriented researcher."[227]

Comparisons between organizations provide also "checks against alternative possibilities" and establish the conditions under which systems of relationship hold.[228] As a result, comparative studies generate theoretical generalizations.[229] Heydebrand suggests also that the comparative approach has the advantage of being "more flexible and encompassing as a research instrument, more open to historical determinants of organizations, and more adequate for purposes of meaningful description, comparison, and explanation."[230] However, I would question parts of Heydebrand's statement. In many respects, the case study approach offers methodological advantages which make it a more flexible

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[227]Idem., p. 303.

[228]Barton, op. cit., p. 338.

[229]Heydebrand, op. cit., p. 2.

[230]Idem., p. 30.

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research instrument and an indespensable one for historical studies. First, it lends itself to interlocking various research procedures such as direct observation, interviews, documents, etc. As a result of this access to different research techniques, the accuracy and range of the data collected can be improved and it is possible to compare the reliability of different research techniques.[231] Moreover, the researcher all along can shuttle "back and forth between analysis and data-collecting," testing the validity of his interpretations and his explanatory hypotheses as his field work progresses.[232]

According to the traditional stereotypical view, case studies are only good as an exploratory exercise[233] to generate insights, hunches and clues[234] and raise problems for theories[235] based on impressionistic information. This view, Blau rightly suggests, does not do justice to the possibility of obtaining "quantitative information from records" and "responses in quantitative form from interviews."[236]

Contrary to superficial views, their theoretical contribution has been also recognized in terms of generalization.[237] Case studies

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[231] Blau, op. cit., pp. 4-5.

[232] Idem., pp. 5, 302-303.

[233] Dennis Forcese and S. Richer, Social Research Methods (Englewood Cliffs, N.J.: Prentice-Hall, 1973); J. Chorpade (ed.), Assessment of Organizational Effectiveness (Pacific Palisades, Cal.: Goodyear Publ. Co., Inc., 1971), p. 174.

[234] McKinney, op. cit., p. 233.

[235] Barton, op. cit., p. 337

[236] Blau, op. cit., p. 302.

[237] According to Lipset et al., generalizations can be established in the following ways: (a) by using variations between systems (comparative cross-sectional analysis); (b) by using variations within the one system (case study-internal analysis) either over a period of time (historical-longitudinal study) or between different parts

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provide "important insights on the basis of which certain generalizations about more or less invariant aspects of organizational structure and process could be formulated."[238] If case studies "tend to be limited to a descriptive analysis of particular types of organizations," they "may, at times, generate sensitizing concepts and analytical variables which, of course, have to be tested by broader comparative, systematic, and quantitative investigations."[239]

This suggests that both types of studies are more complementary than exclusive.[240] As mentioned by Haas and Drabek, we need to maintain case studies at least for greater "methodological variability" since organizational theory is still much in its initial stage.[241]

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of the system (internal comparison) (S.M. Lipset, Martin Trow and James Coleman, Union Democracy (Garden City, N.Y.: Doubleday and Co., 1962), p. 479).

[238] Heydebrand, op. cit., p. 34.

[239] Ibidem. Blau, Heydebrand and Lipset et al. indicate also the possibility of carrying "internal comparisons" in case studies (such as in Gouldner's study of the gypsum plant). See Heydebrand, op. cit., p. 35; Lipset et al., op. cit., p. 479; Haas and Drabek, op. cit., pp. 376-377. In Lipset et al.'s terms, "internal analysis...may...have one important advantage: by taking simple comparative correlation out of the reach of the investigator, it focuses his attention upon the underlying processes which operate within the system. In this way the internal analysis may lead to a deeper explanation of the phenomenon and to generalization of a more fundamental kind" (p. 480). But of course, it has its limitation. "An internal analysis will not ordinarily be as exhaustive of the important elements which affect a particular variable as will a comparative analysis, simply because certain things are invariant for the single system as a whole" (p. 479).

[240] As Lipset et al. suggests, a choice must be made between the comparative and case analyses in any research. This choice centers on "the problem of spelling out the two different logics of analysis for these two methods, and of providing diagnostic indicators which will tell the relative merits of the two methods for a particular research problem" (p. 480).

[241] Haas and Drabek, op. cit., p. 376.

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This methodological variability appears also desirable for one important theoretical advantage of the case study: "it preserves the structural unity of what is being conceptualized"[242] and the holistic character of the object of study. There has been a tendency to neglect this dimension of organizational reality with the emphasis on factorial comparative analysis. It appears to me that the study of change from a systemic point of view, such as the present study of the logging industry, would be a partial failure from the beginning if it was not framed in such a broader perspective.[243] From the point of view of change, the case procedure has the further advantage of focusing the attention of the researcher upon the underlying processes operating within the system.[244] "In this way the internal analysis may lead to a deeper explanation of the phenomenon and to generalization of a more fundamental kind."[245]

For the researcher, especially the isolated doctoral candidate, the case study approach offers attractive material advantages. It is less costly and generally faster than other approaches for the relatively high quality and richness of observation and empirical material that it makes possible to gather.[246]

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[242] McKinney, op. cit., p. 234.

[243] According to Teulings, a review of empirical studies of organizational change shows that those focusing on the qualitative change of the structure as a whole have been very rare. See Teulings, op. cit., p. 353. Most studies have been limited to partial dimensions such as the succession of goals, bureaucratization and debureaucratization, management succession, etc.

[244] Lipset et al., op. cit., p. 480.

[245] Ibidem.

[246] R. Boudon, Les méthodes en sociologie (Paris: Presses Universitaires de France, 1970), pp. 116 and following.

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In an attempt to identify more clearly what kind of a case study theirs was, Lipset, Trow and Coleman distinguished two types of case analysis: the particularizing and the generalizing analyses. In the first type, the analysis focuses on the "description and explanation of the single case...provide(s) information concerning its present state, and the dynamics through which it continues as it does."[247] Previous known laws and generalizations are used to make particular statements about the case. In the second type, it is somewhat the opposite. The particular case is used to develop general statements, "empirical generalizations or theory" and "not to discover anything about _it_ as a system but as an empirical basis either for generalization or theory construction."[248] As a reading of this text will reveal, my study, not unlike theirs, is neither one of these two types and my intention has been all along to be both, although explicitly may be more of the second type than the first type. The description and examination of the logging organizations is done on the basis of previous findings, generalizations, concepts and methods. But, at the same time, I intend to assess these and to suggest some new hypotheses.

This study started originally as the analysis of four different organizations in the same industry with the purpose of doing a comparative analysis. But properly speaking, it is not comparative.[249]

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[247] Lipset _et al_., _op. cit_., p. 471.

[248] _Ibidem_.

[249] There is a good deal of confusion in the field regarding the definition of comparative studies. At one extreme, it means the study of social systems (or part of) in different "cultural" settings or societies. At the other extreme, some writers consider any study of two cases or more of a given social unit as comparative analysis. See, for instance, Heydebrand, _op. cit_., p. 3.

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Rather by studying four large companies which may be considered representative of the whole pulpwood logging industry, it is an attempt to reconstitute the process of change in this industry in order to examine the dominant role of technology and environment on the structure of organizations. The central unit of analysis is the woodlands division of the four pulp and paper companies, but, at times these four companies and the pulp and paper industry as a whole become the center of focus. This shift in focus is needed in order to properly describe and analyze the "contextual variables" or the various dimensions of the environment.[250]

The number of cases in the study is small for some reasons. As Haas and Drabek wrote, "descriptive studies conducted at lower abstraction levels preclude large numbers."[251] To have included more organizations in the study (especially with my limited resources in time, material means and expertise) would have most likely reduced "the richness of the data available on any single organization," complicate the analysis and reduce the chances of reaching meaningful conclusions.

C. Typological and Factorial Approaches

Associated with the shift to comparative studies, there has been a parallel shift to multi-variate (or factorial) analysis away from the typological model originally developed by Weber. As indicated in the

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[250] McKinney considers this part of the case study procedure. "The wholeness or unitary character ascribed to the case is a construct. Objects and acts have no concrete limits; the limits imposed reflect the perspective and the theoretical interest of the observer" (McKinney, op. cit., p. 232).

[251] Haas and Drabek, op. cit., p. 377. This is especially true of longitudinal studies. An excellent precendent is Alfred Chandler's work, Strategy and Structure.

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previous chapter, this shift was generally motivated by the need to break away from a reified bureaucratic model which had a good deal of empirical deficiencies. In this context, the multi-variate approach offers several advantages. It is much more flexible emperically. Relations between variables become a matter of empirical measurement. It leaves the door open to the construction of empirically based typologies such as the one developed by Pugh and his associates.[252] Such typologies are likely to be closer to the complexity of reality. The construction of variables itself become a matter of empirical analysis.

However, despite its desirability, a multi-variate (factorial) analysis is not always possible especially in historical studies because of the difficulty of obtaining the detailed data needed to conduct the statistical analysis which is usually implied in this kind of analysis. This is the case in this study. Although there is no sophisticated statistical analysis, quantitative data have been used wherever possible to strengthen the description and support the analysis. Furthermore, there has been an effort to operationalize each variable in detail so as to maximize the empirical basis.

While trying to use a multi-variate approach, I did not reject the typological approach entirely for one major reason. This approach is a very useful method in historical studies. It can provide a model of change which gives direction to the analysis and help to create a better integration of the different dimensions of the study. Thus, the description of the change in the organizational structure of logging organizations in Chapter 6 has been cast in terms of two opposing types

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[252] Pugh et al., "An Empirical Taxonomy of Structures of Work Organizations".

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II. Techniques

Four basic techniques were used to gather the data: analysis of documents and records, interviews with key informants, a questionnaire, and field observation.[253]

A particular importance was given to written sources in this study. They are usually neglected as being partial, incomplete, difficult to obtain and hard to interpret.[254] Despite these shortcomings, documents and records generally constitute the most important and the most exact source of informations about the past of an organization that one can get. They are almost essential to reconstruct the chronology of technological and structural changes. At the beginning of the research, I was optimistic about this source of data. However, the results were not as satisfactory as anticipated. I encountered several problems. Firstly, there is a dearth of studies on the industry (except for very technical research) as one looks back in the past beyond the early 1950's.[255]

Secondly, industrial organizations do not gather and keep as much information, documents and records as we, sociologists, have a tendency to believe.[256] For one reason or another, companies often do not see their usefulness and are more sensitive to the costs in labour, material

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[253] See Haas and Drabek, op. cit., pp. 331-345 on data collection techniques.

[254] McKinney, op. cit., p. 230.

[255] This was noted also by E. Gosselin in an unpublished paper, "Notes sur une analyse," Laval University, no date (circa 1957), pp. 3-4.

[256] It is not uncommon to find organizations without an adequate and complete chart. See, for instance, Perrow, "Departmental Power and Perspective in Industrial Firms," pp. 79-80.

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and equipment which this task involves and which may appear relatively high if it is done in a systematic and extensive way. Thirdly, the documents and records which are accumulated are often difficult to locate and to organize for research purposes. Fourthly, companies are to a varying degree usually reluctant to let outsiders probe into their affairs. Very often, they fear that "outsiders" will not be in a position to interpret correctly the information which is made available to them and they decide not to take the risk of creating embarrassing situations for themselves. As other students of organizations found out, "organizations, and particularly their senior managements, are becoming increasingly resistant to collaboration in what they see as inessential research."[257] Companies adopt naturally a very pragmatic attitude vis-à-vis research in general, but especially "outside" research. They are very reluctant to pay the cost in time spent by their employees on questionnaires or in interviews if they can't see any evident benefit coming out of it.[258] Not all the companies were equally secretive, however. Two of them adopted an open attitude concerning the availability of the personnel for interviews and questionnaires, and access to logging operations and to documents.

I met with a less open attitude on the part of industry-wide organizations. For example, my repeated attempts to get access to the documentation of the Quebec Forest Industries Association remained unsuccessful despite my good relations with its director. In another

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[257] Inkson et al., "Organization Context and Structure...", p. 319.

[258] Several times I was given the impression that I should not use too much time with the personnel of the companies. My research was considered of little use to them. One of the five companies initially contacted for the study, a large multi-national corporation, refused to participate without stating the reasons of its decision.

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case, my request to obtain a copy of a confidential policy document on labor relations within the industry was refused on the grounds that it was not related to my study although I had pledged confidentiality and knew very well two of the four members of the committee that had drafted the document. However, the same document was made available to me later by the assistant director of personnel in one of the logging divisions of one company. Although he was aware that it was a confidential document, he allowed me to read it in his office and to take notes, ignoring that I had been denied a formal request at higher levels.[259]

As a result of these various problems, it was not possible to use the operational instrument as rigorously and systematically as I would have liked and to find all the data needed to document the operational dimensions of the variables for the past years, especially those of a less recent past.

Among the available documents, I made extensive use of specialized periodicals (for instance, The Pulp and Paper Magazine of Canada series) and various reports of economic, sociological, technical and administrative studies and researches (for example, several M.A. and Ph.D. theses and a long series of research reports on logging done and published by the Pulp and Paper Research Institute of Canada). These works included several studies on the labor supply (one done by this writer in the middle 1960's), various technical studies on different aspects of logging technology and production systems, and some economic and

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[259] I mention this fact because it points out an important phenomenon in organizations which can be used to establish a research strategy. Oftentimes, it is easier to obtain information at middle and lower management levels because people occupying positions at these levels are less suspicious and less distant than those at higher levels.

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organizational studies done by a wide variety of organizations. I also made an extensive use of census data and other governmental statistics.[260]

Interviews and exchanges of correspondence provided a great deal of information on the present situation and were a useful complement to documents and records on the past. They helped me very much to give scope and pattern to the data. I interviewed people at all levels of management (but mostly at higher levels) in the four companies and a small number of high ranking officials in different organizations related to the pulp and paper industry.[261] The number of interviews varied from one company to another and according to many factors (for instance, the degree of concentration of information, the availability of people, their physical accessibility, etc.).

Most of the interviews were of a semi-structured and unstructured nature aiming at getting objective information on the various aspects of the organization of the logging companies.[262] The list of

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[260] These various sources are listed in detail in the bibliography. In none of them was a comprehensive approach similar to the one which I adopted here used. However, they are generally considered highly reliable secondary sources and have the further advantage of being highly pre-quantified. See, for instance, Forcese and Richer, *op. cit*., p. 180.

[261] The Canadian Pulp and Paper Association, the Quebec Forest Industries Association, le Conseil des Producteurs de Pâtes et Papiers du Québec and the Pulp and Paper Research Institute of Canada. See Appendix E for a detailed list of the interviews. See, for example, Heydebrand, *op cit*., p. 38 and Lynch, *op. cit*., p. 350 about the same use of key informants in organizational research.

[262] Inkson *et al*., "Extending the Occupational Environment...". The article includes a discussion on the distinction between subjective and objective data and field observation (pp. 35-39). See also Perrow, "A Framework for the Comparative...", p. 208, about the difference between objective and subjective perceptions of structural features.

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operational dimensions of the various technological structural and contextual variables was used as a questionnaire to gather the "objective" information in interviews. Another objective of the interviews was to elicit interpretations and other subjective perceptions from key informants in order to help me form my own interpretations. There was no attempt to get a statistically representative sample of these subjective views.

Each company directed me to one of its staff members (Consolidated-Bathurst, Domtar and Price) or line-managers (Quebec North Shore) to act as a mentor and go-between. These people were the major individual source of information on their respective organizations. They communicated verbally and in writing what they personally knew about their organizations, made documents available to me, and organized interviews with other members of their companies and trips to their companies' logging operations (Domtar, Price and Quebec North Shore). They performed this thankless task very well.

The location of these field trips is indicated on Figure 2. The objective of the field trips was to get a first hand picture of the organization at work, especially their production system, and to gather more information on the organization through interviews and conversations with staff and line personnel at the district and camp levels. It served also to verify personally some of the information given to me in previous interviews. The usual procedure was to leave early in the morning with a member of the technical staff (forest engineer, assistant-director of personnel, etc.), spend the entire day on the operations and come back at night. The program of the visit was left to my discretion and efforts were made to satisfy my requests within the constra

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the constraints placed on the people by production schedules and unexpected problems. It generally worked out to my satisfaction.

The data gathering phase of the research was spread over a period of three years (from 1971 to 1974) with two peak periods (the summers of 1971 and 1972). I used also the experience and information (about the logging industry in general and one of the four companies, Quebec North Shore, in particular) which I accumulated while working as a research assistant for the Eastern Quebec Planning Bureau during the summers of 1963 and 1964 and as full-time researcher in 1965 and 1966.[263] This work involved a study of the organizational factors of labor mobility in the logging industry of Eastern Quebec. Numerous field trips were made to these companies' operations at the time and, in the case of two companies, Quebec North Shore and Anglo-Canadian Pulp and Paper, stays of few weeks at logging camps were involved.

In summary, the limitations encountered in the gathering of the data did not allow me to establish the systematic measurements of all the variables over the period selected and to proceed with the statistical treatments which would have been desirable for a thorough comparative analysis between the four companies. However, the nature of the data made possible a detailed reconstruction of the sequence of technological, organizational and environmental changes which took place during the last three decades in the pulpwood logging industry and provided a very good understanding of the activities of the logging organizations.

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[263] The work done in 1964 and 1965-66 involved also the logging operations of four other Quebec companies: Canadian International Paper (Gaspe Division), Anglo-Canadian Pulp and Paper (Forestville Division), Tourelle Lumber (Forestville), and Bathurst Pulp and Paper (Chaleur Division). I also went for a short research visit at Marathon Paper in Ontario (Longlac). During this research, I benefitted from the excellent assistance of two graduate students from Laval University for a period of three months.

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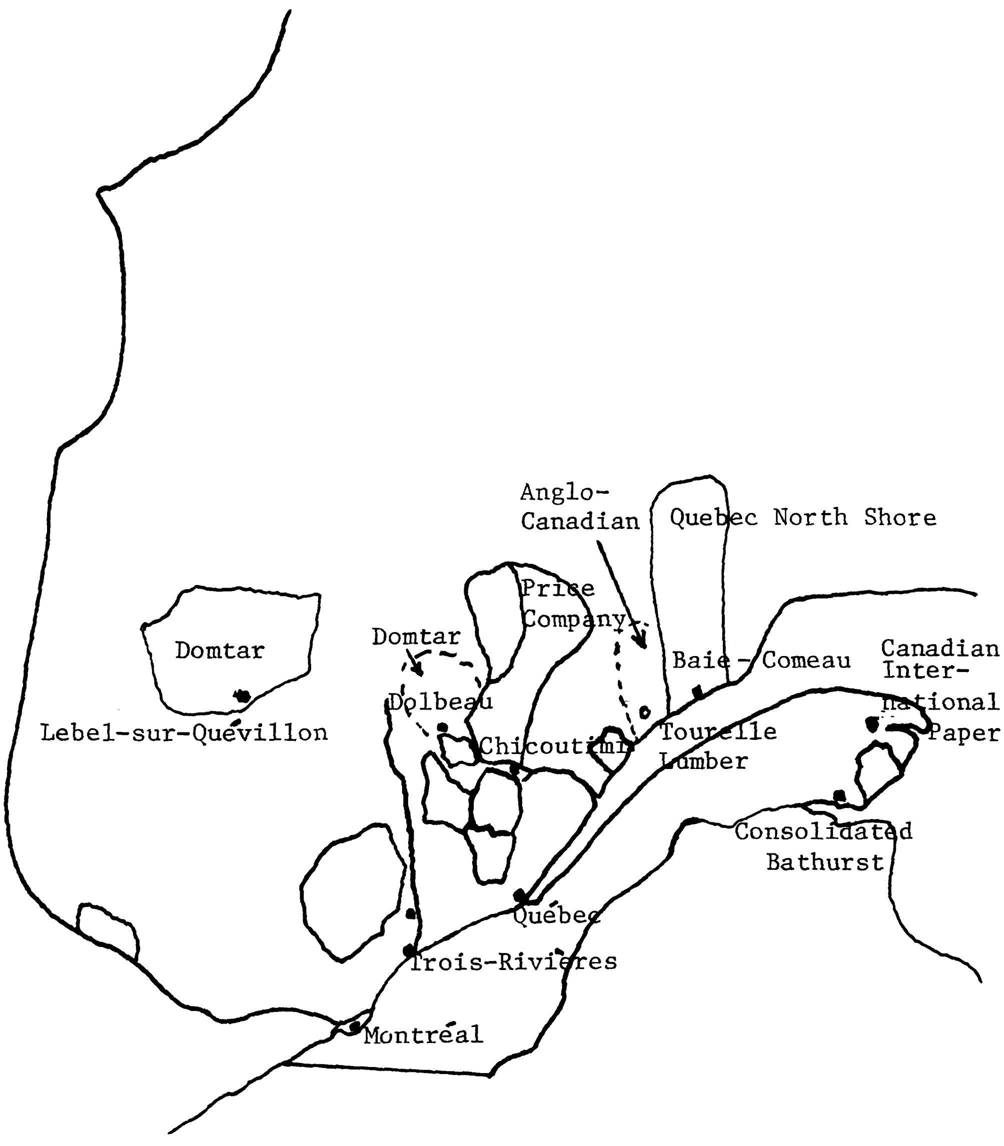
FIGURE 2

Location of Field Trips Made in 1964, 1965, 1971 and 1972



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CHAPTER 3

QUEBEC'S PULP AND PAPER LOGGING INDUSTRY

Industrial organizations do not and cannot remain indifferent to their economic environment. Very often they adopt new techniques or modify their structure to keep up with similar changes in competing organizations. They often adopt new labor relations policies similar to the ones already implemented in other industries for no other reasons than to remain competitive in the labor market. But most often, these changes have to do basically with their economic position and performance.

In order to understand and correctly analyze the changes which have affected pulp and paper logging organizations, we need to consider the development and the economic situation of the pulp and paper industry of which the loggaing industry is an intrinsic part. In the following paragraphs, we will review briefly the origin and the growth of the pulp and paper industry in Quebec, its importance in Quebec's economy, the structure of its production and its exportation, and the recent development problems which have played and are likely to play such an important role in the technological and organizational changes which have modified logging activities in the recent years and are likely to continue to do so in the future.

I. Development and Importance of the Pulpwood Logging Industry in Quebec

The development of the pulpwood logging industry in Canada and in Quebec goes back to the major technological changes which occurred in paper making in the nineteenth century. The discovery of chemical

processes which made possible the use of wood fibre instead of rag waste gave Canada a great advantage because of its abundant timber resources. Combined with its proximity to the American market, these resources became its biggest asset.

> The effect of the technological revolution in paper making, combined with immense volumes of cheap wood of a suitable kind, and duty-free entry to the world's largest newsprint markets -- the United States and the United Kingdom -- was to completely alter the structure and orientation of the Canadian industry. (...) The production of pulpwood to supply the mills grew from 221,000 cunits in 1891 to 570,000 in 1901 and had reached 1,819, 000 cunits in 1911.[264]

Thus, the growth of the Canadian pulpwood logging industry was from the beginning closely related to the growth of the American demand for pulpwood and pulp and paper products, and later, to direct American investments in pulp and paper production in Canada. However, it is only following a series of measures taken by the government of Quebec and the American government concerning the export-import of pulpwood, woodpulp and paper in the early 1900's that the pulp and paper industry really was established in Quebec.

> At the end of the 19th and the beginning of the 20th centuries, Quebec exported to the U.S.A. thousands of cords of pulpwood. The forest industry, quite active during that period, was particularly involved in logging. Provincial authorities conceded large timber territories to American entrepreneurs in return for stumpage rights only. In 1901, at the time when the province had just imposed an additional stumpage fee on all wood bound for American mills, the American customs department increased entrance duties on woodpulp and established prohibitive duties on paper. Confronted with this customs barrier, the Canadian provinces decided in 1910 to put an embargo on export

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[264] Campbell and Power, op. cit., p. 2.

> of pulpwood to the U.S.A. In Quebec, the law stipulated that wood cut on crown lands could not be exported. American paper manufacturers which held 12,000 square miles of timber limits, put an end to wood shipments to their mills. Business boomed in the province. Companies already in business increased their investments, expanded their plants and demanded more timber limits. New companies supported financially by large capital were established. The pulp and paper industry of Quebec was taking off.[265]

However, the take-off did not materialize before the American government under growing internal pressure due to the depletion of timber resources at home and to increasing demand for pulp and paper, removed the tariffs on newsprint and wood pulp in 1911 and 1913, respectively.[266] It marked the beginning of the most important phase of expansion of the Canadian pulp and paper industry. Between 1913 and 1929, the production of pulpwood rose drastically to reach 5.6 million cunits (see Figure 3) and Quebec's pulp production increased to half a million tons in 1914, doubled to 1 million tons in 1922 and reached 2 million tons in 1929.[267] It is during that period that the industry laid the basis of the economic and organizational structures which have been generally maintained up to now.[268] From 1929 to 1951,growth

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[265] L'expansion industrielle de la province de Québec (Québec: Ministère de l'Industrie et du Commerce, janvier 1954), pp. 32-33. My own translation.

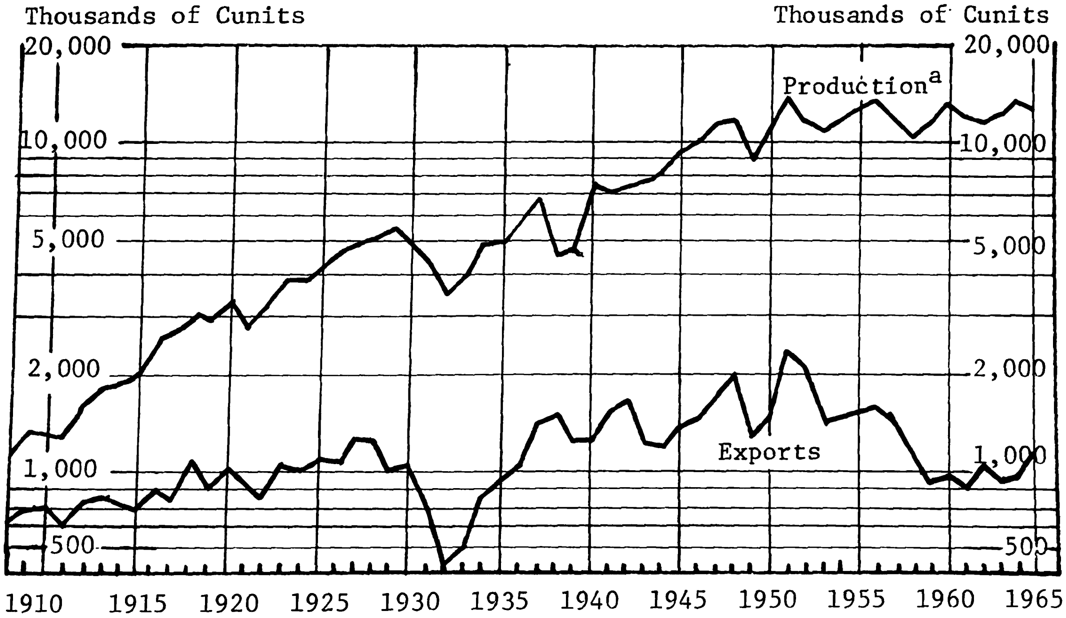
[266] Campbell and Power, op. cit., p. 2

[267] L'expansion industrielle de la province de Québec, p. 33.

[268] For further details on the development and structure of the pulp and paper industry in Eastern Canada and Quebec in particular, see the following works: H. Marshall, F. Southard, Jr., and K.W. Taylor, Canadian-American Industry (Toronto: McClelland & Stewart Co., 1976); V.W. Bladen, An Introduction to Political Economy (Toronto: University of Toronto Press, 1956); J.A. Guthrie, The Economics of Pulp and Paper (Pullman: State College of Washington Press, 1956) and Newsprint Industry (Cambridge, Mass.: Harvard

FIGURE 3

Pulpwood Production and Exports,
Canada, 1908-1965



[a]Estimate for 1965.

SOURCE: Campbell and Power, _op. cit._, p. 3.

continued at a slower pace. Since 1951, the rate of growth in pulpwood production slowed down considerably in Quebec (see Table 3) following substantial reductions in pulpwood exports (see Table 4),

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University Press, 1941); J.H. Dales, _Hydroelectricity and Industrial Development. Quebec 1898-1940_ (Cambridge, Mass.: Harvard University Press, 1957); W.F. Ryan, _The Clergy and Economic Growth in Quebec (1896-1914)_ (Quebec: Les Presses de l'Université Laval, 1966); A. Faucher, _Histoire économique et unité canadienne_ (Montreal: Fides, 1970); C.P. Fell, "The Newsprint Industry" in H.A. Innis (ed.), _The Canadian Economy and its Problems_ (Toronto: Canadian Institute of International Affairs, 1934), pp. 40-53.

TABLE 3

Total Pulpwood Production, Pulpwood Production on Forest Limits, Total Wood Pulp, Paper and Paperboard Production, Quebec, 1952-1970

YEAR	Pulpwood Production (1) Total	(2) On Forest Limits	(2) in % of (1)[a]	Wood Pulp Production	Paper and Paperboard Production
	(in thousand cords)			(in thousand tons)	
1952	8,167	5,508	67.4	4,148	3,520
1953	5,896	3,902	66.2	4,132	3,553
1954	6,076	3,944	64.9	4,299	3,653
1955	6,666	4,239	63.6	4,485	3,774
1956	7,823	5,219	66.7	4,809	4,054
1957	7,952	5,483	68.9	4,619	3,986
1958	5,710	3,965	69.4	4,210	3,694
1959	5,828	4,015	68.9	4,317	3,813
1960	6,671	4,506	67.5	4,496	3,906
1961	6,753	4,656	68.9	4,597	3,947
1962	6,521	4,057	62.2	4,681	4,017
1963	6,068	3,821	63.0	4,760	4,063
1964	6,184	3,915	63.3	5,239	4,473
1965	7,169	4,578	63.8	5,385	4,738
1966	6,653	4,552	68.4	5,819	5,308
1967	7,962	5,730	72.0	5,687	5,151
1968	7,139	5,101	71.4	5,809	5,235
1969	7,250	b		6,482	5,738
1970	7,550	b		6,521	5,802

[a]The difference between (1) and (2) is accounted for mostly by pulpwood cut in large and small private properties, the last category supplying 68.5 per cent of this pulpwood. In 1970, the amount of pulpwood bought by paper mills in Quebec from small independent producers amounted to almost 1,500,000 cords (The Competitive Position of the Quebec Pulp and Paper Industry, p. 21).

[b]Data not available.

SOURCE: Forest Statistics, Quebec Bureau of Statistics.

a greater percentage of pulpwood converted to pulp in Canada, a very rapid increase in the use of chipped wood residue,[269] and the rapid growth of pulpwood production in the Southern States.[270]

The low rate of growth in pulpwood production during this period and the important gain in productivity achieved through the progressive mechanization of logging operations resulted in a considerable decrease of employment in logging (see Table 5).

However, pulp and paper production continued to increase. Between 1952 and 1970, wood pulp production increased by 57.2 per cent and paper and paperboard production by 64.8 per cent (see Table 3). During the same period, the number of mills and employees in the mills increased (see Table 5). Thus, despite some recent difficulties experienced in the late sixties and early seventies which will be analyzed later in this chapter, the pulp and paper industry, the rapid development of which in the first decades of the 1900's had been the basis of the first phase of industrialization of Quebec, remains one of its leading industries. Its importance is indicated by its dominant economic role

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[269] For instance, the amount of wood chips sold by sawmills in Quebec doubled between 1964 and 1969 passing from 559,095 tons to 1,148,600 tons (Forest Statistics, Quebec Bureau of Statistics). In 1970, the Council of Pulp and Paper Producers of Quebec reported that paper mills bought some 1,079,000 cunits of chips (the equivalent of 1,270,000 cords of wood) from Quebec sawmills (The Competitive Position of the Quebec Pulp and Paper Industry (Quebec: CPPPQ, 1972), p. 21).

[270] Campbell and Power, op. cit., p. 2. British Columbia, which has been favored by the growth of the West Coast market and exceptional harvesting conditions such as large diameter trees, did not follow this negative trend. Its production more than doubled between 1951 and 1965 and its pulpwood cost of production has been sensibly inferior to the cost in Eastern Canada.

TABLE 4

Pulpwood Exports and Destination, Quebec, 1952-1970

Year	New Brunswick	Ontario	Outside Canada (mostly U.S.A.)	Total Exports
	(in thousand cords)			
1952	465	435	600	1,500
1953	306	321	242	869
1954	343	337	256	936
1955	416	491	255	1,162
1956	502	423	285	1,210
1957	478	428	218	1,124
1958	303	322	151	776
1959	310	324	90	724
1960	315	311	105	731
1961	329	192	80	601
1962	193	70	7	270
1963	254	234	33	521
1964	264	309	71	644
1965	535	244	155	934
1966	398	230	225	853
1967	396	463	156	1,015
1968	160	267	201	628
1969	108	231	219	558
1970	82	275	246	603

SOURCE: Monthly Report, Pulpwood and Wood Residues Statistics, Dominion Bureau of Statistics and Statistics Canada.

TABLE 5

Selected Statistics on the Pulp and Paper Industry
Quebec, 1952-1971

Year	Companies	Mills	Employees Forest[a]	Employees Mills	Remuneration Forest	Remuneration Mills	Sales Paper & Paperboard	Sales Pulp
	NUMBER				($'000)		($'000)	
1952	40	53	35,025	25,683	85,421	93,227	-	-
1953	40	53	25,551	25,303	66,055	93,202	-	-
1954	40	55	24,849	26,908	64,568	105,918	-	-
1955	40	55	27,288	28,114	71,192	113,894	-	-
1956	37	54	31,911	29,680	84,291	127,493	-	-
1957	37	54	27,534	28,528	75,690	127,088	-	-
1958	37	55	20,109	27,292	57,816	121,954	472,860	71,159
1959	40	56	24,633	26,020	60,314	123,233	495,580	74,548
1960	40	52	24,862	27,911	64,249	134,035	508,943	80,601
1961	40	52	21,279	26,253	50,944	137,932	511,770	85,275
1962	36[b]	54	21,188	26,528	55,763	143,670	527,647	89,648
1963	35	52	19,840	25,897	55,327	145,918	527,937	97,129
1964	33	52	20,681	26,914	c	156,464	585,731	102,983
1965	33	54	20,794	27,338	c	165,632	627,350	107,616
1966	35	54	21,126	28,602	c	190,306	709,872	109,181
1967	31	54	21,727	28,809	c	201,750	713,417	99,713
1968	31	54	18,135	28,815	c	210,120	726,345	110,377
1969	29	54	-	29,518	c	235,495	807,315	131,857
1970	32	56	-	29,612	85,000[d]	251,926	819,286	147,981
1971	-	56[d]	16,400[d]	29,450[d]				

[a]These figures include only forestry employees of the pulp and paper sector.

[b]Some companies have merged into a single group. This explains variations from previous years.

[c]Data no longer available.

[d]Data from The Competitive Position of the Quebec Pulp and Paper Industry, p. 21

SOURCE: Forest Statistics, Quebec Bureau of Statistics and Quebec Yearbook, 1972.

in many aspects. Paper and allied industries rank second to food and beverage industries for the value of their shipments (1.2 billions in 1968) and third to clothing and food and beverage industries for its employment (62,082, 62,076 and 42,480 respectively) (see Table 6). When the major groups of the manufacturing industry are broken down into more specialized activities, the pulp and paper industry ranks second to smelting and refining for the value of its shipments and first in terms of employment and salaries and wages (see Table 7).

However, its economic importance for Quebec is much more significant than the importance of traditional industries like food and beverage, clothing and textiles. First, the pulp and paper industry is related to an abundant natural resource in Quebec (the forest). Second, it involves much higher investments (106 million in 1970), it is basically export oriented and, finally, it provides relatively high wages and salaries to its employees. Regarding this last item, in 1969, paper and allied industries rank second only to the primary metal industry with an average weekly salary per worker of $142.09 against $148.17 for the latter.[271] Finally, the pulp and paper industry is the most important exporting industry in Quebec. About 80 per cent of its production is shipped outside of Quebec[272] and these shipments represented 40 per cent of the total exports from Quebec in 1969.

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[271] Industrie des pâtes et papiers (Montréal: Service économique, Confédération des Syndicats Nationaux, 1971), p. 88. Hereafter referred to as Industrie des pâtes et papiers. This study is based on another study done by Henri Mhum et Associés (an economic consultant firm) for the CSN.

[272] In 1972, 18 per cent of its production went to other provinces and 65 per cent was exported (see Table 14).

TABLE 6

Selected Statistics of the Manufacturing Industry, Major Groups
Quebec, 1968

Major Group	Establishments	Value of shipments of goods of own manufacture ($'000)	Total employees	
			Number	Salaries & Wages ($'000)
Food and beverage industries	1,887	2,097,973	62,076	326,462
Tobacco products industries	17	214,691	6,630	43,443
Rubber industries	37	135,753	6,690	36,519
Leather industries	266	188,408	15,931	62,478
Textile industries	433	822,728	40,499	195,591
Knitting mills	206	239,769	13,825	55,678
Clothing industries	1,539	823,716	62,082	239,823
Wood industries	1,091	330,993	20,223	86,620
Furniture and fixture industries	795	245,040	16,776	78,611
Paper and allied industries	209	1,190,747	42,480	295,553
Printing and publishing	1,055	393,857	22,734	144,625
Primary metal industries	103	870,292	25,235	176,307
Metal fabricating industries	973	703,005	35,553	220,962
Machinery industries	118	202,956	14,491	92,529
Transportation equipment industries	156	895,366	34,660	245,429
Electrical products industries	153	644,480	35,815	220,294
Non-metallic mineral products	338	300,085	14,443	87,333
Petroleum and coal products industries	19	475,448	2,987	25,628
Chemical and chemical products	326	658,821	28,042	193,332
Miscellaneous manufacturing industries	792	308,785	20,050	96,166
TOTAL[a]	10,513	11,742,912	521,222	2,923,385

[a]Totals for each major group do not necessarily correspond to the Quebec total due to confidential data.

SOURCE: Manufacturing Industries of Canada (31-205) and Annual Census of Manufactures (31-201P), Dominion Bureau of Statistics.

TABLE 7

Principal Statistics of the Ten Leading Industries Ranked According to the Selling Value of Shipments, Quebec, 1968

Industry	Establishments	Employees	Salaries & Wages	Selling Value of Shipments
	number		($'000)	
Smelting & Refining	10	13,610	100,284	1,238,980
Pulp and Paper	56	28,127	204,415	887,147
Petroleum and coal	17	7,027	48,109	556,408
Dairy plants[a]	303	8,335	42,998	498,200
Women's clothing	420	20,250	85,895	329,635
Slaughtering and meat packing plants	92	6,162	35,815	321,935
Aircraft and parts	24	16,868	129,302	301,435
Men's clothing factories	260	16,878	66,846	239,179
Synthetic textile mills	43	10,338	47,995	236,648
Miscellaneous machinery and equipment; Railroad rolling stock	103	12,352	47,060	229,357

[a]Includes butter and cheese factories, dairy plants, milk concentrate plants and ice-cream manufacturers.

SOURCE: Secondary and Tertiary Industries Division, Quebec Bureau of Statistics.

II. The Structure of the Pulpwood Logging Industry in Quebec

The very close relationship between the pulp and paper and logging industries does not have to be demonstrated. This relationship is functional as well as structural. On the one hand, the pulpwood logging industry which depends entirely on the pulp and paper industry to absorb its output represents by far the most important segment of the logging industry. Table 8 indicates that 67 per cent of the wood harvested in Quebec in 1970-71 was pulpwood.[273] On the other hand, the pulp and paper industry faces a number of economic problems which it

TABLE 8

Volume of Wood Cut in Public Forests According to the Nature of its Use, Quebec, 1970-71

Use	Volume (In cubic feet)	(Per cent)
Pulpwood	423,700,847	67.1
Sawlogs	205,068,841	32.5
Firewood	1,241,399	0.2
Others	1,412,134	0.2
Total	631,423,221	100%

SOURCE: Rapport Annuel, 1970-71 (Québec: Ministère des Terres et Forêts, 1972), p. 83.

inherits from the logging industry[274] and which contribute seriously to weaken its competitive position on the national and international market.[275]

[273] This does not include the percentage of wood which is harvested for other uses but which goes to the pulp and paper industry under the form of chips and wood residues.

[274] Basically, the relatively high cost of wood.

[275] This problem will be discussed in more detail later in this chapter.

The close integration between the logging and pulp and paper industries is not only a matter of output-input relations, but of structural integration as well. In Quebec, the pulpwood logging industry is almost completely vertically integrated with the pulp and paper manufacturing sector of which it is, for all purposes, a divisional branch. There are even some instances where this vertical integration reaches into the service sector. For instance, newspaper publishing companies like the Tribune Company of Chicago and the New York Times either own completely or control pulp and paper companies and their pulpwood logging divisions. This very close functional and structural integration means that the pulpwood logging industry has been and continues to be dominated by the manufacturing which it is serving.

There are many reasons explaining this dominance of the manufacturing. The amount of capitalization in manufacturing is much larger than in logging. One pulp and paper mill alone represents several times the capital invested in all the loggaing operations of a major company.[276] The much more complex technology involved in manufacturing pulp and paper and the much higher level of skills and qualification required from the labor force greatly contribute to increase its salience over logging. The much greater value added to the original product by manufacturing operations and the fact that they turn out

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[276] Investments of up to $25 or $30 per cunit are required for a completely mechanized operation according to the manager of the largest division of a big pulp and paper company. Since an annual production of 250,000 to 300,000 cunits supplies a large pulp and paper mill, it means that an investment of $10 million in logging is needed to match an investment of $70 to $80 million and more in manufacturing. In fact, with the high rate of inflation of the last few years, the latter figures have more than doubled.

the finished products which are sold on the market contribute further to attract the major concerns and the attention of the direction of the companies.[277]

This narrow perception of the logging division is not foreign to the fact that the major pulp and paper companies never extended their logging activities to other forms of exploitation of the huge territories under their control (for instance, recreational activities like camping or industrial activities like ore exploration and mining) than those directly related to the production of pulpwood and sawlogs.[278]

Since the pulp and paper industry is very concentrated in Quebec, with few major producers, the pulpwood logging industry is very concentrated too. A few multi-national and national corporations dominate the industry as indicated by the figuresin Table 9. The four

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[277] An interesting story illustrates this situation very well. Several years ago, the international president of a multinational corporation decided to visit the logging operations of its Canadian branch in Quebec. By all means, this was a very rare occurrence. The local management wanted very badly to take this once-in-a-lifetime opportunity to favorably impress the president. His stay on the logging operations was carefully planned and organized. This included food. By any standard, food in logging camps some years ago was of poor quality and lacked variety. The quality of the meals received special attention. Thus, the president flew in and spent a few days touring the place and everything went smoothly to the satisfaction of the local management. No criticism from the president. However, as he was leaving to fly back to New York, he left his most important directive. He told his subordinates that the employees on the operations had it too good with the food and that the company could not afford it: food costs had to be cut. Everybody was flabbergasted but food costs were cut and employees, for several months, ate food of a lower quality than the one they had eaten in the past.

[278] The vice-president "Woodlands" of a major company told me in an interview that he and his company were now thinking seriously to diversify the activities of the logging organization in such a way.

TABLE 9

Selected tatistics for the Major Pulp and Paper Companies, Quebec, 1971

Company	Timber Limits[a]			Pulpwood[b]		No. of pulp & paper mills[c]
	In square miles	% of Quebec	Cumulative %	Requirements (in cunits)	Production (in cunits)	
Canadian International Paper	22,494	26				
Consolidated-Bathurst	15,536	18	44	--	--	6
Domtar	11,975	14	58	1,472,000[d]	715,853	7
Price	9,151	10	68	1,420,000[d]	529,705	7
Quebec North Shore Paper	6,721	8	76	706,580	344,000	5
Eddy	4,201	6		377,000	365,000	1
Anglo-Canadian Pulp & Paper	3,432	4	86	--	--	1
MacLaren	2,557	3	89	--	--	1
Others	10,939	12	101	--	--	1
				--	--	27
TOTAL	87,005[e]	101[f]			4,149,886[g]	56

[a] Rapport Annuel, 1970-71 (Québec: Ministère des Terres et Forêts), pp. 166 to 182.

[b] Logging Operation Report, 1971-72 (Quebec: Quebec Forest Industry Association). The difference between pulpwood requirements and pulpwood production (this one being the pulpwood cut on company's limits by company's own logging organization) is accounted for by pulpwood and chips purchased from independent producers or companies' own saw mill residues.

[c] Statistiques des produits forestiers, 1970 (Québec: Bureau de la Statistique du Québec), pp. 46-47.

[d] Estimations for Quebec operations based on total figures which include some operations in New Brunswick for Consolidated-Bathurst and in Ontario for Domtar.

[e] Do not add up exactly because of rounding.

[f] Total exceed 100 per cent because of rounding.

[g] Rapport Annuel, 1970-71 (Québec: Ministère des Terres et Forêts), p. 82.

largest companies control 68 per cent of the timber limits and the eight largest nearly 90 per cent of these limits. The four largest companies produce 70 per cent of the newsprint. Two of them, Consolidated-Bathurst and Domtar control 63 per cent of the production of kraft pulp. Two of them again, Canadian International Paper and Consolidated-Bathurst produce 72 per cent of all wrapping papers and paperboards.[279]

III. The Structure of Production and Exportation of the Pulp and Paper Industry in Quebec and the Cost of Wood

The purpose of the analysis in the following paragraph is to describe the economic factors characteristic of the pulp and paper industry which contibutes to the pressure which has been applied and continues to be applied on the woodlands division to lower costs. In order to do so, I will describe the structure and the recent evolution of the production and exportation of the pulp and paper industry of Quebec in the context of the North American economic environment which is the most crucial for this industry and show how the cost of wood constitutes now (more than in the past) one of the key factors in the difficult competitive position of this industry.

A. The Structure of Production and Exportation

The most important concentration of the Canadian pulp and paper industry is located in Quebec. In 1970, Quebec's paper and paperboard

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[279] Annual Newsprint Supplement (1969) (Montreal: Newsprint Association of Canada), Table 1, p. 2.

production represented 45.1 per cent of the Canadian production, or 5.8 million tons out of a total of 12.9 million (see Table 10). In 1968, there were 54 pulp and paper mills in Quebec, 36 in Ontario and 20 in British Columbia.[280] However, despite its dominance, the industry has seen its competitive position undermined in the last two decades.

> The competitive deterioration to which we refer can be illustrated by the relatively slow growth achieved in the production of key commodities. Thus Quebec's woodpulp output in 1970 was only 45% above its level in 1960, as against comparable advances of 70% for the rest of Canada, 81% for the United States and 62% for Scandinavia. For newsprint, similar ten-year increases were: Quebec 28%; other provinces 28%; United States 62%; Scandinavia 80%.[281]

Recently, more serious difficulties have contributed further to create pressure for more efficient and more aggressive corporate management. In the following paragraph, this situation will be analyzed in reference to the structure and the evolution of the production and shipments since the early 1950's.

1. Production

Commercial production is usually divided into three major groups of products: newsprint, paperboards and other papers, and commercial pulp.[282] My analysis will follow these divisions.

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[280]Even if Quebec has as many mills as Ontario and British Columbia put together, its mills are generally smaller and older, two factors, as we will indicate in a later paragraph, which are determinant in the difficult competitive position of Quebec's pulp and paper industry.

[281]The Competitive Position of the Quebec Pulp and Paper Industry, p. 5.

[282]We exclude here the pulp which is produced and used by the same company in its paper and paperboard production. In 1972, out of a total production of 6.481 million tons of pulp, 5.555 million, or 85.7 per cent were non-commercial pulp.

TABLE 10

Production of Papers and Paperboards, Quebec, Other Provinces and Canada, 1950-1970

	1950	1955	1960	1965	1968	1969	1970
	(in thousand tons)						
QUEBEC							
Total	3,301	3,774	3,906	4,738	5,235	5,738	5,802
Newsprint	2,745	3,159	3,179	3,495	3,776	4,080	4,059
Other papers[a] and paperboards[b] [c]	556	615	727	1,243	1,459	1,658	1,743
OTHER PROVINCES							
Total	3,471	4,220	5,067	6,124	6,584	7,200	7,070
Newsprint	1,303	1,606	1,940	2,482	2,513	2,772	2,683
Ontario (newsprint)	1,231	1,426	1,620	1,743	1,742	1,906	1,865
Other papers[a] [d] and paperboards	937	1,188	1,507	1,899	2,329	2,522	2,522
CANADA							
Total	6,772	7,994	8,973	10,862	11,819	12,938	12,872
Newsprint	5,279	6,191	6,739	7,720	8,031	8,758	8,607
Other papers[a] and paperboards[b] [e]	1,493	1,803	2,234	3,142	3,788	4,180	4,265

[a] All papers except newsprint.

[b] Includes building boards and groundwood printing papers.

[c] Bureau de la Statistique de Québec.

[d] Includes Ontario.

[e] Statistics Canada.

SOURCE: Canadian Pulp and Paper Association.

TABLE 10 (cont'd.)

	Increase				Canada = 100		
	1950-1960 (in '000 tons)	%	1960-1970 (in '000 tons)	%	1950	1960	1970
QUEBEC							
Total	605	18.3	1,896	48.5	48.7	43.5	45.1
Newsprint	434	15.8	880	27.7	52.0	47.2	47.1
Other papers[a] and paperboards[b c]	171	30.7	1,016	139.8	37.2	32.5	40.9
OTHER PROVINCES							
Total	1,596	45.9	2,003	39.5	51.3	56.5	54.9
Newsprint	637	48.8	743	38.3	24.7	28.8	31.2
Ontario (newsprint)	389	31.6	245	15.1	23.3	24.0	21.7
Other papers[a d] and paperboards[b]	570	60.8	1,015	67.4	62.7	67.4	59.1
CANADA							
Total	2,201	32.5	3,899	43.4	100	100	100
Newsprint	1,460	27.6	1,868	27.7			
Other papers[a] and paperboards[b e]	741	49.6	2,031	90.0			

a, b, c, d, e: see previous page.

SOURCE: Canadian Pulp and Paper Association.

Newsprint represents by far the dominant product. In 1972, 60.2 per cent of the commercial production, or 69.4 per cent of the paper and paperboard production was newsprint (see Table 11). Other papers and paperboards amounted to 26.5 per cent of the commercial production and commercial pulp to 13.3 per cent.

TABLE 11

Production of the Pulp and Paper Industry, Quebec, 1972

Product	Production (in thousand tons)	(in %)
Newsprint[a]	4,207	60.2
Paperboards[b]	1,071	15.3
Other papers[c]	778	11.2
Total: paperboards & other papers	1,849	26.5
Total: papers	6,056	86.7
Commercial pulp	926	13.3
Total: Pulp and paper	6,982[d]	100

[a]Includes certain categories of printing paper made of ground wood pulp.

[b]Including building paperboards.

[c]Includes fine papers, sanitary papers, wrapping papers, industrial, coated and building papers.

[d]Since almost all the pulp shipped to mills in Quebec was used in making paper or paperboards, there is a certain amount of duplication in the total figure.

SOURCE: Forest Statistics, Quebec Bureau of Statistics.

This is a static description of the situation. Its evolution over the last two decades is probably more important to analyze in order to assess its impact on the development of the pulpwood logging industry. However, it is not so much the evolution of its production and its shipments in absolute terms which interest us here, but in relation to other producing areas. Indeed, while figures may indicate growth, comparison with other producing areas may reveal that the rate of growth is inferior to theirs and that absolute growth is in fact a step backward in terms of progress. How well did Quebec's pulp and paper industry achieve in this respect? The answer to this question confirms that growth does not necessarily mean progress and that Quebec's position regarding the production of newsprint and pulp has been declining, although it has been improving with respect to other papers and paperboards.

Between 1950 and 1972, newsprint production declined in relative importance. Its share of the commercial production of pulp and paper decreased from 69.0 to 60.2 per cent (see Tables 11 and 12). While it represented 83.5 per cent of the paper and paperboard production in 1950, it was only 69.4 in 1972. In terms of the Canadian production, its share went down from 52 to 47 per cent between 1950 and 1970 (see Table 10). This is due to the fact that newsprint production increased at a slower rate than other papers and paperboards production.[283] One of the major causes of this diminution has been the development of newsprint production elsewhere in Canada and in the U.S.A. Thus, Quebec's share of North American newsprint production decreased from 40.5 per cent in 1966 to less than 35 per cent in 1970.[284]

Other papers and paperboards production increased very rapidly, more than doubling between 1960 and 1972, from 727 thousand tons to 1.849 million tons (see Tables 10 and 11). This upsurge was due partly to the

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[283]Respectively, 2 and 6 per cent annually (Industrie des Pâtes et Papiers, p. 97).

[284]Ibidem.

TABLE 12

Production of the Pulp and Paper Industry, Quebec, 1950-1970

Product	Production 1950	1955	1960	1965	1968	1969	1970
	(in thousand tons)						
Newsprint[a]	2,757	3,137	3,159	3,594	3,887	4,182	4,170
Papers (other than newsprint) and paperboards	544	637	747	1,144	1,348	1,556	1,632
Total (newsprint and others)	3,301	3,774	3,906	4,738	5,235	5,738	5,802
Commercial pulp	694	807	659	863	860	1,016	1,059
Total (commercial)	3,995	4,581	4,565	5,601	6,095	6,754	6,861
Non-commercial pulp	--	--	3,837	4,522	--	--	5,462
TOTAL			8,402	10,123			12,323

Product	Increase 1950-1960 ('000 tons)	1950-1960 %	Increase 1960-1970 ('000 tons)	1960-1970 %	% of total 1950	% of total 1960	% of total 1970
Newsprint[a]	402	14.6	1,011	32.0	69.0	69.2	60.8
Papers (other than newsprint) and paperboards	203	37.3	855	118.5	13.6	16.4	23.8
Total (newsprint and others)	605	18.3	1,896	48.5	82.6	85.6	84.6
Commercial pulp	-35	-5.0	400	60.7	17.4	14.4	15.4
Total (commercial)	570	14.3	2,296	50.3	100.0	100.0	100.0

[a]Includes certain categories of printing paper made of ground wood pulp.

SOURCE: Forest Statistics, Quebec Bureau of Statistics.

tariff barrier which protected the sector from American competition. It was expected that the reduction of tariff decided at the Kennedy Round would create real difficulties[285] for this sector of the commercial production. However, if there were difficulties, they did not prevent its continuing growth as its share of the total commercial production went from 23.8 per cent in 1970 to 26.5 per cent in 1972 (see Tables 11 and 12).

Regarding the production of commercial pulp, Quebec has been unable to take advantage of the important increase in the demand as much as the other producing regions. In 1956, its share of the total North American production was 14.9 per cent, but only 11.2 per cent in 1966 and 10.1 per cent in 1969.[286] The sale of commercial pulp had reached 1.06 million tons in 1970 but was down to 926 thousand tons in 1972. Thus, the trends in the last two decades indicate that the industry has been losing ground in terms of its relative position in relation to the production of newsprint and wood pulp in North America, but made some progress regarding the production of other papers and paperboards.

2. Shipments and Destination of Shipments

The analysis of pulp and paper shipments shows that they are dominated overwhelmingly by one product: newsprint, and one market: the United States. The evolution of these shipments over the last two decades indicates that the relative position of Quebec has deteriorated.

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[285] _Idem._, p. 98

[286] _Ibidem._

a) Products

In 1972, shipments of pulp and paper reached 6.876 million tons. The breakdown by products reveals that newsprint was by far the most important export with 61.4 per cent of the pulp and paper shipments and 71 per cent of papers and paperboards (see Table 13).

The changes in the structure of the pulp and paper shipments in the last two decades show that newsprint dominance has been declining. Table 13 points out that its share went from 70 per cent in 1950 down to 61.4 per cent in 1972. If the index is established at 100 for 1945, then the shipments in 1969 are as following: 220 for newsprint, 340 for paperboard and 140 for pulp (total 220).[287] Pulp shipments are the one which increased the least. Their share of total shipments decline from 17.5 per cent in 1950 to 15.2 per cent in 1970 and 13.5 per cent in 1972.

TABLE 13

Evolution of the Composition of Pulp and Paper Shipments, Quebec, 1945-1972

Year	Newsprint		Other Paper & Paperboards		Pulp		TOTAL
	('000 tons)	%	('000 tons)	%	('000 tons)	%	
1945	1,831	61.8	419	14.1	712	24.0	2,962
1950	2,757	70.0	499	12.6	693	17.5	3,949
1955	3,145	68.8	618	13.5	807	17.7	4,570
1960	3,181	70.2	691	15.2	659	14.5	4,531
1965	3,604	65.3	1,049	19.0	863	15.6	5,516
1969	4,173	62.6	1,471	22.1	1,016	15.2	6,660
1970	4,114	61.3	1,536	22.9	1,059	15.8	6,709
1971	3,981	60.9	1,583	24.2	965	14.8	6,529
1972	4,224	61.4	1,726	25.1	926	13.5	6,876

SOURCE: Forest Statistics, Quebec Bureau of Statistics.

[287] Idem., p. 104.

The excellent progress shown by other papers and paperboards can be imputed to their highly protected national market and to the decline in newsprint export due to increasing competition from the Southern States and the rest of Canada, especially British Columbia.[288]

b) Destination

In 1972, the market structure was as follows: the U.S., Canada minus Quebec, Quebec, the U.K. and the rest of the world. The dominant market was the United States which absorbed 79.2 per cent of all exports in 1972 or 52.1 per cent of all shipments (broken down into 72.3 per cent of newsprint shipments, only 6.7 per cent of other papers and paperboards shipments and 44.1 per cent of pulp shipments) (see Table 14). This clearly indicates the dominace of the industry by one big product, newsprint, and one big market, the United States.

However, the position of Quebec on the American market has been continuously declining since the late 1940's. In 1950, Quebec supplied 40.7 per cent of the American newsprint requirements. In 1960, this proportion was down to 32.7 per cent and in 1970, further down to 30.1 per cent (see Table 15).[289]

In summary, the share of Quebec pulp and paper industry has progressively declined either in terms of its major product or of its most important market. The U.S.A. have increased their self-supplying capacity and the rest of Canada (especially British Columbia) has increased its exports.

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[288] Ibidem.

[289] These shipments represented also a smaller percentage of the total newsprint shipments from Quebec, that is, 72.3 per cent in 1972 against 87.2 per cent in 1950 (see Table 16).

TABLE 14

Production and Exports of the Pulp and Paper Industry, Quebec, 1972

Product	Production ('000 tons)	Production %	Shipments (Canada) Quebec	Shipments (Canada) Other Provinces ('000 tons)	Total Canada
Newsprint paper[a]	4,207	60.2	247	238	485
Paperboard[b]	1,071	15.3	352	553	905
Other papers[c]	778	11.2	314	281	595
Total--paperboard & other papers	1,849	26.5	666	834	1,500
Total--papers	6,056	86.7	913	1,072	1,985
Commercial pulps	926	13.3	237	163	400
Total--pulps & papers	6,982[d]	100	1,150	1,235	2,385
TOTAL: 100%			16.7%	18.0%	34.7%

Product	Shipments (Exports) U.S.A.	U.K.	Other Countries ('000 tons)	Total Exports	TOTAL SHIPMENTS	%
Newsprint paper[a]	3,055	255	429	3,739	4,224	61.4
Paperboard[b]	35	69	14	118	1,023	14.9
Other papers[c]	81	7	20	108	703	10.2
Total--paperboard & other papers	116	76	34	226	1,726	25.1
Total--papers	3,171	331	463	3,965	5,950	86.5
Commercial pulps	409	34	83	526	926	13.5
Total-- pulps & papers	3,580	365	546	4,491	6,876	100
TOTAL: 100%	52.1%	5.3%	7.9%	65.3%	100%	

[a]Includes certain categories of printing paper made of ground wood pulp.

[b]Including building paperboards.

[c]Including fine papers, wrapping papers, etc.

[d]Since almost all the pulp shipped to mills in Quebec was used in making paper or paperboard, there is a certain amount of duplication in the total figure.

SOURCE: Le Papetier, 10, 3 (juin-juillet 1973), mini-cahier, p. 1

TABLE 15

Sources of U.S. Newsprint Supply, 1950-1970

Imports from	1950	1955	1960	1965	1968	1969	1970
			(In thousand tons)				
Quebec[a]	2,407	2,459	2,415	2,703	2,822	3,017	2,902
Other Provinces	2,341	2,611	2,864	3,390	3,285	3,400	3,242
Canada	4,748	5,070	5,279	6,093	6,107	6,417	6,144
Other Countries	171	145	146	255	284	293	315
Total Imports	4,919	5,215	5,425	6,348	6,391	6,710	6,459
Supply from U.S.	1,002	1,374	1,954	2,118	2,834	3,116	3,162
TOTAL SUPPLY	5,921	6,589	7,379	8,466	9,225	9,826	9,621

Imports from	Increase				TOTAL SUPPLY = 100%		
	1950-1960		1960-1970				
	('000 tons)	%	('000 tons)	%	1950	1960	1970
Quebec[a]	8	0.3	487	20.2	40.7	32.7	30.1
Other Provinces	523	22.3	378	13.2	39.5	38.8	33.7
Canada	531	11.1	865	16.4	80.2	71.5	63.8
Other Countries	-25	-14.6	169	115.8	2.9	2.0	3.3
Total Imports	506	10.3	1,034	19.1	83.1	73.5	67.1
Supply from U.S.	952	95.0	1,208	61.8	16.9	26.5	32.9
TOTAL SUPPLY			2,242	30.4	100	100	100

[a]Quebec Bureau of Statistics. Some groundwood printing paper grades included.

SOURCE: Canadian Pulp and Paper Association.

TABLE 16

Newsprint[a] Shipments According to Country of Destination, Quebec, 1950-1972

Destination	1950	1955	1960	1965	1968	1969	1970	1972
				(in thousand tons)				
Quebec	n.a.	126	142	196	218	206	280	247
Other Provinces	n.a.	130	136	187	206	212	197	238
Canada	235	256	278	383	424	418	477	485
U.S.A.	2,407	2,459	2,415	2,703	2,822	3,017	2,902	3,055
U.K.	15	104	240	207	258	256	239	255
Other Countries	101	327	248	312	421	482	496	429
Outside Canada	2,523	2,890	2,903	3,222	3,501	3,755	3,637	3,739
TOTAL SHIPMENTS	2,758	3,146	3,181	3,605	3,925	4,173	4,114	4,224

Destination	Increase 1950-1960 ('000 tons)	Increase 1950-1960 %	Increase 1960-1970 ('000 tons)	Increase 1960-1970 %	TOTAL SHIPMENTS = 100% 1950	1960	1970	1972
Quebec	--	--	138	97.2	--	4.5	6.8	5.8
Other Provinces	--	--	61	44.9	--	4.3	4.8	5.6
Canada	43	18.3	199	71.6	8.5	8.8	11.6	11.5
U.S.A.	8	0.3	487	20.2	87.2	75.9	70.5	72.3
U.K.	225	1500.0	-1	-0.4	0.6	7.5	5.8	6.0
Other Countries	147	145.5	248	100.0	3.7	7.8	12.1	10.0
Outside Canada	380	15.0	734	25.3	91.5	91.2	88.4	88.5
TOTAL SHIPMENTS	423	15.3	933	29.3	100	100	100	100

[a]Includes certain categories of printing paper made of ground wood pulp.

SOURCE: Quebec Bureau of Statistics.

The other papers and paperboards are mostly shipped to Canadian markets and this situation did not change much during the period under consideration. Indeed, 86.9 per cent of these shipments were made in Canada in 1972 (see Table 14) by competition to 92.0 per cent in 1962.[290]

B. The Declining Position of Quebec and its Causes

The preceding section of the chapter documented the fact that the pulp and paper industry in Quebec has seen its international position slip in the last twenty years. This deterioration of the position of Quebec culminated with the economic difficulties[291] which affected the industry between 1968 and 1972. These difficulties led to substantial reductions of profits (see Figure 4), to temporary and permanent mill shutdowns[292] and to substantial reductions of logging operations in many companies.

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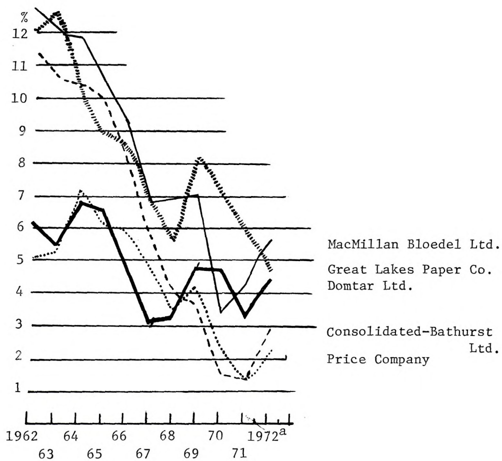
[290] Forest Statistics, Quebec Bureau of Statistics.

[291] In a document analyzing the situation, the Confederation of National Trade Unions concludes that the "crisis" is a reorganization of the pulp and paper cartel. "Considering the size of the pulp and paper industry in Quebec and its enormous investments, a rapid decline is impossible to contemplate. The present crisis consists, like the crisis of the twenties, in an international reorganization of the industry: the giants of the pulp and paper are cleaning their house without bothering for the consequences." According to the same document, this reorganization involves greater concentration, elimination of small and less profitable units of production (companies or mills), the expansion of the actual cartel to include the producers in the Southern States with the Eastern and Western Canadian producers, and an increasing economic role for the state. See On est pas pour s'laisser passer un sapin (Syndicats Nationaux, janvier 1973), pp. 93-94

[292] In his 1971 report to the shareholders, Price Company president T.R. Moore indicated that Price's "mills were each down for the equivalent of approximately two calendar months" on the average during 1971. See Annual Report 1971 (Quebec: The Price Company Limited, 1972), p. 3.

FIGURE 4

Net Income of Major Pulp and Paper Companies
Canada, 1962-1972



[a]1972 quarterly

SOURCE: Le Papetier, février 1973.

There are a number of factors explaining the present situation. Some are related to the way the Quebec pulp and paper industry has been operating (internal factors) and others are related to the environment (external factors). My object is not to discuss these factors in detail. I will mention them briefly and state how they have affected the competitive position of Quebec. However, there will be one exception. One of the internal factors, the cost of production of pulp and paper, depends very much on the cost of wood. There is, thus, a direct pressure to keep the cost of wood as low as possible by increasing productivity in logging operations through mechanization. This, in turn, affects the organizational structure of the pulp and paper logging organizations which constitutes the focus of this research.

The first internal factor has to do with pulp and paper mills. The largest number of mills is found in Quebec, but most of them are more than twenty years old and a good number more than twice this age. Companies have modernized their equipment but the volume of their investment in re-equipment and the construction of new units of production has not been up to the relative share of the Canadian pulp and paper production which belongs to Quebec. As a consequence of this and also the fact that more than one quarter of Quebec's paper production is produced in much smaller quantities than newsprint, Quebec's mills have a smaller output and employ a smaller labor force than the average mills elsewhere in Canada.[293] This results in the loss of some of the benefits of economies of scale.

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[293] _Industrie des pâtes et papiers_, p. 108 to 111.

The industry in Canada is further hampered by a low production ratio which hurts the profitability of its operations. For instance, while a production ratio of 90 per cent is considered the minimum for profitable newsprint operations in Eastern Canada, the production ratio for 1967 to 1970 in Canada were respectively 87, 83, 89 and 87 per cent.[294] There is no reason to believe that Quebec did better than the whole country in this respect.

In the 1960's, Canada experienced a very active period of investment in pulp and paper, with a culminating point in 1967 (see Table 17).

TABLE 17

Capital Expenditures, Pulp and Paper Industry
Quebec and Canada, 1959-1969

Year	Capital Expenditures		Quebec/Canada	Quebec's production in percentages of Canada
	Quebec ($'000,000)	Canada	%	
1959	34.7	110.2	31.5	--
1960	55.4	141.3	39.2	43.5
1961	56.9	138.2	41.1	--
1962	49.3	147.8	33.4	--
1963	61.8	181.6	34.0	--
1964	93.2	293.7	31.7	--
1965	101.4	383.8	26.4	43.6
1966	128.9	506.4	22.8	--
1967	139.4	418.5	33.3	--
1968	104.6	252.3	41.5	44.3
1969	109.3	288.5	37.8	44.3

SOURCE: Industrie des Pâtes et Papiers, p. 114

While Quebec received a large share of these investments, their volume did not correspond to its relative importance in the industry.

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[294] Canadian Pulp and Paper Association, Reference Tables, 1969 and 1970.

Indeed, between 1959 and 1969, they averaged 32 per cent, while Quebec accounted for over 40 per cent of the total Canadian pulp and paper production. This gap is accentuated if we take into consideration that mills in Quebec are, in general, the oldest and thus required more investments for modernization. Consequently, there has been a constant decline in the average return on investment in Quebec between 1964 and 1969, from 9.8 per cent to 4.0 per cent. Comparable figures for 1969 were from 9 to 10 per cent in British Columbia and from 10 to 12 per cent in the Southern States.[295]

The Canadian pulp and paper industry is also affected by a much lower rate of increase in productivity than other industries and its labor cost increases more rapidly. Between 1961 and 1970, the cost of labor per unit of production increased by 53 per cent in the pulp and paper industry, but by 17 per cent only in the steel industry and decreased in such industries as textile (3 per cent), petroleum industry (7 per cent) and automobile industry (25 per cent).[296] Moreover, its productivity is significantly lower than the productivity of the American pulp and paper industry. For instance, the value added per wage dollar in 1968 was 2.43 in Canada but 3.02 in the U.S.A. The value added per production worker was $18,077 in Canada, but $24,181 in the U.S.A.[297] Between 1961 and 1970, productivity went up 17 per cent in the Canadian pulp and paper industry, but 53 per cent in the American pulp and paper industry. During the same period, the cost

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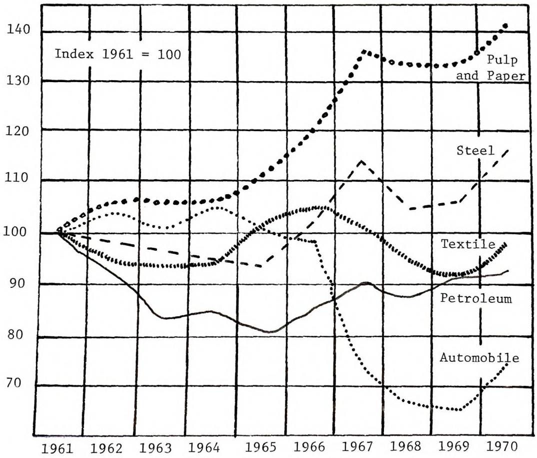
[295] Industrie des Pâtes et Papiers, p. 117

[296] Le Papetier, 10, 1 (février 1973), p. 4. See Figure 5.

[297] Industrie des Pâtes et Papiers, p. 120. These figures are from the Survey of Market, 1970 (The Financial Post), p. 297.

FIGURE 5

Labor Cost per Unit of Production, Four Major Industries
Including Pulp and Paper, Canada, 1961-1970



SOURCE: Le Papetier, février 1973, p. 4.

of labor per unit of production was increasing ten times faster in Canada than in the U.S.A. (an average of 4 per cent per year in Canada against an average of 0.4 per cent in the U.S.A.).[298]

Transportation costs are also to blame for the recent difficulties of the industry. In 1968, these costs were about $22 per ton of newsprint in Eastern Canada, but only $13 on the West Coast and $15 in the South (U.S.A.).

Production costs constitute certainly the most important factor affecting the competitive position of an industry. Table 18 indicates the cost of production of a ton of newsprint. This cost is broken down into its major components and is given for Eastern Canada (mostly Ontario and Quebec), British Columbia and the South (U.S.A.). Not only does the table show that Quebec has production costs higher than British Columbia and the South, but wood costs account for about 40 per cent of the costs of a ton of paper in Quebec and constitute one of the major source of the difference between Quebec's cost and the others.[299] Let us analyze the problem of the cost of wood in more detail.

Wood cost can be broken down into four major components: labor force, transportation, round wood and wood chips and residues. In Table 19, Quebec is in an unfavorable position on two of the four components: transportation and round wood.

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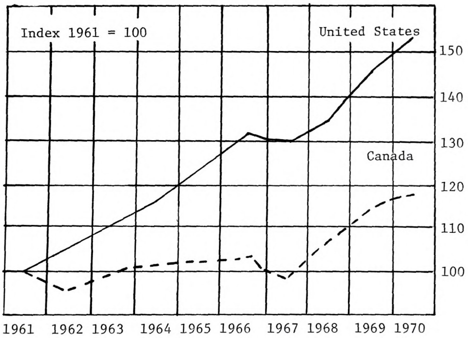
[298] Le Papetier, 10, 1 (février 1973), p. 4. See Figure 6.

[299] Idem., p. 124.

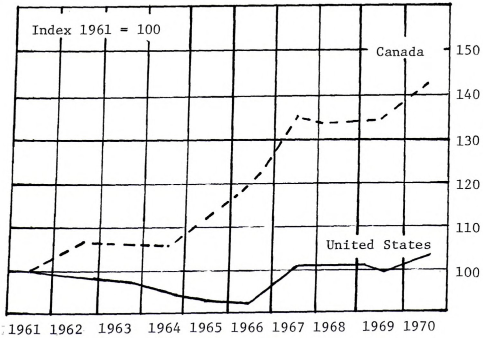
FIGURE 6

Productivity and Labor Cost per Unit of Production, Pulp and Paper Industry, Canada and United States, 1961-1970

1. Productivity



2. Labor Cost per Unit of Production



SOURCE: Le Papetier, février 1973.

TABLE 18

Cost of Production of a Ton of Newsprint,
Eastern Canada, British Columbia and Southern States (U.S.A.), 1968

Item	Cost of Production		
	Eastern Canada ($)	British Columbia ($)	Southern States ($)
Wood[a]	41.50	31.0	38.75
Salaries[a]	22.00	19.0	21.0
Other raw materials	10.50	12.0	5.25
Fuel[a] and electricity	11	10	10
Various charges	9	11	11
Long-term debt	8	15	10
Administration	7	7	4
Average total cost at mill[a]	109	105	100

[a]Items for which Quebec is in an unfavorable position.

SOURCE: Industrie des Pâtes et Papiers, p. 123.

TABLE 19

Cost of Wood per Ton,
Eastern Canada, British Columbia and Southern States, 1968

Item	Cost of Wood Per Ton					
	Eastern Canada		British Columbia		Southern States	
	$	%	$	%	$	%
Labor force	12.65	30.5	11.00	35.5	13.00	33.5
Transportation[a]	8.11	19.5	6.00	19.4	7.00	18.1
Round wood[a]	18.86	45.4	10.76	34.7	16.65	42.9
Wood chips and residues	1.88	4.6	3.24	10.4	2.10	5.5
TOTAL	41.50	100.0	31.00	100.0	38.75	100.0

[a]Items where Quebec is in an unfavorable position.

SOURCES: Industrie des Pâtes et Papiers, p. 124.

The higher cost of round wood in Eastern Canada (that is Quebec) which represents almost half the total cost of wood fibre is due to difference in the productivity of the forest. The number of trees per acre and the tree diameter are much smaller in Quebec than in British Columbia and the Southern States. For instance, in Quebec, a 70-year-old coniferous has a six-inch diameter at four feet from the ground. In Georgia, a thirty-year-old coniferous has a nine-inch diameter at four feet from the ground. The average volume per acre is twelve cords in Quebec but thirty cords in the Southern States. Moreover, wood density is 20 per cent higher in the coniferous of the Southern States.[300] Since these differences are due to the climate, there is not much that can be done besides trying to increase productivity by artificial regeneration and sylvicultural treatments.

Higher transportation costs in Quebec are related to the fact that Quebec industry is older. The closest wood to the mills was used first so that now wood has to be reached in faraway areas increasing the cost of transportation. Moreover, according to a recent study by a consultant firm, wood costs represent the most important problem of the pulp and paper industry in Quebec.[301]

Indeed, in Quebec, wood costs constitute a larger percentage of the manufacturing costs than elsewhere in Canada and in the U.S.A. Moreover, since an increase in wood costs has, in most cases, a greater

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[300] Industrie des Pâtes et Papiers, p. 125.

[301] Acres Québec Limitée, Les effets des changements technologiques sur la main-d'oeuvre forestière au Québec (Montréal: Rapport soumis au Comité d'étude de la main-d'oeuvre forestière, octobre 1969).

impact on the total production costs than an increase in the price of the other factors of production, Quebec is in a more disadvantageous position.[302]

In order to lower the cost of wood, or at least to minimize unavoidable cost increases, pulp and paper logging companies got involved in massive mechanization programs. However, this action was undertaken only in the last twenty five years or so. Indeed, the pulp and paper logging industry has been remarkable for its absence of technological change since its beginning in the nineteenth century until World War II.

> Then, axes and hand saws were used for cutting; handling was done by horses; long-distance transportation was typically by water. While the pulp and paper producing segment of the industry made one technological advance after another, the logging industry remained dependent on the muscular power of men and animals. This technologically sleepy industry began to stir about the time of the Second World War, and since that time the pace of change has been increasingly rapid.[303]

In fact, the only technological developments to take place before 1950 had been the use of trucks to haul the wood in the early 1930's and of bulldozers to build hauling roads in 1935. However, since 1950, the power saw and various models and sizes of trucks, tractors, wheeled skidders, slashers, forwarders, loaders and harvesters have almost completely driven horses out of logging operations (see Table 20) and considerably reduced the human effort involved in logging operations. Table 21 illustrates the rapidity of adoption of a key piece of newly

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[302] Idem., pp. 29 and following.

[303] Campbell and Power, op. cit., p. 6.

developed equipment, the rubber-tired skidder, which is widely in use by now.

TABLE 20

Horse Population on Pulpwood Logging Operations in Eastern Canada, 1959-1967

Operating Year	Number of Horses			
	Ontario	Quebec	Atlantic Provinces	TOTAL
1959-60	300	6402	1437	8139
1960-61	288	5935	1245	7469
1961-62	226	5329	1125	6680
1962-63	203	4476	895	5574
1963-64	227	3381	808	3608
1964-65	82	2894	500	3476
1965-66	60	2137	250	2447
1966-67	15	1569[a]	175	1753

[a]This relatively high figure for Quebec has been considerably reduced since 1967 and is not indicative of the state of technological development on the logging operations of large pulp and paper companies in 1967 nor of the present situation in 1974.

SOURCE: Canadian Pulp and Paper Association (no date).

By 1970, the Canadian pulp and paper industry estimated that it had invested $200 millions in mechanical equipment in the past decade in order to face "rapidly increasing demand for wood," "concurrent diminution and stabilization of total labour," and "higher cost of labour."[304] This increasing capitalization, which by any means remains a very small percentage of the capital invested in manufacturing, is reflected in the diminution of about 25 per cent in employment between

[304] J.R. Hughes, "Logging Operations in Canada--Review and Forecast," in Preprints (Montreal: Canadian Pulp and Paper Association, Woodlands Section, 1970), p. 233.

1960 and 1970 (see Table 5 and Chapter 7 for further discussion) and improved productivity (between 1953-54 and 1964-65, cutting productivity increased by 65.1 per cent).[305]

TABLE 21

Number of Rubber-Tired Skidders on Pulpwood Logging Operations in Eastern Canada, 1959-1971

Year	Number of Skidders
1959	24
1960	62
1961	115
1962	165
1963	453
1964	1,003
1965	2,160
1966[a]	2,486
1969[a]	3,550[b]
1971 (forecast)[a]	3,709

[a]Figures for these years are from Hughes, op. cit., pp. 233, 235 and 236.

[b]Campbell and Power's forecast in 1966 for 1969 was established at 6,800 skidders. The discrepancy between the two figures show how hazardous an undertaking forecasting may be. In this case, the above specialists felt prey to the great enthusiasm for technological change which characterized the whole pulp and paper logging industry in the middle 1960's.

SOURCE: Campbell and Power, op. cit., p. 20. Based on figures from C.R. Silversides, Abitibi Paper Company Limited.

[305]From 1.55 cu./man days in 1953-54 to 2.56 cu./man days in 1964-65. See E.F. Boswell, "Regional Rate of Development and Implications in Quebec," Pulpwood Production Manpower Conference, Canadian Pulp and Paper Association, Woodlands Section, November 1965.

CHAPTER 4

THE SAMPLE: FOUR PULP AND PAPER COMPANIES' LOGGING DIVISIONS

For the purpose of this study, a small sample of five organizations was designed, based on considerations already mentioned in Chapter 2. The population from which the sample was drawn numbered only twenty-nine companies. This number was further reduced once different factors were taken into consideration.

A first group of companies were excluded for not having pulpwood logging operations of their own. Some others were rejected for being too small in size. It was believed that small size companies would not have a fully developed organizational structure including a woodlands division which constitutes the focus of the study.

Size was also considered for other reasons. Previous information on the industry had shown that the technologically leading organizations were generally the large scale ones which often maintained experimental operations to test new methods and new equipment. Moreover, large size seemed to offer the possibility of partially screening out a factor which this writer did not want to include in the analysis, the influence of the personality of management people on the organizational structure and the functioning of the organization. This is not to mean that the personality of a vice-president woodlands is a negligible factor but that its impact seems to decrease with the increasing size and complexity of an organization. Because of the high degree of concentration of the pulp and paper industry in Quebec, the limitation to large scale organizations meant the elimination of several companies.

Several other conditions contributed to further narrowing of the range of selection. Thus, were considered eligible companies which operations are concentrated in Quebec and which are old enough to have used the traditional system ("jobber camps" and primitive mechanization) and are now functioning with the modern system ("company camps" and advanced mechanization). Preferably, the selected companies were to have operations located in different areas of Quebec and were to use the same basic system of production.

Finally, it appeared desirable to include in the sample at least one multi-national corporation and companies which were at different levels of product diversification. On the one hand, it was believed that multi-national corporations may have different development policies, a greater pool of resources, different marketing conditions and a different organizational "philosophy" influencing their structural characteristics and setting them apart from national corporations. On the other hand, companies with a greater level of diversification are more market or consumer oriented and less vulnerable to market and other economic fluctuations. This is recognized by people in the industry as an important influence on companies' policies concerning investment and organization.

I. The Sample: Importance of the Selected Companies in Quebec Logging Industry and Differences in Size

Initially, on the basis of these different criteria which were at the time more or less explicit to the writer, contacts were made by letter with five companies. They included three national corporations and two multi-national corporations which were among the largest pulp and paper companies based in Quebec. One multi-national corporation refused to participate in the study. This research report is the outcome of work done with the other four organizations: Price Company, Consolidated-Bathurst Limited, Domtar Limited and Quebec North Shore Paper Company.

The four companies retained for study satisfy our criteria for size. They are large organizations which account for slightly less than half of all pulpwood produced in Quebec's public forests (see Table 22).

TABLE 22

Pulpwood Production and Size of Limits, Four Companies, 1971-72

Company	(1) Pulpwood Production[a] (in cunits)	(2) Pulpwood Requirements[a] (in cunits)	(3) (1) as a per cent of (2)	(4) Forest Limits (sq. miles)
C-B (7 mills)	715,853	1,472,000[b]	48.6%	15,536.0
Domtar (6 mills)	529,705[c]	1,420,000[c]	37.3%	11,974.5
Price (4 mills)	344,000	706,580	48.7%	9,151.1
QNSP (1 mill)[d]	365,000	377,000	96.8%	6,720.8
Total	1,954,558	3,975,580	49.2%	43,382.4
Total Quebec[e]	4,273,008	--	--	87,650

[a]SOURCE: Logging Operation Report (1971-72). The difference between requirements and pulpwood cut on company's limits by company's organization is made of roundwood and chips purchased from independent producers and, in some cases, of chips coming from company's own saw-mill operations.

[b]Figure estimated for Quebec from total figure which include some operations in New Brunswick for C-B, and in Ontario for Domtar.

[c]Figures are for 1970 (or 1970-1971 season).

[d]The company exports some of its pulpwood outside of Quebec to a mill owned by the parent company.

[e]SOURCE: Rapport Annuel, 1970-71 (Québec: Ministère des Terres et Forêts).

They hold close to half of the total forest limits (see Figure 7). However, they are not of equal size and the difference between the largest one and the smallest one could constitute a relevant factor of analysis. There is no clear answer to this problem. Nevertheless, the potential effect of this difference in size is somewhat compensated for by a structural characteristic of these organizations. Production in the largest companies (Consolidated-Bathurst and Domtar) is fragmented into several sub-divisions which are relatively decentralized and autonomous and correspond in several cases to the woodlands department or division of former smaller companies now merged into the larger ones. As a result, these sub-divisions are much more comparable in size (see Table 23 for the breakdown of these sub-divisions). The disparities in the volume of production between these sub-divisions has to do with their territorial dimensions, their location with regard to the mills which use their supply, their allowable cut, etc.

TABLE 23

Pulpwood Production of Quebec Divisions, Four Companies, 1971-72

Consolidated-Bathurst	Domtar[a]	Price	Quebec North Shore
A: 121,000	A: 219,000	A: 344,000	A: 365,000 (1971)
B: 87,345	B: 126,739	B: --[b]	(455,000 (1972))
C: 494,000	C: 78,200		
D: 64,500	D: 21,900		
	E: 83,866		

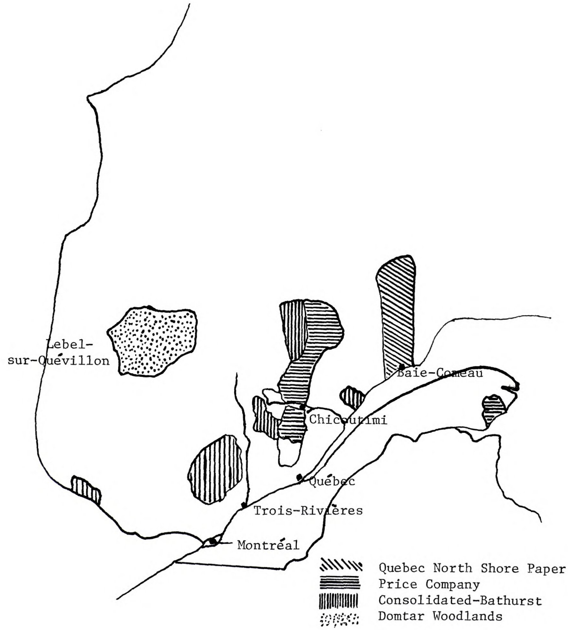
[a]Domtar's figure for 1970-71.

[b]Figures for Gaspesia Pulp and Paper were not available.

SOURCE: Logging Operation Report (1971-1972).

FIGURE 7

Forest Limits of the Four Pulp and Paper Companies in Quebec



In minimizing the impact of size by comparing sub-divisions of major companies to the divisions of smaller ones, we somewhat assume that there is a minimum volume of production beyond which differences in size do not preclude the comparison of what we can consider similar units. This minimum can be somewhat arbitrarily set at 200,000 cunits. The reason why we chose this figure has something to do with the maximum annual volume of production of a camp. By present day standards and with very few exceptions, this maximum stands at somewhere around 100,000 cunits. This is what most of the companies consider the largest manageable unit. Beyond that point, camps become very difficult to administer efficiently.[306] With a minimum of 200,000 cunits for a sub-division, it means that there are at least two camps within the sub-division and consequently, another managerial level (above the camp level) which plans, controls and coordinates their activities. Thus, in 1972, Price Company had two super-large camps,[307] and Quebec North Shore Paper had four large ones and two very small commuters camps.

However, if the impact of size is relatively minimized, it is not altogether eliminated and we will have to consider it in the analysis of the structure of organization in conjunction with other factors like geographical dispersion, etc.

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[306] Companies' policy varies in this respect. For the same total volume of production some companies prefer middle size units (50,000 cunits) while others like very large units (over 100,000 cunits). See Chapter 6 for a more detailed discussion of the factors involved in the choice of policy regarding camp size.

[307] One of them producing over 150,000 cunits of pulpwood and about 100,000 cunits of sawlogs. This was an unusual situation due to a temporary reduction of pulp and paper production during the 1970-72 market depression in the industry. Prior to this depression, the company had five camps and produced in excess of 470,000 cunits of pulpwood (instead of the 344,000 cunits of 1971-72).

II. The Organizations' Immediate Environment

The immediate environment is broken down here into seven dimensions which are more or less part of the organization's para-organizational constraints which bear on the relationship between production technology and organizational structure. Six of them consist of the "contextual variables" used by Pugh and his associates: origin and history, ownership and control, size, charter, location and dependence.[308] We have added another one which is a very important factor in logging: the physical environment. A complete description will be given for each of them. However, since some of the characteristics of these variables are similar for the four companies,[309] they will not be repeated for each once they have been described for the first company. As a result, the description of the environment of the first company will be more detailed and extensive.

A. The Price Company Limited

1. Origin and History

The Price Company Limited is the oldest of our four companies.[310] It was established more than one hundred and fifty years ago (see Table 24) by a lumber entrepreneur interested in the rich pine forest of the Lower St. Lawrence and Saguenay valleys. Its activities were limited to the lumber industry until the turn of this century when they were diversified into pulp making which had become a major source of

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[308]See Chapter 1 for more details.

[309]Unless otherwise indicated, the word "company" or "organization" refer to the woodlands division of the pulp and paper companies selected for this study. The pulp and paper company will be referred to as the "parent company."

[310]In this section, company refers to the parent company.

TABLE 24

Price Company's Major Historical Organizational Changes

1816:	Price Company is founded by William Price as a lumber company.
1870:	J.C. Wilson Limited is founded.
1902:	The first Price pulp mill in Jonquières.
1905:	Anglo-Newfoundland Development Co. Ltd. is founded.
1909:	Anglo-Newfoundland establishes a newsprint mill.
1912:	Price first newsprint mill.
1925:	Price second newsprint mill.
1959:	Price acquires J.C. Wilson Ltd.
1961:	Price acquires Anglo-Newfoundland.
1962:	New kraft pulp and paperboard mill.
1964:	Newsprint production starts at the Gaspesia Pulp and Paper Company in which Price has majority interests.
1967:	Another new newsprint mill in Louisiana in equal partnership with Boise-Cascade.
1974:	Price acquired by Abitibi Paper Company which thus becomes the largest newsprint producer in the world.

SOURCE: Various documents of the Price Company.

industrial development and trade. A few years later, Price got naturally involved in newsprint manufacturing. The demand for this product was high and the technology of paper-making had recently been improved with the development of new chemical processes permitting the use of certain timber resources which the company had in abundance.[311] Pulp

[311]See Chapter 3 for the beginnings of the pulp and paper industry in Quebec.

and paper making became rapidly the most important activity at Price and has remained so ever since.

The second major phase in the development of the company took place after World War II. It was characterized by an effort to diversify the existing activities as well as expand its production facilities in lumber and pulp and paper. It is during this period that Price acquired, in 1959, an old and well-established company (J.C. Wilson Limited) specialized in paper containers and paper towels. In 1961, Price merged with Anglo-Newfoundland Development Company which operated an important pulp and paper mill in Newfoundland.[312] The merger gave to the company its present structure.

Part of the expansion of the company consisted in joint ventures, one in the Gaspesia Pulp and Paper Company with the New York Times and another one with Boise-Cascade in the establishment of Boise-Price Southern Newsprint Corporation which operates a pulp and paper mill in Louisiana.[313]

Its efforts to diversify led Price into mining activities and oil exploration (Table 25). Nevertheless, the company remained heavily concentrated in lumber and pulp and paper as the sales figures for 1973 illustrate forcefully (see Table 26).

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[312] This merger seems to have been engineered by the British controlling interests of both companies.

[313] This move was interpreted by a union as a step taken by a member of the Eastern Canadian pulp and paper cartel to safeguard its position in the shifting production capacities and leadership in the North American pulp and paper industry from Canada to the Southern States group. See On est pas pour s'laisser passer un sapin, pp. 87 and 91.

TABLE 25

Price Group List of Related Companies, 1971

The Price Company Limited
(incorporated in Quebec)
Newsprint, groundwood printing papers, paperboard, kraft paper, kraft pulp and lumber manufacturing
Head Office: Quebec, P.Q.

Price (Nfld.) Pulp & Paper Ltd.
(incorporated in Newfoundland--99.8% owned)
Newsprint manufacturing
Head Office: Grand Falls, Nfld.

Gaspesia Pulp and Paper Co. Ltd.
(incorporated in Quebec--51% owned)
Newsprint manufacturing
Head Office: Quebec, P.Q.

Boise-Price Southern Newsprint Corporation
(incorporated in Delaware--50% owned)
Newsprint manufacturing

Price-Skeena Forest Products Ltd.
(incorporated in British Columbia)
Lumber manufacturing and sales, hemlock, cedar and sitka spruce
Head Office: Vancouver, B.C.

Price Paper Corporation
(incorporated in Delaware)
Newsprint, groundwood printing papers and market pulp sales
Head Office: New York, N.Y.

Price Paper Limited
(incorporated in the United Kingdom)
Newsprint, paperboard and kraft paper sales
Head Office: London, England

Price Kraft and Paperboard Corporation
(incorporated in Quebec)
Offices: Montreal, P.Q.
Don Mills, Ontario

Paperboard: Coated and Uncoated
Solid bleached single white lined regular and high-yield boards for folding carton manufacture, and many specialties such as closure cap boards, carrier boards and paper plate grades.

Kraft Papers: Unbleached
Wrappings, multiwall sack kraft, grocery bag and sack kraft, waxing, gumming, asphalting and duplexing krafts, and other specialty grades for converting.

Price Lumber Company Limited
(incorporated in Quebec)
Spruce, lumber, rough and dressed; pre-cut industrial stock
Head Office: Quebec, P.Q.

Price Wilson Limited
(incorporated in Canada
Rexdale, Ontario

Distribution:
A complete line of wrapping and specialty papers, bags, towels and allied products; laundry and dry cleaning products and equipment.

Manufacturing:
A complete range of grocery, notion, millinery, bread, shoe, hardware, bottle and potato bags. Paper towels in both rolls and sheets. A complete service in the design and manufacturing of folding cartons essential to modern merchandising.

Mining Subsidiaries
Terra Nova Properties Limited and The MacLean Mining Company Limited (incorporated in Newfoundland); Terra Nova Explorations Ltd. (incorporated in Quebec)

NOTE: Companies listed are 100% owned unless otherwise indicated.

SOURCE: Annual Report, 1971, p. 18.

TABLE 26

Sales By Products, Price Company, 1973

Products	Sales ($)	Production (tons)
Newsprint	139,914,000	974,000
Paperboard	9,087,000	41,000
Kraft Paper	8,395,000	37,000
Groundwood Printing Papers	3,466,000	20,000
Market Pulp	716,000	5,000
Lumber	33,902,000	193,000 m.f.b.m.
Converted and Resale Products of Price Wilson	33,989,000	--
Sub-total	229,469,000	--
Minerals (copper, lead and zinc concentrate)	--[a]	33,000 (89,000 in 1972)
TOTAL	--	--

[a]Information of a confidential nature not made available.

SOURCE: Annual Report, 1973.

2. Ownership and Control

Price is a private corporation in which common stocks owned by 9,464 shareholders[314] (of which ninety-five per cent are Canadians) are traded on the Canadian stock exchanges. Despite the large number of shareholders, it was effectively controlled by British interests, Associated Newspapers, through a holding company called Bouverie Investment until it was taken over by Abitibi Paper in 1974. This is most probably not without relevance to the relatively large amount of sales done by Price in the United Kingdom.

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[314]Annual Report, 1973, p. 16.

As an indication of the close links between companies which often exist in the pulp and paper industry in Eastern Canada, Domtar was an important minority shareholder with about ten per cent of the common shares of the company in 1973.

3. Size

There was a total of 5,804 permanent employees at the end of 1973. These include all employees of the parent company in addition to the permanent staff of its Woodlands division. The latter had a payroll totalling 2,797 employees in 1969-70 most of whom are seasonally unemployed during the break of activities occurring in the spring. In its annual report for 1973, the company had net assets amounting to $315,428,000.

4. Charter

Like all private enterprises, Price is basically a profit-seeking organization. Therefore, the annual report is expected to show a satisfactory rate of profit and return on investment for the shareholders to keep their confidence in the company and its administrators. This is clearly reflected in the report to the shareholders submitted by the company's president on behalf of the board of directors.

However, with the separation of ownership and control in modern enterprise, this traditional goal has been weighted against other organizational goals like stability, growth and public acceptance which have been shown to become increasingly important in modern management.[315]

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[315] In Canada, the separation of ownership and control has not been carried to the same extent that it has been in the U.S.A. (see, for instance, J. Porter, The Vertical Mosaic (Toronto: University of Toronto Press, 1965), p. 22 and Part II, and Wallace Clement,

An indication of this influence at Price can be found in the program of reorganization that the company undertook sometime after the acquisition of Anglo-Newfoundland. An important objective of the program was to develop a greater sense of identification with the organization among its employees because, in the words of the president of the company, "a structure, whether it be an organization or a building, is static and can produce nothing, unless the people it houses move about in it with freedom and productive purpose."[316]

It is interesting to quote more extensively from this message because it certainly reflects the main concerns of other companies' officers as well.

> The word Price represents an industrial complex of substance and scope. It represents a group of companies whose products can be found far afield in international markets. It is one of the largest business enterprises in Canada, and provides the livelihood for a considerable number of families. It is our concern.
>
> In the modern world of business there are great advantages to size. Mere numbers alone, however, can achieve little. Size in this sense is meaningless unless the complex it refers to is bonded together in some meaningful form and is directed towards a purposeful goal. In achieving this bond, or organization, it should always be remembered that the total is no more than the sum of the parts. In this context the parts of our organization are our employees. Our concern will thrive only if each and everyone of us contributes the best of our energy, initiative, good judgment, understanding

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The Canadian Corporate Elite (Toronto: McClelland and Stewart, 1975)). Most, if not all, pulp and paper companies are under the control of one or two major blocks of shareholders which are directly represented on the board of directors and usually constitute its most influential members. They also very often sit on the corporation executive committee.

316 T.R. Moore, President, "Foreward" in Our Concern (Quebec: The Price Company Limited, no date but published after 1965).

and cooperation towards the collective goal.

> The advantage of size are substantially diminished when employees, as individuals, cannot identify themselves with the broader perspective and purpose of the total concern.[317]

The new program of reorganization involved such devices as a "share purchasing plan" based on salary deductions, new symbols of identification like modernly designed logograms, etc. In its public relations material, Price emphasized the importance of its contributions to the socio-economic welfare of its employees and of the province in general, but, of course, especially of the regions where its activities are concentrated (for instance, the Saguenay-Lake St. John area).

Furthermore, the socio-economic role of the company (and other major pulp and paper producers) has come under close scrutiny by the public since recent marketing difficulties in newsprint have obliged Price (as well as other companies) to lower its production substantially. This meant the closing down of plants for various periods of two or more weeks at a time. Under these circumstances, the mobilization of the government, the unions and the public at large, is easily understandable since the pulp and paper industry is the most important manufacturing industry in Quebec and an industry which had been always believed to be above such economic problems.

5. Location

Price's logging and manufacturing operations are concentrated in two areas of Quebec and two locations in two other provinces. Logging operations are generally carried in territories close to the sawmills

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[317] Ibidem.

and pulp and paper mills which they supply (see Figure 7). The largest and the oldest logging "division" was selected for the study. It is located in the Saguenay-Lake St. John area, an industrialized region of Quebec where the pulp and paper and aluminum industries were established in the early 1900's. These industries supplanted the existing agriculture, the dominant economic activity of that period, and have remained dominant ever since even if agriculture survived as a well-organized economic activity despite large pockets of depressed farming.

The population of the area is mostly concentrated in urban centers (service and industrial centers). Price woodlands division traditionally recruited its labor force from the rural population, especially in the areas of marginal farming, of the Saguenay-Lake St. John region and other rural areas of Quebec. In the recent years, however, a growing segment of the rural labor force has moved to the neighboring urban centers while continuing their employment in logging operations.[318]

This region of Quebec has been relatively isolated from the rest of the province until the late 1940's. This isolation combined with the high degree of homogeneity of its population has contributed to the development and maintenance of a relatively high degree of social cohesion. Price, which has been closely associated with the development of the region since its beginning, continues to play a central role in its socio-economic life (see Table 27).

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[318]See Chapter 7 for a more detailed description of this evolution.

TABLE 27

Price's Mills Production and Labor Force,
Saguenay-Lake St. John Area, 1967-68[a]

Plants	Production (in tons)		Labor Force[b]	
Alma	267,000[c]	(newsprint)	810[d]	
Jonquières	40,000[d]	(paperboard)		
	7,000[d]	(pulp)	375[d]	
Kénogami	263,000[c]	(newsprint)	1,380[d]	Saguenay-Lake-St. John area
	12,500[d]	(paperboard)		
	26,000[d]	(Kraft)		
	19,000[d]	(linerboard)		
Chandler	166,000[c]	(newsprint)		
Grand Falls (Nfld.)	254,000[c]	(newsprint)		

[a]Price operates also its largest of three sawmills in the same area and is establishing another one which will be larger than the existing one (see Annual Report, 1973, p. 4).

[b]In 1973, 2,100 of its 5,804 employees worked in this region.

[c]Figures for 1968 from the Annual Report, 1968, p. 3.

[d]Figures for 1967 from P.Y. Pépin, Le Royaume du Saguenay en 1968 (Ottawa: Ministère de l'Expansion Economique Régionale, 1969), p. 261.

6. Dependence

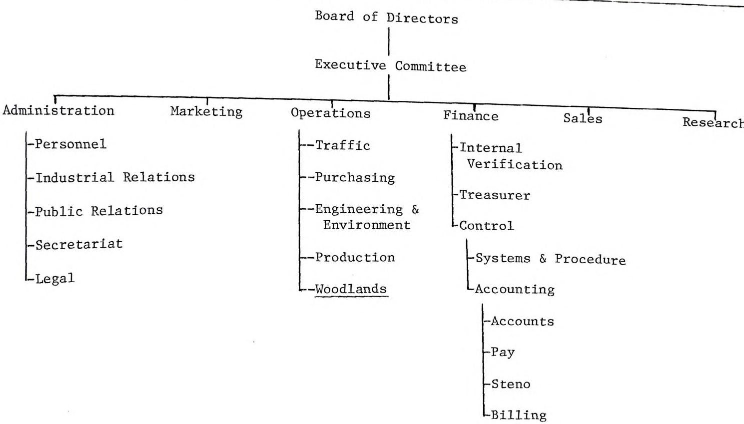
a) Dependence on the Parent Company[319]

Traditionally, the woodlands division has been the largest employer of all the branches of the company. However, with the mechanization of the logging operations and the increasing use of wood residues, the division has lost its first rank to manufacturing. In the Saguenay-Lake

[319]The typical charts of the organization of a pulp and paper company and its woodlands and manufacturing divisions are given in the following figures to illustrate the internal connections of the parent organization (see Figures 8, 9, and 10).

FIGURE 8

Typical Chart of the Organization of a Pulp and Paper Company



SOURCE: Le Papetier, mars-avril, 1974, p. 6.

FIGURE 9

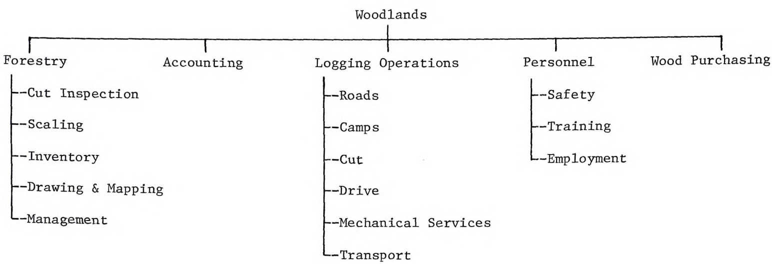
Typical Chart of the Organization of a Pulp and Paper Mill

- General Administration
  - Mill Direction
    - Orders & Traffic
    - Industrial Relations
    - Production
      - Wood Supply
      - Cardboard Machines
      - Paper Machines
      - Finishing & Shipping
      - Chemical Pulp
      - Quality Control
      - Mechanical Pulp
    - Engineering
    - Technical Services
      - Boilers
      - Power
      - Stores
      - Mechanical Shop

SOURCE: Le Papetier, mars-avril, 1974, p. 7.

FIGURE 10

Typical Chart of the Woodlands Division of a Pulp and Paper Company



SOURCE: Le Papetier, mars-avril, 1974, p. 8

St. John division, woodlands employees numbered 1,760 in 1965-66 compared to 2,565 employees in the mills in 1967.[320]

The woodlands division is represented on the major policy-making bodies of the parent company by the vice-president woodlands who also sits on the advisory committee chaired by the president (see Figure 11). As a supplier of raw material to the manufacturing branches, the woodlands division occupies a subordinate position from the point of view of the parent company. However, a recent reorganization of the hierarchical structure has improved the status of the division in this respect. Sawmills operations have been put under the responsibility of the vice-president woodlands. If the lumber sales are far inferior in value to pulp and paper sales, they have been very profitable and have contributed to avoid an untenable financial position for the company at a time when profits were sagging due to poor results in pulp and paper sales.[321]

Lumber production, which had a relatively low profit in the company's business so far, became a key element in a strategy to restore the financial balance of the whole complex. In its 1973 annual report, the company announced major expansions in lumber production from 193 million board feet in 1973 to 320 million in 1975.[322] In terms of organizational functions, the woodlands branch is completely autonomous vis-à-vis the parent company except for two of them which are completely

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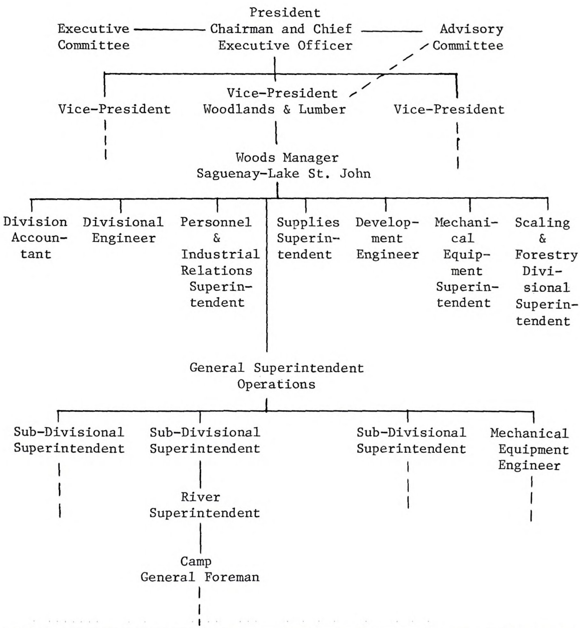
[320] Pépin, op. cit., pp. 236 and 261.

[321] Annual Report, 1971.

[322] Annual Report, 1973, p. 4.

FIGURE 11

Price Company's Woodlands Organizational Chart



SOURCE: Our Concern, p. 11 and Objectif 1972-73 (Price Company, Saguenay-Lake St. John Division, 1972).

centralized at the parent company's headquarters: public relations and advertising, and legal services.

b) Dependence on Other Organizations

Organizational interdependence can be analyzed at both ends of the input-transformation-output sequence. The simplicity of the output relationship is a good reason to deal with it first.

(i) Output

The woodlands division depends entirely on the manufacturing branches to absorb its output. Indirectly, the nature and volume of the output vary with the market conditions for paper and lumber products.[323] This market is mostly North American, the American market being the most strategic and the most sensitive one. Sales statistics published in the annual report of 1970 indicate that the value of exported products to the U.S.A. amounted to slightly less than half of the total value of Price sales.[324]

(ii) Input

The situation concerning the relationship with other organizations at the input end is the opposite of the one at the output end. There are indeed multiple relationships with governmental agencies; labor unions; suppliers of various materials, equipment, services, raw

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[323] Market conditions in the pulp and paper industry do not vary as widely as they do in other industries like the automobile industry. See Chapter 3 for more details on the structure of the market in the pulp and paper industry.

[324] Annual report, 1970, p. 8.

materials (pulpwood and wood chips), and scientific and technical information; business associations; and, finally, local public and semi-public agencies and voluntary groups. Let us analyze the situation for each group.

Government Agencies

The woodlands division maintains relations with both federal and provincial governments. However, since the forests, as a natural resource, fall within the provincial government jurisdiction, the relations with this level of government are by far the most important and extensive ones.

Relations With the Federal Government

These relations are concentrated in two major areas:[325] manpower and forestry research. Since the early 1960's, the dislocation in employment created by technological changes has been the object of special programs designed to help displaced workers to find new jobs, to get special training for new occupations and to relocate themselves within the labor market. The logging industry, because of its rapid mechanization, saw its labor requirements decrease considerably and was one of the major industries affected by these programs.

The concern with technological unemployment in the logging industry was made more serious because of its impact on the depressed rural economies which, during the same period, were to become a prime concern

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[325] The parent company comes under the jurisdiction of such ministries as the Department of Industry, Trade, and Commerce, the Department of the Environment, the Department of Regional Economic Expansion, etc.

of the rural and agricultural development policies of the government. Employment in logging activities was, and continues to be in many areas, the major source of cash income for a good deal of the population of these underdeveloped rural areas. As a result, changes in the labor force requirements of the logging industry have had an impact on the rural economy.

The federal government is also involved in forestry research. There are several establishments where experimental studies are conducted on such matters as timber growth factors, protection against diseases caused by insects, etc. This often leads to collaboration with logging concerns on field experimentation.

Relations With the Provincial Government

Relations with the provincial government cover a wide range of matters: the acquisition, management, control, use and conservation of timber resources; employment and labor relations; economic development; public recreation; environmental protection, etc. A list of elements of woods operations affected by governmental action is given in Table 28.

The Department of Lands and Forests is the most important governmental agency with which logging organizations deal since the Department exercises a direct control on all public forests. Most of the public forests are allocated to logging companies on the basis of the limit system.

TABLE 28

Aspects of Wood Operations Affected by Governmental Action at the Governmental Level

Element	Acting Governmental Department	Element	Acting Governmental Department
Ground rent	MTF	Load Limits	MTC
Stumping dues	MTF	Safety requirements	MTMO
Fire protection charges	MTF	Camp norms	MTMO and MSBS
Infractions	MTF	Explosives regulations	MTMO
Scaling requirements	MTF	Leases re booms and holding grounds	MTF
Fuel taxes	MR	Medicare contributions	MSBS
Transfer fees	MTF	Access on limits by the public	MTF
Forest inventories	MTF	Quebec Agricultural Marketing Act	MAC
Management plans	MTF	Sales tax	MR
Boundary line surveys	MTF	Logging tax	MTF
Licenses and permits	MTF	School taxes	ME
Workmen's compensation	MTMO	County and municipal taxes	MAM
Environmental control	M of the E		
Minimum wage ordinance	MTMO		
Unemployment insurance[a]			
Quebec pension plan	MSBS		

[a]Under the Federal Government responsibilities.

Abbreviations:
- MTF: Department of Lands & Forests
- MTMO: Department of Labor & Manpower
- MTC: Department of Roads & Communications
- MSBS: Department of Health & Social Services
- MAC: Department of Agriculture & Colonization
- MR: Department of Revenue
- ME: Department of Education
- MAM: Department of Municipal Affairs
- M of the E: Department of the Environment

SOURCE: The Competitive Position of the Quebec Pulp and Paper Industry, p. 17

> This is a form of tenure whereby the trees growing on the area covered by a lease are signed over exclusively to a licence holder. The right to all trees growing on the area under lease is exercised under strict supervision by the Department of Lands and Forests. Cutting operations are subject to a yearly permit to be obtained before cutting operations are started and payment of an annual ground rent. The renewal of the permit is conditioned on compliance with all laws governing lands and forests.
>
> Many duties are imposed on the limit holder who must pay the limit acquisition charge, ground rent, stumpage dues and fire protection costs. He must also carry out surveys, prepare management plans at his own expense and make large outlays in road construction to gain access to the trees he is allowed to cut.[326]

At the time of the purchase of a limit, the limit holder must carry out a complete survey of the timber resources located on it and submit a long term program of exploitation based on the potential of the limit as shown by the survey. Both survey and long term program have to be re-submitted every ten years thereafter. They are verified by specialists of the department and modified if not found acceptable according to government standards. Every year the acquisition of a cutting permit is conditional upon the submission of an annual program of exploitation and the description and justification of any revision made to the original survey and long term program of exploitations.

The Department of Labor and Manpower regulates such items as minimum wages, fringe benefits like paid vacations, working conditions (safety, living quarters, etc.) and labor-management relations. In the recent years, the department has also been involved in problems of technological unemployment, labor mobility and manpower training.

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[326] The Competitive Position of the Quebec Pulp and Paper Industry, p. 9.

Outdoor public recreation and environmental protection are matters which have become increasingly important for the provincial government and have led, in the case of environmental protection, to more stringent measures regarding the use of water bodies (rivers, streams and lakes) to drive pulpwood and sawlogs.

Unions

Labor unions were late to come to the logging industry. Whereas, in some cases, pulp and paper mill workers were organized as far back as the 1910's, woodsworkers had to wait until the beginning of the 1950's to get represented by labor unions. How can one account for such a time lag?

Probably the simple most important factor is that, traditionally, woodsworkers were farmers using logging employment as a temporary supplementary source of cash income. Moreover, this income supplement had to be earned within the then very short period of logging operations. Logging employment was a means to make a fast buck. Furthermore, besides thinking highly of individual freedom as all peasants usually do, woodsworkers were working in almost complete isolation of each other and remunerated on an individual basis. As a result, they were not much prepared to use collective action to achieve better working conditions.

Three other factors may have also prevented unions from making inroads into this industry. Basically, an industrial and urban phenomenon, unionism was poorly if at all known by the rural population.[327]

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[327] This applies to unionism as an institution as well as to its representatives who were city people and ill-prepared to understand rural people and to be accepted by them.

Where it was known, it was seen as a foreign institution, not only to the rural society but also, in the case of international unions, to the French Canadian and Roman Catholic background of the peasants. Attempts made by industrial or trade unions to organize woodsworkers were often pre-empted by the tight control exercised by logging companies on the access to forest limits and on recruitment.[328] Union organizers could be screened out by recruiters or people in charge of hiring. They could be stopped at the gates controlling the access to the operations. If they managed to reach the camps, they could be relatively easily spotted and forced to leave the limits at once. It is only after the intervention of the government that this situation was corrected and free access to the limits was guaranteed by legislation.[329]

Finally, woodsworkers' high rate of mobility, irregularity of employment and individualism, and widely-scattered operations and camps made it very difficult for unions to build a stable membership and to form a strong organization at any camp site or even within any given logging company.[330] It is only after logging employment became the

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[328]C.B. Davis, "Ontario--Woods Union Activity," Pulp and Paper Magazine of Canada, August 1959, pp. 85-86.

[329]Forest workers were explicitly covered by the new Labor Code in 1964. "The new legislation, besides defining 'logging operations' (in which it includes felling and barking), deems a limit holder to be an employer for purposes of negotiation of collective agreements with employees in the forest, co-operative forestry syndicates being, however, not subject to the Code (section 2). Forestry enterprises must (section 8) allow all persons holding a permit issued by the Labour Relation Board to have access to their limits or properties. This section contains a new provision obliging the employer to advance to his employees the sum required as union dues" (Quebec Yearbook, p. 317).

[330]In his study of the American lumber industry, Jensen mentions four similar factors unfavorable to union organization: the very high turnover of the labor force, scattered mills and camps, irregularity

main source of cash income, or at least as important as farming, that woodsworkers' conditions changed enough to make possible the establishment of unions. While unions appeared in Ontario as early as the 1920's[331] and made real headway "during a crisis period in 1933-35 and became firmly established in 1946," systematic recruiting began in Quebec "in 1950 and reached saturation in 1966" when "unions claimed to represent nearly 200 units."[332] The first collective agreement was signed at Price in 1951 by the U.C.C.[333] followed by one at Consolidated Paper in 1952 by the C.N.T.U., a rival industrial organization.[334] Here was an apparent paradox. At a time when woodsworkers were becoming "professionals" and drifting out of farming,[335] they were organized first by a farmers' union.

The paradox is only apparent for two reasons. On the one hand, it is quite normal for a given organization, which sees a good deal of its actual and potential membership moving out of its traditional domain,

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of employment and frequent shifts in employment, and individualism. He details also the very strong opposition of employers in this industry to the establishment of labor unions (Vernon Jensen, Lumber and Labor (New York: Farrar and Rinehart, Inc., 1945, especially Chapter 7)).

331 Davis., op. cit., p. 85.

332 R. Ferragne, "Sociological Aspects of Woodlands Manpower Problems," Pulp and Paper Magazine of Canada, September 1967, Woodlands Review Section, p. 379. See also P.M. Archambeault, "Quebec--Woods Union Activity," Pulp and Paper Magazine of Canada, August 1959, pp. 84-85.

333 The farmers' professional association (l'Union Catholique des Cultivateurs) founded in 1924 and recently became l'Union des Producteurs Agricoles.

334 The Confederation of National Trade Unions founded in 1921.

335 See Chapter 7 for further details about this socio-economic change in the rural economy.

to extend its activities into the new domain in order to serve its members more efficiently and thus secure its own survival and influence.[336] On the other hand, the farmers' union had several advantages over industrial unions. A large segment of the woodsworkers had been, or were, members of its locals. The farmers' union knew very well the mentality and problems of the rural population and was an organization which woodsworkers at large were familiar with.[337]

If the farmers' union was the first one to succeed in organizing woodsworkers, it was soon joined by rival industrial unions which managed quite rapidly to control the majority of the potential membership. By 1964, the International Brotherhood of Carpenters and Joiners

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[336] According to Archambeault, the U.C.C. claimed that "its mission is to protect and represent the rural population, either on the farm or in the woods." See Archambeault, op. cit., p. 84.

[337] A report of the International Labor Office described the situation as follows: "The labor force in eastern Canada consists mainly of farmers and farm workers in their off season. While most of them work in logging as paid employees, a very considerable proportion work on their own account and sell their products, mainly to pulp and paper companies. In this area, and in Quebec in particular, the proportion of small holders is considerable. Many generations of European settlers in Canada established their homes in the relative safety of the St. Lawrence Valley, and until comparatively recent times, little further expansion had taken place. The big farms, carved out in the expanse of the bush, had been successively divided up through heritage and many of them had been reduced to a series of small holdings. Their owners followed the same fate as their counterparts in other regions of the world and when finally given the opportunity of supplementing their revenue through industrial earnings, they took to the activity which they knew best and which was carried out near their homes. Their associations reflect this twofold character of their occupation; they still retain the features of farmers' organizations but at the same time they act like workers' organizations in defending the interests of their members engaged in timber works. Such organizations include the Catholic Union of Farmers (Forestry Service), the activities of which are limited to the province of Quebec. This Union bargains on behalf of its members and concludes collective agreements with a number of companies engaged in logging in various places in Quebec" (Labour-Management Relations (Geneva: International Labour Office, 1958), p. 25).

represented 65 per cent of the 30,000 woodsworkers in Quebec[338] and in 1968, the respective membership of the three unions was given as follows: Carpenters and Joiners 13,000, U.C.C. 5,000 and C.N.T.U. 2,000.[339] By 1973, however, the C.N.T.U. had made some important in-roads and relegated the U.C.C. to third place. The rivalry between the three unions has been based on differences in orientations. The U.C.C. has always been influenced by its close ties with the rural society and, as recently as 1963-64, waged an intensive campaign to have the forest integrated to the rural economy by giving a greater economic role to local cooperative logging organizations.[340] The general lack of support received for this policy from the industry, the other unions, the government and the public in general, was an indication that logging was increasingly dominated by, and tied with, the large pulp and paper and lumber industry and the urban society.

As for the two industrial unions, their rivalry is part of a general rivalry which opposes the two major union organizations in Quebec, the local C.N.T.U. and the Quebec Federation of Labor which groups international unions in Quebec. C.N.T.U.'s unionism in the last two decades has been much more militant than its opponents[341] and characterized as being a "syndicalisme de contrôle" (control unionism)

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[338] According to Robert Paquet, its head, in Le Papetier, 1, 1 (January 1964), p. 3.

[339] "Cross-Canada Crisis: A Dilemma in Pulp and Paper Labour Negotiations," Pulp and Paper Magazine of Canada, 69, 11 (June 1968), pp. 68-74, p. 70.

[340] See the complete issue of Le Papetier, 1, 1 (January 1964).

[341] See, for instance, On est pas pour s'laisser passer un sapin (Montréal: 1973) and Politique Forestière pour le Québec (Québec: Fédération Canadienne des Travailleurs des Pâtes, Papiers et de la Forêt, octobre 1971).

opposing strongly the business unionism of the international unions and their foreign domination. In the views of logging management, the militant spirit and need to outdo the other unions generated by this rivalry has led to unrealistic demands to the industry and constitutes a major labor problem.[342] The situation is further complicated by reputed irresponsible leadership in the labor movement. As one spokesman for the industry put it:

> Unfortunately, union leaders have, over the past several decades, started to show a marked internal power hunger which has rendered them indifferent to the realistic needs of their own members, the employers with whom they deal, our national, and even our regional economic policies. In their drive to retain power, labour leaders have started to exercise a degree of quasi nepotism that would make even a family-owned enterprise blush. In their fear of losing power, they have become on the one hand, outrageously militant in their demands and on the other, noticeably reactionary in their philosophy.[343]

At the beginning, logging unions were merely welfare organizations seeking some basic protection for their members. An illustration of this type of unionism can be found in the first labor agreement between Consolidated Paper and the C.N.T.U., one year after the first agreement was signed between the U.C.C. and Price. This agreement covered such things as hours of work, period of pay, solution of grievances, discipline, wages, paid vacations, safety and first aid, living quarters, hiring, promotion and firing, and management rights. The provisions for each of these items were simple and the text of the agreement was

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[342] C.R. Day, "The Labour Relations Scene," Pulp and Paper Magazine of Canada, 70, 14 (July 1969), p. 91

[343] D.M. Johnson, "The Manpower Situation," Pulp and Paper Magazine of Canada, 73, 5 (May 1972), p. 92

only six typewritten pages long. Management rights were accepted without restrictions.

> Rien dans les présentes ne devra être pris comme restreignant le droit de la Gérance du District de reconnaître le mérite et l'habileté, de garder les travailleurs clefs, et de promouvoir en général l'efficacité des opérations. Aucune clause de ce contrat ne doit être considérée comme limitant les droits de la Gérance du District qui sont entre autres, d'administrer le district et de diriger les travailleurs, de manière à assurer l'efficacité des opérations, et le Syndicat convient que la Gérance du District peut changer les méthodes ou allocations de travail en n'importe quel temps.[344]

From these humble beginnings, woodsworkers unions soon caught up with older industrial unions and the scope and importance of the problems at the center of the bargaining process increased markedly. Two decades after the first agreement with Consolidated Paper, labor-management relations at Les Escoumains are now governed by a sixty-page long document of which as much as a third deals with salaries and wages alone. Management rights, although still recognized, have now been narrowed down considerably by the numerous detailed clauses of the agreement.

> Le syndicat reconnaît que la Gérance du District a le droit d'administrer l'entreprise et de gérer ses affaires à tous égards, suivant ses engagements, ses responsabilités et ses objectifs. De plus, la Gérance du District conserve tous les droits et prérogatives qui ne sont pas retirés ou modifiés spécifiquement par la présente convention.[345]

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[344] Convention collective de travail entre Consolidated Paper Corporation Ltd., District Les Escoumains et le Syndicat National des Travailleurs de la Pulpe et du Papier, Section du Bois, Les Escoumains, et la Fédération Nationale des Travailleurs de la Pulpe et du Papier, Inc., janvier 1953, p. 7.

[345] Convention collective de travail entre Consolidated-Bathurst Limitée et le Syndicat National des Travailleurs de la Pulpe et du Papier, Section du Bois, Les Escoumains et Ste-Anne de Portneuf et

Thus, in their complexity and length, present agreements in the logging industry do not differ much from agreements existing in major manufacturing industries. According to one specialist who has been with the industry for a long time, the impact of unionism has been important although unequal. During the first years of its existence, unionism created an upward pressure on wages and salaries and contributed to considerable progress in hygienic conditions, lodging and hours of work.[346] Moreover, if, according to another industry source, changes in the organizational structure of logging enterprises should not be traced to the existence of collective bargaining, at least not directly,[347] there is little doubt that the advent of unionization created pressures on management which contributed together with other factors to major organizational changes (see Chapter 6). Certainly logging companies had to develop their own specialized staff in industrial relations and a growing cooperation among themselves to define common policies and programs to deal with labor-management problems.[348]

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la Fédération Canadienne des Travailleurs des Pâtes et Papiers, 1970, p. 12.

[346]R. Ferragne, "La stabilité d'emploi en forêt," Le Papetier, 5, 5 (October 1968), p. 9.

[347]Interview with the general manager of logging operations, Price, Division Saguenay-Lake St. John.

[348]Interview with the general manager of woodlands, Domtar. For instance, the industry established the Quebec Forest Industries Labour Relations Bureau in 1967 and a policy committee, "le Comité d'Orientation," in November 1970. The policy committee was set up to study the present situation of the work week in the industry and any other item of collective bargaining of a monetary nature and requiring some immediate action on the part of the industry. Among its recommendations, the committee suggested the establishment of a comprehensive welfare program for logging employees which has already been implemented. It recommended also a greater and more systematic cooperation between companies through the Labour Relations Bureau

However, unionization did not help much to solve the basic problem of labor mobility.[349] But changes in manpower requirements caused by mechanization contributed to the development of a more open and far-sighted attitude on the part of management in its relations with organized labor[350] and the familiarization with, if not the adoption of, modern conceptions of personnel management.[351] This is clearly evident in interviews with management[352] as well as the presence of invited management specialists, American ones in particular,[353] at various meetings of the industry.

In summary, the recent evolution in labor-management relations is due to several factors: increasing stabilization and "professionalization" of labor, diffusion effect from manufacturing industries and from the logging industry outside of Quebec (especially Ontario), competition among different unions, increasing capitalization and complexity of the logging operations due to extensive mechanization, and changes in the structure of organizational management.[354].

(Rapport confidentiel du comité d'orientation du Bureau des Relations de Travail des Industries Forestières du Québec, November 1, 1971).

[349] Ferragne, op. cit.

[350] Ibidem.

[351] Such as goal-oriented and problem-solving management theories, needs theories, etc.

[352] For instance, interviews with upper management people at Price, Domtar and Quebec North Shore Paper such as general managers of operations.

[353] For example, Dr. M. Scott Myers, manager of management research at Texas Instruments Inc. at the Canadian Pulp and Paper Association's Industrial Relations Section Centennial Fall Conference in 1967 and Anthony Pearson, general manager of Scientific Methods Inc. (Texas) at the following year's annual meeting of the Industrial Relations Section of the CPPA.

[354] These factors are more explicitly studied in Chapters 5, 6 and 7.

At Price, management has been dealing with several unions according to the different locations of its operations. In the Saguenay-Lake St. John division, office employees are represented by a local of the International Union of Professional and Office Employees (A.F.L.-C.I.O.), forestry technicians (like scalers, forest rangers, etc.) by a local of the Canadian Federation of Pulp and Paper and Forest Workers (C.N.T.U.), as well as the mechanics and other employees at the machine shop, and woodsworkers by a local of the Quebec Federation of Forest Workers (Catholic Farmers Union).

Suppliers of Material, Equipment, Services,
Pulpwood and Technical Information

In the traditional system, the number of suppliers was very limited. Most of the equipment belonged to the workers (axes, saws, hooks, horses, etc.). The only major outside supply was food for men and horses. This situation left the organization with a good deal of freedom. However, with the increasing use of mechanical equipment and the modernization of the various services, the number of suppliers has greatly augmented. There has been a multiplication of types of machines and, consequently, a significant increase in parts and other materials like tools, accessories and lubricants needed for maintenance and repair. At the same time, some of the new equipment is so complex that the skills required to repair it have to be supplied by the dealer. Thus, organizational efficiency is much more dependent on reliable and competent services from these various suppliers than in the past.

On the other hand, the competition which exists among suppliers obliges them to cater to the needs of their customers well enough to

maintain their patronage. For those suppliers, which are only specialized in logging equipment, the degree of their dependency on logging organizations is such that the quality of their service is a matter of survival. In these cases, logging organizations are much less dependent on the suppliers, but not completely independent. Indeed, in some cases the complexity or sophistication of the equipment is such and the market for this equipment so specialized and limited that there is only one supplier. For any logging organization which is using this equipment to suddenly sever its links with the supplier would create too much disruption to be worth it unless other solutions have been exhausted.

In the past, the pulpwood needed by the manufacturing division was almost completely (if not all of it) provided by the logging division's operations. This is no more the case now (see Table 29). There has been a trend toward buying an increasing larger share of pulpwood requirements from independent producers: sawmills, small logging organizations, farmers, other private owners of woodlots,

TABLE 29

Sources of Pulpwood Supply,
Price, Saguenay-Lake St. John Division, 1967

Source	Volume in Cunits
Farmers	13,600
Small Limit Holders	55,250
Company's Logging Operations	261,150
Chips and Shavings from the Company's and other Entrepreneurs' Sawmills	290,000

SOURCE: Pépin, <u>op. cit</u>.

etc.[355] This trend has been very much encouraged by the government for different reasons. Timber resources are more intensively used this way since sawmills' residues, for instance, instead of being burned, are utilized more profitably to make woodpulp. The selling of pulpwood provides also farmers with a necessary complementary source of income and there are even small rural communities which depend almost entirely on the existence of their small logging cooperatives.

This offers several advantages to the logging companies. First, this source of supply is usually closer to the mills than the wood cut on company's limits. Transportation costs are thus lower and delivery can be scheduled more conveniently.[356] Moreover, outside purchases constitute normally a cheaper source of wood and, for the company, a basis of comparison for controlling its own production costs. Finally, outside purchases contribute to maintain company's timber limits at a higher potential and give to the company a greater flexibility of adaptation to sudden fluctuations in the demand from the manufacturing division. This flexibility is, however, limited since independent suppliers, even the farmers through their marketing organization and with the help of government regulations, are usually under contract with the company to provide a <u>minimum</u> quantity by which both parties are bound. Thus, a sudden fall in the demand will result in the company having to curtail its own logging production rather than its purchases.

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[355] For instance, 20 per cent of the roundwood supply comes from private woodlots in Quebec. See Anatole Côté, "Création d'un monopole," <u>Le Papetier</u>, 11, 1 (février 1974), p. 4.

[356] In theory, this is true, but in practice companies have problems of delivery with farmers and cooperatives. See Côté, <u>op. cit.</u>, p. 4.

Logging companies are also dependent on the suppliers of scientific and technical information. Most of this information comes from the suppliers of material and equipment (sometimes their research department), governmental agencies (like their forestry research division), universities (like the forestry research centers), and industry-supported organizations (like the Canadian Pulp and Paper Research Institute supported collectively or the Domtar Research Center supported by a private corporation). These numerous organizations maintain a continuous flow of information readily available to the users.

Associations of Producers

Price belongs to the two most important industrial associations: the Canadian Pulp and Paper Association, representing the pulp and paper industry across Canada, and the Quebec Forest Industry Association which represents Quebec's logging industry.

The role of these organizations consists in creating a common front before the public and other organizations, providing their members with channels of communication and specialized information, acting as public relations agencies and pressure groups for the industry, and sponsoring "ad hoc" research programs on specific problems. Through membership in these associations, logging companies participate in the elaboration of common strategies to deal with the labor unions, various public agencies and sometimes, as it happened in the past, to engage in cartel activities like price-fixing, etc.[357]

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[357] See Chapter 3 for further details on this point.

Local Public and Semi-Public Agencies

Through their parent company, logging organizations are often in close relations with local municipal governments, especially when they are the major local employer or the most important tax payer in small rural or industrial communities. Companies are usually expected to promote community development and to contribute materially to it, especially in the field of recreation. Voluntary associations of a semi-public or public character like fishing and hunting clubs, conservationist groups and a score of other recreational, benevolent, social and cultural groups ask from time to time for their help and cooperation.

At Price, its Saguenay-Lake St. John logging and manufacturing divisions have been in operation for such a long time and occupy such an important place in the socio-economic life of the population that these relations are given a priority treatment by the managers. Among its most publicized activities, there is an annual curling bonspiel and a golf tournament.

7. Physical Environment

It is rather difficult to give an accurate description of the physical environment in which logging organizations operate since their activities are spread over a very extensive territory. Physical conditions vary to such an extent that average figures describe precisely only a small part of this environment. However, it is practically impossible and otherwise irrelevant to give an exhaustive description in this study and we will use aggregate figures established by the

companies themselves.[358]

The characteristics of the physical environment of Price's Saguenay-Lake St. John division are described in Table 30.

TABLE 30

Characteristics of the Physical Environment, Price's Saguenay-Lake St. John Division

1.	Number of merchantable stems per acre (nearest 10)	310
2.	Number of unmerchantable stems and saplings per acre (nearest 100)	500
3.	Average cubic feet per merchantable stem	6.5
4.	Average merchantable height (butt to 3-inch top) in feet	51'
5.	Branchiness class (#1: to 33 per cent; #2: 34 to 66 per cent; #3: 67 to 100 per cent)	#1
6.	Slope (nearest 5 per cent over 100 foot distance)	10%
7.	Ground roughness	Thin soil over rock and boulder
8.	Ground bearing class (#1: hard; #2: soft; #3: very soft; #4: frozen)	#1 & #4
9.	Density	--
10.	Stock	--

SOURCE: Logging Operation Report (1971-72), p. 383.

B. Domtar Limited

1. Origin and History

Domtar Limited is the result of a series of mergers and acquisitions involving relatively large and small pulp and paper companies (some of them family controlled) and other companies involved in various productions (chemicals, construction materials, etc.). The

[358] These figures are found in the Logging Operation Report (1971-72).

oldest member of this group was Canada Paper incorporated in 1857. This pulp and paper company went through a period of expansion in the 1910's and 1920's and was taken over by Howard Smith, another pulp and paper producer, in 1929. In 1943, Howard Smith established its first woodlands department which was later re-organized in 1957 when Howard Smith acquired Donacona Paper. Then a vice-president woodlands was appointed.

In the early 1960's, Domtar's present structure emerged as the result of two major takeovers. The first one involved an important pulp and paper company, St. Lawrence Paper, and a chemical complex, Dominion Tar and Chemicals. The following year, Domtar and Howard Smith Paper Mills were amalgamated. At the time of this final merger, no major changes took place in the woodlands. Howard Smith and St. Lawrence Paper woodlands division continued to function almost completely independent from each other.

In the late 1960's, Domtar felt the need to streamline its organization in a more efficient way. A new vice-president woodlands was appointed in 1967 and a complete reorganization of the woodlands division was done. All woodlands activities became centralized under the new vice-president and the emphasis was put on standardization and the concentration of services. At the same time, the company was locating the headquarters of its several divisions together in a new office building in Montreal.

2. Ownership and Control

Domtar is a Canadian company, the common stocks of which are traded on Canadian stock exchanges. In 1973, it was owned by 27,705

shareholders (a marked decline from about 40,000 in 1970), of which around 90 per cent were Canadians.[359] The control of the company belongs to a holding group, Argus Corporation, which had about 17 per cent of the outstanding stocks in 1967.

3. Size

Domtar had 18,017 employees in 1973, excluding seasonal woodlands employees which numbered about 2,500 in 1970. The 1973 annual report shows net assets of $571.4 million. Company's sales reached a record $655.8 million in 1973, of which $442.0 or 67.4 per cent were pulp and paper products (see Table 31). Pulp and paper production stood at 1,442,079 tons. Its evolution since 1966 indicates that the company has concentrated its efforts on papers other than newsprint which has not only significantly declined in percentage but also in absolute volume. In 1966, Domtar produced 586,976 tons of newsprint, or 43 per cent of its total pulp and paper production, but in 1973, the corresponding figures were 354,020 tons and 25 per cent only.[360]

4. Charter

Domtar is very similar in this respect to Price, and what was written of Price earlier applies here. If there is a difference between the two companies, it is that because of its widely diversified production (see Table 32), Domtar is more "market-oriented" and more customer-conscious than Price. This is reflected even in the woodlands

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[359] Annual Report, 1973, p. 3.

[360] Idem., p. 16

TABLE 31

Consolidated Sales by Main Product Groups
Domtar, 1966 to 1973

Year	Pulp & Paper	Construction Materials	Chemicals	Consumer Materials	Total
1966					
$ millions	272.3	84.1	56.3	17.4	430.1
%	63.3	19.6	13.1	4.0	100.0
1967					
$ millions	272.0	81.0	57.5	17.5	428.0
%	63.6	18.9	13.4	4.1	100.0
1968					
$ millions	279.0	86.4	62.0	--[a]	427.4
%	65.3	20.3	14.5	--	100.0
1969					
$ millions	310.1	90.7	64.0	--	464.8
%	66.7	19.5	13.8	--	100.0
1970					
$ millions	335.7	80.5	68.7	--	484.9
%	69.2	16.6	14.2	--	100.0
1971					
$ millions	338.5	97.7	80.2	--	516.4
%	65.6	18.9	15.5	--	100.0
1972					
$ millions	364.5	110.9	85.4	--	560.8
%	65.0	19.8	15.2	--	100.0
1973					
$ millions	442.0	122.1	91.7	--	655.8
%	67.4	18.6	14.0	--	100.0

[a]This division was sold in 1968.

SOURCE: Annual Report, 1973, p. 16.

TABLE 32

Domtar List of Operating Companies, 1973

Domtar Chemicals Limited
Domtar Construction Materials Limited
Domtar Pulp and Paper Products Limited
- Domtar Fine Papers Limited
- Domtar Newsprint Limited
- Domtar Packaging Limited
- Domtar Pulp Limited
- Domtar Woodlands Limited

SOURCE: Annual Report, 1973, p. 2.

division, the vice-president of which has shown complete acceptance of the "multiple use" concept of forest resources[361] and been thinking of getting its division more actively involved in recreational activities, etc.

5. Location

One of the major consequences of the type of growth which characterized Domtar is the dispersion of its operations and their location in various areas of Quebec which differs widely in terms of their physical and social characteristics. This is especially true of the woodlands division. For instance, woodlands operations at Lake Quévillon are located in a completely isolated area far from any important urban community. A company town was established to provide housing and other services to the woodsworkers as well as the mill personnel. In order to reduce the problems of recruiting and training its labor force which comes from other regions, the company established a technologically advanced system of production[362] which diminishes labor requirements and which can be operated on a year-round basis, thus providing for full employment and labor stability. Domtar thus created the first fully "professionalized" woodsworker group in Quebec.

The situation is totally different at Jacques-Cartier, another woodland division. These operations are located near the metropolitan

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[361] Pulp and Paper Magazine of Canada, September 1969, pp. 99-100. It should be mentioned that the company already established two salmon farms on its properties in Quebec.

[362] The system was made possible because of the high density of the tree stand, the flatness of the terrain and the proximity of the mill.

center of Quebec City and the company can rely on a large pool of woods-workers traditionally trained and living in the nearby rural areas. Paradoxically, it is an unstable work force of commuting workers which have remained very much attached to the more traditional form of organization and a much less advanced technology.[363]

Somewhere along the continuum between these two extremes, the division of Dolbeau is located close to small urban and rural communities where the pulp and paper industry and the lumber industry have been historically the major economic activities.[364] This situation has contributed to decrease the problem of recruiting, training and keeping a stable labor force. Many workers who were coming from far away regions have settled down in the nearby population centers, especially since the operations are on a five-day week basis and that logging camps are closed during the weekends. The stability of the labor force was also favored by the decreasing labor requirements (due to diminishing pulpwood demand). As a result, the divisional management kept the more stable people on its employment list and eliminated the others.

One major overall effect of the wide spatial distribution of Domtar's logging operations is a pressure toward decentralization. Indeed, despite the increasing sophistication and efficiency of communication techniques, the headquarters seem to have come to the conclusion that greater organizational efficiency would be achieved with a smaller

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[363] Adverse environmental conditions (for instance heavy snowfalls and mountainous terrain) have limited the adoption of a more modern technology.

[364] See earlier description of Price's Saguenay-Lake St. John division, which is located in the same area.

central staff and more responsibilities and autonomy at local levels.[365] This policy is better adapted to differences in environmental conditions, to historical factors, and to the fact that each division supplies a different paper mill.

6. Dependence

a) Dependence on the Parent Organization

In terms of employment, Domtar Woodlands is one of the largest divisions of the company. It is under the direction of a full-fledged vice-president and, as in the case of the other companies, its importance has increased in the recent years for the reasons mentioned earlier (see Price Company). However, the parent company still assumes certain functions such as legal work, public relations and advertisement, part of "buying" and "accounting," and provides a department of industrial relations which supplies expert services to all the divisions of the company.

b) Dependence on Other Organizations

(i) Output

Domtar Woodlands depends entirely on Domtar's manufacturing divisions (lumber and pulp and paper) to absorb its output. However, its volume of output is not indirectly as dependent on the fluctuations of the American market like the other companies because Domtar makes only 18 per cent of its sales in the U.S.A. (against 75 per cent in

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[365] Interviews with high ranking managers of Domtar Woodlands. This topic is further discussed in Chapter 6.

Canada).[366] This is particularly due to the specialization in fine and specialty papers which are basically produced for the Canadian market.

Somehow, because of its greater diversity of products and its greater penetration of the Canadian market, Domtar is less vulnerable to the fluctuations of foreign trade than the other companies.

(ii) Input

The situation of Domtar Woodlands, with respect to its dependency on other organizations for its input, is much similar to the one described for Price. However, there are some significant differences.

With regard to the labor-management relations, Domtar has to deal with the two Quebec-based centrals but with a different international union, a local of the United Brotherhood of Carpenters and Joiners of America (A.F.L.-C.I.O.).

The existence of an industrial relations department with responsibilities for providing expert advice to the different divisions of the parent company and to contribute to define, implement and coordinate a homogenous labor policy for the company, gives probably more strength to Domtar in its dealing with unions. It also gives more scope and depth to the woodlands division's industrial relations policy since experts from the central department are directly involved in the labor problems of such different industries as chemical, construction materials, and packaging.

Another major difference between Domtar and Price consists in the much greater percentage of pulpwood requirements which is purchased by

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[366]Annual Report, 1970, p. 5.

Domtar from outside producers. For the 1970-71 season, purchased input amounted to no less than 58.5 per cent of the total pulpwood used.[367] This situation is not without making the company more vulnerable to increases in pulpwood prices resulting from government arbitration.

Domtar has to rely on purchased wood more than the other companies because it owns some of the oldest timber limits, much depleted by now, and no longer able to supply the greater needs of the original mills. On the other hand, high transportation costs preclude any massive supplies from being shipped from the newer and much larger limits which are unfortunately located several hundred miles away from some of the mills.

Domtar has been the last of the four companies to be involved in the development of a completely new town related to the establishment of a major mill.[368] As a result, this company has been in closer relations with provincial and local governments. From the beginning, the policy of the company in agreement with the wishes of the provincial government was to relinquish its direct control over the new community as soon as possible. However, its economic involvement is so important that the process of disengagement has been proceeding at a slower pace than planned.

7. Physical Environment

Physical conditions vary considerably between the three major divisions of Domtar Woodlands. The division of Quévillon is located in

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[367] Logging Operation Report (1971-72), p. 386.

[368] A pulp mill at Lebel-sur-Quévillon in the north-western forests of Quebec in 1965.

one of the best logging areas of Quebec whereas the division of Jacques-Cartier is unfavored with a mountainous terrain. The following table summarizes the basic characteristics of each major division (see Table 33).

TABLE 33

Characteristics of the Physical Environment, Domtar's Quévillon, Dolbeau and Jacques-Cartier Divisions

Condition Factor	Division		
	Quévillon	Dolbeau	Jacques-Cartier
1. Number of merchantable stems per acre (nearest 10)	--	290	--
2. Number of unmerchantable stems and saplings per acre (nearest 100)	--	400	--
3. Average cubic feet per merchantable stem	5.0	5.0	--
4. Average merchantable height (butt to 3-inch top) in feet	40'	40'	--
5. Branchiness class (#1: to 33%; #2: 34 to 66%; #3: 67 to 100%)	2	3	--
6. Slope (nearest 5% over 100 foot distance)	10%	10%	--
7. Ground roughness	flat clay	flat	hilly & mountainous
8. Ground bearing class (#1: hard; #2: soft; #3: very soft; #4: frozen)	2	2	1
9 Density (No.of cunits per acre)	25	15	12
(No.of cunits per mile of road)	6,000	2,000	--
10. Stock: Blackspruce	85%	65%	35%
Balsam fir	5%	25%	65%
Pine (gray)	10%	10%	--

SOURCE: Logging Operation Report (1971-72), pp. 392 and 397, and interview with the assistant wood manager.

C. Consolidated-Bathurst Limited

1. Origin and History

Much like Domtar, Consolidated-Bathurst is the result of series of mergers which took place over a forty-year period until the late 1960's. However, unlike Domtar, these mergers involved only pulp and paper companies and other enterprises related to the paper and lumber industries.

Consolidated-Bathurst's basic structure as a major pulp and paper producer took shape in the 1920's when five small pulp and paper companies merged progressively into one company, Canada Power and Paper. All these companies had sprung to existence during the rapid development of the pulp and paper industry in Quebec in the first three decades of this century. Canada Power and Paper went through a major financial reorganization in the early 1930's and a change in name, Consolidated Paper Corporation. The company remained quite the same until the 1960's, when another series of mergers and takeovers contributed to strengthen the too-narrowly specialized company by extending its activities from pulp and paper (mostly newsprint) into specialty papers, containers and other packaging products and lumber, and changing it from a strictly Quebec based concern into a multi-national corporation. In 1960, Consolidated Paper took over St. Regis Corporation, a packaging company, and, in 1963, Gillies Bros., a lumber company. It then successively took over a small foreign specialty paper company, Concel in the U.S.A., merged with a smaller but important pulp and paper producer, Bathurst Paper, in 1966, and finally, acquired two German concerns, Europa Carton and Bremer Paper in 1967. In the meantime, a small plastic packaging company was added to its organization.

In 1972, Consolidated-Bathurst sold its American division and bought a major glass company, Dominion Glass, in 1973.[369]

Despite its rapid growth in the 1960's, Consolidated's efforts to diversify its activities have remained timid and sales figures for 1973 indicate clearly how heavily concentrated its production continues to be on pulp and paper products (see Table 34).

TABLE 34

Sales Value by Main Groups of Products, Consolidated-Bathurst, 1971

Product	Sales ($ millions)	(%)
Newsprint	102.0	30
Paperboard and containers[a]	140.8	41
Tissue products	32.0	9
Kraft paper and bags	31.0	9
Pulp	27.4	8
Lumber	10.2	3
Total	343.4	100%

[a]Includes sales of $5.8 million by the Plastics Division.

SOURCE: Annual Report, 1973.

2. Ownership and control

Consolidated-Bathurst's common shares are traded on Canadian stock exchanges. Ninety-five per cent of its common shareholders and 99 per cent of its privileged shareholders are Canadians. The control of the company belongs to Power Corporation, a holding company which owns 37 per cent of its common stocks.

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[369]See Table 35 for a description of the network of manufacturing and marketing organizations forming Consolidated-Bathurst Limited.

TABLE 35

Network of Manufacturing and Marketing Organizations, Consolidated-Bathurst, 1972

CONSOLIDATED-BATHURST LIMITEE ET SES FILIALES
Fabrication de papier-journal, carton à contenants, carton à boîtes, pâte kraft, papier kraft, bois d'oeuvre et produits d'emballages.

SERVICES DE LA FABRICATION
Canada: 26
1 usine à pâte, 7 usines à pâte et papier
8 fabriques de contenants
4 fabriques de sacs
2 fabriques de contenants en plastique
3 scieries
1 fabriques de bois de placage

Allemagne de l'Ouest: 11
3 usines, 8 fabriques de contenants

PATES ET PAPIERS
CONSOLIDATED-BATHURST LIMITEE
Dirige le secteur de la pâte et du papier de la Compagnie.

Papier Journal
Consolidated-Bathurst Limitée
Vente de papier-journal au Canada.

Consolidated Newsprint, Inc.
Vente de papier-journal aux Etats-Unis.

Consolidated Pontiac Inc.
Vente de pâte kraft en Amérique du Nord.

Papiers Consolidated-Bathurst Limitée
Vente de carton doublure kraft, carton à onduler, papier kraft et carton à boîtes en Amérique du Nord.

Exportations
Consolidated-Bathurst Limitée
Vend du papier-journal, carton doublure, papier kraft et la pâte sur les marchés d'outre-mer.

Consolidated-Bathurst (Overseas) Limited
Agence d'Exportations Consolidated-Bathurst Limitée pour la vente au Royaume-Uni de carton doublure kraft et carton à onduler.

GILLIES BROS. & CO. LTD.
Fabrication et vente de bois d'oeuvre -- pin et épinette.

Table 35 (cont'd.)

EMBALLAGES
CONSOLIDATED-BATHURST LIMITEE
Fabrication et vente de contenants en carton fort ondulé; fabrication et vente de sacs en papier multi-plis, sacs en plastique résistant pour fins industrielles, papiers enduits au polyéthylène et autres du même genre, produits d'emballage flexibles, et pellicules adhésives.

TWINPAK LTD.
Fabrication et vente de tubes compressibles en plastique, bouteilles, boîtes et autres emballages en plastique.

EUROPA CARTON A.G.
Fabrication et vente en Allemagne de l'Ouest de carton doublure spécial, carton à onduler, carton à boîtes pliant, contenants en carton ondulé et en carton fort et cartons pliants.

BREMER PAPIER-UND WELLPAPPEN-FABRIK GmbH
Fabrication et vente en Allemagne de l'Ouest de carton doublure spécial, carton à onduler et contenants en carton ondulé.

SOURCE: Annual Report, 1972.

3. Size

There was a total of 13,500 employees in 1972, excluding some 2,000 seasonal workers of the woodlands division. Consolidated-Bathurst assets in 1972 amounted to $430.4 million. Table 36 indicates the description of its major products.

4. Charter

Consolidated-Bathurst as a private corporation is submitted to the same pressures and emphasizes publicly the same goals and the same civic role as the other pulp and paper companies.

TABLE 36

Mills Products Shipped in Thousands of Tons, Consolidated-Bathurst Limited, 1967-1972

Product	YEAR 1967	1968	1969	1970	1971	1972
Newsprint	795	777	842	866	792	912
Pulp	1	100	177	170	200	227
Paperboards	330	450	480	486	411	461
Kraft paper	77	79	80	75	80	79
Tissue	60	60	81	78	71	--
Lumber (in thousands of board feet)	69,792	81,359	67,581	69,160	72,664	79,269

SOURCE: Annual Report, 1971 and 1972, p. 5.

5. Location

The different operations of the woodlands division are scattered all over Quebec with the result that there is a high degree of diversity in physical and social environmental conditions between them. The diversity exists also within the larger divisions like the St. Maurice division.

The St. Maurice division is by far the largest operation both in the size of its limits and in the volume of production. It is located north of a well-populated area which includes the largest concentration of pulp and paper manufacturing facilities in the world (seven major mills in the St. Maurice Valley). The company can rely on a large pool of traditionally trained woodsworkers. Most of them come from the rural areas in the neighbouring counties to the south since there was no significant agricultural development in the St. Maurice Valley and the rural population has remained small. Consolidated-Bathurst has

four of its pulp and paper mills situated there.[370] It has not only been associated with the economic health of the region but three industrial centers owe their existence to the construction of its pulp and paper mills at the beginning of the 1900's.[371]

The Chaleur division is located in a traditionally poor rural area where fishing has been one of the basic activities. In such a context, logging operations have constituted an essential source of income for the majority of the population and there has always been an abundant supply of labor. The Saguenay division is located in the same area as Quebec North Shore Paper and the description given later in this chapter for the local conditions at QNSP applies in its case. For those of Consolidated-Bathurst's operation which are conducted in the Lake St. John area, the description given for Price Company's local conditions there are applicable.[372]

6. Dependence

a) Dependence on the Parent Organization

Consolidated-Bathurst Woodlands is the second largest division of the parent company. It is represented on the managerial body by its vice-president whose office has been moved from the headquarters of the St. Maurice division in Grand-Mère to the general headquarters of the company in Montreal. This move seemed to indicate that the woodlands

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[370] Due to this concentration of production, the woodlands division had its headquarters located at one of these plants until it moved to Montreal during the reorganization following the merger between Consolidated Paper and Bathurst Paper.

[371] Ryan, op. cit., Chapters II and III.

[372] We will not be dealing with another division located on both sides of the Ottawa River between Quebec and Ontario (the Ottawa division).

division was given more importance than in the past. However, the vice-president did not interpret that in relation to the increasing capitalization of pulpwood operations for the simple reasons, according to him, that the level of capitalization remains very low compared to manufacturing (one mill alone represents three to four times more capital than the whole woodlands division).

Similarly to other companies, public relations and advertising as well as legal matters are left to the responsibility of the parent company.

b) Dependence on Other Organizations

(i) Output

Consolidated-Bathurst Woodlands depends completely on the manufacturing divisions of the company to absorb its output and, so being, must adjust closely to the fluctuation of the manufacturing production. Consolidated-Bathurst manufacturing is very much dependent on the American market, especially for its newsprint export which is by far its largest product. Net sales statistics, by country, for the last five-year period indicate that the percentage of American export fluctuates between 35 and 40 per cent (less than Price but more than Domtar) (see Table 37).

Because of this high dependency on the American market, Consolidated-Bathurst was one of the most affected companies by the slump in newsprint demand and the unfavorable exchange rate between the American and the Canadian dollars of the early 1970's.

TABLE 37

Net Sales by Country, in Percentage,
Consolidated-Bathurst, 1967-1971

Country	Year 1967	1968	1969	1970	1971
Canada	49	42	40	40	40
United States	42	36	37	34	35
United Kingdom	6	5	4	5	2
Others	3	17	19	21	23
TOTAL	100	100	100	100	100

SOURCE: Annual Reports.

(ii) Input

Consolidated-Bathurst Woodlands' dependency relationships with other organizations are similar to the ones described in the case of Price. However, there are some differences.

In its labor-management relations, Consolidated-Bathurst has to deal with the same two Quebec-based unions. However, its industrial relations services are not as much centralized as they are at Domtar but more than at Price. Centralization at Consolidated-Bathurst stops at the woodlands headquarters and does not overlap with the parent company.

The degree of dependency of Consolidated-Bathurst on private suppliers of pulpwood is another point of difference. With 44 per cent of its pulpwood requirements being purchased outside, Consolidated-Bathurst falls between Price at 31 per cent and Domtar at 58 per cent. As in the case of Domtar, these purchases vary in volume according to the different divisions. In the St. Maurice division, the volume of

purchase is lower than in other divisions because of its greater resource potential and the low cost of its basic means of transportation (river drive).

7. Physical Environment

Conditions vary very much between the woodlands divisions located in Quebec. These conditions are summarized in Table 38.

TABLE 38

Characteristics of the Physical Environment, Consolidated-Bathurst, St. Maurice, Chaleur and Saguenay Divisions

Condition Factor	Division		
	St. Maurice	Chaleur	Saguenay
1. Number of merchantable stems per acre	143	700	130
2. Number of unmerchantable stems and saplings per acre	1,000	1,000	1,000
3. Average cubic feet per merchantable stems	7.6	4.5	8.7
4. Average merchantable height (butt to 3-inch top) in feet	33'	28'	27'
5. Branchiness class (#1: to 33%; #2: 34 to 66%; #3: 67 to 100%)	2	2	2
6. Slope (nearest 5% over 100 foot distance)	varies very greatly	30% of limit over 27% slope	15%
7. Ground roughness	varies between extremes	rolling good	varies between extremes
8. Ground bearing class (#1 hard; #2: soft; #3: very soft; #4: frozen)	varies between extremes	1	varies between extremes
9. Density	--		--
10. Stock	--		--

SOURCE: Logging Operation Report (1971-1972), pp. 165, 181 and 191.

D. Quebec North Shore Paper

1. Origin and History

Quebec North Shore Paper Company was established in 1938 to operate a timber limit and pulp and paper mill recently built by its parent company, the Ontario Paper Company, at Baie-Comeau on the Lower St. Lawrence north shore. Before establishing the new company town and building the mill, Ontario Paper had conducted pulpwood logging operations at other locations on the north shore since the early 1920's to supply its mill at Thorold (Ontario). Growing needs for paper and the abundance of timber resources in this part of Quebec led to the establishment of the mill at Baie-Comeau.

2. Ownership and Control

Quebec North Shore is a subsidiary of the Ontario Paper Company which is a Canadian subsidiary of the Tribune Company of Chicago. Ontario Paper Company operates a newsprint mill and by-products plant at Thorold, Ontario, since the 1910's. The Tribune Company is a holding company which publishes several newspapers including <u>The Chicago Tribune</u>, <u>Chicago Today</u>, <u>The New York Daily News</u>, and five newspapers in Florida, notably <u>The Fort Lauderdale News</u> and <u>The Orlando Sentinel</u>.

3. Size

The Baie-Comeau mill's annual capacity of 500,000 tons of newsprint is more than twice the capacity at Thorold (225,000 tons) and makes it one of the largest pulp and paper mills in Canada. The woodlands division which supplies almost all the requirements for the Baie-Comeau mill plus about 60,000 cunits of pulpwood to Thorold mill constitutes itself one of the largest concentration of pulpwood

operations in Eastern Canada. It produces an annual volume of more than 500,000 cunits, and has a labor force of about 1,200 men (including 70 permanent staff employees) and net assets (after depreciation) of $21 million (1972).[373]

4. Charter

Like the other companies, Quebec North Shore's objectives are to produce profitably. However, since the company is vertically integrated, profitability in the case of the woodlands division is measured slightly differently than usual. The division does not make profits as such but rather succeeds in producing its pulpwood at a cost below or comparable to the cost of other producers operating in similar conditions. This is true, of course, of the woodlands divisions of the other companies. But it is still truer for Quebec North Shore since it is integrated up to the final user, the publishing house. Because of this particular situation, it is possible for the parent company in Chicago to tolerate a less competitive woodlands organization of which pulpwood is slightly more expensive because it provides a stable and sure source of supply over which it has complete and direct control.

5. Location

Quebec North Shore Paper's operations are now all concentrated in one timber limit located on the Lower St. Lawrence north shore. It is

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[373] C.E. Lafond, "Industrial Management and Development of a Large Tract of Timber in Quebec in the Boreal Forest of the North Shore of the St. Lawrence," March 1972. Mimeo. Also, an interview with Mr. Lafond in July, 1972.

an area which, up to the 1950's, was devoid of any industrial development, with the exception of the new pulp and paper mill established by Quebec North Shore Paper in 1936-38 and another small pulp mill located further down the river at Clark City. The local population was small and widely spread among a large number of small and isolated communities distributed along the shoreline with a relatively unreliable system of communication and transportation until the 1960's. The most important source of employment was the logging activities carried out by several pulp and paper companies which were supplying their mills located elsewhere. Most of the labor force required for these large logging operations was coming from the more densely populated rural areas of the Lower St. Lawrence and Gaspé regions located on the other shore of the St. Lawrence Gulf. Under these conditions, the labor turnover has always been very high. However, its abundant and cheap hydro-electric and mineral (basically iron) resources were not to remain untapped and in the 1950's and 1960's, several massive industrial developments attracted a large population which found permanent employment in the mines, the hydro-electric centers and in the transportation and shipping activities.

On the other hand, the timber limits of the company are located in the immediate vicinity of the mill and, as a consequence, the woodlands and the manufacturing organizations have been more closely integrated than usual. The headquarters of both divisions are housed in a common office building next to the pulp and paper mill. Moreover, both divisions share common staff services, like public relations and advertising, accounts (including computer facilities), legal and industrial relations services.

6. Dependence

a) Dependence on the Parent Organization

The woodlands division has always been the largest employer and by far the most important woodlands division of the parent company. However, for historical and probably some administrative reasons, the vice-president woodlands was, until recently, part of the parent company organization (Ontario Paper) and residing at Thorold (Ontario). Baie-Comeau becoming the largest plant of the parent company in the 1960's, organizational necessities created pressure to make the general managers of both, the manufacturing plant and the woodlands division, vice-presidents of their respective sectors. This was done first with the manufacturing and later in 1972 with the woodlands. In the latter case, the decision was made following the loss of key members of the woodlands management at Baie-Comeau and the need to bring back (at least for a transition period) the vice-president who had previously been general manager there before its appointment as vice-president.

These changes in the importance of Quebec North Shore Paper organization at both woodlands and manufacturing levels followed a major policy decision by the parent company in the 1960's to make Baie-Comeau its major production center. Among the factors considered in the decision was the fact that Quebec North Shore Paper had close access to vast timber resources, that its production facilities were more recent than those at Thorold and that it was better located to supply parent company's newspapers in New York and Florida via year-round water transportation.

b) Dependence on Other Organizations

(i) Output

The woodlands division depends entirely on the two manufacturing plants (Baie-Comeau and Thorold) to absorb its output. However, since, contrary to other companies, the woodlands division is part of a completely integrated complex, its output does not depend on the market conditions for newsprint and other paper products but on the regularly growing and otherwise stable needs of the Tribune Company's newspapers.

(ii) Input

Quebec North Shore Paper Woodlands division, like the other companies, has been involved in the same kind of relationships with the federal and provincial government departments and agencies. The one major exception, however, has been with the provincial government and Quebec Hydro, the state-owned power company with whom QNSP has had to make particular deals in relations to the development of the Manicouagan River power resources which flooded part of the timber limits and obliged the company to modify its driving operations down the river.

Quebec North Shore Paper's woodsworkers were organized by unions like the woodsworkers in other companies but later than at Price and Consolidated-Bathurst and also by an industrial international union rather than by the farmers' union. This can be explained partly by the fact that there is practically no farming activities in that area and that the workers have traditionally come from other regions of Quebec.

Concerning the supply of wood bought from outside producers, Quebec North Shore Paper constitutes an exception. The company buys

only about 4 per cent of its supply or 20,000 cunits of wood per year from them because of their almost complete absence in the area.

Baie-Comeau was, for many years, a "one company town" established by Quebec North Shore Paper. During that period, the company owned almost everything in town and exercised complete control over the municipal government. Now, the company is completely disassociated from the municipal institutions but maintains very close relationships with them since it remains the major employer of the city and one of its two most important tax sources (the other one, an aluminum company).

7. Physical Environment

Contrary to the other companies, at Quebec North Shore Paper, physical conditions on the limits are more homogeneous since it consists of only one large tract of timber. These conditions are summarized in Table 39.

TABLE 39

Characteristics of the Physical Environment, Quebec North Shore Paper, Baie-Comeau

Condition Factor	Characteristic
1. Number of merchantable stems per acre	290
2. Number of unmerchantable stems and saplings per acre	500
3. Average cubic feet per merchantable stem	5.4'
4. Average merchantable height (butt to 3-inch top) in feet	30'
5. Branchiness class (#1: to 33%; #2: 34 to 66%; #3: 67 to 100%)	2
6. Slope (nearest 5% over 100 foot distance)	10%
7. Ground roughness	broken terrain--few long hills
8. Ground bearing class (#1: hard; #2: soft; #3: very soft; #4: frozen)	25% class 1 25% class 2 50% class 4 (winter operations)
9. Density (No. of cunits per acre)	20
10. Stock: Spruce:	75%
Balsam:	25%
Jack Pine:	less than 1%

SOURCE: Lafond, op. cit., pp. 12 and following; Logging Operation Report (1971-1972), p. 147.

CHAPTER 5

LOGGING TECHNOLOGY

The recent technological transformations in the logging industry from the traditional short-wood system to semi-mechanized and fully-mechanized tree-length and full-tree systems has led some to think that these changes are leading toward continuous processing systems in logging even if at a slower pace "because of the more variable environmental conditions encountered in logging."[374] For most of the observers, these changes appear to be encompassing ones and assorted with spectacular effects. However, in a much more sober assessment of the recent evolution, a specialist with the industry concluded four years ago, that under these appearances, the "new" technology consists of the same basic systems as in the past but only more mechanized.

> The basic pulpwood production processes used now are the same as those used two decades ago. Something in excess of 95% of the pulpwood produced in eastern Canada is still being produced by short-wood and tree length methods. We labeled the logging area mechanization of the day as 'Partial Mechanization'. A more up-to-date systems label would be a 'Factorable Complex', or a collection of odds and ends. The term means a set of parts that are mutually independent, i.e. exhibiting few systematic relationships, and it is a meaningful description of the way things are.[375]

He identified the pulpwood production systems as a "highly specialized

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[374] Logging Committee. "The Development of Mechanical Logging Methods for Eastern Canada", Woodlands Section Index No. 1325 (B-1), August 1963: WR-345.

[375] B. J. McColl, "A Systems Approach to Some Industry Problems", Canadian Pulp and Paper Association, Woodlands Section Index No. 2588 (B-1) O.D.C. 31, September 1969, p.6.

mass production function."[376]

Today's logging operations are certainly still a long way from automated continuous process production and might probably never achieve such a level of technological sophistication even if this is the direction which is taken by the industry. Indeed, the following discussion indicates that the logging operations workflow is becoming more and more specialized and rigid, that its vertical segments are increasingly interdependent, and the operations progressively more continuous.

In this chapter, the analysis will focus on the technology of the production system (operations and materials technology) and the technological determinants of workers' and work groups' social behavior. The discussion will follow the operational model introduced in Chapter 1 and will deal with each of the three major production systems which characterized the technological evolution of the four companies under scrutiny: the traditional short-wood system and the semi-mechanized and fully-mechanized tree-length systems.

Logging is essentially a harvesting process and, as such, remains a fairly simple activity. Traditionally, logging operations did not vary much from one basic system, the short-wood system. However, with the technological changes of the 1950's and 1960's, logging became more complex and two new systems were developed, the tree-length and the full-tree systems. There are a considerable number of variations in each of them,[377] but the discussion will be limited to their general

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[376] Idem., p.3. I might add that it is a "production line" and not a "service line."

[377] Bennett identified 149 different variations in 1958. See W.D. Bennett, Logging Atlas of Eastern Canada (Montreal: Pulp and Paper Research Institute of Canada, 1958), pp.V to IX.

characteristics. Before getting involved in the details of these three systems, there will be a general description of the technology of logging.

I. General Description of the Technology of Logging

The basic processing operations[378] in logging are classified in Table 40. Not all of these operations are necessarily performed on the logging site and ususally barking and chipping operations are done at the mill.

The first operation, felling, consists of severing the standing tree from its base with a power saw, buck saw, or axe. During the next operation, limbing, branches are removed. Then the section of the tree top considered too small to be used is cut off (topping). After that, during the bucking operation, the tree is sectioned into pieces or bolts of desired length, usually nominally 4 feet long. Finally, the pulpwood produced by individual workers or teams of workers is scaled and recorded, for most of the pulpwood cutters are remunerated on a piecework basis.[379] The last two operations, barking or the removal of the bark and chipping or the reduction of the bolts to small chips, takes place almost always at the mill. However, there have been experiments done in the woods to bark and chip the pulpwood before its transportation to the mill but so far it has not led to any conclusive

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[378] Processing excludes all other operations which do not modify the raw material and are transfer operations (like transportation, manipulation related to loading and unloading, etc.).

[379] This is not the only reason for scaling the pulpwood. Scaling provides also the organization with accurate production figures for better control and scheduling, and the government with the exact wood volumes required for establishing dues and for other forestry controls.

TABLE 40

Basic Pulpwood Logging Operations

Material Processing	Material Handling	Material Inspection (production control operation)	Material Storage (provision for stock piling in the production process)
Felling (cutting down the tree)	Handling proper:[c] Stump piling (or bunching)	Culling	Along skidways
Limbing (removing branches)[a]	Loading	Grading	At landings (roadside, riverside, railside or highwayside)
Topping (removing top)[a]	Dumping	Measuring	
Bucking or Slashing (cutting to length)	Transport: Skidding (from stump to roadside landing)		At concentration yard (mill block-pile)
Marking (identifying output)	Hauling (from roadside landing to final landing or mill)		
Barking (removing bark)[b]	Driving (from final landing to mill by waterways)		
Chipping (reducing to chips)			

[a]Branches plus tops, i.e. slash, constitute 5 to 45% of tree weight.

[b]Bark constitutes 5 to 20% of tree by weight.

[c]Any movement of the tree or its parts less than 50 feet.

[d]Any movement of the tree or its parts more than 50 feet.

SOURCES: Campbell and Power, *op. cit.*, p.13; Logging Committee, *op. cit.*, p. WR-341

results or, at least, to any widespread adoption by logging companies.

The pulpwood is moved from the stump area to the mill in a multiphase operation called transportation. The first phase, forwarding or skidding, consists of the movement of the wood from the stump to

an intermediary landing at roadside[380] by horse or machine. There the wood is stored for variable periods of time before being further processed and transported again.

During the second phase, the wood is carried directly to the mill or to a final landing. The transportation to the mill is done by rail, water or truck. If carried to a final landing, the wood is transported by truck.[381] In this case, the final landing becomes the point of transfer for the long-distance movement by rail or water to the mill which constitutes the third and final phase.

In summary, there are three natural divisions in the logging production process: "(1) from stump to a landing at roadside; (2) from roadside landing to final landing on driveable water, highway or railway; and (3) from final landing to mill."[382]

All the operations described above are common to the three basic logging systems, short-wood, tree-length and full-tree. However, they can take place in a different order and be performed at different locations by different machines (horses included). In Table 41 and in Figure 12, I indicate the order according to which and the location where the different phases of the operations take place in each system. This is a simplified representation which does not reveal the great number of possible variations found by Bennett.

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[380] Thus the expression "roadside landing".

[381] In this study, transporation by truck will be referred to as "hauling".

[382] Logging Committee, op. cit.

TABLE 41

The Tree Pulpwood Logging Systems in Use in Quebec

Area	System		
	Short-wood	Tree-length	Full-tree
Stump	Fell Limb Top Buck (Bark) Forward or Skid	Fell Limb Top (Bark) Skid	Fell Skid
Landing	Transfer to long-distance means of transport	Buck (Bark) (Chip) Transfer to long-distance means of transport	Limb Top Buck (Bark) (Chip) Transfer to long-distance means of transport
Pulp and Paper Mill			

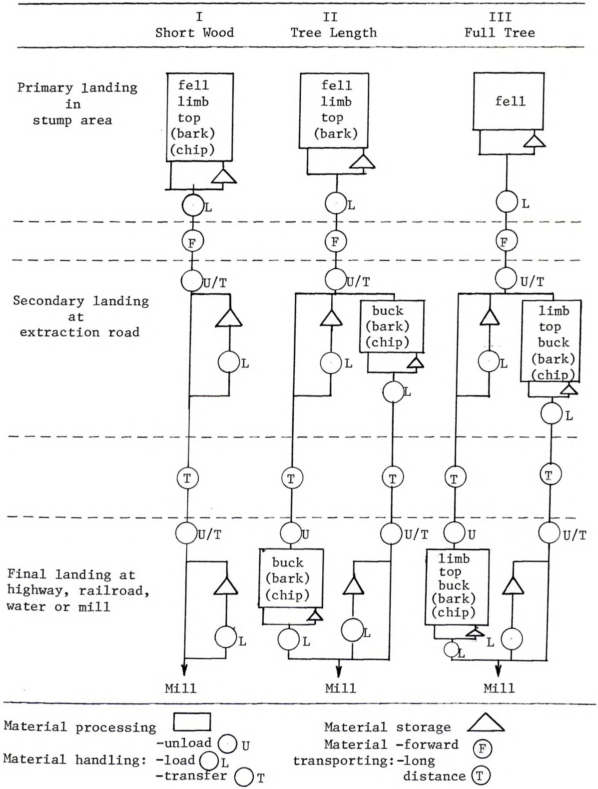
SOURCE: Campbell and Power, op. cit., p. 14

Confronted with such a variety of logging systems and methods, how do logging operators proceed to select the one or ones which will be the most appropriated for their own operations. Campbell and Power view the problem in terms of minimum cost with two basic options open for choice. Accordingly,

> The particular system and method which it is most profitable to use on a given operation will be that which produces the lowest combination of processing, handling, transportation, camp overhead, and mill costs per unit. The variables encountered in logging operations are multitudinous and it is evident that no one method is or can be the least cost method under all environmental

FIGURE 12

The Three Major Pulpwood Production Systems Flow Chart



SOURCE: Logging Committee, op. cit., p. 344.

> conditions. Local stand, soil and topographic conditions all prevail, to a greater or lesser degree, upon the choice of a logging system and of a logging method.[383]

Among other numerous variables not mentioned by Campbell and Power are climatic conditions and seasonal variations, local and regional resources of equipment and labor, and fluctuations in the demand for pulpwood.[384] Under these conditions, logging organizations can take two general but opposite routes to lower costs.

> On the one hand, greater processing efficiency can unually be achieved by the centralization of specialized large-scale processing facilities operated on a continuous basis [full-tree system]. In logging operations, this indicates processing as close to the final delivery point as possible because the concentration of wood fibre increases in size as the wood is moved from the stump to the pulp or paper mill. On the other hand, transportation costs can be lowered by eliminating as early as possible all unmerchantable by-products and thus reducing excess weight and bulk [short-wood]. Consequently, the removal of branches, tree top and bark as soon as possible is desirable. The problem is to minimize the combined processing and transportation costs (including cost of property development to provide access to standing timber and delivery routes to the final landing) under the wide range of environmental conditions found in the woods.[385]

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[383] Campbell and Power, op. cit., pp. 14-15. See also A.W. Bentley, J.D.B. Harrison and B.F. Avery, Organization and Administration of Woods Operations (Montreal: The Woodlands Section, Canadian Pulp and Paper Association, 1938), pp. 4 and 5.

[384] According to another specialist, four major factors should be considered in the selection of a logging system: (1) adaptability of the machines to the terrain conditions; (2) average tree size; (3) availability of labor; and (4) effects of changing wage rates. He suggests that "it may be necessary to adopt all three systems in a given operating area due to the wide variations in terrain and tree size alone" (J.R. Hughes, "Logging Operations in Canada--Review and Forecast" in Preprints (Montreal: Woodlands Section, C.P.P.A., March 1970), p. 237). Other specialists single out transportation as the most importatnt factor in the choice of a production system (A.E. Wakerman, W.D. Hagenstein and A.S. Mitchell, Harvesting Timber Crops (Toronto: McGraw-Hill, 1966)).

[385] Campbell and Power, op. cit., p. 15.

Nonetheless, the most widely used system is the tree-length system which combines advantages of the other two systems without their major shortcomings (see Table 42). At the time of their analysis, Cambpell and Power had to deal only with semi-mechanized systems, that is systems in which some of the work was still done manually by the workers.

TABLE 42

Pulpwood Production by Logging Systems, Canada and Quebec, 1969-1970

Logging System	Volume in Cunits		Per Cent of Total Volume	
	Canada	Quebec	Canada	Quebec
Short-wood	2,065,000	1, 166,465	22.0%	30.0%
Tree-length	7,550,000	2, 678,869	78.0%	68.9%
Full-tree	45,000	39,514	less than 1%	1.1%

SOURCE: Hughes, op.cit., p. 235 for Canada's figures.

Since then, many of the machines which were at an experimental stage have reached commercial use. In a fully-mechanized system, human and animal energy have been replaced by inanimate energy and all operations are performed from the beginning to the end by man-operated machines.

A. The Short-Wood System

This system was still the most popular one as recently as 1963.[386] It put the emphasis on the reduction of transportation costs. Thus most of the processing is done at the stump. All variations of the

[386] Logging Committee, op. cit.

system involve the following:

> A pulpwood cutter, equipped with a high-speed power saw, cuts the tree down, cuts off the top and branches, bucks the tree-length and piles the bolts either at the stump or at a logging roadside (such as a strip road). The nominal length of the bolts is generally 4 feet, 8 feet or 12 feet. The bolts of wood are hauled out by horse, tractor or, increasingly, by skidder to an intermediate transfer point (the "landing") or directly to the long-distance transporting medium (train, truck or water).[387]

In fully-mechanized operations, fellers have been replaced by man-operated mechanical harvesters and horses and tractors by skidders and forwarders.

B. The Tree-Length System

This system has been developed in the 1950's while new machines were designed. It spread very rapidly and within a few years became by far the most commonly used system (see Table 42 above). The tree-length system reduces the processing at the stump but not as much as the full-tree system.

> The cutter, using a power saw, fells, limbs and tops the tree. A wheeled tractor, horse or crawler tractor moves through the woods, collects a number of tree-lengths and hauls them to the landing where a man with a power saw cuts them into the desired lengths.[388]

Since 1966, however, transportation from the stump to the roadside landing is mostly done by rubber-wheel skidders and bucking at the landing has become mostly done by mechanical slashers. In fully-mechanized operations, felling is done by mechanical harvesters.

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[387] Campbell and Power, <u>op. cit.</u>, p. 15

[388] <u>Idem.</u>, p. 16

C. The Full-Tree System

This system constitutes the other end of the continuum. Here the emphasis is put on processing instead of transportation. Only one operation is performed at the stump, felling.

> The full tree -- with its branches and top still attached -- is skidded from the stump to the landing for the other processing operations. This high concentration of wood and processing operations at one point allows the system to use semi-stationary, high-capacity equipment to perform a greater variety of operations than is possible with the other two systems. The significant drawback, of course, is the extra cost involved in transporting largely unusable slash to the landing.[389]

In the most advanced version of this system, whole trees are processed into chips which are automatically loaded on trailers and carried directly to the mill ready for the manufacturing process.

II. Detailed Analysis of the Logging Systems

In this section of the chapter we deal with two systems only: the traditional short-wood system and the mechanized (semi- and fully-mechanized) tree-length system. These have been the only wide spread systems in Quebec's pulpwood logging industry. As noted earlier, with the process of mechanization, there has been a shift from short-wood to tree-length. The mechanized version of the short-wood and full-tree system are used in a very small percentage of logging operations.

A. The Traditional Short-Wood System

This system involved basically a very simple technology, discontinuous operations in space and time, independent and separated

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[389] Ibidem.

workflow segments and a very flexible workflow. Workers and work groups exercised a high level of job control and were socially very much isolated on the job.

1. Technology

The description pertains to two major dimensions of technology: operations technology and materials technology.[390]

a) Operations Technology

Characteristics of the operational system are summarized in Table 43.

(i) Level of Workflow Rigidity

As Table 43 indicates, the level of workflow rigidity was very low. It was a mass production system with a set production line but each phase of which was separated by buffer stocks, geographical distance and time lags (see Figure 13). Hence, waiting times were possible. Buffer stocks existed between the processing of material and its handling as well as between these two operations and material inspection. What contributed very much to the system flexibility were its multiple sources of input (see Figure 13). This was due to a great extent to the low productivity of the production system in general and of certain phases in particular (for instance, felling), and to geographical constraints (for instance, the distribution of the raw material over large areas and the extensive use of the watershed system for transportation) not yet overcome by modern transportation techniques and equipment.

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[390] We ignore here the 75 variations of the system inventoried by Bennett. The most widespread variations in Quebec were those identified by the processing at stump into 4-foot bolts which were piled or bunched in strip or branch road and then forwarded to intermediate landing or hauled directly to final landing.

TABLE 43

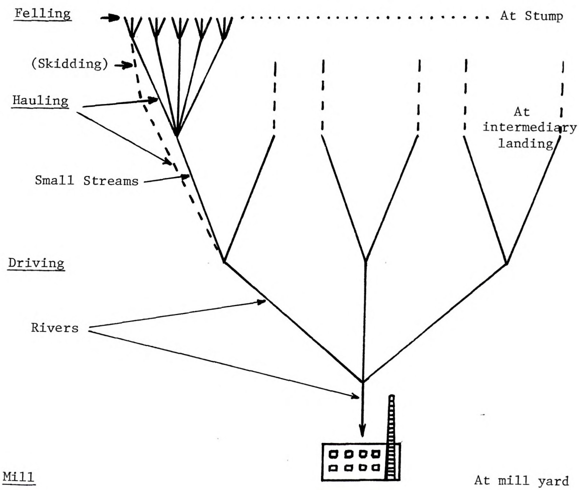
Operational Characteristics of the Traditional Short-Wood System and Mechanized Tree-Length System

Characteristic	Degree: Traditional Short-Wood	Degree: Mechanized Tree-Length
1. Level of Workflow rigidity	Very low	Medium (high)
No waiting time possible (vs. yes)	Yes, waiting time	Some waiting time but less
Single-purpose equipment (vs. multi-purpose)	Single-purpose	Multi-purpose
Portability	Portable	Non-portable
Production or service line (vs. no set line)	Production line	Production line
No buffer stocks and no delays possible (vs. yes)	Yes, buffer stocks and delays	Some buffer stocks and delays but less
Single-source input (vs. multi-source input)	Multi-source input	Multi-source input but in much smaller number
No rerouting of work possible (vs. yes)	Yes, rerouting possible	Some rerouting but less
Breakdown stops all workflow immediately (vs. not all workflow)	Not all workflow	Not all workflow
Breakdown stops some or all workflow immediately (vs. no workflow stops)	No workflow at all	Some workflow immediately
2. Level of automation (mechanization)	Very low	Medium
3. Interdependence of workflow	Very low	Medium (high)
4. Specificity of criteria of quality and quantity evaluation	Medium	Relatively high
5. Operation continuity	Very low	Medium (high)
6. Variety of sequence	Medium	Low
7. Uniformity of equipment	High	Medium
8. Throughput cycle and rate	Long cycle and low rate	Medium to short cycle and high rate

FIGURE 13

Hypothetical Flow Chart Illustrating the Structure of Production of the Traditional System

Operation	Units[a] Structure



[a]Each dot represents one productive unit (for instance, one feller, one skidder, one team of haulers, one team of drivers). Since the skidding phase did not exist in the true traditional system, it is indicated by broken lines in the example given in the figure.

Production was a discontinuous process divided in three phases: cutting, hauling and driving. Each phase was conducted at a different period of the year and the entire production served as buffer stock between each of them (see Figure 14). The breakdown of the process in three major phases had to do with the technology and the environmental contraints. Felling was much more easily performed before the snow cover became too deep and the temperature too cold. Consquently, this operation had to be carried through as early as possible in the period of operations. On the other hand, transportation with horse and sleigh necessitated a good snow cover to ease the traction and a good support from the ice surface on the hauling roads and the bodies of water. Consequently, this operation had to wait later in the winter when these conditions exist. For the same reasons, the hauling phase had to be terminated before the spring thaw which makes roads impassable.

Driving could not start until late in the spring after the early flood waters had receded following the breakdown of the ice on rivers and lakes.

Other characteristics of the production system contributed to its flexibility. Single-purpose and "portable" equipment (like axes, hooks, trucks, etc.) was used. Thus, not only was the same equipment available for different logging tasks and phases of the production process, but it could be and in fact was used on the farm as well.[391]

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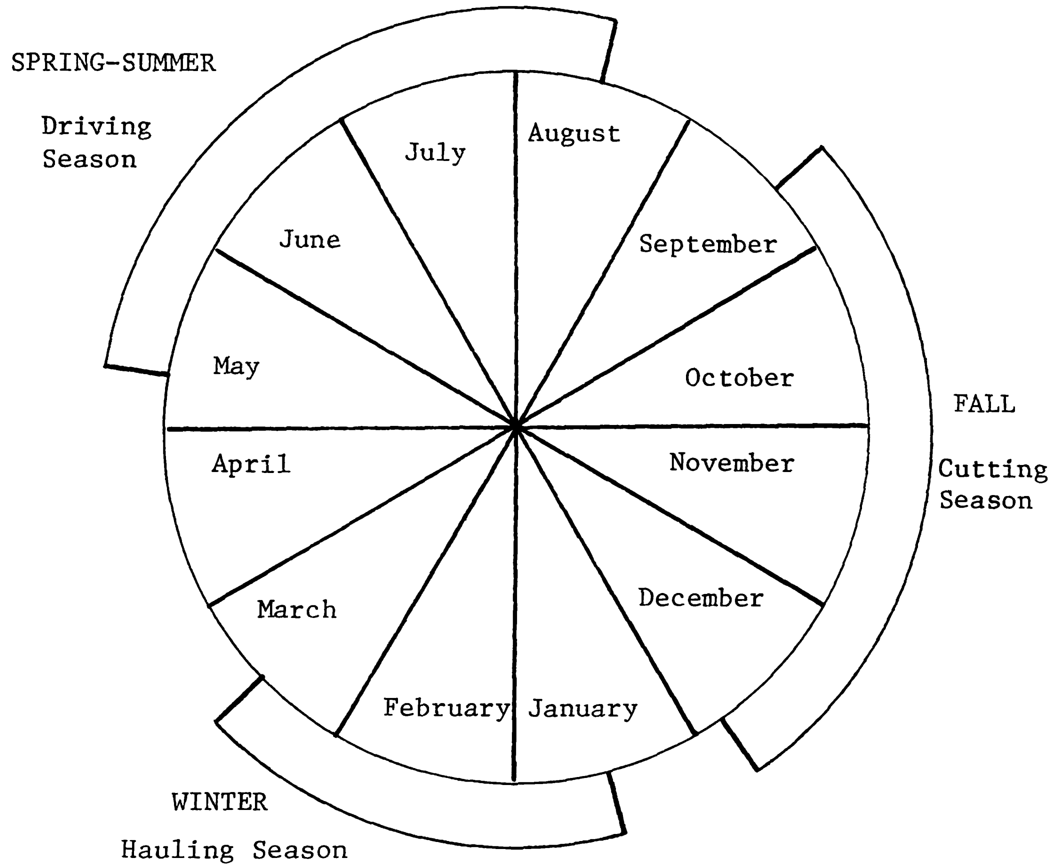
[391] The portability of pieces of equipment like trucks and tractors extended to road maintenance and road construction. Portability will be discussed more extensively later in relation to ownership of the equipment and other organizational aspects.

FIGURE 14

Period of the Year During Which the Major Phases of Logging Operations Were Conducted in the Traditional System



SOURCE: J. P. Curran, " The Process of Mechanization in the Forest Industry of Newfoundland," M.A. Thesis, Memorial University, Newfoundland, 1971; Emile Gosselin *et al.*, *Factors Affecting the Stability of the Forest Labour Force* (Quebec: Quebec Woods Labour Research, Q.F.I.A., 1956-57).

Moreover, the rerouting of work was possible in all cases (except maybe sometimes in the case of the driving operations) because of the multiple sources of input. Similarly, a breakdown in the production line did not stop all the workflow immediately nor at all since only the subunits of the production system directly related to the source of the breakdown were affected.

(ii) Level of Automation (Mechanization)

Before the chain saw made its appearance in the early 1950's, the level of mechanization[392] was very low. All tools were hand tools, that is, powered by human energy. Transportation equipment was powered by animal energy (horses) and, to a limited extent, by inanimate energy (trucks).[393] This low level of mechanization meant that most of the control over the tasks remained in the hands of the production workers.

(iii) Interdependence of Workflow Segments

A distinction must be made between horizontal and vertical segments. Horizontal segments refer to similar phases of the production process performed in different locations at the same time. Vertical segments refer to the different phases of the workflow consecutively performed. Both types of workflow segments can be interdependent but usually, of course, vertical segments are more interdependent than horizontal segments.

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[392] I prefer to use the term mechanization rather than automation which seems to be superfluous in this context.

[393] Before 1950, trucks were almost only used for the transportation of men and supplies and for the construction of forest roads. It is only in the second half of the 1950's that they became generally used also for hauling.

In traditional logging operations the degree of interdependence of the two types of workflow segments was very low. Horizontal segments were duplicated in different geographical locations and constituted inputs of other duplicated segments of the workflow all the way down the production line. The only exception was driving which started with several horizontal segments but narrowed down usually to one major segment, that is, the main waterway to the mill. The considerable time gaps between the various phases of the production process and the lack of technical integration between them (for instance, in terms of the technical exigencies for efficiency) contributed importantly to the low degree of interdependence between vertical segments and the high degree of flexibility of the workflow.

(iv) Specificity of Criteria of Quality and Quantity Evaluation

There was a relatively high degree of specificity of the criteria used to measure production quality and quantity. These criteria covered such items as the length of the pulpwood bolts, their shape, acceptable tree species, wood quality, stump height, and the volume of abandoned stems. Stems had to be cut to specific lengths in order to provide for proper measurement of volumes on which wages and governmental dues were established and to correspond to the width of the grinding machines at the mill (normally 4 feet). Bolts had to be strait enough and only a selected group of soft-woods (mainly spruce, balsam and jack pine) could be processed at the mill. Rotten wood could not be used by the mill and its volume was calculated and deducted from the total.

Finally, governmental regulations reinforced by fines established the maximum height of the stumps and forbade the wastage of abandoned

stems in order to avoid improper utilization of the resource.

It should be noted that none of these requirements existed because of the exigencies of logging technology itself. They were set up for administrative and managerial purposes or originated from technical constraints related to manufacturing.

(v) Operations Continuity

Operations were essentially discontinuous and spread over a five- to six-month period on the basis of an eight- to ten-hour work day and six-day work week. They could be interrupted at any time without harming the production under way (if only to delay its progress) unless stoppages lasted for a period long enough to affect the quality of the pulpwood already stocked[394] or took place while it was urgent to take advantage of seasonal environmental conditions (for instance, winter conditions for hauling operations).

(vi) Variety of Sequences

Since the short-wood system was generally the only one in use, there was no significant change in the sequence of operations even if there was a large number of variations in the short-wood system itself.

(vii) Uniformity of Equipment

The limited quantity of equipment which was used on the operations was fairly uniform because it was very simple equipment (axes, bucksaws,

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[394] Obviously this situation could arise only during the warm season because of insects, fire hazards, etc.

sleighs, etc.).[395] However, as soon as powered equipment was used (like chain saws, trucks, tractors, etc.), more variation was introduced but it remained limited and not at all comparable with the wide range of equipment available since the early 1960's. Moreover, whatever variations in equipment existed at that time, they did not have the impact on the production system that today's variations in complex equipment have. In no case, for instance, did they mean modifications in the sequence of operations.

This is true even if we compare the different logging operations of a single company or those of several companies and despite the wide range of variations in the environment in which they operated. Their equipment was simple and single-purpose and thus could be adapted easily to different environmental conditions without basic modifications.

(viii) Throughput Cycle and Rate

It is impossible to establish meaningful figures concerning these characteristics of the production system. The range of variations in both cases was so wide that even if averages could be established they would be meaningless. Moreover, information on this matter appears to be of little importance for this discussion.

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[395] Although there was a fair amount of variation which affected the quality and efficiency of the tools. Axes, for instance, differed in the pattern and weight of the head used, the axe bit profile, the degree of sharpness and the length and shape of the handle. Koroleff was able to identify 24 different patterns (shape, size, handle, point, etc.) of pulphooks used in Eastern Canada around 1940. See A. Koroleff, Pulpwood Cutting. Efficiency of Technique (Montreal: Canadian Pulp and Paper Association, Woodlands Section, 1941).

b) Materials Technology

In the theoretical chapter, I indicated that the characteristics of the raw material generally contribute to the determination of the technological system which is adopted. This is certainly the case in logging where the equipment had to be designed to manipulate and transform a hard, non-uniform, big, heavy and slippery material.

Hardness. Wood is a solid which requires metallic processing and handling tools and equipment.

Uniformity. One of the most important characteristics of timber is its lack of uniformity. Timber varies widely in terms of location, size, shape, species, branchiness, etc.

Size. The large size of timber requires big and strong processing and handling equipment. In most traditional operations, trees were bucked at the stump to eliminate the problem of size in the absence of heavy machinery to process and handle them.[396]

Heaviness. Timber is heavy and this has the same effects as size.

Slipperiness. The material is fairly slippery because of its long and round shape and of its bark (especially under wet conditions).

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[396] A four foot bolt weighs between twenty and two hundred pounds (A. Legault, "L'exploitation de la forêt suscite des problèmes humains complexes et nombreux," Le Papetier, 1, 3 (juin 1964), p. 9).

2. Workers' Task Attributes

The technological system just described created a number of conditions at the occupational level which influenced workers' and work groups' behaviors in many respects. Table 44 presents a summary of the task attributes of the production of three major occupations: feller, skidder[397] and hauler. Let us analyze each of them briefly.

a) Control Dimensions

In the three jobs, workers had a fairly high amount of control especially on the tools and machines and on the pace of work. In the case of tools and machines, technological simplicity and multi-functionality were responsible for workers' high degree of control. Several factors accounted also for workers' control over the pace of work: the same technological conditions previously mentioned, the wide variations in the raw material on which, and the environment in which, they operated and, thirdly, their physical isolation which made close supervision impossible.

On the other hand, workers' control was significantly less important concerning the workflow and the operation cycle. In fact, workers had a high level of control on their own segment of the production line, but, since the production line was made up of a large number of horizontal segments, workers had a very low level of control on the line as a whole. Thus one segment could be inoperative for several days and it would not affect the operation as a whole. As to the operation

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[397] I somewhat arbitrarily include skidders in the traditional system even if skidding did not become a general phase of the system until the beginning of mechanization (J-5, muskeg, and truck) in transport activities. It was, however, at a very transitional stage. The introduction of the rubber-wheel skidder in 1960 constitutes, from my point of view, the real turning point.

TABLE 44

Workers' Task Attributes of Three Major Occupations, Traditional Short-Wood System

Attribute	Occupation: Feller	Skidder	Hauler
A. Control Dimensions			
1. Tools and Machines	Hand or powered tool, individually controlled, high control	Animal or powered machine, individually controlled, high control	Animal or powered machine, individually controlled, high control
2. Workflow and Amount of Control	Production line (mass production), high control on his own segment but, since it is a multi-segment line, has very low control on the line or workflow as a whole	Same as previous one	Same as previous one
3. Pace of Work and Control	Worker determined, high control	Worker and animal or machine determined, relatively high control	Same as previous one
4. Operation Cycle	Invariable, short, some control on the duration and the sequencing of sub-tasks	Invariable, medium some control on the duration	Invariable, relatively long, some control on the duration
B. Task Differentiation	High and independent	Same as previous one	Same as previous one
C. Work Attention Requirements	Surface to detailed and short to moderately long	Surface and moderately long	Surface and moderately long to long
D. Technological Interdependence	Low	Low	Low

TABLE 44 (cont'd)

Attribute	Occupation		
	Feller	Skidder	Hauler
E. Technically Permitted Interaction	Medium to low	Medium to low	Low
F. Technically Permitted Cooperation	Some	Some	Some
G. Spatial Constraints and Type of Spatial Boundaries	Moderately large space, confined and restricted floating	Large space, confined and restricted floating	Very large space, confined and restricted floating
H. Source of Influence	Semi-technical	Extra-technical	Extra-technical
I. Communication	Intermittent, complete, shouting, talking and signs	Same as previous one	Intermittent, complete, shouting and talking

cycle, similar remarks can be made. Workers had only a high level of control on the duration of the cycle of their segment which was simple and invariable.

b) Task Differentiation

The level of task differentiation was high between felling and the other two tasks, but less so between skidding and hauling which were two transportation tasks. They were all independent from each other, but especially hauling which was performed during a completely different period of the year.

c) Work Attention Requirements

These requirements varied from one occupation to another. Fellers' work required constant surface to detailed attention over short or moderately long periods of time. The length of this period varied according to the feller's own pace of work. Detailed attention was required because he had complete control over the tool (axe or chain saw) which he had to guide and assist with his own energy. Inattention could result in an accident especially with the use of the power saw. On the other hand, surface attention was constantly required from the skidder and hauler. When loading or unloading, detailed attention was sometimes necessary to execute the manipulation of the logs and to avoid possible accidents with the hook or falling logs. During the transportation, surface attention was sufficient when the trails or the roads were on flat ground and trips were easy. Constant attention was, however, required for longer periods of time for these two tasks than for felling.

d) Technological Interdependence

The level of technological interdependence was low for all tasks. It did not matter much for the efficiency of each task how and when the previous or the next ones in the production sequence were being performed. The simplicity of the technology and the low level of integration gave a lot of flexibility to the system. The efficiency of the system was much more dependent on the way each task was performed _per se_ than on the influence of this performance on the preceding or following tasks.

e) Permitted Interaction

The amount of interaction permitted by the technology on the job was very low since, in most cases, workers were working in complete isolation from each other. It is only when the work was performed by a team (usually two men), that interaction was possible. Team work was used in hauling (especially truck hauling) because of the physical difficulties involved in the manipulation of the logs.

f) Permitted cooperation

Due to their complete isolation from other fellers and because of the discontinuity between felling and hauling, there was no cooperation between fellers and between them and the other workers. The only permitted cooperation existed between haulers on the same work team and among drivers belonging to the same gang. In fact, not only was this cooperation permitted, but it increased very much the performance of the teams involved.

g) Spatial Constraints

The space within which jobs were performed varied in size according

to the different jobs from moderately large (few hundred feet) for the fellers and skidders to very large (few miles) for the haulers and drivers. Workers were confined to these spaces (a cutting strip, a skidding trail, a hauling road, and a stream or river) and their movements were restrictively floating. The haulers, of course, had less freedom than the other ones since the loading and unloading spots as well as the roads in between were all pre-determined for them.

h) Source of Influence

Unless involved in team work (in hauling and driving), workers had generally no technical influence on each other since there was a complete horizontal, as well as vertical, segmentation of the production sequence. In hauling and driving, the expertise and cooperation demonstrated in accomplishing the tasks contributed to establish a reputation which was an important source of influence. However, since this was not a matter of requirement by the technology as much as a matter of opportunities created by the technology, the source of this influence was semi-technical.

However, despite these remarks, one should add that, for all the men not involved in team work but remunerated on a piecework basis, there was an indirect technical source of influence. Indeed, the reputation and prestige of a man was very much dependent on his achievements, that is, the amount of wood he averaged a day in cutting, skidding, or hauling.

A good deal of a man's influence was also extra-technical or external to the work situation and based on a man's reputation or social status in his village or parish of residence. Indeed, as I indicate

in Chapter 7, workers in a camp used to come from the same village or parish where they had been recruited by a local jobber. So the social status in the logging camp and at work used to reflect his own or his family's social status in the village or parish of residence.

i) Communication

Communications at work were intermittent and usually complete and were limited almost totally to the few workers involved in team work (haulers and drivers). Talking and shouting were the most important forms of communication.

It is interesting to note that the almost complete social isolation at work was compensated for by the very intimate social environment of the camp after working hours. Not only did the men eat together at the same time in the common "cookery", but they spent most of their leisure time and slept in the same camp and, if there was more than one camp, there were several men in the same one without any other privacy than their bunk beds.[398]

A. Semi-Mechanized and Fully-Mechanized Tree-Length System

The changes in the system of production and the increasing mechanization of the operations which have taken place since have modified the above picture in several significant ways. Indeed, if the present trends continue in the future, logging activities will become predominantly capital intensive with continuous operations, fewer independent and separated horizontal workflow segments and, consequently,

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[398] "Cookery" refers to the building where the food was prepared and consumed, and camp to the separated buildings used as living quarters.

a much more rigid workflow. For the workers it will mean, among other things, a lower degree of job control and a less-isolated work environment.

These general observations should now be qualified according to our distinction between semi-mechanized and fully-mechanized systems. The semi-mechanized system is presently by far the most widely used but this situation is transitory before fully-mechanized operations, which exist already on a very limited scale, become predominant. It is believed, however, that in any forseeable future, the fully-mechanized system will not become the dominant one because of unsolved invironmental problems (like, for example, mountainous terrain) unless the shortage of labor becomes so acute that the logging industry is left with no other alternative.

1. Technology

a) Operations Technology

(i) Level of Workflow Rigidity

Observed changes and some others expected in the future indicate that the workflow becomes increasingly rigid as mechanization increases. Waiting times are still possible between operations phases but the length of delay is being considerably reduced as buffer stocks diminish in size. The reduction in the size of the buffer stocks is due to the extension of the operations to an almost year-round basis and the fact that all the phases are carried out simultaneously due to a desire for better quality pulpwood, and to economic rationalization (diminution of the amount of capital tied up in large inventories). The important point to underline here is that year-round and simultaneous operations

were made possible and somewhat economically necessary by the technological improvements themselves. Thus, the use of trucks for haulage operations made year-round hauling operations a possibility with improved roads. The power saw reduced physical strains enough to make it feasible for most workers to work during a 9- to 12-month period. What was then needed was a vehicle capable of moving the wood cut at the stump to the road on a year-round basis. The industry came up with a temporary solution at first, caterpillar vehicles, and later, with a permanent one, the rubber-wheel skidder.

The new technology made also year-round operations economically desirable. Without anticipating further discussions on the relationship between technology and other variables to come in later chapters, we can briefly mention here some of the elements involved. For one, trucking freed hauling of the dependence on climatic conditions which limited the haulage phase to a short period of the year during which bad weather could result in some of the wood having to be left in the forest until the following year. Trucking eliminated also the problem of the short distance of haulage necessitated by the use of horses and small tractors which obliged the companies to harvest only the wood close to drivable streams and rivers.[399]

To extend hauling operations meant keeping logging camps open with the regular staff. This represented costly overhead expenses which could be offset by extending the other major phases of the operations: cutting and skidding in order to take full advantage of the organizational facilities and services. However, the economic pressure leading

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[399] Curran, op. cit., pp. 85-86

to the extension of hauling was not felt by the companies until they had to bear the costs of amortization of the mechanical equipment, that is, until they became the owners of the equipment.

This happened when the equipment became so specialized to logging operations that it could not be used anymore for other jobs during the dead period of activity in logging. This specialization was necessitated by increasing labor costs (for instance in trucking, hand loading and unloading). Companies had to buy their own equipment also because of conflict between logging and other possible sources of employment like highway construction, building construction, etc. especially frequent as the operations were progressively extended into the summer.[400] Finally, contractors and small owners became

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[400] Bentley _et al._ indicate the following advantages of summer logging: "(1) The need for working capital is spread over the year instead of being concentrated in certain months.
(2) Camp buildings are used to better advantages, since they are occupied most of the time.
(3) If the cutting season includes summer and early winter smaller camps can be built, since fewer men are required at any given time.
(4) The area covered from a camp can be extended in summer by using tents or temporary shelters for operating the most remote wood.
(5) The longer season requires the employment of fewer men, permits careful selection of the best men, and increases their efficiency. It also reduces the number of jobbers, inspectors, and scalers.
(6) It permits greater concentration of hauling operations during the winter.
(7) Summer wood loses about 1,000 pounds per cord in weight and thus reduces the weight to be hauled by 20 to 25 per cent.
(8) The sinkage loss of summer cut wood is lower.
(9) In areas subject to heavy snowfall the cutters are not hampered by having to wade through deep snow.
(10) Stump heights can be reduced.
(11) Sawing is easier in summer than when wood is frozen, and the production per man-day is therefore increased.
(12) The longer period of daylight allows a full day's work, with a period of rest at the hottest time of day. Piece workers benefit by this condition.

increasingly reluctant to commit themselves to buy specialized equipment (like the pallet system in trucking) even if financed and encouraged by companies because they realized that they were becoming too much dependent on the companies for employment.

Other characteristics of the new systems contributed also to their greater rigidity. As mentioned above, the mechanical equipment is increasingly specialized. Production lines are equipped with multi-purpose machines rather than ~~single~~-purpose ones. As a consequence, production stoppages mean a net loss of production time for these machines since they cannot be used for other tasks or operations which they have not been designed for. The workflow thus becomes hard to reorganize in order to accommodate to these stoppages.

The rigidity of the workflow is also increased by the decrease in the number of sources of input at all stages of the production system following an increase in the production capacity of the machines and the closer matching of these capacities (see Figure 15).[401] For

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(13) Better hauling roads can be built in summer, since obstructions may be cleared to the ground.
(14) Scaling can be more easily and more accurately done in summer.
(15) If the main transportation system is by land instead of water, summer cutting may permit deliveries to the mill to be made throughout the year, thus avoiding the need for maintaining large inventories of wood in the mill yard" (Bentley <u>et al.</u>, <u>op. cit.</u>, p. 9).

[401] Following are two examples of the greater integration between different phases of mechanized operations. Both are related to mechanical slashing and indicate how the problems created by integration are solved.

1-Slashing and hauling.

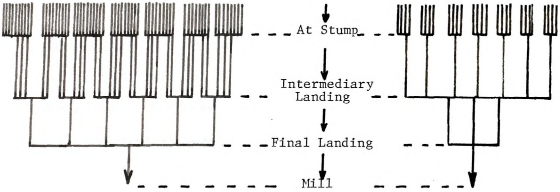
"Being a "hot" operation, roadside slashing requires a cushion in the system to absorb production peaks. As a general rule, hauling capacity is usually set at 125% of the average slasher production per shift."

2-Slashing and skidding.

"The need for better roads at a reasonable cost per unit [created by the use of mechanical slashers] brought an increase of skidding

FIGURE 15

Hypothetical Flow Chart Illustrating the Difference in Workflow Flexibility Between a Non-Mechanized and a Mechanized Logging Operations[a]



[a]It is assumed here that the final output at the mill yard is the same in both cases.

fully-mechanized tree-length operations, one high-productivity forwarder can forward the total production of a high capacity tree-harvester, and so on down the line. Consequently, breakdowns in one of these machines can be very disruptive, not only because they can directly affect other phases of the operations, but because they generate a much

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distances. The use of bigger skidders permitted to maintain the same daily production at no extra cost. It was also found that a few hundred feet more did not really matter. Skidder operators simply learned how to take bigger loads."

(A. Legault, "Mobile Mechanical Slashers--Consolidated-Bathurst's Answer to the Mechanization of Scattered Operations," in Preprints (Montreal: Woodlands Section, C.P.P.A., March 1970), pp. 190 and 194 respectively). The explanation in brackets is mine.

higher volume of lost production.

Despite the increasing rigidity of the workflow, mechanized logging operations still maintain a relatively wide margin of flexibility compared to other production systems like, for instance, an automobile assembly-line system. But they have to, as long as the environment continues to offer so much uncertainty.

(ii) Level of Automation (Mechanization)

The rapid mechanization of the 1960's and the early 1970's was called a technological revolution by many. This judgement certainly needs qualification. In terms of size and productive capacity, progress has certainly been spectacular. In terms of automation, logging operations remain far from being automated. The equipment is still at the level of powered machines and tools (level 2 in Amber and Amber's scale).[402]

However, the generalization of mechanical equipment to all phases of the operation has been accompanied by two important changes. Firstly, sometimes different operations, like processing and handling (loading and unloading, moving from one processing point to another), have been combined into one continuous phase executed by the same machine (for instance, the mobile slasher). Secondly, some of these operations are now automatically done by the machine once the process has been started by the operator. For instance, in some tree-harvesting machines once the tree has been cut under the direct control of the operator, the machine automatically limbs, tops and dumps the tree on the ground

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[402] Amber and Amber, op.cit.

or slashes it into bolts which are stored in a basket ready to be hauled away when a full load is completed.

(iii) Interdependence of Workflow Segments

The degree of interdependence of the workflow segments has increased significantly with mechanization. This increase is, however, limited to the vertical segments and generally does not apply to the transportation to the mill unless it is done by trucks directly from the logging sites. Two types of interdependence have developed between vertical segments. Because of the greater degree of workflow integration, there is a greater quantitative interdependence. As mentioned earlier, buffer stocks have been reduced to create a less expensive flow. The number of segments feeding into the next phase segments also is being reduced which contributes to increased quantitative interdependence ("hot-logging").

Of greater consequence, however, is the development of qualitative interdependence. The more advanced the system becomes, the more dependent each phase of the operations becomes for its own efficiency on the way the previous phase has been performed. For instance, fellers (men or mechanical harvesters) have to be careful about the way they dispose of the cut trees in order to facilitate and accelerate the work of the skidders or the forwarders. The latter must unload the logs in a proper way at the landing if they want to facilitate and accelerate the work of the slashers and diminish the number of logs being broken in the manipulation by the slasher loader operators.

(iv) Specificity of Criteria of Quantity and Quality Evaluation

The specific criteria related to managerial, administrative and governmental necessities are maintained in mechanized operations. However, new technical specifications are added up to the previous ones. For instance, there are specifications concerning the size, length and shape of the trees and logs which can be processed or handled by the various machines.

(v) Operations Continuity

While traditional operations were essentially discontinuous, mechanized operations are becoming increasingly continuous. Their annual duration has been extended over a period of ten, eleven and, in some cases, twelve months. The work week has been reduced in most cases to five days but in an increasing number of operations some entirely mechanized phases are performed sixteen hours a day (two eight-hour shifts).

This greater continuity is not due, however, to technical necessities (as it is, for example, in pulp and paper manufacturing or aluminum smelting and producing). Indeed, mechanical operations can be stopped (and, in fact, are every day) without harming the production underway. However, continuous daily operations requires less equipment and amortization costs. They contribute also to lower overhead costs.

(vi) Variety of Sequences

The most commonly used system, the tree-length, includes three major different sequences according to the location where the trees

are slashed into bolts: at the intermediary or roadside landing, at the riverside landing or at the mill yard (see Figure 16).

The variations of sequence do not generally change the type of operations with the exception of problems of planning and coordination. Indeed, it is a different order of the same simple tasks executed by the same or similar machines. The sequence is different in order to adapt to different environmental conditions (for instance, distance to river from intermediary landing, volume of merchantable wood being harvested, distance to the mill, available means of long distance transportation, etc).

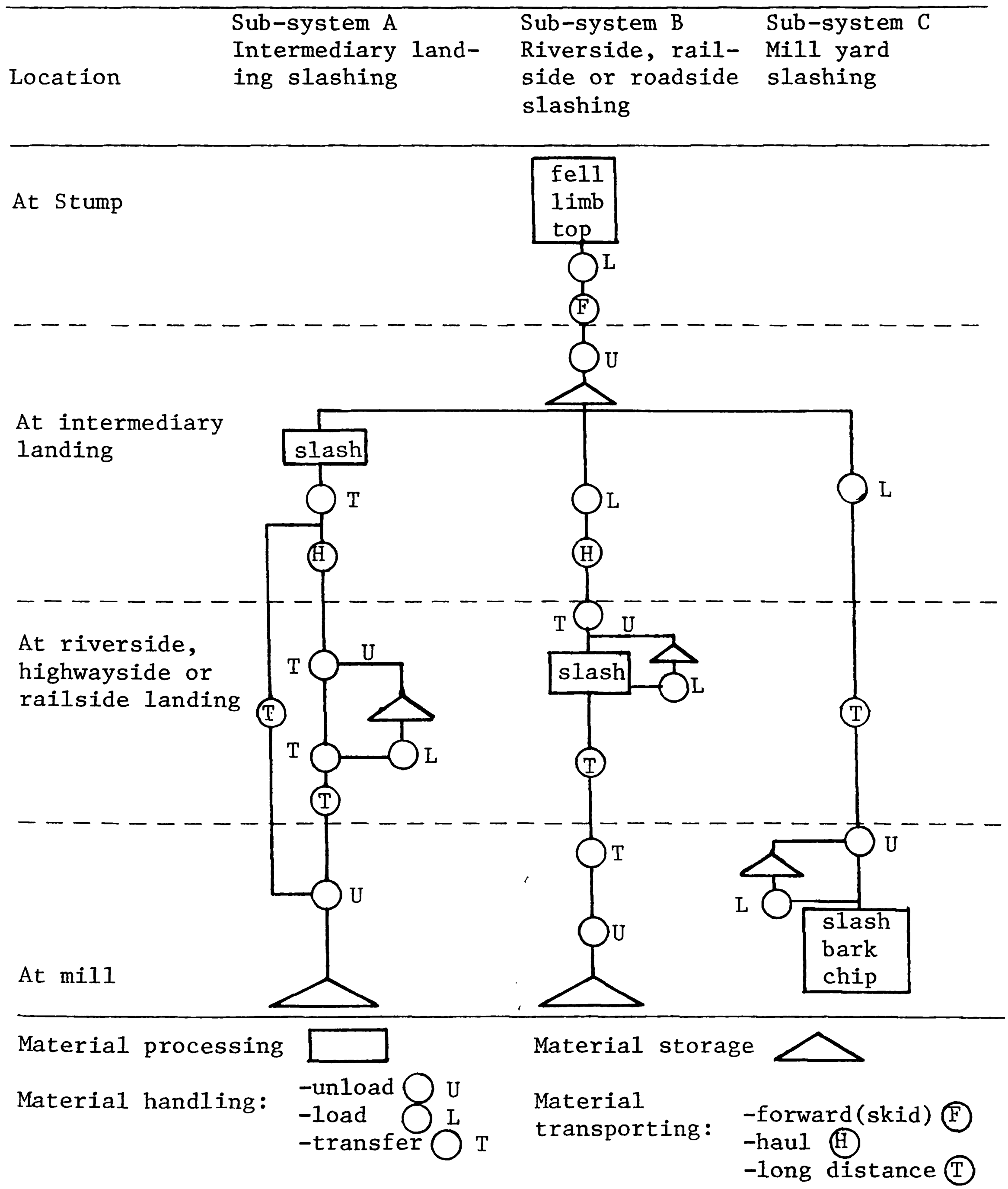
The major difference, as mentioned above, concerns planning and coordination requirements. Sub-system A requires more careful planning and coordination than the other two because it is a "hot" operation in which slashing and hauling are simultaneously done without any cushioning buffer stocks between the two operations. At the other end of the continuum, sub-system C requires the least planning and coordination since it involves only long distance transportation from the intermediary landing to the mill yard and is well cushioned by buffer stocks at both ends. Once proper routines are established, this system is less vulnerable to environmental variations and production hazards since slashing is done by stationary machine at the mill yard under perfectly controlled conditions.

(vii) Uniformity of Equipment

With mechanization and the concommitant specialization of equipment, there has been a very high increase in the variety of logging equipment available and in use. Table 45 gives a complete list of the equipment used by the four companies during the 1971-72 season.

FIGURE 16

Various Operational Sequences of the Tree-Length System



SOURCE: Adapted from Wackerman et al., op. cit., pp. 436-437

TABLE 45

Number of Units Owned and Rented, Basic Logging Equipment, Four Companies, 1971-72[a]

Equipment Category	Number of Units							
	QNSP		Domtar		Price		Consol-Bath.	
	CIE	RENTED	CIE	RENTED	CIE	RENTED	CIE	RENTED
1) Haul trucks:								
-to 50,000 #GVW-gas	-	40	7	33	3	35	17	57
-over 50,000 #GVW-gas	4	-	2	15	-	-	13	40
-to 50,000 #GVW-diesel	-	-	-	3	-	-	-	4
-51,000 to 70,000 #GVW-diesel	12	20	18	9	3	8	15	10
-over 70,000 #GVW-diesel	-	12	-	9	2	1	28	-
TOTAL	16	72	27	69	8	44	73	111
2) Haul trailers:								
-tree length semi-trailers	-	-	21	-	-	-	3	5
-tree length piggy-backs	28	-	-	-	3	14	-	-
-tree length full trailers	-	-	-	-	-	-	-	-
-short wood semi-trailers	-	-	1	17	-	4	10	18
-short wood full trailers	-	-	-	-	5	2	35	2
TOTAL	28	0	22	17	8	20	48	25
3) Truck pallets	-	-	90	30	0	30	-	4
4) Truck front-end loaders:								
-to 100 hp	-	-	1	1	-	-	-	2
-101 to 150 hp	-	1	1	-	1	1	-	-
-over 150 hp	-	-	2	-	-	-	3	-
TOTAL	0	1	4	1	1	1	3	2

TABLE 45 (cont'd)

Equipment Category	Number of Units							
	QNSP		Domtar		Price		Consol-Bath.	
	CIE	RENTED	CIE	RENTED	CIE	RENTED	CIE	RENTED
5) Wheel front-end loaders:								
-to 150 hp	4	-	3	2	1	-	12	-
-151 to 200 hp	-	-	6	-	2	2	1	1
-over 200 hp	1	1	-	-	-	-	1	-
TOTAL	5	1	9	2	3	2	14	1
6) Cable cranes:								
-to 1 yd.	-	-	-	-	-	-	1	-
-over 1 yd.	-	-	-	-	-	-	2	-
TOTAL	0	0	0	0	0	0	3	0
7) Hydraulic cranes (loaders):								
-to 10,000 # at 10'	3	-	1	10	-	2	16	3
-11,000 to 20,000 # at 10'	5	3	8	-	-	1	6	-
-over 20,000 # at 10	-	-	2	-	2	6	-	-
TOTAL	8	3	11	10	2	9	22	3
8) Cable yarders:								
-chokers	-	-	-	-	-	-	-	-
-grapple	-	-	-	-	-	-	-	-
TOTAL	0	0	0	0	0	0	0	0

TABLE 45 (cont'd)

Equipment Category	Number of Units							
	QNSP		Domtar		Price		Consol-Bath.	
	CIE	RENTED	CIE	RENTED	CIE	RENTED	CIE	RENTED
9) Short wood forwarders:								
-wheel	-	-	1	7	-	-	-	-
-flexible track	-	3	18	8	-	-	-	3
-hard track	-	-	-	5	-	-	-	-
TOTAL	0	3	19	20	0	0	0	3
10) Tree length & full tree forwarders								
-wheel	-	1	1	-	-	-	-	-
-track	-	-	-	-	-	-	-	-
TOTAL	0	1	1	0	0	0	0	0
11) Choker wheel skidders:								
-to 80 hp	-	-	30	64	-	6	98	54
-81 to 100 hp	125	80	111	35	23	200	87	71
-101 to 150 hp	-	-	1	1	-	-	77	1
-over 150 hp	-	-	-	-	-	-	-	-
TOTAL	125	80	142	100	23	206	262	126
12) Grapple wheel skidders:								
-to 150 hp	3	-	-	-	-	-	-	-
-over 150 hp	-	-	-	-	-	-	-	-
TOTAL	3	0	0	0	0	0	0	0

TABLE 45 (cont'd)

Equipment Category	Number of Units							
	QNSP		Domtar		Price		Consol-Bath.	
	CIE	RENTED	CIE	RENTED	CIE	RENTED	CIE	RENTED
13) Track skidders:								
-to 100 hp	-	-	-	-	-	-	-	-
-over 100 hp	-	-	-	-	-	-	2	1
TOTAL	0	0	0	0	0	0	2	1
14) Tree length slashers:								
-roadside mobile	9	-	4	-	1	-	10	-
-landing mobile	2	-	-	-	4	-	5	-
-stationary	-	-	-	-	1	-	-	-
TOTAL	11	0	4	0	6	0	15	-
15) Tree length chippers:								
-mobile and portable	-	-	-	-	-	-	-	-
-stationary	-	-	-	-	-	-	-	-
TOTAL	0	0	0	0	0	0	0	0
16) Full tree feller buckers:	1	-	-	-	-	-	-	-
TOTAL	1	0	0	0	0	0	0	0
17) Harvesters:								
-tree length	-	1	2	-	-	-	-	-
-short wood	-	-	-	-	-	-	-	-
TOTAL	0	1	2	0	0	0	0	0

TABLE 45 (cont'd)

Equipment Category	Number of Units: QNSP CIE	QNSP RENTED	Domtar CIE	Domtar RENTED	Price CIE	Price RENTED	Consol-Bath. CIE	Consol-Bath. RENTED
18) Processors:								
-mobile	-	-	-	-	-	-	2	-
-stationary	-	-	-	-	-	-	-	-
TOTAL	0	0	0	0	0	0	2	0

[a] Company's equipment includes company-owned or leased equipment. Figures for Quebec operations only.

SOURCE: Logging Operation Report, op. cit.

Not only do we observe a good number of different machines, but also different sizes or capacities for the same machines.

Of course, the amount of variation is not the same for all companies and even between divisions within each company, but there is greater uniformity of equipment within each unit of production (camp). Two of the most important factors which explain the degree of variation of the equipment are differences in the physical environment and the raw material. With today's expensive machinery, small variations in capacity, size, load factor, weight, ground bearing capacity, etc. can mean a lot of difference in productivity and in profitability. Especially since increasing specialization of equipment has been associated with developments in mechanization, it has become imperative that the equipment be well adapted to environmental and raw material conditions.

To support this argument, the four companies have been ranked according to an index of diversification based on the number of different machines used and the number of different sizes (or capacities) of the same machines. The results, as reported in Table 46, show that the two companies in which operations are the most widely scattered, that is, the ones with the greater degree of variations in environmental and raw material conditions, have the most diversified equipment.

As mentioned earlier, the equipment is more uniform within the particular division of each company. This is shown clearly in the cases of Consol and Domtar for which data are available. Table 47 indicates that, despite the differences between divisions, their degree of diversification is well below the figures established for the whole company.

TABLE 46

Degree of Diversification of Basic Logging Equipment, Four Companies, 1971-72

Company	Number of different machines[a]	Number of different sizes or capacities[b]	Total
Consolidated-Bathurst (the most widely scattered operations)	12	29	41
Domtar	11	27	38
Price	8	18	26
QNSP (the least widely scattered operations)[c]	12	18	30

[a]Maximum possible: 18

[b]Maximum possible: 50

[c]QNSP has the least scattered operations, but Price is much more similar in this respect to QNSP than to Domtar.

SOURCE: Logging Operation Report, op. cit.

TABLE 47

Degree of Diversification of Basic Logging Equipment According to Various Divisions, Consolidated-Bathurst and Domtar 1971-72

Company	Division	Number of different machines	Number of different sizes of capacities	Total
Consolidated-Bathurst		12	29	41
	Chaleur	5	8	13
	Ottawa	7	11	18
	Saguenay	8	18	26
	St-Maurice	9	18	27[a]
Domtar		11	27	38
	Dolbeau	5	7	12
	Eastern-Twps.	6	12	18
	Quebec	8	13	21
	Quevillon	10	14	24

[a]The St-Maurice Division is by far the largest and has the most scattered operations.

SOURCE: Logging Operation Report, op. cit.

(viii) Throughput Cycle and Rate

There are wide variations in both cycle and rate and it is difficult to establish an average which would be in any way of limited significance. However, it is more important for our discussion to know that throughput rates are now much more closely monitored by management at all levels and that, in view of the increases in productivity reported in an earlier chapter, they have increased drastically compared to traditional logging operations.

(b) Materials Technology

Characteristics of the raw material did not change over the years. The only modification brought by the tree-length system concerns the handling and storing of tree-length logs. In this respect, machines had to be designed to handle the unusually long logs and landings and roads had to be constructed to support and accomodate increased sizes, loads and volumes.

2. Workers' Task Attributes

Despite the important changes created by the mechanization of logging operations, it seems that the basic technology has remained sufficiently similar not to modify completely the characteristics of the main production jobs. For example, workers still maintain a relatively high overall amount of control. Table 48 gives a summary of the characteristics of the five major production occupations existing in semi- and fully-mechanized operations.

a) Control Dimensions

According to Table 48, four jobs are very similar in this respect, while the fifth one, slasher operator, stands out somewhat

TABLE 48

Workers' Task Attributes of Five Major Occupations, Semi- and Fully-Mechanized Tree-Length Systems

Attribute	Occupation				
	Feller	Tree-Harvester Operator	Skidder Operator	Slasher Operator	Truck Driver
A. <u>Control Dimensions</u>					
-tools & machines	Powered hand tool, individually controlled, high control	Powered machine, individually controlled, high control	Powered machine, individually controlled, high control	Powered machine, collectively controlled, medium control	Powered machine, individually controlled, high control
-workflow & amount of control	Production line (live), buffer stocks, low control	Production line, buffer stocks, medium control	Production line (live), buffer stocks, low control	Production line (live), buffer stocks, medium control	Production line (live), buffer stocks, low control
-pace of work and amount of control	Production determined, high control (piecework)	Timed production, some control	Production determined, high control (piecework)	Timed production (bonus), some control	Production determined, some control (piecework)
-operation cycle	Invariable and short, some control	Invariable and short, some control	Invariable & longer, some control	Invariable & short, some control	Invariable and long, some control
B. <u>Task Differentiation</u>	High and dependent	High and independent	High and dependent	High and dependent	High and dependent
C. <u>Work Attention Required</u>	Surface to detailed, short to moderately long	Surface and moderately long	Surface to detailed, moderately long to long	Surface, short to moderately long	Surface to detailed, moderately long to long

TABLE 48 (cont'd.)

Attribute	Occupation				
	Feller	Tree-Harvester Operator	Skidder Operator	Slasher Operator	Truck Driver
D. Technological Interdependence	Some	Low	High	High & medium	High & low
E. Technically Permitted Interaction	Moderately frequent and variable (mostly brief)	Infrequent and mostly long	Moderately frequent and variable (mostly brief)	Moderately frequent and variable (mostly brief)	moderately frequent and variable (mostly brief)
F. Technically Permitted Cooperation	Some	None	Some	Some	Some
G. Spatial Constraints	Large space, confined and restricted floating	Very large space, confined, restricted floating	Large space, confined, restricted floating	Small space, confined, fixed boundaries	Very large space, confined, fixed boundaries
H. Source of Influence	Semi-technical	Extra-technical	Semi-technical	Semi-technical	Extra-technical
I. Communication	Intermittent, usually complete, talking and shouting (some signs)	Intermittent, usually complete, talking and signs	Intermittent, usually complete, talking and shouting (some signs)	Intermittent, usually complete, talking and signs	Intermittent, usually complete, talking and signs

differently. A comparison with Table 44 shows also that, indeed, there is much in common between these occupations and those of the traditional operations. Excluding slasher operators for now, workers in the four other occupations have a fairly high amount of control over their power tools or machines and on the pace of work. The reasons for this reside basically in the fact that these tools and machines are still at a low level of automation (level 2 on the scale) and that the operator is the only one to operate the machine at one time. As to the control over the pace of work, the remarks made about these occupations in traditional operations remain somewhat valid here too: technology, variations in the raw material and the environment and physical isolation all contribute to workers' control. However, the increase in workflow integration has undermined workers' control, especially the operators of skidders and trucks who are under the immediate pressure of the preceding phase of the operations (felling and slashing respectively) since there are no buffer stocks between them.

The group of operators (2 or 3) working on a slasher is in a different position. The control belongs to the group, not to each individual, even if the operator of the loader may have more control over the whole operation as the initiator of the cycle of transformation. We should probably speak of negative control in this case. Indeed, each operator entirely controls one phase of the total slashing operation and, as such, can slow down production or stop it entirely. However, none of them can individually speed up production if the other one or two do not want to.

Concerning the other two dimensions of control, workflow and operations cycle, all five occupations have a relatively low degree of control. Because of the maintenance of buffer stocks and of multiple horizontal workflow segments in mechanized operations even if they have been reduced, workers have generally a low level of control on the live production line. However, the reduction in the volume of buffer stocks and the number of horizontal segments which is done with the increase in mechanization is likely to (and has already to some extent) increase the degree of workers' control, mainly in those segments where bottlenecks in the production process can be created such as in slashing because of the very high capacity of production of the new machines and their small number.

As to the degree of workers' control on the operation cycle of their respective segments, it is relatively low. They have some control on their duration but none on their sequence.

b) Task Differentiation

The level of task differentiation is high in all cases but the level of independence varies. Since felling and skidding are immediately related operations, the two tasks are interdependent. Slashing and hauling constitute also "hot" operations and are, consequently, interdependent. However, in fully-mechanized operations, felling is independent of skidding or forwarding since the two operations are separated technically and in terms of control: hourly wages and direct supervision by a foreman replace piecework.

c) Work Attention Requirements

Hand felling is the task which requires the most attention because of the high risk of accident involved.[403] Constant surface to detailed attention is required over short or moderately long periods of time which vary according to the feller's own pace of work. In the case of the other tasks, constant surface attention is sufficient most of the time over longer periods of time, especially for truck drivers.

d) Technological Interdependence

The level of technological interdependence increased significantly with mechanization but it varies with the different tasks and groups of tasks. In the semi-mechanized operations, the fellers and skidders work as a team and the efficiency of the skidders depends partly on the rate and the way in which fellers perform their work as illustrated in Figure 17. In fully-mechanized operations, the same technological dependence between the harvester and the skidder or the forwarder exists but the right method of piling the logs has been automatically incorporated in the mechanical operations of the harvester or has been routinized in the training of the machine operator.

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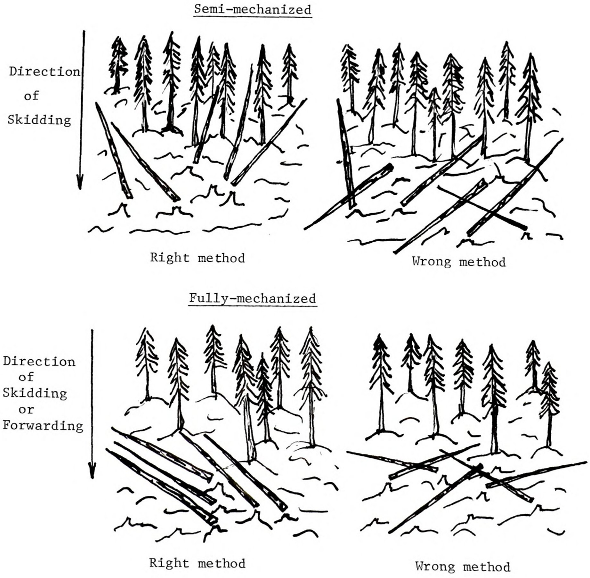
[403] A chain saw weighs about twenty pounds and the chain rotates at a speed of 6,000 to 12,000 revolutions per minute. Vibrations caused by the motor generate weariness and hand numbness, thus increasing the likelihood of accidents. See "La scie mécanique, un outil trépidant qu'il faut manier habilement," Le Papetier, 3, 4 (août 1966), p. 2, and R. Taschereau, "L'ergonomie et la scie mécanique", Le Papetier, 5, 3 (juin 1968) p.2.

FIGURE 17

The Right and Wrong Methods of Felling Trees
in Semi- and Fully-Mechanized Tree-Length Operations



Another group of interdependent tasks are slashing and hauling where the pace of work depends very much on the coordination between the two operations since one cannot proceed without the other. Less interdependence exists in the opposite sequence, hauling-slashing (riverside slashing) because, contrary to the previous one, there is a buffer stock between the two operations so that hauling can be done without slashing and slashing can continue for awhile despite a temporary breakdown in hauling. However, in this case, loading becomes an autonomous task which is immediately coupled with hauling and the one cannot proceed without the other.

The trend in the most advanced systems seems to be to eliminate qualitative interdependence by incorporating the sub-tasks and the efficient ways of doing things in the mechanical equipment so as to decrease workers' control over the job and to minimize the unreliability of human judgement. Most of the interdependence left would be quantitative, that is, related to problems of coordinating different machines and of matching their different output capacities.

e) Technically Permitted Interaction

Since mechanized operations are more integrated than traditional ones, the new technology provides workers with more opportunities to interact with each other. However, this general statement must be qualified according to the different groups of tasks.

(i) The Group Fellers-Skidder

In semi-mechanized operations, this group usually includes two fellers and one skidder. The level of interaction between fellers at

work is very low. Interaction takes place infrequently but for a relatively long duration (the time it takes to "roll" a cigarette and smoke it, or to eat a lunch). This is understandable since the two fellers are physically isolated from each other most of the time and do not have any other way to interact than that one of them stops working and walks over to the spot where the other one is felling trees (which may mean a distance of several hundred feet in dense forest and hilly ground.)

On the other hand, interaction between the skidder and each of the two fellers can be much more frequent.[404] Indeed, at each of the trips that a skidder makes, he can interact with one of the fellers. To do so, however, he and the feller will have to stop working because of the high level of noise generated by their respective powered pieces of equipment.

In a fully-mechanized operation, the operators of the tree-harvester and the forwarder work practically by themselves and rarely have a chance to interact. They are more likely to chat with the supervisor once in a while for receiving work instructions and enjoying a cigarette break.

(ii) The Group Slasher Operators and Truck Drivers

These workers have better opportunities for interaction than the other ones because of their proximity to each other and the

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[404] In Table 49, the time budget given for the fellers and skidders indicates how much time was spent helping each other. It is noticeable that fellers spend much more time helping skidders than vice-versa.

TABLE 49

Fellers and Skidder Operators' Activities in Average Wood and Average Operating Conditions, Price Company, 1968

Feller Activity

Work element	% of time	Non-work element	% of time
Felling	20.33%	Lunching	8.82%
Limbing and topping	34.23%	Skidder-in-way	4.22%
Clearing windfalls	0.10%	Moving to new site	0.19%
Clearing birches	2.01%	Filling chain and repairs	2.97%
Clearing scrub	2.97%		
Felling hang-ups	0.29%	Refuelling	3.64%
Choking*	7.86%	Smoking and social*	4.79%
Assisting skidder, Except choking*	3.36%	Personal	2.11%
		Waiting for skidder	0.48%
Butting	0.10%	Saw trouble	1.53%
Sub-total for productive elements	71.25%	Sub-total for non-productive elements	28.75%

Skidder Operator Activity

Work element	% of time	Non-work element	%of time
Choking	28.86%	Mechanical failure	--
Winching	10.23%	Operating conditions	0.68%
Travel to unload	13.41%	Waiting for load	1.36%
Straightening turn	7.50%	Personal	0.68%
Assisting on landing	0.23%	Lunching	5.91%
Returning from unloading	12.73%	Repairing cable	2.95%
		Smoking and social*	2.05%
Unchoking	12.73%		
Assisting feller*	0.68%		
Sub-total for productive elements	86.37%	Sub-total for non-productive elements	13.63%

*Indicates social interaction.

SOURCE: Earl Marsh, "Work Sampling Applied to Price (Nfld.) Pulp and Paper Ltd. Tree Length Logging Operation", Woodlands Section, C.P.P.A., 1969, pp. 2-3 (WS Index 2511 (B-5) ODC 352).

frequent change of pace which takes place in their activities and provides opportunities for interaction. Changes in the pace of work occur whenever the slasher must be moved along the pile of logs (or to a completely new location) or is waiting for a truck to get ready for loading.

However, the relative physical isolation of each operator and the noise level generated by the machines limit very much the frequency and amount of interaction.

Exceptionally, truck drivers have opportunities to interact frequently with each other, with the supervisor or with other employees coming around when they are waiting to be loaded because usually, in order to keep the operation smoothly rolling, at least one truck is on stand-by at any time that another is being loaded.

f) Technically Permitted Cooperation

The higher degree of integration and interdependence is accompanied by more technically permitted cooperation. This is certainly the case between fellers and skidders. A skidder can help to limb or top the logs if he has to wait for a complete load (which is, however, unlikely). Usually, it is the opposite. Fellers help skidders to locate the trees which are ready and to attach them to the wire. They also facilitate the task of the skidders by falling the trees in the correct position (see Figure 15). In doing so, fellers realize that their work-place is cleared faster. It improves their productivity and, consequently, their wages. It also prevents the skidders from running behind in their work with the same results.[405]

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[405] Louise Lamarre, "Joie de vivre en forêt?", Le Papetier, 1, 5

Cooperation can also be displayed by the operators of the slasher in the loading and unloading processes. In operations where the bolts are corded on the truck by the unloader, the truck driver can help to do it more efficiently by helping to place the bolts on the truck load. Reciprocally, the truck driver usually receives some help from one of the slasher operators to place his truck more rapidly and properly to be loaded.[406]

In fully-mechanized operations, there are no direct opportunities for interaction between the operators of the tree-harvester and the forwarder. Indirectly though, the tree-harvester operator can facilitate the work of the forwarder by piling the logs in the correct position (see Figure 15).

g) Spatial Constraints and Type of Spatial Boundaries

In semi-mechanized and to a larger extent in fully-mechanized operations, work is performed within relatively large space, particularly for the tree-harvester, forwarder and truck operators (several miles for the latter ones). All workers are confined to that space but, in the case of the fellers and the skidder operators,

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(décembre 1964). p. 7. At the roadside landing, buckers help skidders to unchoke the trees.

[406] In an interview, a member of the personnel department of QNSP remarked that the rubber-wheel skidder and the mobile slasher had changed logging operations much more than the chain saw because they had replaced individual work by team work.

their movements are restrictively floating while the operators of the three previously mentioned machines are confined to their cabs most of the time and their boundaries are more precisely fixed.

h) Source of Influence

In all jobs, except the ones of truck driver, tree-harvester and forwarder operators, the source of influence is semi-technical. The group fellers-skidder (and before fellers-skidder-buckers) is sufficiently integrated to generate a hierarchy of influence generally centrered around the operator of the skidder because this machine constituted the determinant element in the reorganization of the sequence of production functions, of the work patterns and of the work unit which are characteristic of the tree-length system. Horizontal cooperation between the two fellers (and, at an earlier stage in the development of the system, between the two buckers) as well as vertical cooperation between the fellers and buckers is articulated by him. However, the source of influence of the skidder is limited by the simplicity of the process and of the tasks involved.

In the work group related to slashing-hauling, the operator of the loader seems to have emerged as the key man. His position is the most important one[407] to determine the volume of production that the team will achieve. If he is fast to load the conveyor which feed the saws, the saw operator must work rapidly because his slowness becomes too visible when the loader must wait with two or three trees up in the air. The loader operator is also the one who drives

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[407] It is also the most spectacular one. He sits in a cabin on top of a small tower operating a hydraulic powered crane which can lift two or three trees each time by grappling them at the big end and

the slasher when it must be moved. This is another prestigeous job for him since it involves the most expensive piece of equipment in logging operations and also the heaviest one (around forty-five tons). The slasher must be moved along temporary, soft and narrow roads where it is very easy to get into trouble (trapped into mudholes, stuck on the road shoulders, etc.).

In the other cases, the source of influence is extra-technical since they are not interdependent with other tasks (tree-harvester and forwarder) or are located down the line in the workflow sequence and cannot affect normally the preceding workflow tasks.

i) Communications

Communications are intermittent in all cases and mostly complete. Because of the noise level, they are often done by shouting and by signs but most of the time by talking since it is usually possible to shut off the powered equipment. An exception to this is the slasher operation where, at least at one company, a visual warning system installed in the machine can be used by the operators in case of emergency.

III. Similarity of the Technology of the Four Companies

So far in this chapter, the technology of logging organizations has been analyzed in general with occasional but without systematic reference to the four companies. This was done for the sake of clarity and understanding. It was possible to do so because of the basic similarities which exist between the four companies. They all use the same predominant system: the semi-mechanized tree-length

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swinging them around like small sticks.

system. All employ the same basic equipment (see Table 50). Moreover, the four companies became involved in technological change at about the same time and proceeded through it at a similar pace (see Table 50).

TABLE 50

Key Stages in the Process of Mechanization, Four Companies

Machine	Year during which it was first used			
	Price	Consol-Bath.	Domtar	QNSP
Power saw (chain saw)	1948	1950	--	--
J-5 and muskeg	1955	1955	--	1953
Hydraulic loader	1966[a]	1960	--	--
Pallet trucks	1960	--	--	1960
Rubber-tired skidder	1960	1959-60	1960	1960-61
Mechanical slasher	1966	1966	1968	1965
Mechanical feller (tree-harvester)	not yet	1973	1966 (1970)	1971-72

[a]Price was late in using the hydraulic loader because it had decided earlier to use the pallet truck system which required manual loading. The company had to wait until its investment was recovered before changing its system.

SOURCE: Interviews, articles in companies' house paper and in other periodicals.

There are, however, differences which should be mentioned. One important variation between the companies concerns the degree of their technological homegeneity. In this respect, Price and QNSP have the most homogeneous systems.[408] All their operations are done entirely by the semi-mechanized tree-length system (with predominantly mechanical slashing) (see Table 51). The major difference between the two

[408]It should be noted that the two companies operate within a more concentrated territory.

TABLE 51

Logging Operations According to Systems of Production, by Volume of Production, Four Companies, 1971-72

System	Company			
	Price	QNSP	Domtar	Consol-Bath.
Short-Wood	--	2,788 (0.7%)	56,281 (14%)	87,903 (11.5%)
Tree-Length	344,000 (100%)	361,929 (98.4%)	473,424 (86%)	669,950 (87.4%)
1. Semi-Mechanized				
Manually Slashed	133,000 (38.6%)	46,363 (12.8%)	79,985 (16.9)	179,539 (26.8%)
Mechanically Slashed	211,000 (61.3%)	315,566 (87.2%)	372,439 (78.7%)	490,411 (73.2%)
2. Fully-Mechanized	--	--	21,000 (4.4%)	--
Full-Tree	--	3,269 (0.9%)	--	8,779 (1.1%)
TOTAL	344,000 (100%)	367,986 (100%)	550,705 (100%)	766,632 (100%)

SOURCE: Logging Operation Report, op. cit.

companies consists of QNSP already experiencing the fully-mechanized tree-length and full-tree systems.

At the opposite end of the continuum, Consolidated-Bathurst possesses the least homogeneous technology. On the one hand, it has already successfully adopted the full-tree system (though on a very limited scale -- 9,000 cunits in 1971) and, on the other hand, has maintained short-wood operations still using the traditional man-horse crews (33,000 cunits produced in 1971 with 125 horses). The old short-wood system was kept for its effectiveness in steep slopes of up to 60 per cent existing in one division (one third of the terrain in that operation consists of slopes over 30 per cent steep).[409] The bulk of Consolidated-Bathurst's operation is, however, done with the semi-mechanized tree-length system (mostly with mechanical slashing).

Domtar has a diversified technology as well but limited to the short-wood and tree-length systems. The feature of its technological organization is the successful use for more than eight years of the fully-mechanized tree-length system at one of its widespread operations (producing 21,000 cunits in 1971). This constitutes, so far, the most advanced system in use among the four companies.

The diversification of operations within each company in terms of production systems and in terms of raw material and environmental conditions seems to be reflected also in the type of equipment used. Thus, if we consider the rubber-wheel skidder which is the most characteristic piece of equipment of the tree-length system, we find exactly the same

[409] Jean-Guy Thibeault, "Expect 50% hike in logging productivity with mechanical processing to 16 ft.," Canadian Forest Industries, December 1971, pp. 36-38.

distribution (see Table 45). All skidders at QNSP and 97 per cent at Price have the same capacity (that is, between 81 and 100 hp.). On the contrary, the situation is much less clear-cut at Domtar and Consolidated-Bathurst. Only 60 per cent at Domtar and 41 per cent at Consolidated-Bathurst belong to the 81 to 100 hp. category. The rest at Domtar falls almost completely in the first category (up to 80 hp.), while at Consolidated-Bathurst it is spread between the first category (40 per cent) and the third one (101 to 150 hp.) where 20 per cent of the skidders belong.

Another indication of the wide variations among divisions (and even within divisions) of the same company is given by the index of productivity of the machinery. Again, this index for the skidder reveals extremely wide variations which certainly reflect the wide range of variations in raw material and environment but maybe some differences in efficiency. Figures in Table 52 indicate that the range across companies spans from a low of .30 machine hours per cunit (which is the most productive) to a high of .62. A verification with the systems of production indicates that part of these variations is due to the difference in efficiency between manual and mechanical slashing. Skidding productivity in manual slashing operations is consistently lower than in mechanical slashing (see Table 53).

This is, no doubt, due to the fact that manual slashing involves the five-man crew system in which the skidder operator is not only dependent on the fellers for its productivity but on the two crew members who are bucking at the secondary landing. Sometimes he may have to wait until they finish to buck the previous load before he can unload the new one. There may be also more chatting time lost with this system.

TABLE 52

Skidder Productivity, Four Companies by Divisions, 1971-72

Price	QNSP	Domtar		Consolidated-Bathurst	
.47	.51	Quévillon	.30	Chaleur	.43
(all divisions)	.55	Dolbeau	.42	Saguenay	.62
		Others	NA	Saguenay	.45
				Saguenay	.51
				St. Maurice	.51
				St. Maurice	.50
				St. Maurice	.43
				St. Maurice	.548
				Ottawa	.486

SOURCE: Logging Operation Report, op. cit.

TABLE 53

Skidders' Productivity According to Slashing Methods, Four Companies, 1971-72

Company	Division	Manual Slashing	Mechanical Slashing
Price (all mechanical)		--	.47
QNSP (all mechanical)		--	.51
Domtar (all mechanical)	Quévillon	--	.30
	Dolbeau	--	.42
Consolidated-Bathurst	Saguenay	.62	.45
			.51
	St. Maurice	.51	.50
		.51	.43
		.548	

SOURCE: Logging Operation Report, op. cit.

There are also differences in the overall level of mechanization attained by each company which may be used as a rough indication of its technological status. However, this is difficult to measure. One measurement would be to establish the ratio between the number of pieces of equipment and the volume of production. It cannot be done for several reasons. Variations in the make, model and capacity of the same piece of equipment eliminate possible comparisons.

Moreover, fluctuations in the annual volume of production due to fluctuating demand are not reflected in the equipment park which remains constant thus falsely affecting the ratio.

A way out of the problem is to consider the volume of production which is mechanically slashed by opposition to the volume manually bucked. This measure avoids the problems mentioned above and has other advantages as well. The total production can be easily spread between these two categories irrespective of the systems used. Moreover, bucking or slashing has been the last phase of the production system which has been the object of systematic technological change in the recent few years.[410] It also involves a significant reduction in labor requirements and thus becomes an accurate gauge of technological progress.

Ranked on this basis, QNSP appears to be the most advanced company and Consolidated-Bathurst and Price the least advanced (see Table 51). Again, this should not be interpreted literally. For instance, some companies will proceed more gradually in their mechanization either for

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[410] Mechanical felling, which is the next step in technological change, is not yet spread widely enough to be considered. It has hardly passed the experimental stage.

financial reasons, to take advantage of later developments or modifications, or because of particular conditions of the raw material and the environment.

IV. Price Company: A Typical Case

It appears useful at this point to describe in more detail the technological evolution at Price Company (Saguenay-Lake St. John Division).[411] It consititutes a vivid illustration of how the situation evolved not only in this one particular instance but also in the case of the other companies.

A. From 1950 to 1955: The Beginnings of Mechanization

At the end of the 1940's, logging operations at Price were done entirely with the traditional short-wood system. Individual woodsworkers using bucksaw cut the trees into four-foot bolts that were piled at the stump. Later on, this wood was hauled by horse and sleigh to the streams, lakes and rivers to be driven later during the year.

The first breakthrough in mechanization was the power saw which appeared for the first time at one of the camps in 1948 and spread progressively in the early 1950's. The first models were bulky, heavy, more or less reliable and did not ease the physical effort required by the workers as much as they do today with the light improved models, but they increased productivity which in 1948 was at a low 1.5 cords per man-day.

The other phases of the operations were not affected and all the wood was manually handled by men and hauled by horses and sleighs.

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[411] This account is based mostly on information published in the company's house journal.

B. From 1955 to 1960: Intensification of Mechanization

During this period, the company continued to use the short-wood system and its innovative efforts were directed at modernizing the hauling phase of the operations. It generalized the use of trucks to haul the wood. This necessitated a better road network but at the same time forced the first major reorganization when the company had to introduce skidding on a large scale and did so by using mechanical equipment instead of horses: small tractors and other caterpillar vehicles like the "J-5" and the "muskeg."

For the first time, it became possible to advance the period of hauling operations in the fall without having to wait for winter roads. However, the handling continued to be predominantly manual.

C. From 1960 to 1966: The Great Transformation

This period constituted the most active period of change. The articulated-frame rubber-wheel skidder was introduced and the tree-length system started to replace the short-wood system, thus marking a shift from transformation at the stump to transformation at the roadside. Mechanization intensified. The remaining horses were eliminated completely and very few caterpillar skidders were still in use at the end of the period. A first step was taken to improve the manual handling of the bolts. The pallet-truck system was introduced with the wheeled skidder and contributed to diminish the physical efforts required from the workers as well as limit the number of operations and accelerate the cycle of production: most of the wood cut during the day could be in the river the same day except for the time required to scale it.

Despite the fact that the painful manual handling operation was not eliminated, there was enough change to transform logging as the following tables so clearly illustrate. In Table 54, figures show that half the labor force used in 1960-61 cut more pulpwood in 1965-66 than in 1960-61. This increase in productivity is clearly illustrated in Table 55 where the per-machine-day production and the per-man-day production went respectively up from 10.90 to 15.77 cords and from 2.30 to 3.38 cords during this five-year period (representing respectively a 44.6 per cent and a 47 per cent increase in productivity). This was achieved mostly through the shift from short-wood to tree-length and the adoption of the rubber-wheel skidder.

D. From 1966 to 1973: Consolidation of the Tree-Length System

The major changes of this period have been the progressive elimination of the manual handling and manual bucking of the logs. Thus, a great deal of physical hardship is done away with and a very significant increase in the level of productivity is achieved (see Table 56). These changes involved the use of three new machines. The hydraulic mobile loader, the piggy-back trailer truck and the riverside mobile slasher. Later on, the roadside mobile slasher and the riverside stationary slasher were added to the equipment. However, the changes were not entirely completed by 1972 since, during the 1971-72 season, 39 per cent of the production was still manually bucked (see Table 57). This may be the reason why the labor force remained fairly stable during that period. Thus, while the company employed over 1700 workers in 1965-66, it still needed over 1600 workers in 1969-70.

TABLE 54

Logging Complement Comparison of a C.P.P.A. Member Company, 1960-61 and 1965-66

Complement	1960-61	1965-66
A. Limit cut (cords)	344,730	471,000
B. Complement:		
-men (maximum on operation)	3,037	1,760
-wood extracting units:		
*at stump: -horses	1,100	40
-mechanical units:		
-small tractors (steel and rubber tracks)	109	83
-rubber-tired skidders	1	205
*main road: -trucks	106	42
TOTAL HAULING UNITS	1,370	370
C. Method distribution from stump (percentage of total production)		
*prehaul (short-wood)	99%	15%
*skid (tree-length)	1%	85%
	100%	100%
D. Mechanization (percentage of total production)		
*at stump	32%	83%
*at main road	67%	100%

SOURCE: B.H. Hunt, "Rubber-Tired Skidders--Canadian Progress," Mimeo, January 1966, p. 2 and "Introduction à l'exploitation de l'arbre en longueur," Mimeo, juin 1966, p. 2 and 3.

TABLE 55

Progress Made on a C.P.P.A. Member Company
Tree-Length Skidding Operation With Rubber-Tired Skidders,
1960-61 to 1965-66 and 1971-72[a]

Operating Season	Number of Skidding Units	Production		
		Total Production	Per Machine-Day	Per Man-Day
1960-61	1	500	10.90	2.30
1961-62	7	4,400	11.20	2,57
1962-63	6	10,200	13.50	3.26
1963-64	24	42,100	14.36	3.23
1964-65	105	235,600	16.22	3.42
1965-66	205	405,100	15.77	3.38
1971-72[b]	229	344,000	17.00	--

[a]Above operation covers skidding operations of soft-wood species from stump to main road. Skidding conditions were:

Distance: 0 to 2,200 ft., average 600 ft.
Forest stands: spruce and balsam and mixed wood stands
Cords per acre: 7 to 23, average 13
Trees per cord: 8 to 24, average 16
Tree height (merchantable): 33 ft.
Branchiness: 70 per cent (bole)
Snow depths: 0 to 40 inches
Terrain and ground cover: wide range (flat to mountainous)
Operational season: May to February.

[b]Estimated for an eight-hour day. Figures from Logging Operation Report, op. cit.

SOURCE: Hunt, "Rubber-Tired Skidders-Canadian Progress," pp. 7 and 8, and "Introduction à l'exploitation de l'arbre en longueur," p. 8.

TABLE 56

Impact of Mechanization on the Productivity of Piecework Felling, Price, Saguenay-Lake St. John Division, 1967 to 1970

Year	Production System		
	Cut only and cut and pile	Pallets	Tree-length and mechanical slashing
1967-68	2.51	3.91	4.95
1968-69	2.44	3.90	5.16
1969-70	2.19	3.78	6.31

SOURCE: Untitled report prepared by the Personnel Department, Price, Saguenay-Lake St. John Division, 1971.

TABLE 57

Production by Logging System, in Cords and as Percentage of Total Production, Price, Saguenay-Lake St. John Division, 1967 to 1972

Year	Total Production (cords)	Logging System					
		Cut only and cut and pile		Pallet		Mechanical slashing	
		(cords)	(%)	(cords)	(%)	(cords)	(%)
1967-68	325,876	5,417	1.7	233,120	71.5	87,339	27.0
1968-69	287,267	3,988	1.4	161,751	56.3	121,528	42.3
1969-70	633,112	1,134	0.2	439,483	69.4	192,494	30.4
1970-71	344,000[a]	--	--	139,000[a]	39.0	211,000[a]	61.0

[a]In cunits. Projections.

SOURCE: Untitled report prepared by the Personnel Department, Price, Saguenay-Lake St. John Division, 1971.

ORGANIZATIONAL TECHNOLOGY, STRUCTURE AND ENVIRONMENT: THE PULP AND PAPER LOGGING INDUSTRY OF QUEBEC

VOLUME II

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CAMILLE GEORGES LEGENDRE

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ORGANIZATIONAL TECHNOLOGY, STRUCTURE AND ENVIRONMENT: THE PULP AND PAPER LOGGING INDUSTRY OF QUEBEC

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CHAPTER 6

LOGGING ORGANIZATION

The description and analysis of logging operations have been limited so far to the technology of the production system. The next step is to focus on the other major dimension of these operations, the organization which conducts them. It was sketchily described in preceding chapters, but a systematic analysis is the object of this chapter. It is divided into two parts. In the first part, the two basic types of organization (the contractor or "jobber" organization and the company or "foreman" organization) will be examined. Their characteristics will be described and the reasons for replacing the once dominant "jobber" system by the "foreman" system discussed. In the second part, a detailed analysis of the structural characteristics of the logging organization of the four companies will be made and it will be completed by an assessment of their structural similarities and differences.

I. The Traditional Functions of the Woodlands Division

As stated earlier, the Woodlands Division or Woods Department is responsible for supplying the manufacturing plants with the basic raw material which enters into the process of pulp and paper making. This entails a number of responsibilities and activities which I would like to spell out before we deal more specifically with the type of organization which may be set up to execute them.

Bentley *et al.* describes the objectives of woods administration as following:

> The woods organization is responsible for the production

> and transportation of the required volume of wood, and for its delivery at the required time and place, at the lowest possible cost. If long-term operations of the manufacturing plant are contemplated [which is always the case for the companies which we are studying],[412] it must be able to ensure delivery for the future as well as the present. The personnel have to: (1) secure all necessary information respecting their forest properties; (2) plan operations in an economical and efficient way: (3) organize and control the actual work of removing timber from the stump to the mill; (4) arrange for the protection of the property against damage by fire, insects, diseases, trespass or other causes, and (5) increase its value and productivity.[413]

He groups the various activities of the organization under two broad categories, <u>planning</u> and <u>operations</u>. Usually, these activities are carried at the same time (rather than consecutively), "but at any given moment the emphasis placed on one or the other may be modified according to existing circumstances".[414] For instance, in the first years of a new operation, the organization may be focused on "such surveys as are necessary for working plans" and wait later on for "improvements in logging methods, reduction of logging costs, and the improvement of the forest itself".[415]

A. Planning Functions

Planning functions include surveys, forest inventory, general

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[412] My addition.

[413] Bentley <u>et al</u>., <u>op. cit</u>., p. 1. The discussion in the following pages relies heavily on this work.

[414] <u>Ibidem</u>.

[415] <u>Ibidem</u>.

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Ibid., p. 2.

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working plan and current plan and budget. Surveys are of two kinds. Valuation or inventory surveys cover the whole forest properties and include such things as "an examination of the title of the property", "a check of boundaries and areas on the ground", the volume of merchantable and non-merchantable wood by species and its distribution, "the capacity of the drainage system", and the effects of topographical conditions on operations and costs, "the position of the property with relation to the converting plant, its relative accessibility, availability of a supply of good labour, and degree of hazard from fire and other sources of damage".[416]

Operating surveys deal with areas to be cut in the immediate future and describe them more precisely. They are used "as the basis for laying out roads and locating camps and other improvements, and for the accurate estimation of the volume of wood to be handled by such improvements".

The forest inventory is essentially a detailed record of the property as described by the valuation or inventory survey and as revised annually on the basis of the operational survey and other information regarding reductions in growing stock caused by cutting, forest fires and other causes of depletion. Periodical revisions indicate also the increment due to annual growth and periodical systematic examinations of the property are made to check its accuracy.

The general working plan establishes the principles which are to govern operations[417] and the long term program of production. It

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[416] Idem., p. 2.

[417] For instance, this involves the choice between the two different policies which can be adopted regarding the exploitation of a property:

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[illegible] *Ibid.*, p. 7.

specifies which areas will be successively cut taking into account such factors as accessibility, available means of transportation and transportation plans. It indicates the general cutting and delivery volume and schedule, the allotment of areas from which the wood is to be taken, the production system and technology which are to be used and the volume of wood which is going to be bought from outside producers. The plan is usually fairly flexible since conditions may change quite substantially due to circumstances beyond control like forest fires, change in the demand for pulp and paper products, etc.

The current plan and budget deals with the specific operations of the current year. It stipulates such things as the amount of wood required from each district, areas where the cut will be done, hauling and driving programs (road, stream and river improvements), the number of camps and their location, the number of men needed, the kind and amount of equipment, of commissariat supplies and of buildings required, the time of the year when different phases of operations are to begin and to be completed, the amount of money required for the coming operations, etc. The budget constitutes the yardstick without which "woods operations cannot be satisfactorily analyzed, controlled, and explained, because definite information is lacking."[418]

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(1) should the company harvest "the most accessible areas...first and the operation spread rapidly over the whole area in search for the so-called 'cheap wood'," or (2) could the property "be developed as a productive unit intended to supply wood of the same degree of accessibility year after year?"

[418] *Idem*., p. 7.

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B. Operating Functions

Operating functions include all activities "which are involved in the supply of wood to the ultimate point of delivery".[419] These activities can be divided into nine sub-groups: operations, control, accounting, supply, engineering, protection, scaling, employment and industrial relations, and wood purchasing. These sub-groups may be different from one company to another but they identify activities which are common to all logging organizations.

1. "Operations" consist of all "those activities directly connected with the production, transportation, and delivery of the required amount of wood at the required time and place". It is the main "function of the woods organization, and all others are supplementary to it".[420] Production consists of having the standing tree cut and the wood ready for measurement. "Transportation involves the removal of wood produced from the forest to the mill".[421] Delivery indicates that the wood has passed "from the control of the woods organization to that of the mill".

Operational work involves the following activities:

(1) Construction of camps and buildings including services (water, power, T.V. and communication systems).

(2) Construction of hauling roads, river improvements, and railroads (whenever it is the case).

(3) Construction of loading equipment for railroad cars and ships or dumping sites along river banks or lakeshores.

(4) Transportation of men and supplies.

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[419] Ibidem.

[420] Ibidem.

[421] Details of these operations have been given in the previous chapter.

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[1] For more detail...

[2] *Ibid.*, p. 12.

(5) Cutting and piling wood.

(6) Preliminary transportation: haul to landing or bank.

(7) Main transportation.[422]

Two outstanding problems related to operations will be dealt with elsewhere. The most important one concerns the selection between company camps and jobbers. The second one which has been briefly discussed in Chapter 5 has to do with the seasonal distribution of the different phases of the work (for instance, year round hauling versus winter hauling).

2. Control is exercised through "the systematic study and recording of actions taken in carrying on the work of [the] organization". It has two purposes. The first one is to analyze the "results obtained from methods and equipment" and the second one to supply "data for the estimation of future cost".[423] Much of the data used for control is also used for accounting. However, there is a distinction between the two, in that control is concerned with the results obtained and accounting with the payment of expenses incurred. Results obtained are reviewed periodically at different levels of the hierarchy.

3. The basic function of accounting is to present an accurate and complete description of the financial position of the logging organizations. Periodic reports keep the wood organization informed "of the relationship between actual expenditures incurred and the estimated expenditures" of the budget.

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[422] For more details, see the previous chapter.
[423] *Idem.*, p. 12.

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Ibid., pp. 13-1...

4. Supply has to do with the purchasing, storing and distributing of provisions, supplies and equipment which are required for the operations. In logging, this function has always been very important because of the large quantities of materials which had to be transported over long distance and very often under difficult conditions.

5. Activities related to the design, construction and maintenance of all the structures, roads, and other improvements necessary to the operations and to the selection and maintenance of equipment belong to engineering. These responsibilities call for a wide knowledge of the principles of civil, hydraulic, and mechanical engineering.

6. Protection of the forests constitutes a very important activity since they are exposed to considerable and various hazards which are very difficult to eliminate and can be controlled only by careful prevention and constant monitoring. The main hazards are fire, insects, fungi, climatic damage (like wind-falls), and trespass (that is, unauthorized cutting of timber).

7. Scaling constitutes another key function. Indeed, the exact measurement of all timber produced provides for:

> (1) The payment of stumpage to the government or other owners of the trees.
> (2) The payment of contractors (if any).
> (3) The payment of individual pieceworkers.
> (4) [The] determination of volume supplied to the mill.
> (5) The basis of control and cost accounting.[424]

8. As in any other organization, the employment and management of personnel (that is, the establishment of conditions of employment,

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[424] *Idem.*, pp. 18-19.

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wage rates, housing conditions, etc.) has been and will remain one of the main functions of logging organizations. However, several problems more particular to logging operations have contributed to focus the attention of the organization on personnel management. In the past, logging has been a labor intensive industry and the recruitment of a large labor force for its seasonal operations represented probably the greatest challenge. Personnel problems were also related to the chronically high turnover which made it difficult and costly to maintain a stable labor force.

9. Finally, "operating functions" include the purchase of wood outside the company organization which has become an increasingly important source of supply in the recent years. This activity involves the purchase, inspection, delivery and measurement of round wood and chips from other companies or more likely from farmers and other small operators harvesting on their own lands or Crown lands.

These were, and still are, the most important functions and activities carried out by logging organizations. How were these organizations set up to successfully perform them?

The dominant feature of logging organizations in the past was their great simplicity and their unusual flexibility. Their simplicity will become apparent in the course of the analysis and it is enough for now to indicate some of its aspects. Logging organizations had a low level of specialization (for instance, very few specialized jobs), a simple hierarchical structure, few controls and few standardized procedures.

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their simplicity, had to do with the need for a considerable pool of labor because of the seasonal concentration of their operations and their low productivity.[425] Thus, according to Curran, "the organization of the woods departments" of the two companies he studied "were extremely elastic and displayed characteristics unusual in an industrialized era", "because of the vast seasonal variations in the labor force".[426] In fact, because this pool of labor was mostly rural, "the timing and planning of wood operations were largely dependent upon the availability of the specialized or surplus local farm labor force and of local equipment at certain periods of the year, especially in autumn, winter and early spring time".[427] Consequently, what was needed was an organization which, when the time had come, could be rapidly and considerably expanded and still function efficiently.

Traditionally, the woods department comprised four levels: the head office, the division, the district and the camp. Each will be described here.[428]

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[425] Flexibility had certainly something to do also with the territorial dispersion of the units of production, environmental variations, etc. These factors are discussed later in this chapter.

[426] Curran, op. cit., p. 36.

[427] Ibidem.

[428] I will rely closely on Curran's own description (since most logging organizations followed a similar pattern) but also on Bentley et al., op. cit. As indicated in Figure 18, organizations were set up according to the line-structure system. In Bentley's terms, "The main line of authority runs from the woods manager to the district [division] manager, thence to the inspector [district superintendent] and so to the jobbers or camp foremen. All orders proceed from the woods manager to the district [division] manager, and so to the men directly concerned with their execution; therefore, officials in charge of the different divisions [functions] at the head office do not issue orders directly to their "opposite numbers" in the districts [divisions]" (p. 23).

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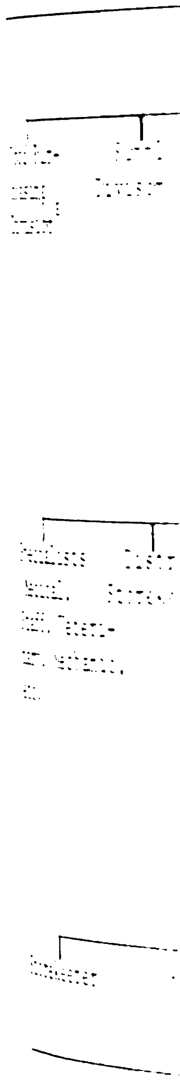

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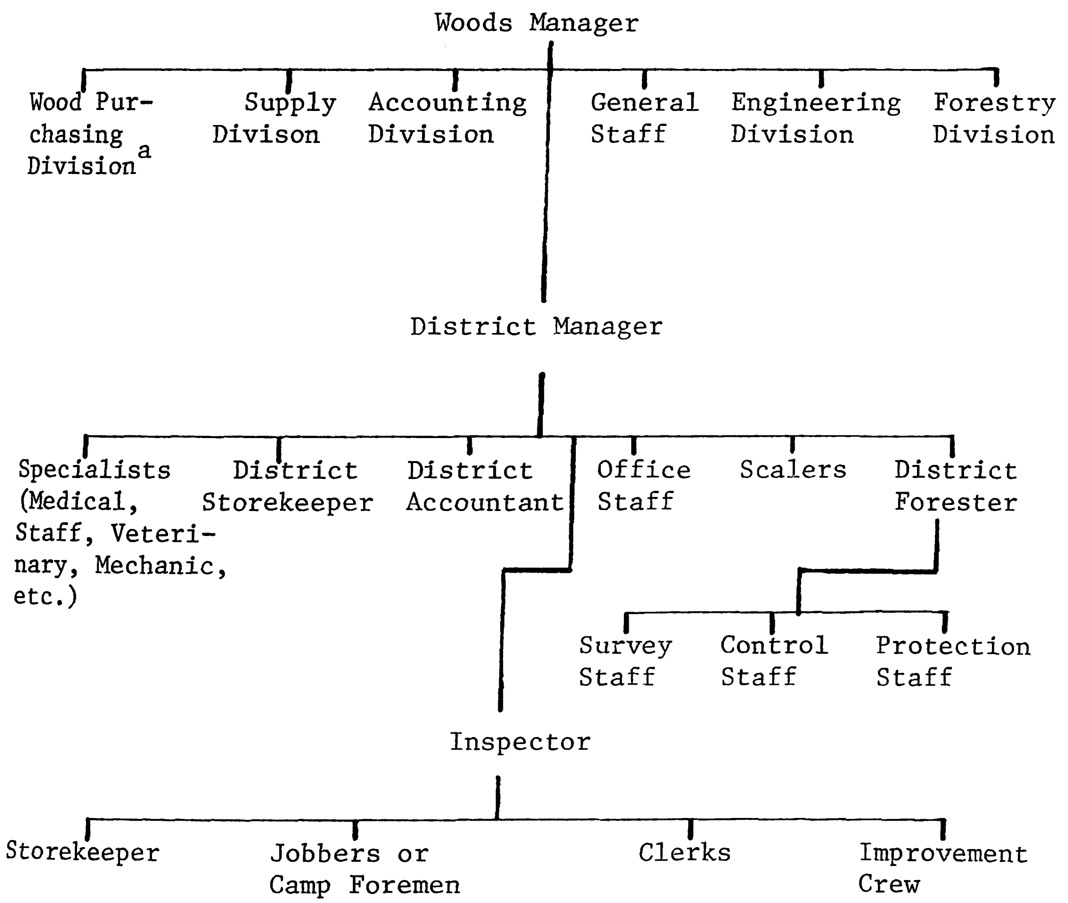
SOURCE: Bentley

FIGURE 18

Outline of the Organizational Chart of a Woods Department Before World War II



NOTE: For the sake of simplicity, only one district and one sub-district are shown on the chart. Actually the district organization would be repeated in several districts and there would be several sub-districts (under inspectors) in each.

[a]In this chart, the term "division" refers to "department" in my text, "district" to "division", and "sub-district" to "district".

SOURCE: Bentley <u>et al.</u>, <u>op. cit.</u>, p. 22

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1. Head Office

The head office was responsible for establishing the size of the annual cut and for wood delivery. However, it had little control on day to day operations because of the poor state of communications between itself, the divisions and especially the camps.

Its main activities were centered on three basic functions: planning (especially long range); coordination between the mills and the divisions, and establishing minimum standards of operations and controlling their implementation (policing). Doing so required the head office to take an overview of the company's operations and adjust its own accordingly. The coordination of divisions' activities aimed at securing the required output at the projected average cost per cord. Thus, not only was there a policy to mix high and low cost wood from year to year in order to keep the average cost at a relatively constant level but the head office had to make sure that the mills got the right mix of wood (that is, the right percentage of spruce, balsam, jack pine, etc.). The head office enforced its quality standards (good cutting, hauling and operating practices) by regular inspection (spot checks) during the season and by a final one at the end.

All these activities were carried out by a limited staff with special expertise. These "experts" had been promoted up from inside in most, if not all, cases and, consequently, possessed a complete overview of the logging organization and of its operating procedures for each of the three major levels.

2. The Divisional Office

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units called divisions and districts or sub-divisions. The divisional units were the most important ones. They were staffed and operated quite autonomously. Their number varied from time to time and from company to company, depending on the size, the fragmentation and the geographical dispersion of a company's timber holdings, and the volume of wood harvested. Divisions were responsible for both line and staff functions and their degree of control varied between companies according to the different methods of camp operations, their proximity to the head office, etc. However, the divisional head office had generally more control than the head office over production, "particularly through the policing statuses (scalers) attached to the camp sites".[429]

Following is a brief summary of the divisonal functions:

(1) Before the annual cut, divisional activities were concentrated on <u>planning</u> it on the basis of the quota and the budget received from the head office. This included plans for new camps to replace those where timber resources had been exhausted, new roads and dams, camp sites, repairs to the existing camps and other existing installations. Plans determined also areas to be cut and projected cuts and an annual budget was established with the contractors (or camp supervisors, if any) who were coming back with the organization.

(2) The next group of activities was related to the <u>execution</u> of the logging operations. Divisions were responsible for the requisition and delivery of food and supplies for the camps. They were

[429] Curran, <u>op. cit</u>., p. 46. Table 58 indicates the distribution of functions between the head office and the divisional head office.

Distribution of

Function

Planning Functions

1. Sales

2. Asset Inventory

3. General Operating Plan

4. Current Plans and Budget

Operating Functions

1. Operations

2. Control

3. Accounting

4. Supply

5. Engineering

6. Protection

7. Staffing

8. Employment

9. Food Purchasing

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NOTE: Bentley

TABLE 58

Distribution of Functions in a Woodlands Organization Before World War II

Function	Executive Agency: Head Office Division[a]	Executive Agency: District
Planning Functions		
1. Surveys	Forestry	District Forester Survey Staff
2. Forest Inventory	Forestry	District Forester
3. General Working Plan	Forestry	District Forester
4. Current Plans and Budget	Forestry Engineering Accounting	District Forester District Accountant
Operating Functions		
1. Operations	General Manager	District Manager Inspectors, Jobbers, etc.
2. Control	Engineering Forestry	 District Forester Inspectors Camp Clerks
3. Accounting	Accounting	District Accountants Camp Clerks
4. Supply	Supply	Storekeepers
5. Engineering	Engineering	Improvement Crews
6. Protection	Forestry	District Forester
7. Scaling	Forestry	District Manager Scalers
8. Employment	General Manager H.O. Staff	District Manager Jobbers Office Staff
9. Wood Purchasing	Wood Purchasing	District Manager

[a]"Division" stands for "department", and "district" stands for "division" in my text.

SOURCE: Bentley et al., op. cit., p. 23.

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also in charge of the verification of production (scaling).

(3) A new phase of planning and executing centered on the haul-off phase of the operations. The division carried the same responsibilities as (2) above and maintained mechanical services for the equipment.

(4) At the end of the winter was a period of evaluation based on the annual statistics of the output and costs. Company's staff was usually retained by the division to perform the evaluation of the two completed phases.

(5) Finally, during the drive period, the division was again in charge of supplies and equipment, supervised rail shipments (if there were any) and was usually involved in the planning activities described in (1) above.

Here is how the divisional office was manned according to one account.

> To carry out their activities the Divisional office maintained a variety of statuses. Generally these can be described as those necessary to accomplish the usual activities in the usual phases of the yearly cycle. Additional staff from the central office was co-opted when unusual circumstances prevailed. The divisional staff included truck drivers to move supplies to the camp sites, accountants to record costs, tractor mechanics to keep the machinery that was used in operations and in road building in good condition, storekeepers to requisition supplies scalers to measure individual and camp output, as well as a variety of persons involved in planning and building roads, dams, and camps.
>
> A nucleus of these employees were retained year-round and were augmented by additional part-time staff at peak periods. An example of this was the status of scaler. During the peak production period each scaler had an assistant

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[430] Curran, op. c

[431] Idem., p. 45.

> assigned to him and these two comprised the team mentioned earlier. At the end of the peak period the assistant was "laid off" while the scaler was retained on the job as long as possible. Similarly with storekeepers and general office personnel. The men engaged as assistants were really in the position of apprenticeship and after several years' experience, and if sufficient openings on a permanent basis were available, they could move up to become a scaler or storekeeper in their own right.
>
> For staff who did not possess skills which were usually adaptable, other methods of retaining them on the payroll were devised. Camp operators or contractors often became fire wardens during the peak fire season in [June], July and August. Others were hired to perform special tasks on projects that appeared as almost "make work" activities. Work on the drive or on the loading plant as well as in road construction was available to some of them.[430]

What was remarkable about these two methods of retaining "a hard core of expertise" which could always be tapped was not only the on-the-job training which they provided to recruits but the great flexibility which they gave to the organization to face its seasonal need of labor. In other terms, they provided "a cheaper method of getting the peak work done."[431]

> The "make work" projects during the off-season provided the camp contractors and others with sufficient employment throughout the year so that they did not have to seek employment elsewhere and thus possibly be enticed away from the paper companies. <u>Because of the emphasis placed on retaining a pool of skilled help the woods departments were able to increase the numbers employed by several thousand men</u>

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[430] Curran, <u>op. cit</u>., p. 44. Addition in brackets mine.

[431] <u>Idem</u>., p. 45.

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with little inconvenience, inefficiency or disruption. If a job was not clearly defined or understood then the person who performed it was attached to "an experienced hand" until he had mastered it. If it was of a nature that could not be easily mastered, then the person who occupied the status was given sufficient other employment to justify his remaining at the call of the paper companies.[432]

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[432] Ibidem. Italics mine. Usually, since the division office was the base of the operational activities, all problems wound up in the office of the divisional manager. The description of the situation at QNSP is not unlike the situation which existed elsewhere. "All the services, maintenance, repair, supply, recruitment and hiring, accounting, etc., were centralized at Baie-Comeau which was called "the base". This system was inherited from the beginning of the logging operations when the cut was done near Baie-Comeau, when the camps were small and material and mechanical equipments were limited.

Here is how a district superintendent describes it: 'Before, "the base" included a very large garage where all the machinery was repaired and maintained (for instance, the machinery used for the main roads), hiring was done there, final quittance also, etc. The men who were quitting had to sleep there overnight to get their final pay the next morning, those who were arriving had to do the same to wait for going to the camps. There was a cook house and the garage occupied the equivalent of five two story bunk houses like this one and the stock of parts and equipment was particularly big.

[The divisional manager] decided about everything and nothing. He solved the least problem which supervisors referred to him. [...] A row of benches which was placed near the door of his office was always full of people waiting to see him. Due to the increasing distance [between the camps and the divisional office] serious problems of inefficiency and delays resulted. Moreover, important problems of authority were created: often times supervisors would bypass their superintendents for instance. The divisional manager was doing everything from his office in Baie-Comeau and was going very seldom in the woods'" (C. Legendre, Rapport de travail: Quebec North Shore Paper (Mont-Joli, Québec: Bureau d'Aménagement de l'Est du Québec, mimeo, October 1965), pp. 69, 70 and 71).

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[436] Curran, op. c

3. The District

The district was an operational segment of a division. The district office was responsible for the cut and haul-off operations within a territory which included five or more production camps.[433] As such, the district was more a bureaucratic part of the line structure than a material one. The district superintendent was transmitting orders from the divisional manager and with the other personnel of the district was generally supervising the operations so that they would follow the established plans and be done according to the rules and regulations of the company.

> [Division] managers are responsible to the Woods Manager for all the work in their own [division]. Each of them may have a staff similar to that outlined, and be assisted by a number of [superintendents], each charged with operations in a [district]. A superintendent may be in charge of several camps, and occupies a position more or less analogous to that of the "walking boss" of the lumber camps.[434]

As such, the district did not have any separate headquarters to speak of. District officers were usually living at one of the camps in their district.

4. The Camp

Camps have always been the basic unit of production. Their volume of production was traditionally small (around 5,000 cords per year)[435] because of the limits imposed by the short duration of the hauling period (from 40 to 50 days)[436] and by the walking time from

[433] R. Silversides, "Woodlands Department Organization", draft of an unpublished memo, Abitibi Paper, Iroquois Falls, Nov. 9, 1966, p.1.

[434] Bentley et al., op. cit., p. 22.

[435] Curran, op. cit., p. 54 and Bentley et al., op. cit., p. 8.

[436] Curran, op. cit., p. 54.

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the camp to the work place.[437] The camp territory was thus measured by a radius of one-hour walks which meant approximately 12,000 to 15,000 cords of pulpwood (or a three-year operation).[438] There were somewhere around 50 men per camp with variations to smaller units.

Each division comprised a large number of camps, sometimes up to 15 or 20. Depending on the suitability of the terrain and the availability of drinking water, the camp was usually located near the center of the area to be cut. At first, camps were poorly serviced with communication: trails more than anything else, then roads and later telephone links.

A typical logging camp included the following buildings:

-a cookhouse which was the center of the complex and served as the center of communication with the outside world and of social discourse within the camp;

-a bunkhouse as the sleeping quarters for the workers;

-a staff house equipped with a small office;

-a barn for horses;

-a shed for food storage;

-a saw filer shack;

-a small multi-purpose shack

There were few permanent positions in the camp because of the variations due to the different phases of operations. Permanent positions included the contractor (or the camp foreman) and his assistant,

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[437] This put limits on the area which could be harvested and thus on the volume of wood.

[438] Curran, op. cit., p. 54.

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the cook and his assistant(s), and the bunkhouse man. During the cutting phase there was a sawfiler, and during the haul-off phase, a blacksmith.[439]

II. The Jobber System

The most important organizational characteristic of the logging camps in the traditional system was that they were usually managed by contractors. The contractor system was prevalent almost for the entire period since the beginning of the pulpwood logging industry. There are some reports that some companies had their own logging operations at the beginning for a short period of time but they, like others, functioned with the contractor system for the best part of the period.[440]

There were two types of contractors: the large ones and the small ones. The large ones used to sub-contract the cut or the haul-off to small contractors instead of doing it directly. Correspondingly, they were also much stronger financially. There were both advantages and disadvantages for a company to deal with large contractors. On the one hand, the company did not have to bother finding suitable jobbers. If the large contractor was financially responsible, the losses of his sub-contractors were his own instead of the company's. There were also savings on overhead costs (office work and staff), for the

[439] Other positions included barnmen, carpenter and assistant clerk (cf. Convention collective de travail pour la forêt entre Consolidated Paper Corporation et le Syndicat national des travailleurs de la pulpe et du papier, section du bois, Les Escoumains, Saguenay, 1952-53, p. 9).

[440] C.D. Sewell, "Company Versus Jobber Camps", Pulp and Paper Magazine of Canada, May, 1960, pp. 163, 164 and 166. Part of a panel discussion with G.E. Cross, F.N. Wiley, R.S. Young and W.J. Johnston.

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company had to deal only with one jobber. Issuing supplies was simpler and in the case of large contracts, stores and storage facilities could be turned over completely to the jobber. There was more commitment to their jobs on the part of the small jobbers because they were usually dependent on the large one before and after the logging operations for other work or help (which was not the case with the company). Finally, large contractors and their sub-contractors usually supplied their own horses and logging equipment.[441]

On the other hand, there was "a tendency to do more careless work and to avoid [the] fulfillment of minor terms of the contract". Indeed, it was difficult for company's personnel to control the work of the sub-contractors since it had to deal through a second party (the head contractor or his staff). Moreover, the large contractor may have felt his importance: he had relations with the executive officers of the company and, implicitly, the company, by letting out large contracts, was admitting that its woods management could not operate as efficiently and cheaply. There was also a tendency to exploit the workers. Here is how Bentley and his associates analyzed the system in this respect.

> The price paid for a contract is the result of bargaining; and the contractor cannot know the conditions at each camp or "logging chance" as well

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[441] Bentley _et al._, _op. cit._, p. 8. Details concerning these various practices as well as an assessment of their respective advantages and disadvantages can be found in the same issue of the _Pulp and Paper Magazine of Canada_ in the texts of the other members of the panel discussion mentioned in the above reference to Sewell, "Company Versus Jobber Camps."

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[443] Ibidem.

> as the company does. To ensure a profit to himself he prices his subjobs at so low a rate that the margin of profit to the subjobber is close to nothing. The latter is then forced to exploit his men. Again, the contractor may pay his subjobbers a fair price for their wood but charge them unfair prices for supplies and supplementary services, with the same ultimate result.[442]

As a consequence, the government intervened "with respect to wages paid and prices charged" and this did "much to bring the system into disrepute.[443]

In order to take advantage of the contractor system without its shortcomings, companies tended to set up contracts so that they could control contractors' work "as if the camp or the job were run by a company foreman". This was true especially with small jobbers which were treated almost like company foremen.

Very often, in both cases, the company built the logging camp, furnished and transported the supplies and tools to the camp and usually determined the location and boundaries of the cutting areas. The company also laid out the logging scheme and the haul roads, paid the workers and kept the accounts, set the piecework rates for the

[442] Ibidem. For obvious reasons, contractors who were not self-financed and had a great deal of equipment and material were in a difficult bargaining position vis-à-vis the companies. The latter usually provided the staff and expertise to handle administrative and accounting functions (including payroll) for the contractors which they supported financially. This was obviously a means to exercise indirect, if not direct, financial and operational control over the contractors.

[443] Ibidem.

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446 Sewell, op. cit

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men and followed "the progress of work and the costs".[444] In many cases, it even supplied a good deal of hauling gear and a large percentage of the horses.

In both types of contracts, the company managed the transportation phase itself (river drive, railroad or ship transportation). In the case of river drive, the conditions were "so variable that they did not readily lend themselves to contract arrangements".[445] Investments in improvement work (like the building of camps, river improvements, main roads, etc.) were also done by the company. In the period during which the contractor system prevailed, there were always, of course, small contractors but not always large contractors. Sewell reports that the small contractor system was prevalent at first and that the industry later went into a phase of pyramidal concentration where large contractors dominated. Finally, companies became dissatisfied with the large contractor system and moved back to the small contractor system before adopting the "foreman" system.[446]

Sewell did not give details concerning the reasons for these changes. The very advantages of the large contractor system (besides the shortcomings described above) might have brought its downfall. Indeed, once these large entrepreneurs had successfully established their position of dominance on the whole logging business in a certain area through economic and social bondage, they were in a much more

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[444] Ibidem.

[445] Ibidem.

[446] Sewell, op. cit., p. 164. Consolidated-Bathurst had its last large contractor in 1965 and its last small contractor in 1972. Price Company still has small contractors. In 1970-71, they cut 71 per cent of the total production (that is, 369,000 cords out of a total of 518,000 cords).

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favorable bargaining position vis-à-vis the companies.[447] In fact, they might have become so powerful that companies decided to operate without them.[448]

At this point it may be useful to draw a description of the contractor organization in terms of the structural variables selected in our analytical framework. The picture which emerges in one of an organization where experience and seniority was the basis of knowledge and expertise rather than formal education and scientific or technical training. Thus, contractor organizations were characterized by a low level of specialization, a very low level of formalization and standardization, and a rather high level of centralization. Let us review each variable in some detail.

A. Specialization

Under the contractor system, specialization was kept to a minimum.[449] The division of labor was based mostly on functions rather than tasks, that is, specialization within each function was very limited. Since many functions were combined or inexistent, the overall degree of specialization was low. Of course, several functions were performed at the company level, like forestry, legal matters, and whatever public relations and advertizing functions there was (not much as a matter of fact, since logging organizations do not sell their output to the public or other companies).

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[447] Especially if they were financially self-supported.

[448] This was certainly not the only factor and even probably not the determinant one. Factors involved in the downfall of the contractor system are discussed later in this chapter (see pp. 323 and following).

[449] The rationale for it is discussed later (see page 319 and following).

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Transport activities were very limited but there were some people affected by it, like truck drivers. Employment consisted mostly of recruiting workers through a network of personal relationships and in assigning them to the jobs for which they were needed. About the only information required by the clerk at the camp was the name of each new recruit, his age, his matrimonial status and his place of residence. There was obviously no training function. If somebody needed some, he would get it on the job with or without any help from a fellow worker.[450] The only jobs related to welfare and security were those in the food services which were completely specialized and the first aid service which was usually cumulated by the clerk or another staff member. There was no separate function for buying and stock control. The clerk (or clerks) would usually take care of that under the direct orders of the contractor who very often was doing all the buying himself.[451]

Machine, building, and electrical maintenance and improvements in general were usually performed by few handymen who were polyvalent specialists. Road maintenance was often a specialized function depending on how large the road system was. Accounting was limited to the essential (that is, ledger accounting) and was done by the clerk.

Production control was based on the figures provided by the scaling department of the company. The contractor would rely on this information plus his own experience and the experience of his general foreman to evaluate how well the job was progressing. Inspection of

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[450] Usually from one of his relatives (father, brother, uncle, etc.).

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the product was done by the contractor and his foremen but mostly by the company's scalers using company's standards of measurements for quality and especially quantity. The three functions of methods, design and development, and organization and methods were, for obvious reasons, absent from the organization.

On which basis was this low level of specialization inherent to the contractor system? Firstly, the contractor was performing one central function, the function of production at the camp level. He was essentially responsible for the staff functions immediately related to this primary task. In this respect the size of his organization and the simplicity of the technology concurred to maintain specialization at a low level.

Secondly, since the contractor was himself operating under the piecework system (a fixed price for a certain volume of pulpwood or a fixed price per cord of pulpwood) where he was in a weak bargaining position, it was in his direct interest to limit his costs as much as possible. The two major items of cost were labor and supplies. On the one hand, he could try to lower his labor costs by keeping the piecework rates and hourly or monthly wages at a minimum. However, his options were limited by governmental regulations fixing minimum wages,[452] and by competitors in the logging industry and the labor market in general. Later unions further contributed to diminish his leverage regarding labor costs. On the other hand, the cost of supplies could be lowered or kept within acceptable limits by

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452 Forest operations were incorporated in the Minimum Wage Act by Ordinance No. 39 in April 1941.

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controlling very carefully their consumption and use or by trying to get them at lower prices. The latter solution was not available when supplies were provided by the company and the former was finally the only one leaving some possibility of action. One of the results was very often poor food for the men and the horses alike.

However, he could still diminish his costs and directly increase his profits by maintaining his overhead costs as low as possible. One way of doing that was to employ polyvalent people and to cumulate as many tasks as possible in a given job or position. Thus, the clerk would also be the nurse or first aid man, the storekeeper, etc. The bunkhouse man would also cumulate the task of laundry man, repairman, etc. Of course, this was sometimes made easier because one specialized job was not enough to keep one man busy all the time. However, the contractor was also taking advantage of the fact that his staff men were isolated in the woods, available 24 hours a day, and paid on a monthly basis without much, if any, specification as to the number of hours which were required of them.

Another way of keeping his overhead costs down was for the contractor to push the production as much as he could in order to shorten the period of operations and close his camp earlier than estimated.[453] Consequently, he was not interested in keeping the less productive workers and was encouraged to allocate the best wood (or "best chances") to his best productive men.

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[453]This was known as the "cut out fast and get out fast" strategy.

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In the case of the large contractors, the organization was more specialized, of course, if only because of its sheer size which implied closer administrative control and a bigger volume of administrative processing. Nevertheless, overall specialization was kept to a relatively low level since the camps were still operated by small sub-contractors in most cases.

B. Standardization

In the contractor organization, there was a very low level of standardization limited to such functions as the inspection of the output and some operating and financial control. Output inspection was highly standardized, of course (it covered the frequency, range, method, and type of inspection) because it was the basis on which pieceworkers (the great majority of the personnel), the contractors and the government respectively received their salaries, made their profits, and calculated its fees.

Stock control, operational control and financial control were very irregular occurrences and there was hardly any established procedure regarding these controls. They were done as needed and as felt needed by the contractors. Some contractors liked more regularity but it was not the norm. This held true for stock taking, operation planning and scheduling, progress checking, maintenance, people control, and communication. Supplies were ordered as needed, people recruited as needed and nothing was done in terms of research and development, obtaining ideas, training people, not to speak of organizing out -of-work activities.

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Experience and the ability to guess or gamble were the basis for solving problems and sorting out people and things.

In fact, there was little need for standardization. The organization was small and was, in fact, functioning only four or five months of the year. Moreover, it had a very limited number of functions which, by any means, remained very simple to handle. As one company manager summarized it very well, "the jobber approach to logging [was] one of 'get in and get out' [as fast as possible] for the best results".[454]

C. Formalization

The level of formalization was very low (which seems to be a normal state of affairs following the preceding description). Again, since the contractor organization was small, involved in a simple job over a short period of time and in a hurry, there was no time and money to waste in recording or writing what was going on or had to be done. The personnel had been recruited on the basis of personal or kinship relationships. People were usually well-known to those with whom they were related on the job and were living in the same quarters twenty-four hours a day. Everyone knew how a logging operation functioned and what was expected of him. The few newcomers could learn it informally.

Thus, control and the transmission of information and orders could easily and more efficiently be done by verbal communication. The only major exceptions to this situation were the recording of expenditures and of the production of the workers on the piecework

[454] Sewell, op. cit., p. 164

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D. Centralization

The contractor organization was highly centralized at the camp level.[455] It was based on a mixture of charismatic and traditional[456] leadership characterized by discretionary authority. The contractor himself, as a self-made man and entrepreneur on the rise, controlled everything directly or through his general foreman whom he considered usually his right-hand man.

Evidence of the large amount of discretion held by the contractor was the fact that there was no job security for anyone. Men could be fired at any time if the jobber was dissatisfied with them for any reason whatsoever. The only significant countervailing power a worker had was the high production and quality of work he was doing. Before firing "top" men, a contractor would always think twice. Still, quality of work did not constitute a sure protection against the fluctuating mood exhibited by contractors. It certainly did not measure up to the protection provided by the security of employment won by unions in collective agreements at a later stage in the evolution of the industry.

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[455] From a wider point of view, however, that is, embracing the whole logging organization of a pulp and paper company, this situation corresponded to decentralization.

[456] As described in Chapters 5 and 7, logging activities and organizations were very closely integrated to the rural society.

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III. The Change to the Company System

It seems that the phasing out of the large contractor system and the return to the small contractor system coincided with the need for the pulpwood logging industry to rationalize its operations following "the steady increase in the production of pulp and paper products" in the immediate post World War II period.[457] Logging companies became more and more directly involved in logging operations through the financial support given to the contractors and the supply of auxiliary equipment (for instance, tractors, graders, etc.), of expertise (for instance, administrative staff, specialists in industrial relations, etc.) and even of production equipment (for instance, trucks, skidders, loaders, tractors, etc.). This trend which developed mostly from the late 1940's and the early 1950's coincided also with the beginning of unionization,[458] increasing governmental regulations,[459] labor supply problems,[460] and the beginning of large scale mechanization.[461]

Finally, in the 1950's, companies started to abandon the contractor system altogether in favor of direct control.[462] As a former

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[457] See Chapter 3 for details regarding the evolution of the demand for pulpwood. See also Gosselin et al., op. cit., p. 109.

[458] The first unions appeared between 1950 and 1952 (see Chapter 4 for further details).

[459] See Chapter 4 for further details.

[460] See Chapter 7 for details.

[461] See Chapter 5 for details.

[462] As it will become evident later in this chapter, it was not an overnight change in any respect. Some companies, like Price, still had many jobbers in 1972 despite the fact that the majority of their operations were done under the foreman system. Other companies which have completely abandoned the contractor system may contemplate revised versions of it for specific phases (like hauling or long distance transportation) as a means to wrestle with rising

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logging manager wrote in 1959, the contractor had become merely "a foreman with some equipment paid on an incentive basis who is free to come and go as he pleases between contracts".[463]

There were several reasons for this move. Companies believed that they could partially offset ever-increasing costs by substantially increasing the amount of wood cut in each camp and by operating over longer periods, thus reducing the number of men required for production as well as for supervision. This increased the need for tighter controls on the operations by the company. It was believed that this would be better assured if companies took direct control of the operations.

The necessity to hold costs in line obliged companies to constantly search for means of lowering the labor content in production. Mechanization has been the answer, but an increasingly costly answer. The contractor could not afford this costly equipment unless he was supported by the company which could not, under those circumstances, tolerate his freedom to leave with the equipment if he decided to go. Mechanization meant also the rapid development of logging systems and equipment which require organizational control and ready adaptation to new situations and techniques, often beyond the scope of the average jobber.

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costs. However, in no case, to this writer's knowledge, did a company think seriously, let alone try, to go back to the contractor system as it was known or to make it the standard system in its operations.

[463] Sewell, op. cit., p. 164

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> Today's logging operations are increasing in complexity. Not very long ago on our operations a job was assessed as being one which would permit 4, 5 or 6 trips with horses per day and the jobber or contractor, from his experience in the past, had his production tables fairly well fixed in his head. Today, this is changing rapidly. We have decreased our horse population from 898 in 1953 to 281 in 1959. The horses were employed almost exclusively on the snow. Now we have about a dozen different kinds of mechanical production units. They may be used to handle 4-, 8-, 12-, 16-foot tree-lengths and full trees 12 months a year. We have units which will slash, branch and bark wood. The dozen machines mentioned do not include tractors or trucks, which are a fairly broad field within themselves. The number of ways in which it is possible to use these machines, singly or in a different combinations to give a coordinated operation, are numerous and the conditions under which they may be operated vary considerably. Our operating methods will continue to increase, rather than decrease and we must be left a certain flexibility in the use of the different kinds of equipment at our disposal. It is difficult to imagine how a contractor would meet these demands.[464]

To the need for flexibility in methods should be added the need for flexibility in the quantities of pulpwood to be cut which fluctuates from year to year and even within the same operating year. Company operations have a net advantage in this respect.

Mechanization and the new methods of operation have required more competent staff and employees who have necessitated training programs. "The jobber approach to logging is one of 'get in and get out' for

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[464] *Ibidem*.

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the best results. Under this system the staff, which is necessarily limited, has the function of supervising the very rapid logging operation taking place around them. Little or no time is given to training the men involved. [...] It is very much easier to organize courses in company camps than in contractors' camps and the results are more lasting."[465]

The costs involved in training staff and employees and the disruption created by high labor turnover have been a powerful incentive to provide greater security of employment. The jobbers could not fulfill this condition. Only a strong and stable organization like the company could do it because it functions in the long term.

The unionization of the labor force has been another imperative in favor of the control of harvesting operations by the companies. They, not the great number of jobbers, could efficiently work out and administer increasingly complex labor agreements. Moreover, the companies were also forced to intervene directly in the labor-management relations because they were finally footing the bill for the increase in wages and the improvement in working conditions obtained by the unions from the jobbers, and they were also held responsible by the government for the compliance of their jobbers with the existing labor legislation and other governmental regulations.

Mechanization coincided also with the development of new and more flexible forestry practices. Such practices, like silvicultural treatments, could not be put under the responsibility of jobbers or could not be performed adequately by them because they lacked the expertise

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[465] Ibidem.

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to do it and were not the holders of the forest limits. As one manager of operations put it:

> Our company has started to use Forest Site Types on the operations because it is a very good synthesis of the many different conditions of topography which affect logging. It is essential that the foreman or contractor know what the types are and be able to recognize them. Today some of our company camp foremen can do this, but I would venture to say that we do not have one contractor who can. In the future to obtain the most economical logging costs, it will be important to know the difference between the types of stands, in order that they may be exploited in the most economical manner possible. We have found that it sometimes pays to exploit selectively; other times on a diameter-basis and again on a clear cutting basis. It is imperative that the man in the field know what this is all about.[466]

Costly mechanization, concentration of the production facilities, extended period of operations have constituted some of the major factors pressing for everyday meticulous planning if the benefits of these changes are to be fully realized. Only the company possessed the amount of control sufficient to provide planning and put it into operation efficiently, if at all.

Research, experimentation and analyses with new equipment and methods became needed. It was most difficult for the companies to expect jobbers to carry on these functions. Indeed, the contractors did not see any advantage to it. As Sewell put it, they "might, after spending considerable sums of money [if they had it, which was very unlikely], succeed in reducing [their] wood costs. If [they] did so,

[466] *Ibidem*.

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Ibid., pp. 14

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If the contractors had hardly any financial incentive in doing research, the companies had certainly some in taking over the control of logging operations. On the one hand, the contractor system did not allow any cost recovery by the company on the better than estimated performance achieved by contractors. On the other hand, in the situations where contractors incurred a deficit, the companies had to give them a settlement if they wished to keep them in subsequent years.

These were the most important factors accounting for the change of system in general. Obviously, they were not equally important for each company and some other factors may have played a role in particular cases either to accelerate or to slow down the rate of change.[468]

IV. The Company or Foreman System

In the preceding sections of the chapter, I described the starting point of the organizational evolution in the logging industry and indicated some of the major factors which led logging companies to shift from the contractor system to the foreman system. However, one is left with one important question: more precisely, where did this change lead to? To answer this question, one must look at the type of organization which is operating now.

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[467] Idem., pp. 164 and 166.

[468] See the texts of the panel discussion referred to above in footnote 440 for more details.

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Obviously not all logging companies' organizations are exactly the same.[469] However, through a close examination of them, we can establish a profile[470] from which we can identify a general structure. This is what I will do in this section of the chapter before discussing the four companies' structural differences in the final section.

A. General Structure

One basic characteristic of the new structure is its complete integration from the president of the pulp and paper company down to the woodsworker. For the first time, there is a continuous hierarchical line or chain of command (see Figure 19).

FIGURE 19

Difference in the Chain of Command Between
the Old Traditional Jobber System and the New Company System

Old System	New System
President	President
(Vice-President Woodlands)	Vice-President Woodlands
General Manager of Operations	General Manager of Operations
Manager of Division	Manager of Division
Manager of District	(Manager of District)
------------------------	Camp Supervisor
Jobber or Contractor	Foreman Operations
Camp Foreman	Foreman
Workers	Workers

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469 Our awareness of this fact has been already indicated at the beginning of the chapter.

470 I deliberately do not use the concept of ideal-type here because I do not believe that we reach the level of abstraction characteristic of the ideal-type.

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Functions which existed in the past have become important and been expanded. This includes such functions as personnel and administration. This expansion has not always been in terms of size but certainly in terms of responsibilities and duties. In some cases, the function's new importance has been recognized by creating a new department where before it was performed by people working without the framework of a departmental structure (for instance, personnel).

New functions have been added and new departments established to support them. This has been the case for instance with research and development and industrial relations.[471]

Over the last two decades, there has thus been a very important expansion of services and staff functions and positions within the organization. The rapid pace of change, large investments in equipment, and managerial and administrative demands created by the increasing complexity of the relations with other organizations (unions, other companies, governmental agencies, voluntary associations) constitute some of the factors which account for this development.

At the same time, this expansion of staff functions has led to the development of a more complex set of inter-departmental relationships and a new equilibrium of power in the decision-making process within the organization. Indeed, despite the fact that the production function remains the most important one and still weighs very heavily in organizational decisions, staff functions have increased

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[471] Industrial relations and research and development are not mentioned in the list of functions and departments given by Bentley *et al*. (cf. Bentley *et al*., *op. cit*., pp. 2 and 7).

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their influence significantly.

A good illustration of that is the function of planning. By their very nature, logging concerns always gave some importance to planning because of the problems related to the management and administration of a natural resource which is renewable in the long term but is treated as an expendable resource in the short and mean terms. However, planning has now become a key function not only concerning forestry but also manpower resources, equipment and technology. Consequently, research and development has been added to the organizational functions. Companies have thus increased the personnel affected to these tasks, upper and middle management have devoted more time and energy to them and the amount of paperwork dealing with them has increased.

These characteristics of the foreman system of organization and others which will be detailed in the following paragraphs suggest that the emphasis is now put on "formal expertise" (rather than experience). However, as I will indicate later, this typical feature of the bureaucratic model is not without creating problems in logging and having to be tempered by a good deal of reliance on experience.

In terms of our structural variables, the new structure is characterized by a high level of specialization, a high degree of standardization, a relatively high degree of formalization, and finally, a mixture of administrative centralization and operative decentralization.

1. Specialization

A multiplicity of functions and roles are now clearly identified and performed in modern logging organizations. Only two of these

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In the following paragraphs, a detailed description of the major functions will give us a more accurate picture of the level of specialization reached in present day logging organizations.

a) Transportation

Transportation has become a specialized function with the development of truck hauling and, in some cases, of long distance transportation by truck to replace, respectively, snowmobile hauling and stream driving, and river driving. Truck drivers are involved in a full time occupation and may even be specialized according to the kind of vehicle they drive. Thus, companies especially select and train drivers for the large capacity trucks which are used on long distance transportation to the mill. Sometimes this system requires also dispatchers to coordinate the operation. There are also bus drivers working on the passenger and urgent delivery service.

b) Employment

This function is now fully developed in the organizational structure at the divisional level. Within the personnel department itself, there is some form of specialization in that usually senior officers are affected to the recruitment and selection of qualified staff and line personnel (in cooperation with the relevant level of management).

Criteria used for the selection of the personnel indicate also the greater stress put on specialization. Formal education and formal training receive more stress now than in the past. It is not so much experience as expertise which is emphasized. There is evidence of this in the fact that there is more hiring from outside and less promotion [illegible] are not [illegible]

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functions are not directly performed by the woodlands branch: legal services and public relations and advertisement. When needs for these services occur,[472] they are handled by the parent company which is very well equipped to take charge of these matters.

However, the logging organization has been involved in public relations through its responsibility for forest fire protection for a long time. Moreover, since the late 1950's, middle and upper management people have had to perform increasingly demanding public relations duties, especially in the regions or territories where their companies' activities constitute a major economic force and since outdoor and ecologically-minded groups have become more vocal about the conservation of the natural environment and its multiple use for the benefit of various segments of the population.[473]

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[472] The needs for advertisement are not frequent and are mostly limited to the hiring of woodsworkers and to propaganda in favor of forest fire prevention. The woodlands does not need to advertise its product since it goes directly to the manufacturing branch.

[473] Here is how the problem originated according to one company's vice-president: "Two decades ago the conflicts of interest we now face were for the most part non-existent. As we move into the age of the internal combustion engine, we mechanized to maintain downward pressure on costs, built roads throughout the forest. Our operations became more obvious and more accessible to a more mobile populace. The urban dweller is offended by our "harvesting" the forest. The politics of confrontation now practiced by pressure groups and communities has increased the involvement and sensitivity of goverments and their departments." (J.G. MacLeod, "Whose forests are these anyway?", Pulp and Paper Magazine of Canada, 73, 1 (January 1972), pp. 115-117: p. 117).

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Still, line management has a good deal to say about employment, more than in other industries. This could be a carry-over from the days when recruiting and hiring were done by the contractors and their foremen. In the present situation, even if the hiring is officially done by the personnel office, much of the recruiting in many places is still done through personal contracts.[475] Indeed, camp supervisors are interested in maintaining a nucleus of good men who they know well and can trust for their competence because that is likely to make the difference between successful operations and promotions and difficult operations and career stagnation. The existence and maintenance

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[474] Curran found that jobs of "assistant to" in various capacities are disappearing and that the function of training performed by them before is now expected from outside (from trade schools, universities, etc.). I believe that this is an overstatement. In fact, jobs of "assistant to" are not disappearing totally. It is true that companies do not maintain them when the volume of work does not justify it anymore (which has been the case for many management positions in the past since every fall companies had to face a very large influx of labor for a short period of time) and since the administrative background of the management personnel is in general better now than before.

However, new line management people without experience in logging are still usually appointed "assistant to" for awhile in order to get the "feeling" of the job as well as to learn how to cope with the amount of uncertainty still very much present in the production process. For instance, Consolidated-Bathurst's management is against having "assistant" and "assistants to" but make exception for short periods of training (interview with the special projects manager, Consolidated-Bathurst).

[475] For instance, before the seasonal employees (almost all the production workers) are recalled in the spring for the beginning of the annual operations, very often supervisors get personally in touch with their good men to make sure not only that they will come back with the company but that they will come back to work in their own camps. They consequently either notify the personnel office of the division that these men should be sent to them when they show up

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of a "following" like this is especially found where former jobbers or jobbers' foremen were kept in supervisory functions when the company took over all logging operations.

c) Training

Training has become a vital function for the organization. Before mechanization, training for logging operations was a matter of socialization in the family and on the farm. With the progress of mechanization and other changes, training on the job has been complemented to a variable degree by formal training programs designed and financed largely in collaboration with the governments. These programs cover not only specific vocational training but also general education requirements.

In their personnel departments, most logging organizations now have specialists affected to this task.

d) Welfare and Security

Basic welfare and security functions, like safety, medical services, fire protection and canteen, have been and are still provided. Some others, like sports and social, are also provided sometimes. Very often, however, the tasks involved are not demanding enough to assign a full time person to them. As a result, they are often cumulated with other jobs. Canteen services, for instance, are usually done by camp clerks.

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for work or they instruct their men to ask the personnel office to assign them to their camp)(cf. Legendre, op. cit., pp. 80-83).

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In some cases, services which in the past required several full time employees are now performed by one full time or one half time employee per camp. For instance, in the past, medical services could require a small hospital of nine to ten beds in the village where the company had a depot. Now with a much better communication network, it is preferable to send a seriously sick or injured employee directly to a public hospital.[476] For the same reason, a part time physician is often preferred to a full time one to take care of the cases which have to be treated.

e) Buying and Stock Control

Tasks in this field are partly shared with the parent company. The purchase of large quantities or volumes of goods is done as much as possible by the central purchasing department of the parent company in order obviously to get lower bulk prices or rates and a better quality of products and services. Otherwise the purchasing tasks are performed at different levels of the logging organizations by people affected to it.

Storekeeping and stock controlling functions are jointly performed by full time employees who are specialized according to the materials (for example, mechanical equipment parts, foodstuff, etc.).

However, specialization in the administration (accounting, etc.) of these matters takes place only at the corporation level (parent company).

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[476] Interview with the division manager, St-Maurice Division, Consolidated-Bathurst.

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f) Maintenance

This is one of the functions the structure of which has been most developed as a direct consequence of technological change. Usually, maintenance services are broken down into mechanical, building, electrical, road and sometimes electronical maintenance. Specialists include engineers and skilled workers (mechanics, electricians, carpenters, etc.). Within an occupational group like mechanics, some are specialized (for instance, in hydraulic systems) but companies still use them at different kinds of mechanical jobs because of the diversity of problems needing solutions and to economize on maintenance labor costs.

For some specialized services which are not required as often as others (like electronic and electrical maintenance), companies either contract them out or use the parent company's own personnel and facilities.

g) Accounts

This is another function of the organization which has been expanded and refined. Ironically, this expansion has been characterized in most cases by a reduction in personnel following the adoption of computer facilities at the parent company and other advanced mechanical equipment in office works. However, it is a highly specialized function with well defined jobs like wages clerks, costs clerks, ledgers clerks, and cashiers, and the use of different accounting systems like cost center accounting, budgeting, cost follow-up, and auditing.[477]

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[477] See the section on administrative reorganization below (pp. 408 and following).

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Thanks to the almost unlimited possibilities of electronic data processing, costs are established rapidly and with a profusion of details, salaries can be paid weekly and cost follow-up can be done once or twice a month regularly. This is a far cry from the situation which existed two decades ago.[478]

h) Production Control

Production control is a line responsibility which is taken very seriously. Progress made are reviewed daily at the camp level following extensive and detailed planning and scheduling of all normal activities.[479] In logging, these workflow controls are done according to the major phases of the operations: cutting-skidding, slashing-hauling, transportation. Machine loading is another production control which is under the responsibility of the line.

i) Inspection

This is a function which has been modified significantly. It has been extended to several activities of the organization other than production. One finds now that camp administration is inspected regularly by the accounting department, that the quality of food and the cleanliness of food installations are verified and that mechanical equipment and facilities are inspected as well as safety and scaling.[480]

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[478] Not only is this possible now but possible despite the increasing complexity of the administration. Nobody thought twenty years ago that it was possible, for instance, to keep track of the costs down to the nuts and bolts via a computerized inventory of the stocks of parts and supplies.

[479] Every night, foremen for the various phases of the operations make a report on daily production and other significant information to the general foreman. To make sure that he gets this information (even if they are only estimates), the latter always manages to take a few minutes to go by their quarters and chat with them.

[480] Legendre, op. cit., pp. 149-150.

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New job titles have thus appeared in the chart of the organization: camp accounting verificator, food inspector, scaling inspector, mechanic inspector, safety supervisor, etc.

j) Methods

With the rapid changing technology and the development of new logging systems, most companies have staff specialists assessing and devising new ways of producing the output. Usually these specialists do not constitute a department but are administratively related to an already existing department. Some companies in the past established a whole new department, but a more realistic appraisal of their needs and financial resources convinced them that the present formula was preferable.[481]

In some cases, companies are using the "task force" approach. Under that system, no permanent specialist is working on methods. Instead, whenever there is a problem worth examining, a task force of staff and line people is set up to tackle it. It is more economical and more efficient that way.[482] Another approach sometimes used now is the establishment, by a number of companies, of an "ad hoc" committee or group to carry on work studies.[483]

k) Design and Development

In logging, almost all the development work done by a particular company concerns new equipment or modified versions of already used equipment or installations (not the output).[484] Because of the period

[481] Interview with the Woodlands assistant operations manager, Domtar 1972.

[482] Idem.

[483] Interview with the development engineer, Price.

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of change in which they have been involved in the last two or three decades, companies have put various specialists (like engineers and draftsmen) to work on innovations, very often in collaboration with equipment manufacturers.[485] Usually this function includes a small staff which does not constitute an administrative department as such.[486]

1) Organization and Methods

This function is practically non-existent in logging organizations. The normal way to handle the development and implementation of new administrative procedures is to set up a "task force" when management people cannot handle it individually.

2. Standardization

The relatively high[487] degree of standardization of present-day logging organizations is evident in the greater number of controls (and their increased frequency)and procedures.

a) Inspection

The existence of well established procedures of output inspection has not changed in the last two decades. All the output is measured

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output, for instance, chips instead of logs or bolts) but almost nothing on new products since logging organizations have been set up to produce essentially the major raw material input for the manufacturing sector of the industry.

485 For an assessment of the strategy followed by logging companies to deal with innovation, see McColl, op. cit. I also discussed this problem in an interview with the director of the Woodlands Section of the Canadian Pulp and Paper Association.

486 Interview with the development engineer, Price.

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[488]Hughes, op. cit.,

to establish the volume of production and visually examined at random for quality evaluation. Differences with the old system reside in the fact that inspections are now carried on sooner and with different methods and standards. The scaling of production has to be done sooner because, on the one hand, daily production controls are necessary to properly assess the performance of the mechanical equipment for a more efficient use, and, on the other hand, workers are now paid regularly twice a month and in several cases every week.

b) Stock Control

Stock controls are taken regularly at short intervals (as often as every week) at the camp level. This varies among companies. In some cases where stocks have been computerized, a permanent inventory is made available for mechanical equipment parts and other equipment supplies.

c) Operational Control

Operational control is taken much more seriously than in the past in the sense that it is now much more systematically done. Firm plans as well as schedules are established annually but are revised every month and sometimes at shorter intervals if necessary. Regular progress is checked every week and a full report produced every month. Planned maintenance and breakdown procedures are now routine features of most companies. This is very important in logging because the frequency of breakdown in mechanical equipment is very high. Maintenance costs for mechanical equipment have been, up to now, very high, in fact too high[488] and companies have been trying hard to lower them by establishing good standard procedures.

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[488] Hughes, op. cit.

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d) Financial Control

The basic method of financial control is the management information system, that is, the establishment of a detailed budget every year covering all activities and comparison every month or so between the budget and the current expenses and performances. This constitutes a net progress over the contractor system where controls were very irregular, if they existed at all, and could lead to very bad surprises at the end of the season of operations. With the present controls, financial "surprises," if not always eliminated, can be maintained within a reasonable range and most of the time prevented.

e) People Control

This is another area which has been affected by the effort of rationalization of the past few years. In most companies, staff and line positions have been the object of work studies, job descriptions or job evaluations. An "ad hoc" committee, set up by the industry, is working on a job description program covering all logging occupations and has done it so far for clerical jobs, mechanics, and a few other occupations.[489]

Sets of regulations have been established for all employees with accompanying disciplinary measures for violations. In the case of unionized employees, this is part of the collective agreement and the union has played a very important role in shaping these regulations

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[489] Obtained from a letter and documentation from Martin Poulin, Service des programmes et examens, Direction générale de l'éducation permanente, Ministère de l'Education, Québec, July 26, 1972.

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and disciplinary measures and determining their range of application. People control includes also a periodical salary and wage review for non-unionized employees (at least once a year, but most often twice a year or more). All costs centers establish detailed labor budgets. Finally, personal reports by supervisors are also periodically filed for staff employees as a routine procedure or upon request by superiors.

f) Communication

Decision seeking and decision conveying procedures seem to vary according to the nature of the decision. If it concerns economic matters, there are usually very precise procedures to be followed. In any case, decisions can be sought as needed as long as they are justified. According to the importance of the decision sought, the procedures may involve a project justification scheme or not.

g) Ideas

In a rapidly changing environment, obtaining new ideas and staying on top of new developments are vital for an efficient organization. Most companies have research and development specialists working usually on "ad hoc" development programs with program objectives being periodically reviewed (at least every year). Besides that, all companies look for ideas by means of conference attending, conference reporting and periodicals circulation. The industry organizes several conferences or meetings every year[490] and individual companies usually make sure that they are adequately represented at them.

[490] These include, among others, the Annual Meeting of the Canadian Pulp and Paper Association and more specialized meetings or seminars on technological developments, industrial relations, etc.

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i) People Recruiting

With the establishment of a completely integrated organizational structure, the recruitment of people takes on a new perspective since the possibilities of a career within the organization are seriously enhanced and the organization more interested in acquiring and keeping qualified personnel. However, it seems that the recruitment policy has remained more or less well defined and has been partly influenced by the parent company's policy, especially concerning the recruitment in the upper management levels. The selection of personnel at different levels of supervision proceeds usually by way of interviews with an officer of the personnel department and with the would-be superior of the candidate. In cases where special skills are required from the applicant (like clerks, mechanics, etc.), some testing and grading is commonly done.

Promotion procedures seem to be fairly flexible and include grade and qualification, internal posting and selection, and other "ad hoc" procedures, As mentioned earlier, there seems to be a trend toward hiring from outside the organization rather than from inside because of the difficulty to

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of the difficulty to find qualified personnel within the organization. Demands to increase the staff or increase the work required from people must be based on demonstrated actual or future needs and are usually not granted very easily. Demands based on future needs seem to apply only in the case of highly qualified specialists (like engineers) who are available in the market at the present time but might not be available in the future when the organization will really need them.

j) People Training

Since the training of the personnel has become a priority, a diversified set of programs are available. They include day and block releases to attend courses (block release being much preferred), machine operator training, incentives to attend evening classes, special courses set up for supervisory personnel and management and finally, in some cases, on-the-job management trainees. In order to develop a greater interest for these programs, many companies offer cost refund or monetary compensation to employees registering in them.

There is no apprenticeship system similar to those which exist in other industries or trades.

k) Activities

Activities are relatively numerous and include such things as the parent company's house journal, regular ceremonies (for instance, the annual watch distribution to celebrate senior employees), sports and social activities (like bowling, curling or the New Year's party) and visits to other companies' installations and operations. Handbooks may be provided for few specialized employees but it is by no means a standard procedure. In a few companies, uniforms are provided for employees in services like food and mechanical maintenance.

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1) Miscellaneous

Since the takeover by the companies, personnel statistics have improved considerably and now personnel files include sickness, time worked, absence, mobility, and accident records for each employee. There is some operational research done but usually on a very limited scale (for instance, linear programming and other mathematical analysis (like regression analysis) on equipment and operations).

3. Formalization

Despite the fact that logging organizations have been known in the past for their absence of paperwork, especially at the lower level of the organization, the situation has evolved quite radically since.

a) Role Definition

Roles are much more clearly defined now than in the past. Usually every new employee or every seasonal worker returning to work in the spring receives a written confirmation of engagement and a copy of the labor agreement if he is a unionized employee. There are organizational charts revised at irregular intervals and a job description for about every job in the organization except piece-work jobs (wood cutters and skidders mostly).

Among other formal documents, one usually finds manuals of procedure for staff and line departments, written policies, workflow schedules and programs, and, finally, research programs and reports whenever research groups are set up. There are few handbooks and usually no written instructions for production workers.

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b) Information Passing

A greater volume of information is passed in written form now than in the past. However, logging people, especially at the lower rungs of the structure, stand up to their reputation and still transmit a great deal of information verbally.[491]

Management approval in written form is required for all important decisions. Minutes, agenda and reports are usually prepared for senior executive meetings, conferences, and production meetings. Welfare documents exist also either separately or included in the labour agreement. Suggestion schemes, which existed sometimes in the past years, have been abandoned completely. However, there may be memo forms, notification of engagement to employees, dismissal forms, and the usual parent company house journal specifically designed to inform employees about what is going on in the company.

c) Recording of Role Performance

The recording of role performance has become an essential part of the organizational control.

Of course, detailed records of output inspection (scaling) are kept and become records of piecework employees' production. Other production workers work records are compiled as well as records of all production workers' time. The organization also accumulates records of maintenance performed on each individual piece of equipment and,

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[491]This characteristic of the logging "culture" is discussed more extensively in the later paragraph on "communications" (see pp. 413 and following below).

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at least in some cases like mechanics, work assessment records. Logging organizations also use a petty cash voucher, application or engagement forms for direct workers, and requisition form for materials, parts, vehicles, etc.

Records of direct workers' work are made at least weekly if not daily. Written application for spending $1000 are usually requested but not always (for instance, not when the expense has been previously budgeted). In some organizations, a requisition may be needed before engaging any direct worker.

d) Miscellaneous

Other indicators of formalization include appeal forms against dismissal for unionized employees, written trade unions procedures, and scale slips identifying units of output. Logging organizations do not usually use dispatch notes and do not have written history.[492]

4. Centralization

The evaluation of the relative degree of centralization is based on a thirty-four item list covering a wide range of areas of decision. This list is obviously not exhaustive. One could easily double or triple the number of items. However, the areas covered because of their importance lend themselves very well to an assessment of the degree of centralization in present logging organizations.

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[492] One exception is QNSP about which two books have been published: Carl Wiegman, Trees to News: A Chronicle of the Ontario Paper Company's Origin and Development (Toronto: McClelland & Stewart, 1953) and Harvey H. Smith, Shelter Bay. Tales of the Quebec North Shore (Toronto: McClelland & Stewart, 1964).

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The findings point out few basic generalizations. The first one concerns the time dimension involved in the decision. Centralization appears to be directly related to long term commitments. Thus, the longer the term of commitment for the organization of a given decision, the higher in the hierarchy the responsibility for the decision is located.[493] For instance, even if decisions related to production are generally decentralized, as we shall see later, decisions concerning the creation of a new job (new job title) which involves longer financial and structural commitments are usually centralized at the upper levels of the management hierarchy.

The second generalization deals with decisions of a financial or economic matter. Of course, all decisions can be translated into financial terms or have financial implications. What is meant here are decisions which are formulated in financial terms or involve immediate financial considerations, salary increases or buying procedures. Our observations show that the more explicit and immediate the financial character of a decision is (and the higher the amount of money involved), the higher in the hierarchy it is likely to be taken.

A third generalization can be made regarding decisions related to production, that is, for instance, how a job has to be done or which machinery or equipment is to be used for a job. Results show that the more closely and more immediately a decision is related to production, the more likely is it to be taken at the lower levels of management (decentralization).

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[493]This corresponds to a familiar pattern in complex organizations.

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Finally, a fourth generalization can be made regarding decisions related to personnel matters like appointments, promotions, etc. It appears that there is a tendency toward decentralized decision-making with regard to these matters. For instance, appointments, promotions, and dismissals are generally the responsibility of the immediate superior usually after clearance with his own boss.[494]

V. Structural Differences Among the Four Companies

A comparison between the structures of the four logging organizations, not surprisingly, show a great deal of similarity. That is to be expected since these organizations are involved in the very same activity. However, differences between them exist and an explanation of these differences becomes crucial for the understanding of the role of technology.

The discussion will focus firstly on the structural variables and then on various aspects of the structure of these organizations where the differences are most outstanding.

A. Structural Variables

As measured by our instrument, the differences in the main structural variables between the four organizations are very limited. All organizations are very much alike and their basic functions performed very similarly. The most important differences appear to exist with regard to new functions like Methods, Research and Development, and Organizations and Methods rather than to older functions.

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[494] A more detailed discussion on centralization is done later in this chapter (see pp. 360 and following).

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Some organizations, like QNSP, have established a department to study problems of methods and do research and development. Others, like Domtar and Consolidated-Bathurst, have only few individuals affected to it and rely on "ad hoc" task forces. The difference seems to be due to financial factors. QNSP has the reputation in the industry of being a "fat cat".[495] The parent company is believed to have a good deal of money and the logging organization to maintain a fat management structure and to buy the best of the most recent equipment. This would explain why QNSP has set up a full department to deal with research and development while other companies, like Domtar, have cut down their investments in this function. Indeed, in the 1960's at the apex of mechanization fever and when predictions about the wonders of the new technology were filling business periodicals and industry meetings, Domtar had a full research and development department which was very active designing and experimenting with new processes and new equipment.

However, in the late 1960's, a more realistic outlook emerged, the technological fever slowly subsided and the industry entered an economic slump. As it happens usually in that kind of situation, management reacted by trimming the "fat" off the organization in order to lower costs. Functions such as research and development, which were not deemed essential to carry on the productive goals of the organization, were the first ones to be affected by the austerity program.

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[495] Mentioned in interviews by high ranking managers of two other companies.

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B. Line Structure (Chart)

The comparison between the line structures of the four organizations show a fairly good correspondence between the different levels. However, the four organizations can be broken down into two sub-groups: Consolidated-Bathurst and Domtar on the one hand, with an identical structure of ten managerial levels, and Price and QNSP on the other hand, with a similar structure and eleven hierarchical levels (see Figure 20). As the figure indicates, hierarchical levels have been separated into three categories in order to account for the differences between these organizations. The discussion will focus on each category in order.

1. Upper Management Levels

At this level in the organization, the position of vice-president woodlands is the key one. Indeed, the vice-president is responsible to the president of the parent company for all matters regarding the supply of wood fibres to the manufacturing sector of the company. All major policy decisions dealaing with logging operations and investments are elaborated and taken at his level and budget expenses analyzed and approved by his office. All major service and department heads, like the chief forester, the manager of operations, the manager of wood products, and the head of certain more sensitive positions such as the manager of special projects, the research and development engineer or the managerof planning, report directly to him.

In Figure 20, two companies, Consolidated-Bathurst and Domtar, have general managers of woodlands located at the company's headquarters reporting to the vice-president while the other two companies do not

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2	Vice-Pre Woodlan
3	Gen. Man
Middle Management Division & District	
4	Divisio Manager
5	Manager Operatio
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8	--
Lower Management	
9	Camp Superint
10	--
11	Forem Cutti
12	Asst. Fo
13	Woodswo

SOURCE: Intervie
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FIGURE 20

Line Structure of Four Logging Companies, Quebec, 1972

Level	Company			
	Consol-Bathurst	Domtar	Price	QNSP
Upper Management				
1	President	President	President	President
2	Vice-Pres. Woodlands	Vice-Pres. Woodlands	Vice-Pres. Woodlands	Vice-Pres. Woodlands
3	Gen. Manager	Woodlands Operations Manager	--	--
Middle Management (division & district)				
4	Division Manager	Woods Manager	Division Manager	Manager of Woodlands
5	Manager of Operations	Logging Superintendent	Gen. Super-tendent Logging	Manager of Logging Operations
6	District Superintendent	Assistant Logging Super-intendent	Sub-Division Super-intendent	Logging Superintendent
7	--	--	River Super-intendent	Assistant Logging Superintendent
8	--	--	--	Assistant District Woods Superintendent
Lower Management				
9	Camp Superintendent	Head Camp Foreman	District Supervisor	Camp General Foreman
10	--	--	Operations Supervisor	--
11	Foreman Cutting	Foreman Cutting	Foreman Cutting	Asst. General Foreman Cutting
12	Asst. Foreman	Asst. Foreman	Asst. Foreman	Foreman
13	Woodsworker	Woodsworker	Woodsworker	Woodsworker

SOURCE: Interviews with management and staff personnel of these companies and printed documentation made available to this writer.

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have them. This difference is due to the fact that Consolidated-Bathurst and Domtar have the most dispersed operations and a greater number of operating divisions. If the managers of these divisions were reporting directly to the vice-president, the latter would have a span of control too wide and responsibilities too heavy for one man to handle them efficiently.[496] Thus the span of control of these two vice-presidents is kept at seven and six subordinates respectively, with two general managers at Consolidated-Bathurst and a woodlands operations manager at Domtar (instead of the ten and eleven subordinates which these vice-presidents would have if the logging division heads -- five at Consolidated-Bathurst and seven at Domtar -- were all reporting directly to them).

2. Middle Management Levels

Middle management includes the division and district levels of management. The head of the division is responsible to the headquarters for the production and delivery of wood fibres, the administration of the services, and the application of the policies established by the vice-president's office within the divisional territory. The manager of operations is in charge of the production (cut, haul and usually transportation) for the division. The district superintendent assists him by being responsible for the operations carried within the boundaries of a district.

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[496] The vice-president Woodlands at Domtar had also under his responsibility the new plant producing high quality pulp and residual chemicals at Quevillon. As for the vice-president Woodlands of Consolidated-Bathurst, he indicated in an interview that he faced increasing demands on his time to deal with the environment of woodlands organization.

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It is at the middle management levels that imbalances between the line structure of the four companies are the most evident. Unexpectedly, the height of the structure is the shortest in the two larger organizations: Consolidated-Bathurst and Domtar, which have three hierarchical levels. The smaller two companies, Price and QNSP, have respectively four and five levels. None of the major organizational characteristics (for instance, size and technology) provides a satisfactory explanation of these differences. According to size, larger organizations should have more levels. The technology of the production system is basically the same. Neither does geographical dispersion explain the difference. The smaller companies are, by far, the most geographically concentrated.

A more plausible explanation seems to be related to organizational "featherbedding", management training policy, and changes in the organization of production. In the case of Price, the positions of sub-division superintendent and river superintendent taken together are no more than the position of district superintendent at Consolidated-Bathurst or assistant logging superintendent at Domtar. At QNSP, the manager of logging operations and the logging superintendent are doing together what is done by the manager of operations at Consolidated-Bathurst or the logging superintendent at Domtar. In the same way, the assistant logging superintendent and the assistant district woods superintendent at QNSP are doing together the work of a district superintendent at Consolidated-Bathurst or an assistant logging superintendent at Domtar.

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also be related to historical factors. In the 1960's, both Price and QNSP faced a rapid reduction in the number of employees and in the number of camps due to increased productivity and the concentration of production in few very large camps.[497] At the same time, the tasks of coordinating and controlling became less cumbersome. Consequently, over a period of a few years, the services of a number of supervisors (including some jobbers) were no longer required. They could have been transferred to other line positions or laid off. Both solutions were used. However, this was not enough and, in order to keep the most promising ones and to reward some others for their long and loyal years of service, these companies maintained some otherwise unnecessary positions or even added new ones (for instance, assistant district superintendent at QNSP despite the fact that there is no district superintendent).[498]

The present situation at Price and QNSP is thus more transitional than permanent.

The two larger companies, Consolidated-Bathurst and Domtar, have had to face similar reductions in personnel and in the number of camps, but they have absorbed the impact more easily probably because of the greater number of divisions and districts. The establishment of a new division by both companies in the late 1960's created new positions which probably eased the problem of a surplus if it existed. Moreover, at Consolidated-Bathurst the average volume of production in each

[497] At QNSP, the problem was compounded by the closing down in the early 1960's of the two oldest divisions located near its main operations which created a sudden influx of experienced personnel.

[498] In some cases, these companies used these positions to train younger members of the management.

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camp was kept to the lowest level of the four companies (50,000 cunits/year). As a result, the number of camps did not diminish to the same extent that it did in other companies and less disruptions were created.

3. Local Management

As mentioned earlier, in logging the camp is the basic unit of production or the equivalent of a manufacturing plant. This is where all the basic functions of the logging organization are put to work in a coordinated system to produce pulpwood. Thus, the head of a camp assumes a most important role since he is responsible to coordinate the activities of the different departments and services directly involved in production. It is, in other terms, at the camp level that the organization proves itself to be successful and profitable or a failure.

At this level, the organizational structure of the four companies is very much the same (see Figure 20). Indeed, with the exception of one company, the other ones have a three-level hierarchy (excluding the rank and file workers). Besides the camp supervisor, there are foremen in charge of each major stage of the production process: (a) cutting and skidding, (b) slashing and hauling, (c) and long distance transportation. Finally, these foremen are assisted by assistant foremen who are responsible for the work of a certain number of workers: eight or nine crews of fellers (that is, two fellers and one skidder operator or two fellers, one skidder operator and two buckers), one crew of slasher operators and haulers (that is, two or three operators on the slashing machine plus a variable number of truck drivers teamed with a slasher, generally between four and six of them), and one crew of workers in transp

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The one exception to this pattern, Price, has four hierarchical levels. As mentioned earlier, Price has concentrated its operations in super-camps which produce up to 170,000 cunits of pulpwood and sawlogs in a single year.[499] Moreover, the company kept several jobbers[500] who contract cut and haul-off jobs at the same camps where the company conducts its own operations. The size of the whole camp operations, on the one hand, plus the problem of supervising at the same time private contractors and company's foremen, on the other hand, c nstitute such a burden that the camp supervisor (called district supervisor in this case) need an assistant to take charge of the company's own operations.

C. The Shape of the Structure

What is the shape of the present structure of organization? If we compare it with traditional organizations, we have a pyramid of about the same height but with a much narrower basis (see Figure 21). The substantial reduction in the labor force explains the narrower basis of the structure of present-day organizations. However, to explain the similarity of the height of the structure is more complex. In both cases (the traditional organization and the present one), the number of supervisory levels has to do with the need for control and coordination. In both cases, these needs are great but for different reasons. In the

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[499] This alone is the equivalent production of a whole division in some other companies or even of the whole woodlands department.

[500] There were still sixteen of them in 1970-71.

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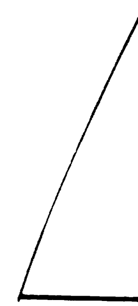

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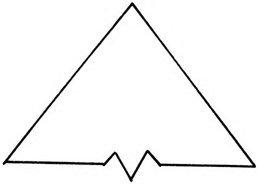
FIGURE 21

Shape of the Hierarchical Structure of Logging Organizations in the Traditional and Modern Systems



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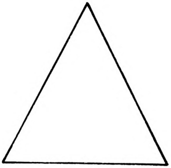

Modern System

traditional organization, these needs were created by the large size of the organization (the large number of workers, camps and districts) and the limits put on the span of control by the very poor state of communications.

With the mechanization of the logging operations and the subsequent reduction of the labor force and the number of camps and districts, the height of the structure should have been reduced. It was not and understandably so. The expansion and specialization of functions and roles in the organization, the necessity to establish tighter and more detailed controls on the organization, and the execution of all the production phases simultaneously have considerably increased the problems of coordination and control. One way to solve these difficulties has been to parcel out responsibilities of an increasing scope along the chain of command. What has been taking place is a specialization of management. This was done by expanding and rationalizing staff functions (horizontal management structure) but also by maintaining a relat

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maintaining a relatively long chain of command (vertical management structure).

D. Centralization and Concentration

Should we take the above changes in the shape of the hierarchical structure as an indication of a parallel change in the degree of centralization and concentration[501] in logging organizations? Indeed, we should, but the answer to this question is a complex one. Generally there was an increase in the degree of centralization of the staff functions and an opposite trend toward the decentralization of the line functions. The movement of concentration went in the opposite direction. Staff functions were deconcentrated and line functions were concentrated (see Figure 22). These general trends did not affect each level of the structure equally. For one, the head office has become, on the one hand, more closely involved in the activities of the divisions and the camps, and on the other hand, much more absorbed in problems concerning the relations between the woodlands and the parent company and other outside agencies such as other companies, governments, and so on. The division has remained the hub of the logging organization. Its planning, coordinating and control functions have been enhanced. Camps have gained in importance due to the greater complexity of their organization and their much greater size and

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[501] In the following discussion, centralization refers to the location of decision-making power at the highest levels of the managerial structure. Concentration refers to the location of production, administration and services facilities and personnel at few sites.

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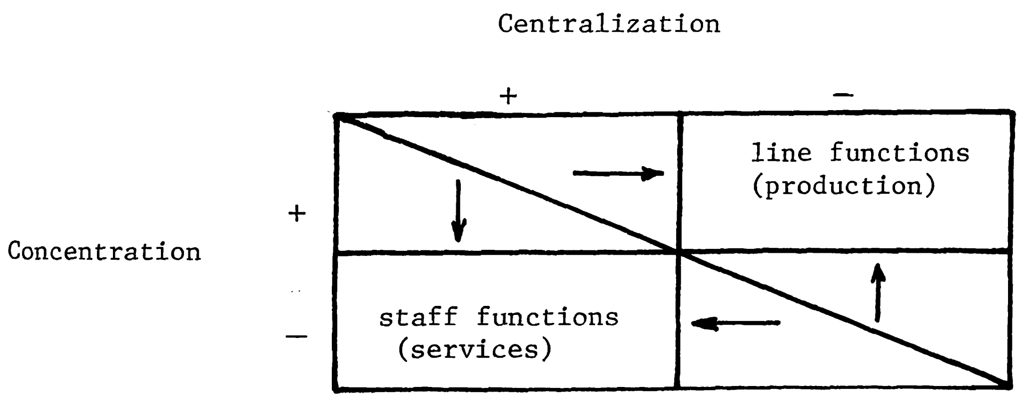
FIGURE 22

Centralization and Concentration in Logging:
Trends in the Last Decades



Concentration

Head Office	Division	Camp
Industrial relations Forestry Legal Purchasing	Administration: -personnel -accounting -research & development -forestry -safety -purchasing	Mechanical maintenance and repairs Scaling Supplies

financial needs and resources. The big loser in this reorganization has been the district which is now only an appendix of the division (when it still exists in the structure at all). These very general observations must now be qualified and analyzed.

Generally, a centralized organizational structure is associated with routine activities. Departure from the established ways of doing things are now welcomed (because they are not necessary) and must be cleared with above. On the contrary, a decentralized structure corresponds to a situation where uncertainty predominates, that is, where the organization has to face constant fluctuations and contingencies related to technolo

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related to technology, raw materials, or the environment. In this case, departure from the established ways of doing things are necessary and welcomed and a decentralized structure provides the organization with the flexibility necessary for constant adaptation.[502] Moreover, decentralization should reach the level at which most of the uncertainty is felt.

Superficial observations indicate that the organization of logging operations should be centralized. Indeed, it is a simple mass production process during which the original raw material goes through little transformation (in size and shape alone). This suggests the possibility of establishing a very routine system where centralized controls would be basically impersonal and administrative.

As a matter of fact, however, the possibilities of establishing a centralized structure exists only for service functions like forestry, purchasing, accounting and others because they face few contingencies[503] and they can be completely routinized. Furthermore, it is desireable to standardize these services across the whole organization in order to provide a common basis for coordination and control.

The situation is different with the production functions. There, the organization is facing a large number of contingencies and fluctuations stemming from the equipment, the nature of the raw material and the environment, especially the physical environment and the supply

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[502] Thompson, op. cit., Ch. 6

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of labor.[504] While long and middle term decisions can be made efficiently at the higher levels of the management structure, short term decisions have to be left to the lower levels.

Moreover, a lot of these contingencies and uncertainties are variously clustered on the basis of regional and sub-regional territories. Any good decision must consequently be based on an immediate and intimate knowledge of the local conditions. Decisions must be made rapidly also otherwise delays become costly, the more so when costly equipment and machinery are involved. The wide dispersion of the different logging operations[505] makes it very difficult to communicate rapidly despite major improvements in the road networks and in the different techniques and equipments of communication. Furthermore, it has always been difficult if not impossible for members of the organization spacially removed from the logging operation sites to be familiar enough with local conditions to take the right decisions at the right moment on the basis of the few clues which could be transmitted to them over the telephone or the radio communication system.[506] Consequently, a great number of short term decisions have

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[504] Contrary to what one would expect, mechanization has not diminished the number of contingencies faced by the organization. In many respects, it has increased them. For instance, the number of breakdowns of the mechanical equipment is much higher than the number of breakdowns when horses and men were used. Horses and men were also much more flexible to adapt to adverse weather conditions or extreme terrain characteristics.

[505] See Figures 23 and 24 in the following pages.

[506] "Un surintendant-général qui remplit bien son rôle ne reste pas ici derrière son bureau. [En dépit de l'excellent système de communication qui existe, il est nécessaire d'aller sur les lieux.]... dans une industrie comme ici, il y a tellement de facteurs. On ne peut pas prendre tous ces facteurs ici au bureau, les mettre dans un computer et sortir avec les résultats. Il faut être sur

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FIGURE 23

Example of the Geographical Location of the Different Structural Units of a Logging Company

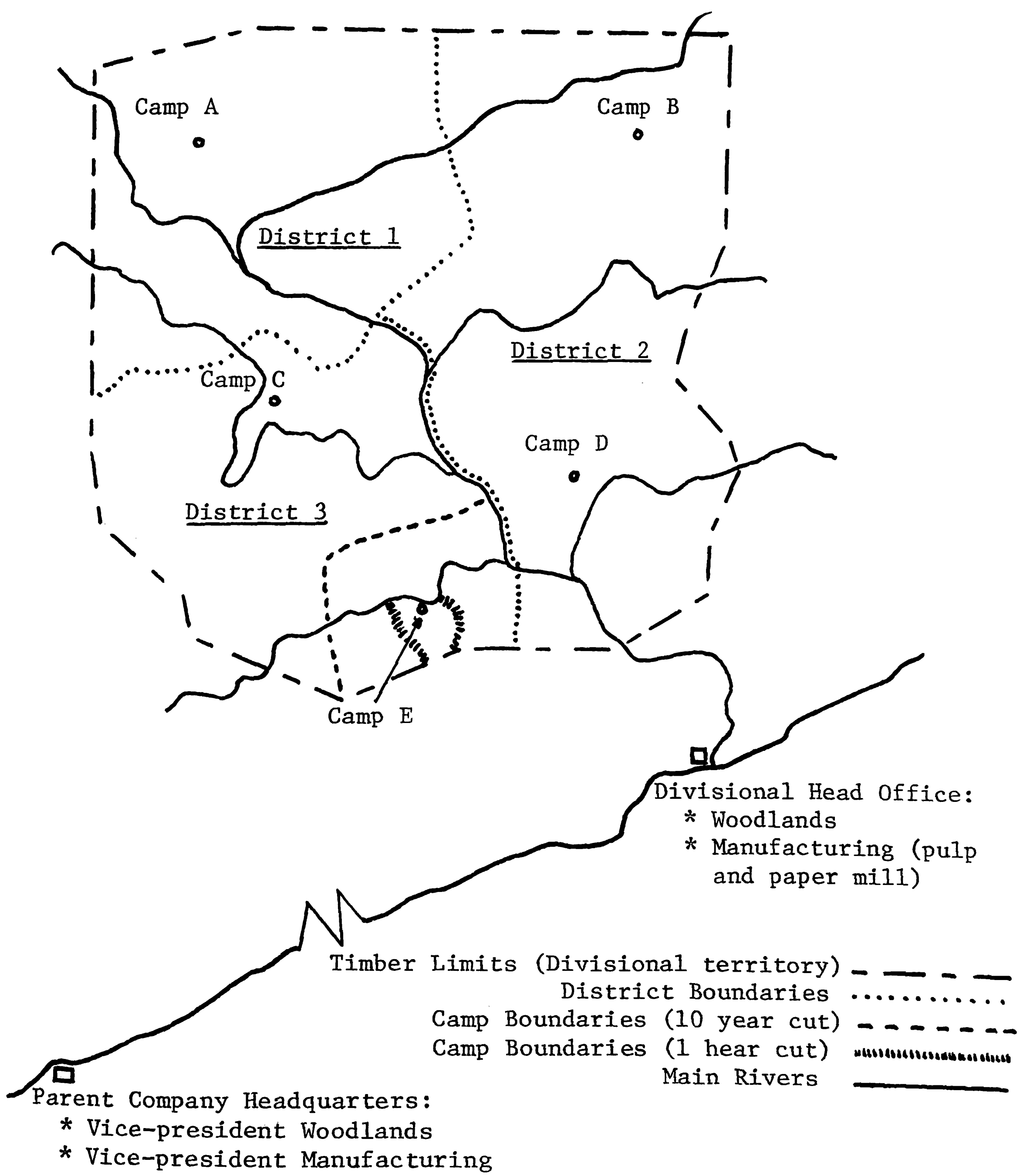

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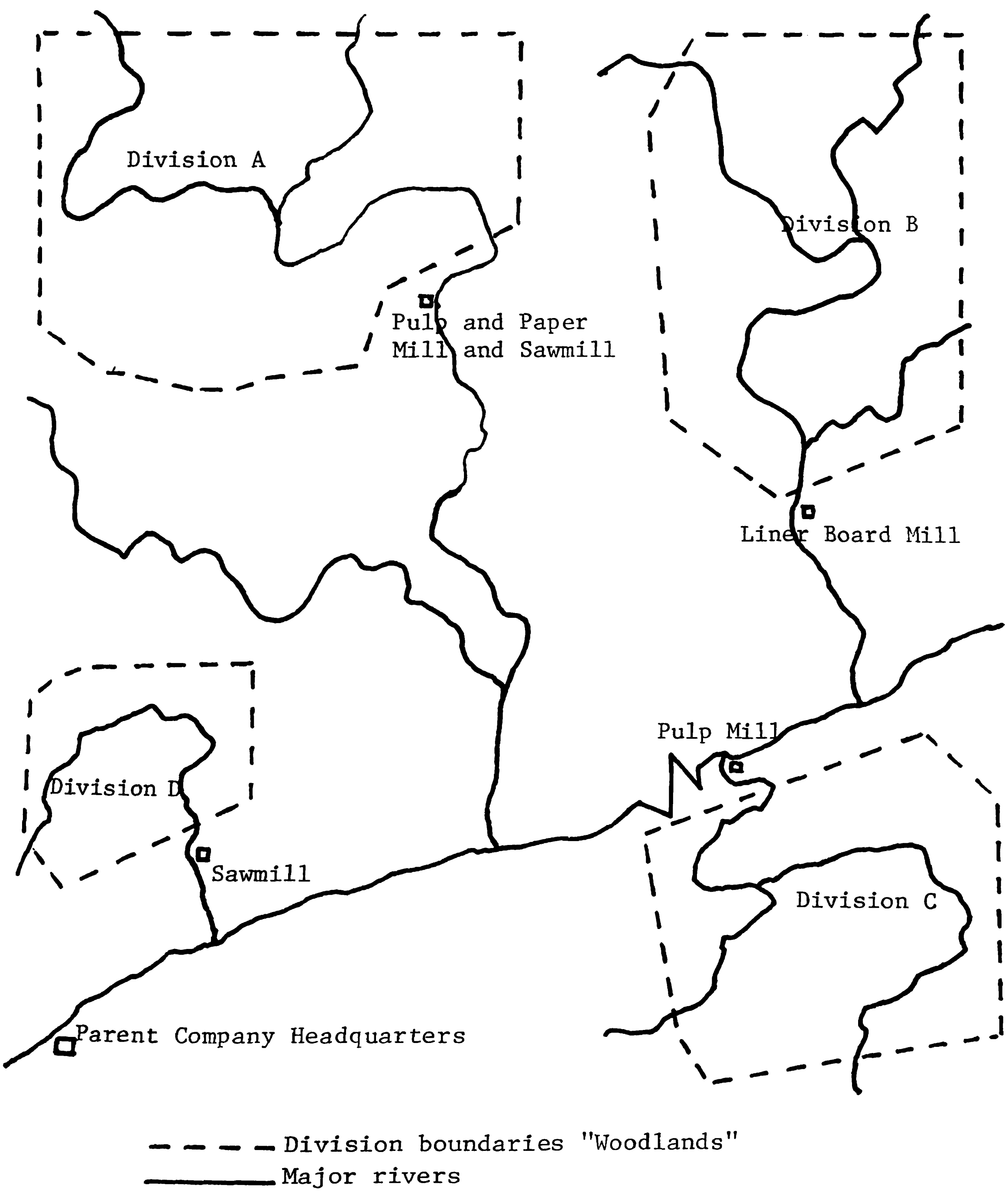
FIGURE 24

Example of the Geographical Dispersion of the Woodlands Operations of a Pulp and Paper Company



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to be taken locally if the organization is to be efficient.

Since production is by far the most important function of logging organizations, it has determined the overall structure of the organization. As Thompson puts it, "where contingencies are many, organizations seek to cluster capacities into self-sufficient units, each equipped with the full array of resources necessary for the organization to meet contingencies".[507] The result has been the deconcentration at the camp level of the basic administrative functions and of the services directly related to production (mechanical maintenance and repairs, supplies of parts and other supplies and scaling). Most of the other services and the bulk of the administration are concentrated at the division level.

The decentralization at divisional and camp levels is not only the result of specific operating conditions in the logging industry, but also of a change in management ideology which has much to do with the management philosophies developed in the 1950's and 1960's, such as "management by objectives", management by participation and management by incentive (implemented by new administrative systems based on cost, profit or responsibility centers).

In my conversations with logging people, the past has always been referred to as a period of authoritarianism. The portraits of renowned and successful general managers and jobbers were always those

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place avec les gens pour prendre une meilleure décision. [...] Pour prendre une décision, il faut voir les conditions qui existent" (Interview with the general superintendent of logging operations, Price, Saguenay-Lake St. John Division).

[507] Thompson, _op. cit._, p. 78.

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of strong men commanding their organizations like an army,[508] with absolute and undisputed authority, and whose control extended into every corner of the organization, sometimes to minute details.[509] Everybody agrees now that this era is over and that this kind of management philosophy cannot work anymore. Workers are just not the same anymore and they would not stand to be driven the way they were in the past. But management people hasten to mention also that this is no more possible anyway because things are just too complex now in logging. Willy-nilly, people at the top must delegate their authority, not only if they want things to be done properly but if they want them to be done at all.

1. The Woodlands Head Office

It was mentioned earlier that the head office was one of the beneficiaries of the changes in the structure of management. Its basic functions have not changed. It is still responsible for long and middle range planning, for overall coordination and control, for policy making, for coordination with the parent company's policies and plans and for external relations with other companies, governments and other agencies. However, the relative importance of these

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[508]This writer did not accumulate statistics but there seems to be a significant number of army trained people in the management ranks of logging organizations. It may simply be that there were more jobs available in this industry after World War II and the Korean War than in other industries. However, their military background certainly influenced their conception of what proper management is like and was congruent with the authoritarian style then dominating the industry.

[509]See, for instance, Albert Tessier, Jean Crête et la Mauricie (Trois-Rivières: les Editions du Bien Public, 1956); Smith, op. cit.

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functions has changed. The head office is more directly involved at the same time in the logging operations as well as in external relations.

The head office has become more directly involved in the operations in two different ways. First, the head office has been under pressure to increase its control for various reasons. Rising costs of production, labor problems (shortage and turnover), and more aggressive unionism, increased governmental control and direct intervention, environmental movement, changes in technology and organization, greater financial investments in logging and company's reorganization following mergers are all factors which have been calling for a greater involvement of the head office.[510] Periods of change always call for more centralized control in order to maintain cohesion within the organization, to give direction and ease altogether the transition from one stage to another.

In order to fulfill its new role, the head office needed to develop and take advantage of better communications and better administrative instruments. Both became available and were utilized. On the one hand, better road networks and other means of communication

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[510] In the case of one company, the head office indicated its desire to exercise more control on the divisions, especially with regard to industrial relations and personnel. Contrary to the usual practice, the divisional manager was not given authority over the personnel affected to these functions in his division. The company moved the divisional director of industrial relations to the head office and the rest of the divisional personnel noticed an increase in demands for information and in standard procedures from the head office. The company was centralizing these two functions seemingly because of the increasing costs of labor and the complexity of labor-management relations. Moreover, since 1971, labor bargaining involves someone from the head office. (Interview with

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(telephone, radio communication, etc.) improved considerably the rapidity, accuracy and quality of communications. On the other hand, companies benefited from the progress made in administrative methods[511] and equipment (electronic data processing machines and facilities).[512]

Secondly, the expansion of staff functions has also contributed to extend the presence of the head office at the divisional and camp levels. This was the case of new staff functions like industrial relations and research, development and methods, but also of already existing ones which were reorganized or modified in one way or another, like accounting and other administrative controls.

Three of the four companies (Price, Consolidated-Bathurst and Domtar) went through major reorganizations in the 1960's following a series of mergers which altered considerably the size and the domain of these companies. For the woodlands organization, such reorganizations meant, in some cases, the establishment of a vice-president woodlands (Domtar) and the relocation of the head office (Consolidated-Bathurst and Domtar). In all three cases, these transformations had the effect of increasing the influence and power of the head office on the rest of the organization. This has not been without frictions, not only because of the normal problems of integrating different organizations, but also because of the historical autonomy of the divisions.

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the assistant director of personnel and industrial relations, Price, Saguenay-Lake St. John Division).

[511] In fact, some of these methods or systems were not new but had never been applied to the administration of logging activities before.

[512] For instance, the head office obtains a fully detailed cost every month for each divison and camp.

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The divisions contitute the most important unit of decentralization. Their boundaries usually coincide with a manufacturing division (or pulp and paper plant). This goes back to the days when wood limits were purchased to supply the newly established pulp and paper plant usually owned by a small company which has since merged with others to become the large corporation described in Chapter 4. This original relation between the logging division and the manufacturing division has been generally respected and each woodlands division is still basically supplying the same manufacturing division it was set up to supply originally.[513]

Nevertheless, more than an historical creation, each woodlands division is a geographical as well as a bureaucratic entity, probably more bureaucratic now than before but certainly still very much geographical. The division, in this respect, is identified with a territory possessing a specific physical (timber distribution, topography, climate) and socio-economic (labor market, availability of supplies) environment. As I mentioned earlier, quoting Thompson, the division must cope with the numerous contingencies of its particular environment and is provided with all the facilities that it needs to do so.

Since it is not directly involved in production, the division is mostly responsible for scheduling and delivery and constitutes a

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[513] There are few cases which slightly vary from this pattern. A division may supply several manufacturing units which have been added since the beginning of the company but usually located in the same area. Moreover, what originally were relatively small divisions may have become (since the mergers) one big division which supplies the original manufacturing plants.

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decentralized and deconcentrated center of services, planning, coordination and control. Its typical time perspective is the middle term with a mixture of short and long term. It serves as an intermediary in purchasing and dispatching the delivery of supplies to the camp.

With the end of the annual operations sometime in March, divisional headquarters move into one of their most active periods of the year. During the six or eight weeks or so of the operational inactivity, the personnel of the division establishes the financial reports for the year with the help of district and camp staff and management personnel,[514] makes a complete inspection of the equipment and whatever maintenance and repair work needs to be done on it, and complete the preparation of the plans and schedules for the next year of operations.

As was the case in the traditional system, part of this activity includes "make work" jobs but much less now than in the past since the period of inactivity is much shorter and the volume of work to do much bigger.

3. The Camps

Camps have considerably gained in importance during this period of change. It is not that their essential function, production, has changed. It is still the same and more so than ever because what has changed is their size and number. Their remarkable increase in

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[514] They include key supervision personnel (district supervisor, camp supervisors and other senior supervisory personnel) and staff personnel (camp clerks and maintenance workers like mechanics).

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size is probably the most striking aspect of the change in logging organizations. Whereas camps included around sixty men in the old days, most of them have doubled and tripled that number and some even reached up to four and five hundred men.[515] Because of increased productivity and longer operations, their volume of production has increased more than ten-fold to reach, in some exceptional cases, up to 150,000 and 170,000 cunits per year. In Table 59, the average size of the camps of the four companies indicates that there are wide variations from one company to another and even within the same company.

TABLE 59

Average Camp Size,
Four Companies, 1972

	Consolidated-Bathurst	Domtar	QNSP and Price	Price (maximum size reached)
Camp Size	50,000 cunits	100,000 cunits	125,000 cunits	170,000 cunits

SOURCE: Interviews with representatives of these companies and "Organigramme de l'exploitation forestière Saguenay-Lac St-Jean", Price, 1971-1972.

With few units of production of this size, companies can produce more than at any time before with a large number of small camps. This is vividly illustrated by the situation at Price's Saguenay-Lake St. John Division. Table 60 shows that, over a period of fourteen years, the number of camps was reduced from 33 to 5, but total production went up from 238,000 to 725,000 cords.

[515] See Appendix F for the detailed description of a super-camp at Price.

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Basically, the increase in the size of the camps has been made possible by the greater mobility provided by the truck and later by the car in travel from the camp to the harvesting areas. Men can now be trucked away or drive in their own cars every day for 12 to 15 miles to their place of work, a trip which takes about half an hour. This mobility has considerably extended the harvesting territory covered by a camp, from two to three square miles (bearing around 20,000 units of wood) up to 100 square miles and more (bearing around 1,000,000 units of wood). This means now the establishment of production unit of a more permanent design.

TABLE 60

Total Annual Production, Number of Camps and Labor Force, Price, Saguenay-Lake St. John Division, 1958-1972

	1958	1963	1968	1971-72
Annual production (cords)	238,000	430,000	640,000*	725,000*
Number of camps	33	17	8	5
Number of men	--	1,500	1,500	1,430

*Estimated or planned, including pulpwood and sawlogs.

SOURCE: Trait d'Union, Novembre 1963, Mai-Juin 1964, Septembre-Octobre 1968, and "Organigramme de l'exploitation forestière Saguenay-Lac St-Jean", Price, 1971-72.

Camps constitute now little less than small villages with their variety of buildings: power house, cook house, recreation rooms, dormitories, administration headquarters, shops and repair garages, etc. These buildings are serviced with complete water and sewage systems (hot and cold running water, indoor plumbing), heating systems (usually oil stoves and furnaces), refrigeration systems, diesel lighting plants and telephone or

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The number and variety of occupational statuses has greatly increased: mechanics, cooks, truck drivers, road equipment operators, wood cutters, harvesting equipment operators, clerks, foremen, scalers, labourers, janitors, etc.[516] Shift work was introduced with mechanization so that, at any one time of the day, there are now workers sleeping in their two-mate bedrooms.[517]

Several factors account for that increase in the size of the camp. Probably the single most important factor has been the increase in the quantity and quality of services which must be provided by the camp (better living accommodations, mechanical repair facilities, etc.). The higher costs in material equipment and overhead thus generated have pressured the companies to eliminate as many camps as possible in an effort to keep these costs at an acceptable level. This increase in the quantity and quality of services was a direct effect of mechanization and the demands formulated by the workers. For instance, it was necessary to build large garages sufficiently equipped, stocked and staffed to handle the maintenance and repair of a wide range of machines twenty-four hours a day in summer as well as in winter. Living accommodations for the workers (sleeping quarters, food service and recreational and social facilities, like TV rooms and meeting halls) were improved constantly to satisfy the demands of the unions and the

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[516] See Chapter 7, Table 93 for a detailed list of occupations in a logging camp.

[517] This had to be taken into account in the layout of the camps so that the dormitories for workers on shiftwork would be located away from the major source of noise during the day.

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workers. Better communication facilities (telephone lines, radio-telecommunication installations, television towers, all-weather roads, etc.) have been provided at expensive costs to increase the accessibility of the camps to urban centers.[518] However, despite these last improvements, camps are increasingly distant from the division headquarters,[519] as close timber stocks are depleted, and must become more self-sustaining.

Production units had to be adapted also to the capacity of the new machinery. A mobile slasher, for instance, has an annual production capacity of about 50,000 cunits. It is, of course, financially sound to set up production units which will fully use equipment capacity and avoid the shifting back and forth of this equipment from one camp to another which is costly in terms of the production time lost and the disruption introduced in the functioning of the system.

People in the logging organizations believe that the size limit has been reached and that the optimal size lies somewhere within that limit, that is, around 100,000 cunits a year. In excess of that, the territory covered by a camp is too large and extra costs start to overtake the advantages. The distance from the camp to the cutting areas becomes too big, travel time too long and the costs of transportation too high. Local management also runs into coordinating difficulties,

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[518] See the part of this chapter on communications.

[519] In some cases, camps are as far away from the division headquarters as 130 to 150 miles (for instance, at QNSP, Price and Consolidated-Bathurst).

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[522] *Ibidem.*

not only because of the great number of people to be supervised (up to 500 men in one camp)[520] but also because they become too widely spread (crews may be working so far away from each other as twenty to thirty miles). In some cases, satellite camps have to be set up to provide food at noon and basic maintenance services during the day.

There are also some logistic advantages in carrying operations simultaneously at several locations instead of few very concentrated ones when large volumes of pulpwood are required. It assures an even flow of output to the mill(s) "in the event that washouts, floods, forest fires, or landslides should block one transportation system".[521] It contributes also to level the harvesting costs each year by mixing cheap and expensive wood. Finally, on crown timber limits, forest management policies usually oblige companies "to balance the actual cut with the estimated allowable cut for each compartment or unit of management".[522]

4. The Districts

This level in the organization has almost completely lost its raison d'être. In some companies, the district has been eliminated completely. In most organizations where it still exists, the district is only an operational appendix of the division and its head no more than a divisional representative "on the road" concentrating on operational problems. He is partly a trouble-shooter assisting and advising

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[520] At Camp Pamouscachiou on Price's Shipshaw limits.
[521] Wackerman *et al.*, *op. cit.*, p. 470.
[522] *Ibidem*.

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camp foreman whenever they may need it, and partly supervising the implementation of policies and decisions made by the division or the head office. A sure indication of the minor role played by the district is the fact that it does not have a headquarters of its own. Most often, its head has his office at one of the camps under his responsibility.

There are several factors which explain such a situation. The most important one is probably the concentration of production facilities which drastically reduced the number of camps and thus the need for an intermediary level in the hierarchy between division and camps. Another important factor is the great improvement in communications. Problems can now be referred very rapidly to the division headquarters whenever necessary.

E. Planning and Research

The exploitation of a renewable resource which can be easily exhausted, logging always required that a special attention be given to planning mainly because of problems of forest management and administration. However, in the last two decades, planning and research and development have become crucial functions for the enterprises. Large investments in equipment, the rapid pace of change, and new managerial and administrative demands created by intensified inter-organizational relations and technological requirements are among the factors which contributed to their increasing importance.

1. Planning

Planning has become a much more complex matter. It can be divided into two components: forest management and operations planning.

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a) Forest Management

The objective of forest management is to establish, in advance, how the timber limit is going to be exploited in such a way as to assure the regeneration of the resource, the supply of enough fibres to satisfy manufacturing needs, and the full use of the timber resource at the lowest possible cost. Before defining a plan of utilization of the resource, the first step consists of knowing as exactly as possible the nature of the resource and the conditions of its accessibility. Thus the planning process is done in three phases:

(i) Long Term Planning

A complete survey of the resource concerning the areas, types, locations, and volumes of timber as well as the topography of the territory and the possible transportation routes is done every twenty years. The survey is done by aerial photography completed by a sampling on the ground. The territory to be developed is divided into three different sub-units of analysis: the district, the working circle and the compartment which is the smallest unit (see Figure 25).

For each compartment, the survey gives tables indicating: a) the list of the timber stands, b) the type of stands, c) their age and d) superficies, e) the volume per acre for each stand and f) the total volume of timber within each compartment. Other information included in the survey are the average diameter and height of the trees and their health condition.

The general survey is accompanied by a general program of exploitation which indicates, among other things, the quantity of timber which can be harvested without reducing the total volume.

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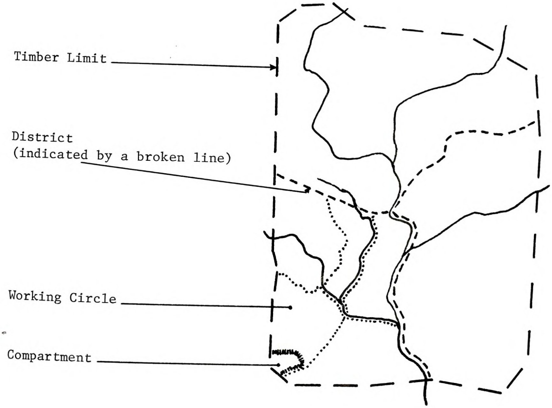
FIGURE 25

The Various Units of Forest Management



Size of the territorial units:
Timber limit: more than 1,000 square miles
District: between 58 and 228 square miles
Working circle: around 6 square miles
Compartment: about 1 square mile

SOURCE: R. Royer, "L'aménagement forestier chez Consolidated Paper Corp. Ltd.", Le Papetier, 2, 5 (octobre 1965). pp. 4-23.

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(ii) Mid Term Planning

The next step consists of establishing a long term harvesting plan (ten-year period). This plan is much more precise than the preceding one because it indicates precisely where the logging operations will be carried year by year for the following ten years.

According to Wackerman, the plan spells out the following items:

> 1. Which camps or commuting areas will cut how much volume each year? This is known as the yearly cutting allotment or assignment for the camp. The totals must be within the allowable cuts for each district.
>
> 2. Which camps (if in underdeveloped areas) will be built in which year, and which will cease to operate?
>
> 3. How many all-weather roads or winter snow roads will be built each year, and how will they be allotted by district, working circle, or compartment?
>
> 4. What silvicultural treatments [if any] will be applied in the major stands?
>
> 5. Which forest-protection measures will be taken and where?
>
> 6. What primary products will be made?[523]

(iii) Short Term Planning

Every year a program for the coming annual harvest is completed in the spring. It is based on intensive surveys of the exploitation carried during the winter. Its preparation is described this way by the chief forester of Consolidated-Bathurst:

> Firstly, our forest engineers trace a preliminary program in the office with the help of aerial photographs and forest maps made before the preparation of the plan. Then, crews of foresters

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[523] Wackerman et al., op. cit., p. 61.

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> go in the field for several weeks to take samples which data allow us to establish the volume of wood available in each operation with a precision to 90%. At the same time, our foresters determine the boundaries of the territory to be harvested by each logger by stripping the trees.[524]

Finally, the records of the inventory are updated every year at the end of the annual harvest.

b) Operations Planning

Two of the major decisions in planning the operations are the selection of the method of harvesting and the selection of the equipment. Because of the diversity of conditions, there are several ways of conducting operations. Difficulties of balancing the operations and the great dependence on environmental conditions preclude the determination of any standard method of harvesting. Indeed, according to Wackerman,

> Harvesting, being an outdoor operation, must be conducted with regard to weather conditions and a terrain that varies as harvesting progresses over an area. No standard method of harvesting can be established for all operations, even on the same chance or limit, as can be done for production activities housed in factories and carried on under controlled conditions. Seldom, if ever, are any two harvesting operations alike in all respects; thus equipment must be adapted to each operation and used in the most efficient way for best results.[525]

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[524] Royer, op. cit., p. 16.

[525] Wackerman et al., op. cit., p. 71. See also Hughes' assessment of the choice of logging systems in 1970: "The choice of system will depend to a great extent on such factors as the adaptability of the machines to the terrain conditions, average tree size, availability of labour, and the effects of changing wage rates, etc. It may be necessary to adopt all three systems in a given operating area due to the wide variations in terrain and tree size alone" (Hughes, op. cit., p. 237).

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[526]Wackerman

[527]Interview
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The list of factors which influence the choice of operating methods includes the size of the product, the daily and annual output required, the amount to be harvested per acre, the labor required and available, the duration of operations, the integrated use of stands for pulpwood and sawlogs, the facilities already available, legal limitations (for instance, the size of the equipment allowed on public roads), the policy of the owner, and stand improvement.

Always according to Wackerman, the pace of change has been rapid.

> Much thought and effort has been given to developing economical ways of handling and hauling logs and other timber products. Most of the methods now used have evolved from long experience in actual operations. New equipment and new methods are constantly being tried, and those showing promise are promptly adopted. There has been constant improvement in the techniques of harvesting through the years because of the rapid advances of machine technology.[526]

This is not without creating planning headaches for management. As one former general manager put it in an interview, "there is a certain amount of gambling in the choice of new equipment. We do not have all the data and the time to establish our positions. There is a planned budget of investment for five years, but this remains flexible to take advantage of new developments".[527]

If the choice of a system of operations and equipment has become a complex decision, their efficient utilization requires every year careful planning based on an intimate knowledge of the conditions in which they will operate. Thus,

> Prior to the start of cutting operations, a survey of stand and terrain conditions is made by the

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[526] Wackerman <u>et al.</u>, <u>op. cit.</u>, p. 64.

[527] Interview with the former general manager of operations, Domtar, Summer 1972.

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> job foreman, and roads to be built are located. Roadside slashing requires a very careful planning of road construction and cut sequence since slashing and hauling must be carried on without interruption and at the same rate throughout the season. Usually, one fifth of the hauling roads required is built one year ahead.[528]

All the companies studied conform to this general forest management and planning procedure. However, QNSP had gone a step further four years ago.[529] It established a planning department (including development and industrial engineering). The department head's objective was to develop a three dimensional model (long, mean and short terms) designed to be amenable to computer processing (for the mean and short terms only).[530]

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[528] Legault, "Mobile Mechanical Slashers: Consolidated-Bathurst's Answer to the Mechanization of Scattered Operations", p. 181.

[529] At the time of the interview with the head of the planning department in 1972.

[530] According to him, the long term cannot be dealt with by specific methods, much less by the computer. It would be a waste of time and money. The focus is rather on the direction which the operations will take on the limit and the general location of camps and main roads. The factors taken into account are the topography, the water supply for the camps, the distance of the camps from telecommunication towers (the line between a tower and a camp cost somewhere around $15,000 per mile), and the distance from the camp to the cutting areas. The latter must be kept within certain limits because companies are usually obliged to pay full wages for travelling time in excess of half an hour a day. The short term has not been worked on yet but the objective is to reach a point whereby investments, costs and the methods of operation will be integrated in a blue-print as detailed and precise as the ones used in building construction.

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His mean term objectives are to estimate the costs of pulpwood in the compartments and to establish a harvesting program for the total limit with average cost which does not vary much from year to year. In other terms, the basic goal is to eliminate variations in the cost of pulpwood, that is, eliminate uncertainty. The list of factors which he is using in the model is worth mentioning because it shows very well the degree of precision to which this effort of rationalization is pushing the organization. Compared with the previous list given by Wackerman, it also demonstrates how this precision would not be reached without the possibilities opened by the electronic equipment like the computer. This list includes: volume per acre, tree stands, harvestable superficies, total superficies, superficies of water, total volume, average diameter at the stump, camp distance (accessibility), hauling distance to final landing, average skidding distance, length of main, secondary and tertiary roads, class of topography, and harvesting class (for instance, harvestable in winter or not).

One of the major advantages of such a model designed for the computer is its flexibility. Indeed, if conditions change (they are likely to change: for instance, the demand for pulpwood from the mill), the established plan can be scrapped and another one established by the computer within hours.

A major objective of this approach is to avoid mistakes which, with the mechanization of logging operations, are becoming increasingly costly (like the construction of unnecessary roads). As he said:

> Before, in the good old days with horses, when somebody made a mistake at one place, it was not too expensive. He could make up for it elsewhere. But with machines which very often cost over $100,000, we cannot

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> indulge in making many mistakes. We must think it over ahead of time. The cost of planning seems to add to other costs, but it is a necessity.[531]

He further emphasized his point by describing an experiment that his department made four years before. They took aerial photographs of a territory before and after the logging operations. Using the before-operation photographs, they established an ideal plan of operations based on the factors mentioned above. They then compared the plan with the after-operations photographs. The result showed that twice the quantity of necessary roads established by the plan had been built and that this costly mistake could have been avoided if only one of the factors, the skidding distance, had been increased.

F. Ownership System

One characteristic which logging shares with very few other industrial activities is the mixture in the ownership of the mechanical equipment between employee ownership and company ownership. Any change in this mixture in one way or another constitutes an interesting phenomenon because the ownership and control of the means of production has been shown since Marx to be closely related to social organization. Thus, any change in the pattern of ownership which is related to changes in technology (the means of production) is likely to indicate something about the relation between technology and organization.

One will remember that, in the old system of production, the equipment in use was also used on the farm. Since most woodsworkers were

[531] Interview with the head of the planning department, QNSP, 1972.

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also farmers or living on a farm, they owned this equipment and used to bring it with themselves in logging operations. The rest of the equipment was supplied by the jobbers who owned it or rented it. This system of ownership was in line with the organizational system itself which was a pyramid of "jobbers" all the way from the pulp and paper company down to the simple woodsworkers. In essence, a man was taking a "job" and meant that he took full responsibility for it. He had the skills and the know-how, the equipment and the tools, and accepted the material risk involved. This system went along very well with a seasonal and labor intensive activity like logging.

This situation started to change with mechanization. Non-portable, complex and costly equipment progressively replaced the old one. At the same time, as we saw earlier, companies took over the operations almost entirely and, for any practical purpose, logging became a year-round activity. The rules of the game were, so to speak, changed. Indeed, it is estimated, for example, that investments in mechanical equipment for one single camp run into $2 to $3 million. Some pieces of equipment, like a mobile slasher, cost as much as $125,000. Very few entrepreneurs, not to mention poor farmers, could support these investments. The companies could and did.

However, as long as logging operations remained a seasonal business, nobody was interested in investing in non-portable equipment which was to remain idle half of the time. With year-round operations, the profitability of the investment was no longer in question and it became an interesting proposition for the companies.

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production systems, bottlenecks, breakdowns and any other failures in the production process must be avoided at all costs. In this respect, the possibility that individual owners of key pieces of equipment could pull out at any time[532] and for any reason constitute too great a risk to be reasonably accepted by the companies.

Some of the most enticing features of contracting were eliminated. For example, the dream of making a fast buck is long gone. The tight control exercised by the companies and the pressure of the unions considerably reduced the margin of profit that a contractor could expect from renting equipment to logging organizations. Furthermore, even if the desire for independence and entrepreneurship still lingers in the mind of many country folks, present-day conditions make it such a complex undertaking that few can seriously pretend to try it, let alone succeed in it. On the contrary, conditions continuing to change in the same direction which they have taken so far, an increasing number of workers are ready to trade their desire for independence and freedom for the security of a steady job and a regular income.

So far, I discussed factors pressing for increasing company ownership which has been certainly a major trend according to figures in Table 61. Nevertheless, I must account for the fact that a significant part of the mechanical equipment is still owned by individuals. Figures

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[532] Of course, a contractor is responsible for the completion of his annual contract but he could always abandon a given company for another or go out of business at the end of his contract. Then the company would have to find another contractor or buy the equipment itself, find already trained men or train new ones, etc. These are disruptions which are not congruent with a stable and well-oiled organization.

TABLE 61

Ownership of the Means of Production (Mechanical Equipment), Four Companies, 1971-72

TABLE 61

Ownership of the Means of Production (Mechanical Equipment), Four Companies, 1971-72

Machine	Price		QNSP		Domtar		Consolidated-Bathurst	
	Owned[a]	Rented	Owned[a]	Rented	Owned[a]	Rented	Owned[a]	Rented
Haul trucks	13	101	16	72	46	95	81	112
Haul trailers	8	26	28	0	58	17	78	25
Hydraulic cranes	4	10	8	3	15	10	25	3
Choker wheel skidders	103	322	125	80	221	101	276	126

[a]Owned or leased by the company.

SOURCE: <u>The Competitive Position of the Quebec Pulp and Paper Industry</u>, pp. 59-60.

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in Table 62 indicate that the type of ownership varies according to the type of equipment (more expensive and complex machines are company-owned)[533] and the company (for example, Price owns less equipment. I must account for these differences.

Companies usually find some direct financial advantages in leasing or renting equipment. They may like to keep their money to invest equity capital elsewhere in order to get a greater return on investments. They also like to keep operating capital when there are budget restrictions. This was the case in the past few years when the industry was in a tighter economic situation. Finally, it may bring them tax reduction or tax deferments.[534]

Probably the most common argument in favor of individual ownership is the cost of maintenance and repair. According to the companies, costs of maintenance and repair are much higher on equipment owned by the companies than equipment owned by individuals. It is argued that individuals care about what they own but do not care about equipment which belongs to the companies.

Another argument states that individual ownership creates greater stability and lowers the usually high turnover of production workers. In a sense, it is as if the worker was buying his job with his machine and at the same time needed a steady job to be financially able to keep his machine.[535]

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[533] While in all cases there are more haul trucks rented than company-owned, all the tree-length slashers, processors and harvesters (but one) are company-owned.

[534] Wackerman _et al._, _op. cit._, p. 495.

[535] Interview with the director of industrial relations, Consolidated-Bathurst, April 1972.

TABLE 62

Ownership of Basic Logging Equipment, Four Companies, Quebec and Ontario, 1971[a]

	Number of Units					
	ONSP	Domtar	Price	Consol-Bath.	Quebec Own-[b] Rent-	Ontario Own-[b] Rent-

TABLE 62

Ownership of Basic Logging Equipment, Four Companies, Quebec and Ontario, 1971[a]

Equipment	Number of Units											
	QNSP		Domtar		Price		Consol-Bath.		Quebec		Ontario	
	Owned[b]	Rented	Owned[b]	Rented	Owned[b]	Rented	Owned[b]	Rented	Owned[b]	Rented	Owned[b]	Rented
1. Haul Trucks:												
a) To 50,000 #GVW (gas or diesel)	--	40	7	36	3	35	17	61	52	687	113	42
b) Over 50,000 #GVW (gas or diesel)	16	32	20	33	5	9	56	50	153	219	115	206
2. Haul Trailers	28	--	22	17	8	20	48	25	146	104	418	67
3. Truck Pallets (* & boxes)	--	--	90	30	--	30	18*	4	91	120	--	--
4. Track Front-end Loaders	--	1	4	1	1	1	3	2	13	16	21	4
5. Wheel Front-end Loaders	5	1	9	2	3	2	14	1	52	27	56	6
6. Cable Cranes	--	--	--	--	--	--	3	--	9	--	34	15
7. Hydraulic Cranes (Loaders):												
a) To 10,000 # at 10'	3	--	1	10	--	2	16	3	30	95	6	4
b) Over 10,000 # at 10'	5	3	10	--	2	7	6	--	41	20	18	2
8. Short Wood Forwarders	--	3	19	20	--	--	--	3	76	291	3	7
9. Choker Wheel Skidders:												
a) To 80 hp.	--	--	30	64	--	6	98	54	307	215	231	37
b) Over 80 hp.	125	80	112	36	23	200	164	72	723	666	485	39
10. Tree-Length Slashers	11	--	4	--	6	--	15	--	44	--	33	2
11. Harvesters, Processors, and Full-Tree Feller Bunchers	1 (bun.)	1 (har.)	2 (har.)	--	--	--	2 (proc.)	--	23	1	49	2

[a]Quebec operations only.

[b]Owned or leased by the company.

SOURCE: Logging Operations Report, 1971; The Competitive Position of the Quebec Pulp and Paper Industry, pp. 50 and 60.

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Companies mentioned also that it contributes in satisfying the need for independence and autonomy so common among workers from rural backgrounds. A higher level of satisfaction is seen as desirable if only to curb the high level of turnover.

Another advantage is not often made explicit by companies but has certainly been taken into consideration. Individual ownership may be a means of passing on to the workers operational costs over which the companies have little control due to the uncertainty created by the physical environment. Thus, inactivity due to inclement weather and mechanical breakdowns due to the roughness of the terraine are some of these unpredictable costs which have to be directly borne by the workers owners.[536] This was the case with rubber-wheeled skidders.

Individual ownership is also used as a device to save overhead costs and capital when the job is a routine one in which the profit margin is small, control easy and the efficiency sure and even better when some extra care is taken by individual owners. Trucking in the long distance transportation phase (and even in the hauling phase) is one such example.

Finally, management personnel often mention the fact that individual ownership mix with company ownership contributes to a healthy competition within the organization. They maintain that they can use the productivity records and the maintenance and repair cost

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[536] Generally, unions have denounced financial schemes set up by some companies to help individual ownership as being a disguised form of economic exploitation.

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figures achieved by individual owners as bench-marks to evaluate company's performance and stimulate progress.[537]

In the case of the chain saw, there is a particular factor which largely accounts for their individual ownership.[538] Under the piece-work system of renumeration, the size of the production of an individual worker (thus his income) and the amount of physical efforts which he must exercise to achieve it are not only directly related to the type (weight, size, shape, etc.) of chain saw which he uses, but also to the condition in which the chain saw is maintained (sharpness, cleanliness, lubrication, etc.). Working in a variable environment which affects so much of their production, it is not surprising then to find that woodsworkers in general clearly prefer to possess their own chain saws rather than rely on company ones.[539]

One finds few cases where, suprisingly very costly equipment belongs to individual workers who certainly did not have the capital

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[537] Interview with the general superintendent of logging, Price, summer, 1972.

[538] As mentioned earlier, the relatively high portability of the chain saw is another factor accounting for its individual ownership.

[539] The companies prefer that too because they save on administrative costs and avoid many problems. However, this does not mean that the present situation is ideal. In a conversation, a former general camp supervisor who had become inspector of chain saws and knew very well all the secrets about this tool indicated to me that companies should supply the chain saws. The latter would be maintained in good condition, there would be less accidents and less loss of time due to breakdowns since spare ones would be available. According to him, chains are badly sharpened because workers do not always know how to do it and do not use the proper equipment supplied freely by the company to do it. There is not enough tension on the chain and this provokes kickbacks which cause accidents (Legendre, op. cit., pp. 143-144). His opinion was nonetheless not accepted by most management people to whom I mentioned it.

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to invest. Exceptionally, I met a worker who owned his own bulldozer (evaluated at $55,000). He could own such an expensive piece of equipment for three reasons. Firstly, he could get financing for his machine under conditions stating that he was obliged to pay his monthly instalment only when his machine was working. Secondly, he was himself a skillful bulldozer operator and self-made mechanic who could do almost all the repairs himself.[540] He liked it and was proud of it. He was thus saving a lot of money for himself.[541] Thirdly, a bulldozer is a portable piece of equipment which can be used in many other activities, such as highway and road construction. Thus, he could always find some work outside logging if the conditions were not satisfying or if there was no work available in the woods.

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[540] It is a well known fact that rural workers (in particular, French Canadian woodsworkers) are very handy, especially in mechanical repairs. Companies are very well aware of it and have benefited from it. Even if maintenance and repair costs are believed to be too high, they would be more so if it was not for the maintenance and repair work done by workers themselves (as mentioned to me in conversations with several people). In the camps which I visited, I often observed machine operators using company's facilities to do their own maintenance and repair work at night after working hours. However, with the increasing urbanization of the work force, this situation is likely to change. Workers are unlikely to learn the skills by themselves the way they were doing it on the farm and they will require more formal training.

[541] And for the company as well because the latter did not need to pay costly mechanical repairs. As the general manager of operations said, "tractors are a necessary evil for the company. We need them but there is no money to make with them. It is better to pay $13 or $13.50 per hour to rent one than to own one" (Legendre, _op. cit_., pp. 140-144).

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G. Relations Between Woodlands and Manufacturing

In a previous chapter (see Chapter 4), relations between woodlands and manufacturing were described as those existing between two separate branches of the same company. They both have come to be identified as full-fledged units of the parent company, each being headed by a vice-president. Such a separation simply acknowledges the fact that logging and manufacturing are completely different activities which are performed in a widely different set of conditions.

However, the two sectors are closely related because one supplies the other with its main raw material. From this point of view, the relationship between the two has become the object of more attention in the last few years. There are several reasons for this change. For one thing, as indicated in Chapter 4, manufacturing is now much more concerned about obtaining a cheaper wood fibre supply. This creates pressure on the woodlands to find new methods and to use new equipment designed to increase productivity and to stabilize its costs if not lower them. One way to offset cost increases has consisted in buying wood fibres (pulpwood and chips) from independent producers.

The quality of the pulpwood supply and the right mixture of species are two important factors which affect the quality of output and the productivity of the sensitive pulp and paper manufacturing process. Because of strong market competition and increasing costs, companies have become much more conscious about these considerations and greater pressure has been put on the woodlands division to provide a better

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provide a better quality of supply. In the words of a company's representative, woodlands must become more "consumer oriented".

> Reduced wood cost is an essential factor in a return to a more satisfactory profit situation. Concentration is required on the cooperative linkage between mill and woods in areas of inter-related opportunities. Woods operations must be consumer oriented.[542]

Another company's representative was more explicit about the ways woodlands can satisfy the demands of manufacturing.

> Increased wood cost and sharply reduced profitability in many mills will result in strenuous efforts to improve productivity. This may be accomplished by improved fibre producing facilities allowing more flexibility in the use of wood species and the form of wood delivery. A total wood cost concept will be necessary that will require close cooperation between mill and woods departments.[543]

The relationship between woodlands and manufacturing takes also the form of sharing common services and facilities, and coordinating their policies. This has been for the parent company a way to eliminate extra costs due to the duplication of services (in overhead and equipment) and also to the lack of coordination. The extent of this cooperation varies from one company to another and even within

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[542] W. H. Martin, "Woodlands Implications in Manufacturing Trends", Pulp and Paper Magazine of Canada, July 19, 1968, pp. 75-77. A similar language was used by the vice-president woodlands of Domtar during an interview.

[543] T. N. McLenaghen, "Manufacturing Trends in Pulp and Paper", Pulp and Paper Magazine of Canada, July 19, 1968, pp. 73-74. One example of this new cooperation has been the shipping of wood fibre to the mills in the form of wood chips necessitating the building of storage facilities including unloading, loading and scaling equipment to manipulate and weigh the supply of chips.

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the same company according to the various divisions. For instance, at Price's Saguenay-Lake St. John division, this cooperation is limited to sharing a common computer terminal located at one of the mills and to using the same public relations department. But at QNSP, woodlands and manufacturing have a common accounting department, a common industrial and public relations department, the same computer facilities, and are housed in the same divisional headquarters. At Domtar, Dolbeau woodlands division is completely separated from the manufacturing to the point of having its own headquarters in another part of the town, while at Quévillon, the woodlands division shares administrative facilities, industrial and public relations, and housing facilities for its personnel with the manufacturing division.

The necessity of coordinating certain policies is especially evident in labor management relations. The migration of woodsworkers to urban centers where they live side by side with mill workers makes it increasingly difficult to maintain and justify totally different policies regarding working conditions and wages between two segments of the same industry and the same company. Moreover, strategies must be harmonized because they may work at cross-purposes to each other.

However, this is not always an easy task, as the following example given to me by the vice-president woodlands of Consolidated-Bathurst shows. One of their manufacturing divisions was involved in a labor conflict and the mill was shut down following a strike by the employees. The company decided to tough it out and test the union. Contrary to most mills, this mill was supplied from a nearby limit by

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continuous daily truck shipments. There was thus only a very small inventory of wood in the mill yard. In order to be consequent with its strategy and the situation, the company had to stop wood shipments and discontinue its logging operations at once for the duration of the strike. Otherwise, the union and the workers were to think that the company was not serious in taking a hard position and were to expect an early settlement.

Well, that is exactly what happened. The company had to settle earlier than it wanted to and on different terms because the manager of the mill could not obtain from the manager of the woodlands division to stop wood shipments and logging operations right from the beginning of the strike. The manager of woodlands argued that to do so would put him in an impossible position to resume production after the period of inactivity provoked by the strike because it would not be possible to get the logging employees back on the job in the middle of the logging season. They would have found work elsewhere during the strike. As a result, the mill would face a shortage of wood and would be forced to close down until the next logging season.

Finally, after much pressure from the mill management and the head office, the logging manager closed down his operations. Once the strike was settled, the mill resumed its production but wood operations could not be re-opened as predicted by the manager. After using the small inventory accumulated at the beginning of the strike, the mill ran out of supply and closed down until the next season of operations.

The degree of geographical isolation of both woodlands and manufacturing divisions from the company's headquarters, the proximity of the head managers

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the head managers of both divisions[544] are all factors which have much to do with the variations in the relations between woodlands and manufacturing.

In summary, conditions of operation of both woodlands and manufacturing have changed in the past fifteen years. Market pressure and increases in the costs of production have forced a greater integration of both in determining not only the volume of wood fibre needed but its form of delivery, its composition, its quality and its cost.

H. Supervision and Control

Supervision is another important dimension of the organization which has been affected by this period of changes. Good supervision, as it is required now, is not exactly what good supervision was in the traditional system. Companies and supervisors themselves do not always know what good supervision should be now and, when they know, they find it difficult to implement. There are problems related to the level of qualifications possessed by supervisors, to the legitimation of their role and to conflicts in the conception of supervision.

If we divide the required basic qualifications of supervision

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[544] The same divisions which were involved in problems of conflicting strategies reported earlier were also plagued at one time by a conflict of personality between their respective managers. If was not only a personality matter, however. The company found that its structure was nurturing problems since one of the managers, usually the manager of the mill, was considered the senior manager and had authority over the other one on certain matters which were related to both divisions. The problem was solved by making both completely independent from each other and reporting only to their respective vice-presidents.

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into three categories, technical, administrative and social ("human relations"),[545] it is the first two groups of qualification which have been the most modified by the changes in logging. Many supervisors do not possess the technical knowledge to understand the functioning of the new mechanical equipment.[546] They could overcome this problem at least partially if they had the experience of working with the machines. But they do not, because a large number of them were already supervisors when the new technology was introduced and others were promoted to supervisory functions from staff functions like scaling.

This problem is very much transitory and should be solved as soon as the old personnel has been replaced through the natural process of attrition by qualified and experienced younger people and that technical training is provided to those who need it.[547] In the

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[545] F.C. Mann, "Toward an Understanding of the Leadership Role in Organization", in R. Dublin <u>et al</u>., <u>Leadership and Productivity</u> (Scranton, Penn: Chandler Publishing Co., 1965), Ch. III.

[546] In an article on mechanization and accident prevention in the woods, J. Hughes suggested that, "Before speaking of the qualities of a good operator, one must admit from the beginning that the supervisor must know the machine and be able to use it. And I insist on the fact that he must know the mechanical limits of the machine and the risks which the operator faces [...]. We believe [...] that it was enough to introduce a machine in the woods, to put someone operator and another one in charge of maintenance for the worker to be sheltered from accident in his cab.

This attitude was to cause us many deceptions: production was inferior to the one hoped for, there were mechanical breakdowns, the cost of operating was often too high, and accidents were caused by the total ignorance of the new risks involved in the use of a new machine" (<u>Projections</u>, janvier, 1970).

[547] Training courses have been organized as early as 1965 in cooperation with the Department of Education (<u>Trait d'Union</u>, mai-juin, 1965), but they did not always reach the majority of the personnel for which they were intended.

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meantime, since the technical qualities of the supervisory personnel are more crucial than the others in a period of technological change, like the present one,[548] logging organizations are facing a real problem.[549]

Supervision problems are also related to the lack of administrative competence on the part of the supervisory personnel.[550] Supervisory tasks involve now a good deal of administration, especially in the positions above the first line supervisor. Camps' budgets, for instance, now reach well over the one or two million dollar mark and must be very carefully established and closely monitored.

> On a small operation all the detailed information summarized in the word control may be represented merely by the accumulated experience of the operator. In a large woods department personal knowledge and judgment must be supplemented by exact and detailed records of past performance, if efficiency is to be maintained and improved. As woods operations have become more systematic and orderly, and as plans for their execution have extended over larger areas and longer periods of time, the idea of systematic control has been naturally taken over from modern industrial world and adapted to the particular conditions encountered in the wood.[551]

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[548] Mann, op. cit.

[549] Supervisory personnel should be able, for instance, to help the workers use the new machines, to learn and adopt from the beginning the correct functioning procedures, etc., to avoid as much as possible the costly trial-and-error method.

[550] The level of formal education has been particularly wanting since a small segment of the supervisory personnel has achieved more than primary education.

[551] Bentley et al., op. cit., p. 12. If this was true in 1938, it is certainly more so now.

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In order to solve this penury of qualified administrators, companies have largely used available staff members (especially from the scaling department) to man supervisory positions.[552] Another solution has been to be very flexible in the definition of the tasks so that the most competent people get to do certain things which are not formally theirs. Here is how it is described in a preceding report.

> The distribution of tasks varies according to men, their personality, their competence and capacity. At one camp, the general supervisor will be only an administrator while his assistant handles harvesting and hauling operations. An another, the general supervisor will be responsible for hauling and fill up time keeping forms because his assistant is not educated enough to do it.[553]

Similarly, when Domtar implemented its new budgeting system in the late 1960's, it faced the same problems and used similar solutions.

> A problem often occurred when a manager who controlled a significant portion of the division's expenditures was not considered competent enough to prepare his budget or periodically re-estimate his costs. *This usually was a manager at the camp foreman level*. In such instances, a responsibility cost center was designed for his job, but it was assigned to his immediate superior. As a consequence, some superintendents became responsible for several cost centers which required monthly re-estimations for a large number of accounts involving several millions of dollars. This may prove to be an incentive for training first line supervisors.[554]

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[552] Legendre, *op. cit*. p. 77. Obviously, this does not solve all the problems. The companies had to keep experienced personnel, that is, former contractors and foremen who worked for contractors. These people did not abandon old habits at once and often got into conflict with the younger personnel.

[553] *Idem.*, p. 75.

[554] M. J. Rouse, "Cost Control in Woodlands--Is Responsibility Accounting the Answer?" (Montreal: mimeo, Domtar Limited, December 1967). Italics mine.

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With the transformations in the organization, the personnel of supervision, especially at the lower echelons of the hierarchy, faced a problem of legitimation and uncertainty concerning its role. Let me analyze this problem in more detail.

There is usually a distinction made between two types of authority: formal and informal. The first one refers to the authority officially defined for a given position or function while the second one identifies the real authority recognized to the person occupying the position or function. This second dimension of authority called "leadership" is the one which usually makes the first one work efficiently or not.[555] The two types of authority need to be legitimized in order to be accepted by the subordinates. Formal authority is usually legitimized _de facto_ by the system of values commonly accepted by the people in the organization. As to the informal authority or leadership, it develops and is legitimized in the course of the interaction between people.

In logging, the problem of legitimation comes from the fact that the basis of legitimation has changed with the new system of organization. In the traditional logging system, both formal and informal authorities were legitimized "somewhat" _de facto_ because of the close relationship which existed between the social system at large and the social organization of logging activities.[556] The structure of

[555] Blau and Scott, _op. cit._, Chapter 6

[556] G. Fortin, _La fin d'un règne_ (Montréal: Editions Hurtubise--HHM, 1971), especially Chapters 1 and 5.

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authority at the logging camp was usually parallel to the one existing in the village or rural town from which the woodsworkers and other employees were coming. The same people were in positions of authority at both places. The "jobber" was in general an influential economic, social and political figure at home and fathers commanded the same respect in the woods which they had at home in the family. The basis of authority and leadership was, in both cases, traditional, that is, rooted in seniority, experience and personal knowledge of the individual and/or his kinship group. Authority was a sacred institution.

The situation is different now. The traditional basis of legitimation has been eroded. The parallel which existed between the two structures of authority has been weakened if not destroyed since the "complémentarité" between agriculture and logging has disappeared. The basis of legitimation within the logging organization has been modified too. It is increasingly dominated now by technical and formal knowledge ("expertise") rather than seniority and experience. Many supervisors promoted from the rank and file or from other departments lacked the technical and formal knowledge to support their authority.[557] Their insecurity is further increased by cross-purpose pressures. There is a growing number of staff specialists or experts who keep on by-passing them (for instance, to deal directly with mechanical equipment operators) or seem to impose or suggest procedures

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[557]Technical qualifications are not always easy to acquire, especially in a period of rapid technological change during which technical knowledge and technical experience increase in volume and complexity (see an earlier quotation of Hughes, p. 399).

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which are cumbersome and hard to understand and seem to have nothing to do with good logging. Moreover, workers, especially the younger ones, have a different conception of authority now. Authority is no longer sacred and absolute for them. They discuss orders and demand to be treated with soft gloves. Furthermore, companies press continuously for greater productivity and better mechanical maintenance. In summary, many supervisors have been forced to question their role and position.

How could they solve the problem or, more likely, alleviate it? How, for example, could a scaler-foreman compensate for his lack of technical qualifications and experience in dealing with his teams of fellers and skidder operators? I don't have much information on which to base an answer to these questions, but I can engage in some "educated" speculations. Most likely, by emphasizing the social and human relations side of his job, that is, by showing to the work groups what he can provide to them in terms of work assistance, personal services, etc. These services will oblige them to him, likely increase their loyalty toward him and thus his influence on them. However, the closer he becomes to his subordinates, the more difficult it is for him to take management's interests.

Nevertheless, this solution appears to be the most probable for another reason. Indeed, not only does the basis of the scaler-foreman's informal authority appear limited, but also does the extent of his formal authority because of the amount of direct control that the workers have on their work.[558] The difficulty stems from several

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factors: the dispersion of the workers over large areas which prevent any continuous surveillance,[559] and wide variations of the raw material (in volume and conditions) and the physical environment. Obviously, one major consequence of this situation is the unsuitability of authoritatian supervision.[560]

The same considerations do not necessarily apply, however, to mechanical slashing. The situation is different and so is the role of supervision. The nature of slashing technology and the working environment contributes to lower considerably the amount of control which workers possess.

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[559] The new mechanized systems of production and the facility of transportation provided by the pick-up truck have somewhat eased the work of the supervisors. "The machines which workers use are located near the roads or in places easy to reach" (Hughes in Projections, janvier 1970), and the quantity and quality of work done by the teams of fellers-skidder can be assessed by the hour simply by looking at the trees or the logs which are continuously piled at roadside.

[560] Most of the companies have been abandoning this style of management. Since the early 1960's, logging organizations have been greatly influenced by a "human relations" movement. Courses, seminars and conferences were attended or organized to give supervisors and other management personnel basic training in the new approach to supervision. Despite his first denial that anything had changed in management policies, the general superintendent of one company indicated that this was probably the most important. "It is always the same thing as it was twenty years ago: to produce wood at the lowest cost possible. Thus the general principles have not changed. However, there is one thing. Maybe we give more importance to each individual who works for us. When I started here (at the end of the 1940's), it was about like in the army. It was a big organization. We had from 3,000 to 4,000 men during a 4 to 6 month period. It was thus impossible to know everybody by their first name and impossible to know everybody's problems" (interview with the general superintendent of logging operations, Price, Saguenay-Lake St. John Division). Several other persons mentioned the same thing in interviews, among them the director of personnel of QNSP.

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On the technological side, the high capacity and expensiveness of the slasher creates from the beginning a pressure to produce on the operators. They are also under the pressure created by the trucks waiting to be loaded. Finally, since mechanical slashing involves the combination of three or four different operations in a technically and spatially integrated system, it decreases the amount of individual control while increasing team control and the need for coordination.

On the raw material and physical environment side, conditions also contribute to diminish operators' work control. The raw material is much more uniform even if there remains some variations in length, size and piling which affect also the rate of production.[561] The spatial integration of slashing operations gives them full visibility and makes direct visual supervision possible. It thus increases the foreman's real authority. Moreover, since the slasher moves on roads and operators are sheltered from bad weather in their cabs, variations in the physical environment have a much lesser impact on the operation and this contributes to further reduce workers' control.

What can be the role of the foreman under these conditions? The necessity of maintaining cohesion within the team of operators and

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[561] This lack of complete uniformity has, for instance, increased the importance of the loader operator's ability and made him the key man of the slashing operation. Thus he is the one who usually drives the mobile slasher when it moves along the hauling roads. This increases his social status because it is a delicate operation. Since mobile slashers weigh several tons, they easily get bogged down or even break down if they are not carefully driven. Special attention has to be paid because of the generally poor quality of the hauling roads which are temporary roads.

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of coordinating slashing and hauling operations seems to call for his administrative and social qualifications more than his technical qualifications. The amount of work control which remains for the operators and the absence of complete work routinization suggest that direct visual supervision is not sufficient to maintain a satisfactory level of productivity and that some monetary incentive should be established. Some companies recognized this since they set up a mixed system of remuneration including an hourly wage supplemented by a production bonus.

Another factor which contributes to accentuate the social side of supervision in logging is the togetherness provided by the isolation of the camp. There workers have plenty of opportunities to meet outside working hours to talk about the work or to chat about any other topic of mutual interest. However, these opportunities are limited by several features of camp life. Supervisory and staff personnel live in separate quarters from the workers and do not usually eat at the same time.[562] They also usually have separate TV rooms. The intimate and personal atmosphere which existed in the camps in the former days has somewhat been replaced by a more impersonal context with the considerable increase in the size and the heterogeneity of the personnel in the camps.

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[562] I also observed that they do not sit together. This is not caused by animosity between the workers and the supervisory personnel but more likely by an implicit consciousness about status differences.

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I. Administrative Organization

One segment of the organization which went through a great deal of change during the period under study is the administration. There were changes in personnel, in the structure of its organization, and in the equipment, methods and procedures used.

Changes in personnel were two-fold, There has been an overall reduction of personnel affected to administrative tasks. For instance, between 1964 and 1970, the accounting department of the Saguenay-Lake St. John division of Price was reduced from 104 to 63 people.[563] This reduction in personnel was consequent to a reduction in paper-work made possible by the use of new office equipment but not in a diminution of work. On the contrary, the volume of work has increased considerably.

New exigencies of qualification became also necessary either to use and work with the new equipment or to use the new methods and procedures. As a consequence, the existing personnel had to adapt to the new tasks and the new personnel was hired on the basis of its qualifications for these new tasks as well as on the basis of its capacity to adapt to further changes in the future.[564]

The structure of the administrative functions was also adapted to the new conditions of production. There was first a greater specialization of tasks and services. Thus at Price Saguenay-Lake St. John division, there are now accounting experts in chain saws,

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[563] Interview with the divisional accountant, Price, summer 1972.

[564] *Ibidem.*

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[565] Ibidem.

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in spare parts for loaders, in oil and fuel, etc. New services included, for instance, a data processing service (punching and verification).[565] There has been also a greater concentration of some services. For example, in the past, Price had pay offices at several locations (Québec, Hébertville, Chicoutimi, etc.). These have now all been concentrated at Chicoutimi.

Changes in mechanical equipment have been almost as spectacular in administration as in production. The immediate results have been a reduction in personnel and a considerable increase in the volume of information handled in a much shorter period of time. For instance, the use of an electronic calculator brought the following changes at Price: mechanization of pay accounting in the late 1940's, of stores accounting in 1952 and of all other accounting procedures in 1965.[566]

New administrative methods and procedures were also introduced, not only because they were needed, but because they were made economically feasible (and even physically feasible) by the new mechanical equipment. These new methods include detailed budgeting[567] and management by objective.[568] Budgeting associated with some form of responsibility-based accounting (cost centers) has become the standard

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[565] Ibidem.

[566] Ibidem.

[567] Rouse, op. cit., pp. 1 and 2.

[568] Interview with the general superintendent of logging operations, Price, Saguenay-Lake St. John Division.

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[572] Ibidem.

method of administrative planning and control. This represents a change in time orientation from an emphasis on the past (experience) as a guidepost to an emphasis on the future.[569] This is apparent, for example, in the following description of budgeting as a means of control.

> If each manager has been instrumental in preparing his own budget and if the concept of responsibility accounting has been adhered to, it follows that his budget becomes a goal to which he is totally committed. This budget then becomes a yardstick by which his performance can be measured.[570]

All these transformations in the administration were an answer to needs originating in the production system[571] as well as elsewhere inside and outside the organization.

The most pressing needs were probably those related to the new system of production. The technology of logging has been changing rapidly and "in accounting terms, a piece of equipment gives us as much problem as an employee".[572] The new units of production have become much larger. The demise of the jobber system put under the direct responsibility of the company for the first time, most of the variable costs which were associated with production. Finally, there

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[569] See above, the discussion on planning and research, for more details about this change in orientation.

[570] Rouse, op. cit., p. 8.

[571] "We [the accounting department] are a service. We had to adapt to changes in production" (interview with the divisional accountant, Price, Saguenay-Lake St. John Division). "The role of the accounting organization [is] defined as being one of support and it [is] responsible for all technical aspects of the system, and for insuring that the information being produced is in accordance with the needs of management" (Rouse, op. cit., p. 61.)

[572] Ibidem.

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was an increasing demand for more information, an information of a greater complexity stemming from different sources:

(a) "the increasing complexity of industrial organizations";[573]

(b) the movement toward "management decentralization which has been motivated by this complexity as we search for the "best" methods of attaining corporate objectives and goals, while at the same time developing capable, experienced executives";

(c) "the delegation of authority to a decentralized management for most of the expense budget";

(d) "the increasing emphasis being placed upon tight cost control, coupled with raising the productivity of our labour and capital";

(e) "management's recognition of the need for sound planning and tight control if its enterprise is to be successful";

(f) management's realization of the inadequacy of presently existing information and techniques;

(g) demands from employers' associations, unions and governments.[574]

Another major factor which contributed to the administrative reorganization was the problem of integration created by the numerous mergers which took place in the 1960's at Price, Domtar and Consolidated-Bathurst. Here is how the situation was described by a member of Domtar Management.

> When a company expands rapidly by following the route of acquisition there tends to be a sharp increase in information requirements. This is due to a number of reasons, including the increasing complexity of

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[573] Rouse, op. cit., pp. 3 and 4. All items from the same source, except (g).

[574] Governments' needs for information (income and profit taxes, sales taxes, pension funds, etc.) have increased considerably with the expansion of the Welfare State (interview with the divisional accountant, Price, Saguenay-Lake St. John Division). Companies complain

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the corporate tax structure. However, another important reason is the reluctance of some entities to adopt a standard reporting system. This problem predictably developed at Domtar and in woodlands this resulted in a proliferation of auxiliary information for effective planning and control in a rapidly changing environment. Consequently, many anomalies were incorporated into the accounting system, and by 1967 the following weaknesses were apparent in woodlands management reports:

1. Some woodlands divisions reported on a calendar year basis, others on a woodlands production year basis.

2. All woodlands budgets were presented on a calendar year basis, as per the financial requirements of the corporation. Thus, woodlands budgets were prepared in August for the following year, and usually approved early in October. This meant that for those operations using a river drive delivery system, production of the pulpwood covered in the budget had begun in May. Thus, prior to approval of the budget by senior management, nearly half of the expenses had already been incurred.

3. For divisions operating on a woodlands production year basis, the accounting period for direct costs was April to May (or March to April) while period costs were accounted for on a calendar year bases.

4. The most important weakness was that no systematic procedure existed by which senior management could be appraised of the performances of its nine divisions, with respect to the approved budgets and the final woods costs.[575]

As a result, while the new administrative policy of these companies emphasized decentralized financial responsibility, they

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about it, sometimes bitterly, because of the cost involved in its preparation and also, naturally, for other more political or ideological motives.

[575] Rouse, *op. cit.*, pp. 9 and 10.

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experienced a period of administrative centralization aimed at designing, implementing and assessing new administrative methods, norms and procedures. This was very well expressed by some local management personnel in comments like the following:

> The divisional manager has complete authority except [...] over staff positions in the department of personnel and industrial relations. In this case, the company centralized control in Quebec [head office of the company] because of the great importance of the cost of labor and the increasing complexity of labor-management relations. Since last year, the bargaining procedures included somebody from Quebec. The transfer of Mr. X [divisional head of industrial relations] to Quebec is part of the same trend. We feel more and more the presence of W [his superior at the head office]. We keep on receiving requests of information and standard procedures from them.[576]

J. Transportation and Communications

Slow and inefficient transportation facilities and almost complete isolation (lack of communication) have been traditionally the most serious physical constraint which logging organizations faced in planning and carrying their operations. If the problems related to physical distance have not been completely eradicated today, they have been greatly overcome with the development of comprehensive and rapid transportation facilities and instant telephone and radio communications. As it was implicitly or explicitly apparent in the preceding sections of this and other chapters, these changes have had a considerable impact on logging operations and logging organizations.

For one, some of the most important logistic problems have been

[576] Interview with the assistant director of personnel and industrial relations, Price, Saguenay-Lake St. John Division.

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solved. Traditionally, these problems were crucial to the organization and completion of logging operations. The transportation of men, horses, equipment, food and other supplies as well as the transportation of pulpwood to streams, rivers and lakes depended basically on the horse and only secondarily on the railroad and waterways. The system was thus established according to the horse's needs and capacity, that is, relatively small loads and short daily distances. Companies generally had a network of big and small "depots" (respectively at about 25 and 12 miles distances) along the main river valleys related to a "base" located at the headquarters of the division.[577]

Transportation was very slow, difficult and unreliable. The best solution was to move everybody and everything on the site of the operations at once at the beginning of the logging season.

Communications were also in very poor conditions. There were no telephone links and the mail was coming only once in a while. Logging camps could be in complete isolation for weeks at a time.

The first breakthrough was the construction of roads to transport men and supplies by truck and snowmobiles and the establishment of telephone lines between the base and the depots and camps. These were considerable improvements but still lacking in efficiency and reliability. The first roads were of bad quality and poorly maintained

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[577] See, for instance, G. E. Lamothe, "Souvenirs d'un pensionné", Trait d'Union, mars-avril, août and septembre-octobre 1966. According to him, the first truck road was built in 1927 and the first bulldozer was bought in 1936 and created a scandal because it was to take the place of people (Price, Saguenay-Lake St. John Division).

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during the winter. Telephone lines were not always clear, often damaged by natural hazards and their use limited to very few people and to two persons at any one time.

The gradual expansion and upgrading of the road system following the use of trucks to transport pulpwood, the extension of logging operations to fall and summer and the generalization of car ownership modified completely the problems of logistics. Since supplies could be moved rapidly and in large quantity at any time (daily deliveries are now possible everywhere), the maintenance of large stocks of food and other supplies was eliminated and with it the depots in a first phase, and the base in a second phase (see Figure 26).

Telephone lines were progressively replaced by radio communication systems, more reliable,[578] much easier and less expensive to maintain and repair and much more flexible. Now almost all points on a limit can be instantly reached from any other point and from the divisional headquarters and district office (divisional head office and camps, buildings within camps, harvesting sites and camps, etc.).

Besides solving logistic problems, these improvements in transportation and communication have greatly simplified the functions of control and supervision.[579] Management and staff personnel at the divisional office have instant access to any kind of information which

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[578] Probably not true of the first radio systems but certainly so of the more recent ones.

[579] Silversides, op. cit., p. 2.

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FIGURE 26

Three Phases in the Evolution of Transport in Logging (Men and Supplies)

(1) Horse	(2) Truck and Bus (early road system)	(3) Truck and Car (present road system)
Base ↓ Small Depots ↓ Large Depots ↓ Camps	Base ↓ Camps	↓ Camps

they need or desire from the operations and can transmit information or orders the same way to whomever they want.[580]

Because of its great flexibility, the system has contributed considerably to develop coherence within the organization and an unusual sense of familiarity between people at different levels of management. With such a system, there is hardly any secret for anybody

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[580] The radio system of communication has been very well received and people have rapidly adapted to its use. Rural culture is essentially a "verbal" culture not a literate culture. Poorly educated, when they could write at all, woodsworkers always disliked to communicate in writing. In the isolation of the logging camp, a great deal of practical knowledge and life experience has been shared in the long conversations that fill the long hours of inactivity. This factor has contributed to slow-down processes of formalization. However, verbal communications are certainly a more rapid and efficient way to transmit orders and informations.

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since so many people can listen in at the same time.[581]

The system also contributes to eliminate many otherwise costly delays in the maintenance and repair of the mechanical equipment and its efficient use.[582]

Safety has been improved very much. Accidents can be reported rapidly, injured people treated or otherwise evacuated rapidly to hospitals or other treatment centres if necessary. Consequently, where in the past companies maintained small dispensaries and in a few cases small clinics with medical and para-medical personnel, they have now only first aid trained personnel to deal with safety casualties.[583]

The enthusiastic comments by an experienced general superintendent of operations somewhat summed it all:

> The system [of communication] which we have, it is a gold mine. We cannot put a price on it, evaluate it. It helps to create a team. Everybody knows. First, there is nothing confidential. We have 142 units I believe. Two networks: one

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[581] It was not an objective of this study to do a detailed analysis of the system of communication and the formal and informal aspects of the day-to-day life of the organization but it would be a fascinating subject. In this respect, the camp clerks in charge of the radio system are in a unique position. In very few organizations (maybe no other) are few employees like them so well informed about almost everything, not only concerning the organization itself but also other employees' personal lives. Indeed, a great deal of what in other organizations is considered and treated as confidential information, is here transmitted, talked about and so on.

[582] Interview with the general superintendent of logging operations, Price, Saguenay-Lake St. John Division.

[583] Interview with the division manager, Consolidated-Bathurst, St. Maurice Division.

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has 80 units and the other 40 [sic]. Thus everybody listens when I speak. But I think it is good.

For the operations, it is priceless. Decisions are immediately taken by the foreman and his men. In case of emergency, like forest fires or accidents, we save lives and money.

This is due to the spread of our operations. The company spent a fortune before to maintain telephone lines and poles every one hundred feet up to the 50th parallel in three different branches. Oftentimes there was no communication and we could only speak to one person at a time. Now we can talk to a whole river.

The system was installed four years ago in the first sub-division, three years ago in the second and two years ago in the third. We have a system which is working 24 hours a day. Moreover, key men can get on the system in their car when they are at home.[584]

K. Environment

From time to time in this chapter as well as in the two preceding chapters, the environment of the organization was referred to explicitly or implicitly as an important variable to understand the different aspects or features of logging and logging organizations. Naturally, the relevance of considering the environment to understand organizational realities is not particular to logging. However, logging is not an activity entirely comparable to other activities and we should indicate what is particular to the environment of logging which can be associated with these differences between logging and other activities.

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[584] Interview with the general superintendent of logging operations, Price, Saguenay-Lake St. John Division.

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In this section, I will focus on the physical environment which appears to be the most significant and particular one in logging. The economic environment was dealt with in Chapter 3, the inter-organizational environment was described in Chapter 4, and labor will be analyzed in the following chapter (Chapter 7).

The physical environment of logging can be divided into three major components: (a) the timber stand, (b) the terrain, and (c) the climate. Each of them varies widely and in many relevant aspects as can be seen by the number of factors listed for each in Table 63.

TABLE 63

Environmental Factors Affecting the Productivity of Logging Operations

(a) Stand Factors	(b) Terrain Factors	(c) Climatic Factors
Cover type	Terrain type	Temperature
Species composition	Soil Classification	Precipitation
Forest site type	Drainage class	(rain or snow)
Stand per acre	Topography	Snow depth and
Trees per cunit	Ground roughness	density
Residual stand	Grades and Distances	Ground wetness
Saplings		or frost
Brushiness		Wind velocity
Branchiness		

SOURCE: W. D. Bennet and H. I. Winer, "A Study of Environmental Factors and Their Effect on the Productivity of Tree-Length Skidding", Pulp and Paper Research Institute of Canada, September 1964, R. N. No. 47, pp. 4-7.

Compared to other major harvesting activities (agriculture, fishing and mining), logging seems to be the activity with the most variable and the most unpredictable environment (see Table 64). Indeed, agriculture which is the closest harvesting activity to logging is affected mostly by climatic varia

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by climatic variations. Under normal climatic conditions, each type of crop (raw material) is uniform and grown on a uniform and relatively flat terrain. Obviously these conditions may change if there are too wide fluctuations in climatic factors. However, these fluctuations are not as wide and extreme as they are for logging since agriculture is a seasonal activity limited to the warm period of the year.

TABLE 64

Environmental Characteristics of Four Major Harvesting Industries

Activity	Characteristic			
	Raw Material	Terrain	Climate	Period of Operations
Agriculture	Uniform	Uniform	Variable	Seasonal
Fishing	Variable	Uniform	Variable	Seasonal
Mining	Variable	Uniform	Uniform	Annual
Logging	Variable	Variable	Variable	Annual-Seasonal

Fishing is also a harvesting activity, even if of a different crop. Like logging, it is dependent on climatic conditions and its crop is not uniform. However, it is a seasonal activity which is not performed during the winter months and its terrain, the sea, is uniform under normal climatic conditions (mild winds). Thus, even if its crop is more variable (or better said, more unpredictable)[585] than logging's crop, fishing is performed under less difficult environmental conditions. Mining, which we classified here as a harvesting activity by stretching slightly the meaning of the term, does not present the same environmental difficulties either. Besides being

[585] Certainly less visible and "palpable" (even with modern electronic equipment).

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also an annual activity, its only other common characteristic with logging is the variability of the ore body (raw material). Naturally, this variability is not the same for all ores and some ore bodies are more uniform or predictable than others based on the results of boring, but in all cases, except maybe oil, there are variations in the ore body (density, form, etc.).[586]

Operating in such a variable environment has very important effects for logging.

For one thing, it affects considerably the level of productivity of workers as well as machines. In a study of tree-length skidding, Bennett and Winer found that between 60 and 70 per cent of the variation in productivity of that phase of operations was associated with environmental factors.[587]

Environmental factors present also a real challenge to engineers and equipment designers. Good equipment must be able to perform under extreme weather conditions varying widely (for instance, in temperatures ranging from 90 degrees down to 40 and 50 degrees below zero). It must be safe and durable to keep the costs of maintenance and repair

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[586] One could also consider the degree of safety of these activities for the workers involved. In this respect, logging again appears to rank high on the accident hazard list. Agriculture is certainly the safest activity of all. Next, would be fishing. Finally, mining and logging. Underground mining is certainly the most dangerous activity in general since it involves the risk of one's life very often (especially coal mining). Logging hazards are mostly related to the use of hand tools (especially the chain saw), to the manipulation of logs in transfer operations, to falling trees (dead trees or newly cut ones) and to the drive.

[587] Bennett and Winer, <u>op. cit.</u>,p. 14.

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588 Idem., p. 1.

as low as possible. As Bennett and Winer put it:

> Mechanical equipment must be designed to meet or overcome the generally unfavorable conditions in the forest areas it will be required to traverse or work in. Moreover, the forest engineer must have a sufficient knowledge of the varying environmental complex within which the forest grows to enable him to select the right equipment and to allocate it to areas where it will operate effectively and economically.[588]

A major organizational consequence is that a great deal of control on the job is left to the workers since production activities cannot be as routine as they should theoretically be in a mass production process of a simple product. This condition itself is associated with the piecework system of remuneration, the weak type of supervision found in logging and the individual ownership of some of the means of production.

To deal efficiently with this peculiar environment, logging organizations must possess a flexible structure. This explains that their production functions are so decentralized and that their operations, even if they are concentrated in few large camps, are dispersed over large areas in order to balance the cost of wood from year to year and to avoid being hurt too hard by environmental hazards like forest fires, floods, etc. However, one can trace back to the same environmental conditions the relative centralization of financial decisions. Under such variable conditions, decentralization of financial decisions at the local level would likely lead to the overspending of considerable amounts of money on road building, supplies, overtime, etc. All

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[588] _Idem._, p. 1.

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these could be very well camouflaged and justified by local management in the name of "our local conditions" or "our peculiar conditions here". One way out of this problem is for the organization to institute detailed planning and budgeting and to put the direct control of all non-budgeted expenses at the higher level of management.

However, this has not been completely successful and companies have been particularly concerned with budget "padding". Of course, budget "padding" is nothing new in organizations. It is an old strategy used by subordinates to increase their control, power and prestige. In logging, however, it has fulfilled a particular function. It has been a means for subordinates to protect themselves against bad financial results in situations where budgetary provisions have to be made on items about which information is lacking or over which there is not enough control because the raw material and the conditions of the physical environment are too variable. Usually, the best one can do in such circumstances is to base future estimations on the situation of previous years. But, in logging, even this method is often of limited use because past situations are subject to varying interpretations. For instance, if, in the past, overspending has occurred in road construction, it is practically impossible to agree on the cause of it. Past conditions do not exist anymore and are difficult to reconstitute because of their complexity: the forest has been destroyed, exact records of climatic conditions do not exist etc.[589] As a result, one interpretation is worth another interpretation.[590]

[589] See Table 63 above for a list of the variable factors involved.

[590] One possible solution is the experimental planning done at Quebec North Shore Paper (see pp. 383-385 above).

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As far as the present conditions are concerned, sophisticated techniques of aerial photography and cartography provide companies with excellent information about the forest stands and the conditions of the terrain. However, the use of this knowledge is limited because of its statistical nature which includes errors and variations. For instance, from the knowledge that the stands in two given cutting areas are eighteen-cunits-per-acre stands, one cannot conclude that they are identical for production purposes. They are likely to be different in terms of the concentration of the merchantable stand, the nature and volume of the residual stand, etc. As a result, the cost of harvesting these two areas will not be the same. These variations thus open the door to differences in interpretation between foremen and other management officers concerning the quality of the stands, the best way to harvest them, and the various costs involved in the harvesting operations.

Due to this uncertainty, foremen and other lower management officers are under pressure to play it safe by emphasizing the difficulties of the physical environment and the lower quality of the forest stand in order to justify the budgeting of higher costs of production. In doing so, they are likely to end up winners no matter what happens. If the operation year turns out to be really bad (due to poor weather conditions, for instance) the costs abnormally high, financial results will not be too far from the established forecasts and bad losses will appear in the books. If, on the contrary, the operation year turns out to be exceptionally good, the savings or "profits" shown will boost the standing of those responsible for it with managment.

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Finally, if the operation year is an average one, they will be able to end up with a small surplus or a balanced sheet which will be a proof of good administration. Moreover, the unused part of budgeted costs can always be allocated to the improvement of living conditions in the camps and small social expenditures[591] which help to make workers more satisfied and thus to increase productivity and lower turnover and absenteeism.

In order to limit budget padding to its minimum, middle and upper management officers usually study their subordinates' budgets in detail and, in at least one company, a financial controller has been appointed with the unique responsibility to screen budgets and monthly reports of expenditures in order to find loop-holes in the system of administrative controls. But, as one company found out, budget control is itself limited by environmental constraints. This company tried to enforce a new system of control on its production centers in which budget performance was the key measure of administrative efficiency but had to keep its period of review to once a year because of "uncontrollable factors".

> To achieve the objectives it was early decided that the only valid standard for measuring performance was a well prepared budget. Since <u>the timing of woodlands expenditures</u> is influenced to a large degree by <u>many uncontrollable factors</u>, it was recognized that an annual budget could not be further refined to a monthly basis for comparisons with month-to-date performance.[592]

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[591] Such as movies and other recreational activities.

[592] Rouse, *op. cit.*, p. 12.

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Environmental factors have also contributed to limit the advantages derived from the specialization of occupations, equipment and organizational segments, and the greater interdependence and integration which are usually associated with it. The costs of inactivity due to adverse environmental conditions or to mechanical breakdowns have increased considerably. Companies are trying to maintain some degree of polyvalence within the organization at the local level in order to offset these problems.[593]

One should note also that because of the uncertainty created by the environment, formal expertise cannot completely replace experience. Thus, because it could not rely on monthly budgeting for financial control, the company mentioned earlier was forced to rely instead once more on the experience of its management personnel.

> However, by taking advantage of the knowledge and experience of each manager who controls expenditures, a reasonable accurate picture of performance could be obtained by having him estimate, on a monthly basis, the final cost for his activities during the accounting period. Any anticipated variances from budgets could then be noted and if significant, explained.[594]

In fact, the expertise which companies are in need of is a mixture of experience and formal education and training. The experience of the woods cannot be transmitted by books or communicated in courses.

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[593] Experienced camp foremen for instance used to keep some road construction or road maintenance work and other works in reserve to be used to keep production workers active whenever they are momentarily forced to inactivity in their regular work.

[594] Rouse, op. cit., p. 12.

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One gets it in the field. What is in reality unpredictable and non-uniform cannot be formalized. This is why field training is so crucial for management in logging. Generally, companies always send young forest engineers fresh from the university with experienced people on the operations for training periods of variable lengths.

In summary, the characteristics of the environment in which logging organizations operate contribute clearly to prevent logging organizations from becoming full-fledged industrial bureaucracies. As one district superintendent expressed it to me, logging operations tend more and more to function like a mill but not entirely.

> Now we would be half way [toward functioning like a mill]. In accounting and administration, we have already reached 90 per cent. He does not believe [like me] that it is possible to reach 100 per cent. Rather 80 or 85 per cent because in the woods it is different from the mill: there are more unknowns and imponderables.[595]

L. Systems of Remuneration

There have been traditionally three systems of remuneration in use in the logging industry affecting three different groups of employees. In the first system, employees are paid on a monthly basis and receive a fraction of the monthly rate for every period of work inferior to one month. The occupational categories falling under this system are supervisory, managerial, most staff and maintenance personnel such as cooks, scalers, clerks and skilled workers. Another group of employees is paid on an hourly wage basis. This system was practically

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[595] Notes from an interview with a district superintendent reported in Legendre, op. cit., p. 156.

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non-existent in the old logging operations where its equivalent was the daily wage. However, in the modern mechanized operations, due to changes in mechanical maintenance and repair and the daily scheduling of operations, the hourly wage system was established to cover a number of occupations in maintenance and repair, including mechanics, welders, electricians, etc.

The third system, production or piecework wage, has been the traditional form of remuneration for all production workers except the river drivers who were paid on a monthly or daily basis. However, following the changes in the production system brought by mechanization, the question was raised whether the system of remuneration should be maintained or changed, whether piecework was still adapted to the new production processes, the new social and economic aspirations of the workers and the economy of the large enterprises. In fact, some changes were done. Hourly wages with or without bonuses were established for some occupations, but most of the production workers remained on a piecework basis although the majority were put on group piecework instead of individual piecework.

Changes in the remuneration systems are important to analyze because they are closely related to job control and the control over and ownership of the means of production. In logging, these changes were particularly influenced by the series of factors which have been the object of analysis all along. The focus of the discussion will be on the change from piecework (production wages) to time wages. Before analyzing the evolution in logging, I will briefly review the nature, functions and advantages of piecework.

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1. Nature

Piecework wages consist of tying the earnings of an employee to his production measured in volume or number of parts or units. The relation between production and wages may be constant in the sense that there is a one-to-one relation between earnings and production, or variable in the sense that the relation will change as the volume of production increases usually in the direction of a decreasing rate of earnings as production increases past certain levels. Piecework wages apply to individual workers as well as groups of workers. In each case, there are different advantages and disadvantages.

2. Functions or advantages

Production based remuneration has been the object of countless studies. A review of these by Marriott[596] and the results of an extensive multi-national study carried on in the European steel industry[597] point out to a complex network of advantages (functions) and disadvantages (dysfunctions) for the various organizational parties concerned: employer, employee and union. On the basis of Bolle de Bal's classification, these advantages and disadvantages can be summarized in the following tables (see Tables 65 and 66). An interesting aspect of his analysis is that he separated manifest and latent functions and dysfunctions, and applied his distinctions to the three major parties concerned, the employer, the employee and the union,

[596] R. Marriott, Incentive Payment Systems (London: Staples Press, 1961).

[597] B. Lutz and A. Willener, Niveau de mécanisation et mode de rémunération (Luxembourg: Editions Luxembourg, 1960). See also Marcel Bolle de Bal, Problèmes de Sociologie du Travail (Bruxelles: Editions de l'Institut de Sociologie, Université Libre de Bruxelles, 1969).

TABLE 65

Functions of Piecework or Production-Based Remuneration

Nature	Unit of Reference		
	Employer	Employee	Union

TABLE 65

Functions of Piecework or Production-Based Remuneration

		Nature	Unit of Reference: Employer	Employee	Union
Manifest Functions	Primary	Economic	Cost reduction	Income increase	
		Psychological	Stimulation (incentive)	Reward for personal contribution (effort and responsibility)	
	Secondary	Economic	Cost control Competitive position on the labor market	Income control High income in case of wage freeze	
			Autonomy of the organization		
		Organizational	Improvement of methods (work studies and budget accounting)		
Latent Functions	Primary	Psychological	Interest	Interest (against monotony and boredom)	
		Socio-economic	Compromise with union	Sharing of results of technological and economic progress	Compromise with management
	Secondary	Psychological	Regulation	Freedom from management authority (hierarchical control and managerial discretion)	
		Sociological	Struggle against unions' influence		Control over and rejection of managerial power

SOURCE: Bolle de Bal, _op. cit._, p. 157.

TABLE 66

Dysfunctions of Piecework or Production-Based Remuneration

Nature	Unit of Reference		
	Employer	Employee	Union
Economic	Establishment and	Insecurity and variability	

TABLE 66

Dysfunctions of Piecework or Production-Based Remuneration

	Nature	Unit of Reference		
		Employer	Employee	Union
Manifest Dysfunctions	Economic	Establishment and functioning costs Decline in quality of work done Deterioration of material and equipment	Insecurity and variability of income Income vulnerability to unfavorable economic conjuncture Job insecurity	
	Psychological	Devalorization of the work force (due to fatigue and lack of compliance with safety rules)	Increase in the pace of work (fatigue and physical exhaustion)	
	Psycho-sociological	Mistrust of workers Distortions in the hierarchy of qualifications Disequilibrium in the interdepartmental wage hierarchy Tensions due to the inequality of individual salaries	Negligence of safety rules Tensions due to the fear of not respecting the norms to achieve expected earning level Deterioration of solidarity and friendship among workers	Obstacle to an equilitarian wage policy
	Socio-economic			Atomization of wage increase
	Sociological			Individualization of work relations between employer and employee

TABLE 66 (cont'd)

	Unit of Reference		
Nature	Employer	Employee	Union

TABLE 66 (cont'd)

	Nature	Unit of Reference: Employer	Employee	Union
				Difficulties of control over norms, production and salaries
Latent Dysfunctions	Economic	Cumulative effect of basic salary increases	Decrease in real wages	
	Technico-economic	Obstacle to modernization of work methods (fear of workers' and unions' reactions)		
	Psycho-sociological	Deterioration of workers' motivations	Decline in motivation toward professional training and qualifications	
	Sociological	Mistrust of unions		Weakening of labor consciousness; atomization of bargaining; management manipulations; weakening of bargaining power

SOURCE: Bolle de Bal, op. cit., p. 163.

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assuming that what might be advantageous to one party might not be to the others since the relations between employers and employees are largely conflictual.

Basically, for the employers, piecework is desirable because it acts as a direct financial stimulus for the workers to increase their efforts since they are rewarded in direct proportion to their output. This results in increased output, lower costs of production and higher earnings for the workers.[598] Moreover, it decreases the need for direct supervision which represents cost savings for the employer and greater freedom from management for the workers. The employer can also establish more accurate cost projections and simplify his clerical and accounting procedures. The work studies required to establish the rates lead furthermore to improved organization of work. Piecework wages are also usually simpler to understand for the workers than other forms of remuneration.

As for group piecework wages, they increase some of the previously mentioned advantages as well as add some of their own. Thus, on the one hand, they simplify clerical and inspection systems, time-studies and cost systems. They also increase the volume of production. On the other hand, "the spirit of team work increases mutual helpfulness, reduces labor turnover, and decreases the middle-time due to

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[598] In summary, production wages "reduce unit labor costs by allowing workers to earn higher wages than they would get under ordinary circumstances, in exchange for more production" (Sylvia Ostry and M. A. Zaidi, Labor Economics in Canada (Toronto: Macmillan of Canada, 1972, 2nd Edition), p. 185.

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[599] Marriott, o

[600] Idem., p. 5

[601] Ibidem.

emergencies or tool difficulties".[599] It contributes also to the elimination of inefficient workers and gives more flexibility to management to move workers to different operations when needed.

Obviously, the balance sheet is not only positive and piecework wages have serious drawbacks. Output quality has a tendency to deteriorate as well as the equipment and material used in the production process. Workers tend to oppose and use restrictions of output to prevent modernization programs in methods of work and new machines which are proposed or introduced "because of the fear that the job may be restudied and earnings reduced".[600] There is a pressure for higher minimum wages since workers tend to see their highest earnings as normal. The establishment and operation of the remuneration system increases the amount and cost of clerical work. Workers tend to overwork themselves undermining their health and to disregard safety regulations and thereby increasing the risk of accidents. The system generates also jealousies and conflict among workers "because some are able to earn more than others or because fast workers are dissatisfied with the slower or older workers in the group."[601] There are also difficulties in setting the piece or bonus rates accurately. If they are too low, they create dissatisfaction because workers are under pressure to work too hard. If they are too high, workers earn too much and tend to slow down in order to avoid a revision of the rates. Piecework contributes also to deteriorate

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[599] Marriott, op. cit., p. 66.
[600] Idem., p. 52.
[601] Ibidem.

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602 Idem., p. 6

603 Idem., pp.

workers' work motivation and to create tensions due to the insecurity and variability of income and the fear of not respecting the norms to achieve the expected income levels. This system generates also mistrust on the part of the employer vis-à-vis workers and union and vice-versa. Furthermore, the atomization of the wage increases and the individualization of work relations contribute to weaken the union's organization and bargaining power. Piecework tends finally to eliminate incentive to personal professional training since increases in income do not depend much on professional qualification.

Again, group piecework tends to accentuate some of these problems and creates its own. It decreases individual incentive and, as a result, fast workers slow down and slow ones show little improvement, thus increasing fast workers dissatisfaction.[602] The calculation of earnings becomes very often more difficult. There is "much complaint of shirking or slacking due to weakening of self-interest--especially in the larger or more scattered groups".[603] Finally, all these problems and others are increased by fluctuations in the composition of work groups.

Despite its ambivalence, production-based remuneration has shown itself to be particularly useful in and suited to the following conditions:

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[602] _Idem._, p. 66.
[603] _Idem._, pp. 66-67.

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(a) when workers control the output which is due largely to their energy and skills, that is, in situations where workers have a high degree of job control and of control over the means of production. The system rewards the more productive and constitutes an incentive to the more reliable and experienced workers;[604]

(b) where the cost of labor account for a large percentage of the total cost;

(c) when the value of the product is low;

(d) where the lack of judgment does not affect product value or quality;

(e) where workers' output is not difficult to ascertain or measure;

(f) where quality considerations are less important than quantity considerations;

(g) where it is possible to provide a steady flow of work to the workers;

(h) where close supervision is not possible because workers are in separate areas for safety or environmental reasons.

To this list of circumstances where production wages are particularly good from the point of view of the employer, I would like to suggest also situations where the output is far from stable and predictable due to variability of conditions in the working environment and the raw material or the resource.

As for group production wages, Marriott indicates that it is especially warranted (a) "where the operating of one machine depends on several workers and their output cannot be separately measured"; (b) "where work is closely related and interdependent"; and (c) where administrative savings are particularly wanted.[605]

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[604] Ostry and Zaidi, op. cit., p. 185; Wackerman et al., op. cit., p. 84.
[605] Marriott, op. cit., p. 64.

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[606] Idem., pp

[607] Idem., pp

The analysis of the situation of production wages in logging should also take into account a number of factors which influence productivity and financial incentives. According to Marriott, social scientists have discerned three categories of such factors: (a) external and environmental factors; (b) working groups factors; and (c) internal and personal factors.[606] In the first group of factors, Marriott mentions the strong influence of physical working conditions on the performance of workers in industry, the role of the factory organization (for instance, the need for the trust created by the employer especially in periods of technological change), technical efficiency and the quality of formal industrial relations (together with good informal relations), and the influence of social and cultural factors external to the factory in order to understand the reaction of workers to financial incentives. The second group of factors concerns conditions "arising from the formal and informal relationships in the worker's immediate group" (for instance, group integration as a factor of good productivity) and includes also the effects of supervision (for instance, the limited influence of supervision "on productivity when the pace of work is prescribed by an incentive payment system"). Dealing with the third group of factors, Marriott focuses on "the relation between individual and the work or operation he is doing" mentioning how important are the standards of output established by the piecework workers, "their almost constant evaluation of what they have accomplished and what they aim for," and their need to know the results of their work at frequent intervals.[607]

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[606] Idem., pp. 208 and following.

[607] Idem., pp. 230 to 234.

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Such is the situation with piecework remuneration in general. What is the situation in the logging industry? Let us deal first with the traditional logging system.

3. Piecework and the Traditional Logging Organizations

What is striking about the piecework system in the traditional logging operations was its high degree of functionality for both employers and employees (probably more so, however, for the employers). Remarkable also was the high degree of similarity between the ideal conditions for the operation of piecework remuneration and logging conditions (see Table 67). Due to the fact that close supervision was impossible because of the wide dispersion of workers over a large area and the difficulty of communication, piecework remuneration was the best indirect and impersonal instrument of control that management could use to maintain a satisfactory level of productivity. It was also probably the best strategy to reduce costs in view of the fact that the employer's control over production and productivity was considerably reduced by workers' control over the means of production and the uncertainty created by the wide variations in the resource and the physical environment. By doing so, however, the employer was shifting most of the cost of this uncertainty on the shoulders of the employee. The latter was the one that had to bear the complete loss of earnings due to bad weather, poor wood conditions, equipment breakdowns, etc. The employer could do this for several reasons but one had to do with the nature of the production process. On the one hand, since the various phases of the production were very fragmented in time and space, needed a very large labor force and were poorly

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TABLE 67

Production Conditions for Which Piecework Remuneration is Well Suited and Logging Operations Conditions

A. Ideal Production Conditions for Piecework Remuneration	B. Similarity of Logging Operations Conditions with A.
1. High degree of workers' control over output--job control and control over the means of production	Very high
2. Costs of labor are a large percentage of total costs	Very high
3. Value of the output is low	Very high
4. Product value or quality not much affected by lack of judgement of workers	Very high
5. Workers' output not difficult to ascertain or measure	Very high
6. Quality considerations less important than quantity considerations	Very high
7. Possibility of providing a steady flow of work to the workers	Very high
8. Close supervision very difficult	Very high
9. High degree of variation in the resource and the physical environment of the work place	Very high

mechanized, disruptions here and there in the production system were not very costly. Total production was not much affected by them. On the other hand, since production could be very much affected by adverse weather conditions, piecework wages represented the best insurance against considerable financial losses due to the forced inactivity of the large labor force.

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This system of remuneration was also functional with the seasonality of logging operations. Operators had to rush within the short period of operations to complete their contracts and piecework was a good incentive to increase the level of productivity.

Production wages fitted equally well with the characteristics and attitudes of the woodsworkers. For most of them, as is described in Chapter 7, logging was a second source of income which they welcomed as a cash supplement to their low farm incomes. They were interested in earning as much as they could within the winter months during which they could work outside. Moreover, the freedom from management control and supervision which piecework remuneration gave them corresponded very much to their independent and individualistic mentality.

4. Piecework and the Modern Logging Organizations

This system of remuneration came progressively under pressure as conditions started to change in the early 1950's. The pressure came from different sources: (a) changes in the system of production (mechanization and organization of work), (b) changes in the scheduling and duration of operations, and (c) changes in the conditions and attitudes of the labor force.

Changes in the system of production, as we have seen earlier, involved relatively large investments in machines and equipment and a much greater integration and structuring of activities which required much more stability and regularity in the production. As one specialist put it:

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[608] Wackerman

> When heavy investments are incurred as in mechanizing harvesting operations, the man-day or man-hour output is less important than the machine-day and the machine-hour output. It is essential, therefore, to keep the machines working at capacity, and thus the men who will keep the equipment producing are employed at an hourly, daily or monthly rate. Management cannot afford dilatory workers who are satisfied with half a day's wage or half a day's work.[608]

Another important problem with piecework is that it tends to encourage the over-utilization of the equipment and to increase the frequency of breakdowns. This has several important and undesirable consequences which all contribute to increase the cost of production significantly. On the one hand, as the equipment becomes much more expensive to buy, to lease or to rent, production losses become very costly. More so since the productivity of the new equipment is particularly high. Moreover, with the greater inegration between various phases of the production process in the new systems of production, breakdowns at any point in the process are more likely to cause disruptions in the other phases and to create a greater loss of production. For instance, a breakdown in a mobile slasher involves not only the machine (two or three men) but also the trucking operation and the team of truckers involved (about four to six truckers and their machines). If the breakdown is serious, as I have been able to observe in several cases, the work stoppage may last for several days (maybe more), disorganize the work schedule for several weeks and disrupt other phases of the operations (such as long distance transportation or even, in some cases, cutting and skidding).

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[608] Wackerman et al., op. cit., p. 86.

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Finally, the costs of mechanical repairs and maintenance have increased several-fold to the dismay of management. The new equipment is complex and consequently more vulnerable, not only breaking down more often but more extensively and thus requiring more time to be fixed. It needs also much more expensive repair and maintenance facilities and technical personnel.

An important justification of piecework in the past was that the period of operations was short and, because productivity was almost entirely dependent on the workers, a strong incentive system was needed to achieve production targets. The situation is almost totally different now. Operations are spread over a nine to eleven-month period and a good deal of the productivity depends on the new expensive mechanical equipment. What appears desirable now is not so much a feverish agitation of a few months but a sustained and regular production in a longer period.

Pressure against piecework has been coming also from changes in woodsworkers' new life conditions and aspirations and from the limits of normal human capacity. When logging operations lasted only a few months, woodsworkers could more easily sustain the physically demanding work pace associated with piecework.[609] But with the extension of the period of operations, a man cannot sustain a superior work pace over a long period. He has to settle for a more normal

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[609] This is an understatement. Logging took a heavy toll of temporary and permanently injured, physically exhausted or "burned" and otherwise ill workers. Companies have had continual safety problems because workers refused often to wear some of the required safety equipment because they found it uncomfortable to work with and slowing down their work pace and sometimes expensive to buy.

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Besides these physical limitations, piecework has become less and less adapted to workers' life conditions and aspirations. As described in Chapter 7, logging has become a "professional" source of employment. Better educated and thoroughly socialized to the consumption-oriented life, woodsworkers expect job security and income security to face their individual and familial obligations. This is difficult to achieve with the uncertainty inherent to the piecework system.

> ...The piecework system..., Duchaine said it was a good thing for the employers because payment was determined by output and minimum supervision was required. However, from the logger's point of view, it was subject to too many variables -- the cord rate, terrain and wood conditions, weather and the whim of the supervisor or jobber. 'This is one of the chief causes of turnover amongst woodsworkers', he said, 'because they are always looking for better wood, better terrain and better rates.' It's true that the piecework system is deeply anchored in the mind of the worker. Only in the last few years with the advent of heavy machinery in the forest and the extension of the working season is the logger realizing that this method of payment is not only ruining his health but is the principal cause of his insecurity'.[610]

Under these pressures, straight piecework has been progressively modified in the past two decades. First, different rates were demanded by the workers and their unions for different qualities of wood. Poor wood (low density per acre, high degree of branchiness, rough terrain, etc.) became remunerated at a higher rate. Later, the more complex and

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[610] "Woodlands Technology Growth Related to Labour Problems by Union, Management Men", Pulp and Paper Magazine of Canada, 69, 20 (October 1968), pp. 41-42.

more satisfactory stump diameter method of payment was established.

> By the stump diameter method of payment, pieceworkers are no longer paid on the volume produced but on the amount of work necessary to process a certain number of trees. The rates per tree are set in such a way that, for small diameters, pieceworkers receive more than the equivalent volume, while, for big diameters, they receive a little less. This method, which permits a man to make reasonable earnings every day almost regardless of stand conditions, is fairer and reduces labor turnover.[611]

Secondly, minimum daily wages were established to protect workers' earnings against loss of production due to accidental breakdowns or inferior production due to inexperience (in the case of new workers) or other problems.[612] Earnings became also protected against illness and other problems related to the conditions of production such as travelling time to the work site.

Finally, piecework wages were replaced by hourly wages with or without incentives in some of the operating positions on the big and complex pieces of equipment such as slashers, leaders, trucks and harvesters. As the division manager of one of the most advanced production systems said, there are too many factors to take into account in establishing piecework rates for the operator in the fully-mechanized system and the machines are too complex. They rather prefer to increase supervision and use, what he called, "indirect incentives".[613]

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611 Legault, "Mobile Mechanical Slashers...", p. 194.

612 "In woodlands contracts it is interesting to note that a trend has begun whereby the employees' wages are protected for a 'short time loss of work' due to conditions beyond their control, such as inclement weather or the possible breakdown of equipment" (C.R. Day, "The Labour Relations Scene", Pulp and Paper Magazine of Canada, 70, 14 (July 1969), p. 91).

613 Interview with the manager of logging operations, Domtar, Division of Quévillon.

On mechanized slashing operations, hourly wages are usually supplemented by production bonuses to maintain production at acceptable company's levels.

Despite these changes, piecework has remained the dominant form of remuneration for non-mechanized and semi-mechanized felling and skidding operations. Both the employers and the employees seem to prefer it this way, although the first ones probably more so than the second ones. The employers have maintained piecework wages because cutters and skidders still possess too much control on their jobs.[614] Cutters are still spatially widely spread, isolated and of difficult access, and, as a result, impossible to supervise directly. Moreover, they still own their basic tool, the chain saw and other less important pieces of equipment. As for the skidders, if it is easier to supervise them than the cutters because part of their work is done at the landings, their work at the stump sites and between stump sites and landings remain quite difficult to supervise directly because of the great distance involved, the spatial isolation and the difficulty of access. Moreover, many operators own their own machines, thus increasing their control on the job.[615]

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[614] In its recommendations to the Quebec Forest Industries Labour Relations Bureau, the policy committee proposed to maintain the piecework system where control of productivity belongs mostly to the employee (that is, in cutting and skidding) (unpublished confidential report, November, 1971).

[615] Increasing probably more the subjective feeling of control than the real control since, in many cases, those buying their own skidders are financed by their employers and may, financially, put themselves in a risky situation since they have to pay for whatever has to be done on the machine in maintenance and repairs and to support heavy financial commitments in periods of inactivity.

As for the workers, they do not seem ready to give up the piecework system under any kind of conditions.[616] Firstly, they do not want to face a decline in earnings. This has been often the case with the shift to hourly wages. Secondly, they value very much the freedom from supervision which they enjoy in the present system and which would surely disappear under the new system of remuneration. Thirdly, a large number of workers would not consider logging employment if it was not for the possibility of making a good income because logging does not offer much interest otherwise. It is still a physically demanding job which is performed in difficult conditions: isolated life in the camps, poor working conditions (extreme heat or cold, rain, snow, mosquitos, etc.), low social status and very poor career opportunities. Moreover, for a very large segment of the logging labor force, logging employment is still regarded as a last resort occupation and a temporary one.[617] Under these circumstances, the main reasons which keep workers in the woods are very often the

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[616] "(Duchaine) suggested a guaranteed annual salary independent of wood quality, terrain, weather, machine breakdowns and sickness. 'This would bring the logger a higher wage than mill workers, to compensate for the isolation and the kind of life he must lead in the forest.' What the logger wants is to be able to guarantee his family a weekly wage, something he cannot do today. If there is a machine breakdown, if it rains, he must double his efforts the next day or the next week to make up his loss.

'A guaranteed wage is a fundamental requirement for the security the woodsworker seeks', added Duchaine. He suggested a transition period with a guaranteed weekly salary based on production rates set by experts before completely aboloshing the piecework system" (Woodlands Technology Growth Related to Labour Problems by Union, Management Men,", op. cit., p. 42).

[617] P. Cottell, "Occupational Choice and Employment Stability Among Forest Workers", unpublished Ph.D. dissertation, Yale University, 1972; Conseil de la Main-d'Oeuvre de la Forêt, Etudes sur la pénurie de travailleurs forestiers au Québec (Québec, octobre 1973). See also Chapter 7.

absence of job opportunities elsewhere and the possibility of making higher earnings in logging. Piecework provides them with this opportunity. If the system of remuneration is changed, this kind of opportunity is likely to disappear and, as a result, logging companies may face either a significant decrease in productivity which they cannot absorb or an important loss of their best employees which they cannot accept either.[618]

In summary, piecework has been replaced by hourly wages (with or without bonus or other incentives) only in occupations where working conditions are better, the mechanical equipment more complex and much more expensive, breakdowns of extensive consequences for the organization and where direct supervision is not only possible but warranted. As mentioned earlier, this has been the case in fully-mechanized cutting, skidding and slashing operations. The only other important modification to the original piecework system which was made in the 1960's was the shift from individual piecework to group piecework when the wheeled skidder and the mechanical slasher were introduced. In both cases, this change represented economies in administration (in particular, scaling) and corresponded to the new technological conditions of work. In slashing, the operation of the slasher depends on more than one worker and their output cannot be separately measured. In cutting and skidding, "work is closely related and interdependent".[619]

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[618] I was told several times by various members of management that their respective organization did not want to innovate with hourly wages for fear, among other things, of creating a stampede away from their operations of their production workers.

[619] Marriott, op. cit., p. 64.

CHAPTER 7

LABOR

An analysis of the impact of technological change on the organizational structure of the logging industry would remain very incomplete if the key role played by the labor resource was to be ignored. First, the demand for labor was directly affected by the changes in the technology of the production system. Not only did these changes modify the nature of employment (for instance, from seasonal to annual employment), but they transformed also the occupational structure of the industry (for instance, they increased the importance of technical and skilled occupations). Second, and more important, the characteristics of the labor resource as well as their modifications during this period not only directly influenced the policy of the companies regarding the rate of technological change which was to be implemented, but contributed also to modify the impact of technology on organization and affected the extent of its transformation.

In the following pages, I shall begin the discussion with the second aspect (that is, the supply of labor) and, in the following part, deal with the demand of labor and its modifications over the last three decades.

I. The Supply of Labor: From "Complémentarité" to Professionalism and from Surplus to Shortage.

In order to understand the impact of the characteristics of and variations in the supply of labor, it is necessary to follow its evolution since the 1930's. This evolution can be broken down into three periods. The first period corresponds to the days when logging activities were seasonal and in "complémentarité" to farming, the dominant economic activity.[620] During the second period, which was a period of transition, logging employment became the main occupation for most of the woodsworkers but it remained complementary to farming and to construction and fishing activities. Logging employment was then accepted generally as a temporary necessity in a situation which did not leave any better choice. Finally, during the third period, the seasonality and "complémentarité" of logging employment have practically been eliminated and the majority of the woodsworkers have become in fact, if not enthusiastically, a professional labor force with the logging industry.

Before engaging in the description of this evolution, I will briefly describe some of the basic characteristics of the logging labor supply.

A. Characteristics of the Labor Supply

An unconventional activity, logging has traditionally attracted an unconventional labor force. In comparison with the average labor force, woodsworkers have been almost exclusively male, much younger than average, predominantly single, very poorly educated, largely

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620 They were also in "complémentarité" to much less important activities such as fishing (which, however, replaced farming as the dominant activity in some areas) and construction (buildings and roads).

coming from rural areas, French Canadians, and highly mobile. An examination of statistics covering the last two decades or so indicates that generally these characteristics have not changed significantly.

1. Age, Marital Status and Schooling

Of all major occupational groups, loggers were the youngest group in 1961 (see Table 68). Their median age for that year in Quebec was 30.4 (the lowest in Canada) compared to 36.5 for the total labor force in the province (see Table 69). No figures were yet available for 1971, but there are indications that this occupational group has been aging. The rural labor force has become older in general and logging has not been able to attract as many younger workers as it used to in the past, if one judges by the recent difficulties which have affected the industry.

TABLE 68

Average Age of Male Labor Force for Selected Occupational Groups, Canada, Quebec and Ontario, 1961

Occupational group	Average age (years)		
	Quebec	Ontario	Canada
Loggers	33	38	35
Farmers & farm workers	40	44	43
Craftsmen, production process & related workers	37	39	39
All occupations	38	39	39

SOURCE: Census of Canada, Volume III, Part I, Bulletin 3.1-11, Cat. #94-509, Table 17.

TABLE 69

Medium Age, Logging and Total Male Labor Force,
Eastern Canada and Provinces, 1961

Occupational group	Ontario	Quebec	New Brunswick	Newfound-land	Eastern Canada
Logging	36.2	30.4	33.1	32.0	32.6
Total labor force	38.1	36.5	37.9	36.1	37.4

SOURCE: Ferragne, "Sociological Aspects of Woodlands Manpower Problems," p. 379. Calculated from 1961 Census of Canada, Volume III, Part I, Bulletins #94-510 and 94-511, Table 17.

Not surprisingly, the logging labor force is also largely unmarried (see Table 70). About half of the woodsworkers were single in Quebec in 1951 and 1961. In both cases, this is above the Canadian average.

TABLE 70

Male Loggers' Marital Status,
Quebec, Ontario and Canada, 1951 and 1961

Marital Status	Quebec 1951	Quebec 1961	Ontario 1951	Ontario 1961	Canada 1951	Canada 1961
Single	21,563	14,884	10,522	4,466	56,043	30,815
Married	20,092	13,061	8,522	5,002	61,369	36,587
Widow	789	239	525	145	2,328	711
Divorced	13	8	29	15	327	136

SOURCE: Census of Canada, Volume III, Part I, Bulletin 3.1-11, Cat. #94-509, Table 17, 1951 and 1961.

Woodsworkers belong generally to the lowest educated groups. The proportion of woodsworkers who had more than primary education was only seven per cent in 1951 and thirteen per cent in 1961 (see Tables 71 and 72). Despite this increase, woodsworkers in Quebec were less educated than those of the other provinces. The increase was certainly not sufficient to bring the level of formal education up to the needs of the industry.

TABLE 71

Extent of Formal Education of Woodsworkers, Canada and Selected Provinces, 1951 and 1961

Province	Proportion with more than elementary school education 1951	1961
Newfoundland	8%	21%
Nova Scotia	19%	27%
New Brunswick	9%	13%
Quebec	7%	13%
Ontario	17%	20%
British Columbia	39%	50%
Canada	16%	22%

SOURCE: John A. Dawson, "Woods Operations and the Canadian Labour Force," Pulp and Paper Magazine of Canada, Convention Issue 1966, p. WR-94.

For obvious reasons, the logging labor force has been, and still remains, almost exclusively a male one. However, this situation may change in the future if the supply of male workers does not satisfy the demand as it seems to be the case presently. One company in Ontario is now carrying on an experiment with female production

TABLE 72

Degree of Schooling Achieved by Male Loggers, Quebec, Ontario, Canada, 1951 and 1961

Degree of Schooling	Quebec 1951	Quebec 1961	Ontario 1951	Ontario 1961	Canada 1951	Canada 1961
Elementary						
a) Less than 5 yrs.	8,306	7,537	4,963	2,200	27,434	16,937
b) More than 5 yrs.	29,351	17,416	10,885	6,067	70,087	38,427
Secondary	4,204	3,194	3,077	1,308	20,052	12,450

SOURCE: Census of Canada, Volume III, Part I, Bulletin 3.1-11, Cat. #94-509, Table 17, 1951 and 1961.

workers.[621] The change is made possible because of the better working conditions offered with mechanization.

2. Rural Labor Force

Logging has traditionally recruited its labor force in the rural areas close to its operations which are usually at some distance from the location of other industrial activities.[622] Census statistics for 1971 indicate that this still seems to be the case (see Table 73). It had been suggested that the labor force had become urbanized in the last decade. Census data tend to show that this trend was limited with few outstanding exceptions such as the Saguenay-Lake St. John

621 Great Lakes Paper had four women on its operation in 1974.

622 For instance, Ferragne found in 1964 that only 19 per cent of the workers in his sample were from a town or a city and 50 per cent were still living on a farm (cf. Ferragne, "Sociological Aspects of Woodlands Manpower Problems," p. 380).

TABLE 73

Male Labor Force, 15 Years and Over in Forestry and Logging Occupations, According to Residential Area (Urban, Rural Non-Farm, Rural Farm), Canada, Ontario and Quebec, 1971

	Canada	Ontario	Quebec
Urban	23,625	5,085	6,380
500,000 and over	2,905	495	425
100,000 - 499,999	2,055	1,030	395
30,000 - 99,999	2,170	860	305
10,000 - 29,999	5,320	830	1,185
Under 9,999	11,175	1,865	4,065
Rural	42,225	5,975	13,490
Non-farm	36,625	5,195	11,050
Farm	5,595	775	2,440
Total	65,850	11,055	19,865

SOURCE: Census of Canada, 1971, Cat. #94-718, Volume III, Part 2 (Bulletin 3.2-4), Occupation Groups by Sex, For Canada, Provinces and Census Divisions, Table 3A.

area in Quebec, the Lakehead in Ontario and Vancouver Island in British Columbia where a considerable number of woodsworkers live in urban areas (see Table 74). A comparison between key counties or census divisions in Quebec reveals that there was very little change in the proportion of woodsworkers coming from the rural and urban areas and even from the rural farm and rural non-farm areas between 1951 and 1961 (see Table 75). Unfortunately, data from the 1971 census are not yet available and they could indicate a different picture.

TABLE 74

Male Loggers and Related Workers[a] for Selected Urban Centers, Quebec, Ontario and British Columbia, 1951, 1961 and 1971

Urban center	Number of loggers and related workers 1951	1961	1971
Chicoutimi-Jonquières	362[b]	469[b]	290[c]
Québec	104	173	205
Trois-Rivières	37	29	45
Shawinigan	73	95	145
Thunder Bay (Ontario)	--	1,181	770[c]
Timmins (Ontario)	--	421	225
Port-Alberni (British Columbia)	--	325	885

[a]Includes forest rangers and cruisers, loggers, logging foremen, laborers in logging, etc.

[b]Sum of figures for Chicoutimi, Chicoutimi-Nord, Arvida and Jonquières.

[c]Metropolitan zone.

SOURCE: Census of Canada, Volume IV, Table 6, 1951; Volume III, Part I, Cat. #94-504, Table 7, 94-505, Table 10, 94-506, Table 11, 94-519, Table 4, 94-520, Table 5, 94-521, Table 6, 1961; Volume III, Part II- Cat. #94-719, Tables 4 and 5, 1971.

3. Ethnicity

In Quebec, woodsworkers have always been overwhelmingly French Canadians (see Table 76). In fact, the French Canadians have been overrepresented in this occupational group and not only in Quebec but in Ontario as well.

B. Before World War II: Farming in a Traditional Society With Logging as Extra Income Opportunity

During the period preceding World War II, the labor supply of the logging industry was coming almost entirely from the rural countryside and the great majority of the woodsworkers in Quebec were farmers or

TABLE 75

Male Loggers and Other Primary Occupations Workers,[a] for Selected Counties or Census Divisions, Rural, Rural Non-Farm and Urban, Quebec, 1951 and 1961

County or census division	Rural farm 1951	Rural farm 1961	Rural non-farm 1951	Rural non-farm 1961	Urban 1951	Urban 1961
Abitibi	2,850	1,979	1,655	1,546	3,127[b]	270
Beauce	922	699	592	321	353	255
Bellechasse	515	411	384	242	--	14
Bonaventure	1,247	1,246	565	855	--	4
Champlain	815	1,086	574	870	405	358
Chicoutimi	1,409	1,282	869	993	781	775
Dorchester	829	1,044	421	491	135	130
Gaspé	4,682	3,402	1,898	2,862	80	279
Hull	991	654	636	467	369	221
Lac St-Jean	2,174	2,077	1,483	1,480	447	583
Matane	1,882	2,379	941	1,445	683	792
Saguenay	4,558	1,772	4,321	1,709	300	434
Témiscouata	1,398	1,592	841	767	239	569
Témiscamingue	1,202	484	731	344	2,446[b]	91
Total Québec	36,943	27,566	23,621	19,459	14,448	7,034

[a]Census figures do not allow any breakdown by occupations. Consequently, these figures include loggers, fishermen, trappers, hunters and miners. Because of occupational "complémentarité," many fishermen, for instance, are loggers during the winter. Generally, the number of other primary occupations is relatively small in most of these counties or census divisions and the figures correspond very closely to the residence of loggers.

[b]The unusually high number is due to the fact that in these two areas, mining is a very important activity.

SOURCE: Census of Canada, Volume IV, Labour Force, Table 10, 1951 and Volume III, Part I, Bulletin #3.1-8, Cat. #94-508, Table 15, 1961.

TABLE 76

Ethnic Origin of the Male Logging Labor Force,
Quebec, Ontario, Canada, 1941, 1951 and 1961

Ethnic Origin	Quebec			Ontario			Canada		
	1941	1951	1961	1941	1951	1961	1941	1951	1961
British Isles	1,365	2,155	747	3,488	6,720	2,470	19,940	44,501	20,643
French	27,738	41,971	30,658	3,773	7,165	4,064	39,596	60,468	42,836
Other Europeans	164	263	190	3,101	7,510	4,325	9,902	19,339	11,463
Others (Indians and Asiatic)	361	100	253	1,040	580	693	3,969	1,404	3,323
Total	29,724	44,576	31,882	14,149	22,118	11,594	63,639	127,488	78,826

SOURCE: Census of Canada, 98-194P-6, Occupations, No. 0-3J, Table 3, 1941; Volume IV, Table 12, 1951; Volume III, Part I, Bulletin 3.1-15, Cat. #94-515, Tables 21 and 22, 1961.

sons of farmers[623] for whom farming was not only their most important occupation but also their way of life. Priority was given to the work on the farm and it was only when farming activities were at their lowest level and could be handled by women and children (that is, in winter), that the men became available for logging employment which provided most of the cash money which farmers could use for improvements on the farm and to buy manufactured goods for the family. In the words of a student of that period:

> Son travail en forêt n'était considéré que comme une occupation secondaire apportant un nécessaire revenue d'appoint au revenu principal provenant de la ferme. Ainsi la mobilité du travailleur forestier était en partie expliquée par les exigences de son travail principal, c'est-à-dire l'agriculture.[624]

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[623] "Until about the mid-1950's, the eastern pulp and paper industry placed almost total reliance on a work force that was busy farming from May until mid-September" (G. Godwin, "Woodlands operation of 1980, " Pulp and Paper Magazine of Canada, Vol. 65, No. 4 (April 1964), pp. 99-101). Woodsworkers were also former farmers who abandoned the land during the boom years of the 1920's. In eastern Canada, 38 per cent of the labor supply was coming from agriculture, 52 per cent from general labor, 7 per cent from hunting and fishing, 2 per cent from construction and 1 per cent from mining. Being an activity involving a high level of muscular activity, logging always attracted a younger labor force. In the 1930's, 75 per cent of the woodsworkers were between 19 and 35 years, 15 per cent between 14 and 18 years and 20 per cent over 35 years (cf. L. Nix, "Woods Labour," Canadian Pulp and Paper Association, Woodlands Section, W.S. Index No. 541 (B-2), 1939).

[624] Fortin, op. cit., p. 18. This was particularly true for farmers living in the second and third farming belts. In the second belt, agriculture was mixed and average and farmers needed a supplementary income from another activity like logging. In the third belt, agriculture was very poor (colonization parishes which were less than 50 years old) and "farmers" drew most of their income from logging and welfare benefits. These people constituted the bulk of the labor supply for the industry. Very few woodsworkers were coming from the first farming belt, which was advantaged by a rich soil and located near the large urban centers or along the main east-west communication systems where agriculture was specialized and prosperous.

There are indications that in the traditional rural society of Quebec, logging did not enjoy an important status position. According to Miners, day-laborers who used to become woodsworkers during the winter occupied an inferior social status in the rural parish society. It was one of the minor occupations which were left for the sons who could not be, or were not, established as farmers and did not get educated.[625] Koroleff explains that in eastern Canada forest workers had a higher status in the past during the pioneering stage but lost it later during the economic slumps because of the influx of transient amateurs in need of work.

> ...an old time professional logger was typically a skilled, hard working and high productive man (except for a periodic spree at the conclusion of a long season's work); his pride in his profession and loyalty to a good boss urged him to strive to outdo the others. With the passing of the pioneering stage, and particularly during the economic slumps, the status of forest workers in eastern Canada considerably deteriorated and the efficient labor force became heavily diluted with transient amateurs. Even though subsequently the actual conditions of forest work were greatly improved, and continue to improve, as to camps, food, remuneration, treatment, etc., the general prestige of forest workers has not yet been adequately re-established. Its increase... is an important need, but is hindered by considerable instability of woods labor, greatly aggravated by the high seasonality of woods work. While many workers lack the desire to devote themselves to logging as permanently as possible, there is also a lack of opportunity for continuous employment in the woods.[626]

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[625] H. Miner, St. Denis, A French-Canadian Parish (Chicago: The University of Chicago Press, 1939, 1967), pp. 200-201 and 249-254.

[626] A. Koroleff et al., Stability as a Factor in Efficient Forest Management (Montreal: Pulp and Paper Research Institute of Canada, 1951), p. 67. Another source also mentions that temporary workers never become qualified foresters proud of their work (see Sven-Ingvar Sjostedt, "Training and Safety of Logging and Forest Workers," World Forestry Congress, no date, pp. 1863-1868).

Since most of the logging labor force was recruited among farmers and their sons, logging companies had to adapt their organizations and established their policies in consequence. The period of logging activities was scheduled at the time in the year when agricultural activities were at their lowest point. Personnel policies and remuneration systems corresponded also to this situation. Being mostly peasants or sons of peasants, woodsworkers had an acute sense of their independence and autonomy further accentuated by the fact that logging employment was second to farming. In consequence,

> Logging entrepreneurs, knowing the value given by farmers to their independence, favored piecework individually contracted. The only basis for the remuneration of the woodsworkers and the haulers was their daily or weekly production. No quotas were imposed on them, neither minimum nor maximum.
>
> Workers, when in the woods, could start working, whenever they wished, stop all activities whenever they desired and choose at will whichever pace and method of production. Underlining this extreme freedom given to the workers in the woods was the conception that each farmer has his own pace of work and that one should not tamper with it. In such a context, there was no need for any complex planning of production nor for workers' supervision. Companies did not organize production themselves but gave it under contract to entrepreneurs. These last ones used to redistribute the work to subentrepreneurs who themselves gave it under contract to woodsworkers and haulers. Thus, one could not strictly speak of hiring or labor management relations, but rather of relations between big and small entrepreneurs which were all their own bosses.[627]

More than the "complémentarité" of activities, there was also an occupational "complémentarité". In logging, farmers and their sons were using skills which they had learned on their farms clearing the

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[627] Fortin, op. cit., p. 19. My own translation.

land for agriculture or chopping wood for home consumption. They were also using the same tools (axe, buck-saw, hook, etc.) and horses.

> In fact, the only required investment from the farmer who wanted to work in the woods was most often a bigger and stronger sleigh than the one he was using on his farm.[628]

There are reasons to believe that the labor force was generally more stable before the war. However, during the war and the late 1940's, labor turnover became an issue. Data examined by Koroleff showed that:

> The average length of the workers' continuous stay in a camp was merely 46.6 working days in 1943-44; it gradually declined to 41.4 days in the 1946-47 season; increased to 45.1 in 1949-50; and in the 1950-51 season dropped to 42.6 days. In the course of the last eight seasons, men continuously stayed in a camp, on the average, only 43.7 days; and in the last half of that period the average length of their stay was almost two per cent less than it was during the first four years.[629]

In 1945, this created real problems to logging operators.

> When an operator starts a job and hires 100 men, he has to plan immediately on continuous recruiting to keep his gang up to strength. Thirteen of the original 100 do not stay more than a week on the job, fifty of them do not complete one month's work... only three out of the 100 will remain on the job more than 6 months, and only 15 will stay longer than 3 months. These are the professional woodsworkers whose main source of income is logging. If we remove the 15 steady workers from our calculation of average run we find the other 85 stay only about 26 days.[630]

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[628] Ibidem. My own translation.

[629] Koroleff et al., op. cit., p. 15.

[630] W.A.E. Pepler, "Woods Labour in Eastern Canada," The Pulpwood Committee of the Pulp and Paper Industry of Canada, 1945. Quoted in Koroleff et al., op. cit., p. 16.

C. After World War II and During the 1950's: A Transitional Period During Which Logging Becomes the Main Occupation

After World War II, conditions changed considerably, not only in the forest industry, but in the economic and social environment as well. An observer of the situation described it in the following terms:

> Depuis le dernier conflit mondial, cette industrie a connu une période de très forte expansion par suite de la demande accrue de papier journal et d'autres produits ou sous-produits de la pulpe et du papier. Au même moment l'ensemble des secteurs de l'économie canadienne s'est développé à un rythme sans précédent. Inutile d'insister ici sur le fait que cette expansion économique a été accompagnée par des investissements massifs dans les secteurs les plus dynamiques de notre économie ainsi que par des changements presque révolutionnaires dans les techniques de production et dans les politiques de gestion.
>
> Dans un contexte de changements économiques, sociaux et technologiques très rapides, il est normal d'assister à une concurrence accrue entre les différents secteurs de l'économie pour les ressources dont ils ont besoin et, en particulier, pour une main-d'oeuvre mieux entrainée, plus stable (quoique suffisamment mobile) et possédant une haute capacité de production. En outre ces changements s'accompagnent d'habitude de modifications profondes dans la structure des emplois et des occupations, tant sur le plan du marché du travail que dans les diverses entreprises.
>
> (...) L'industrie forestière ne pouvait échapper aux effets que la dynamique d'une poussée généralisée d'industrialisation exerçait sur la main-d'oeuvre rurale parmi laquelle elle recrute traditionnellement ses travailleurs. En outre les transformations profondes que les entrepreneurs forestiers ont introduit dans les modes d'exploitation et de conservation des resources forestières ainsi que dans l'organisation de l'habitat humain en forêt exigeaient de la part des travailleurs une adaptation rapide susceptible de modifier leur comportment, dans la forêt ou dans leur milieu d'origine.[631]

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[631] E. Gosselin, "Notes sur une analyse interdisciplinaire de certains problèmes de main-d'oeuvre en forêt," unpublished mimeo paper, no date (circa 1957).

Among the most important changes which affected the forest labor force during that period was the depression which afflicted agriculture following the end of the war. During the war, demand for agricultural products for export had increased considerably. In most rural areas where agriculture was poor and mainly subsistence agriculture, the sudden increase in prices for agricultural products caused by the high war demand generated a short period of prosperity during which the standard of living of the rural population increased significantly as well as capital investment in farm equipment.

The fall in demand and in agricultural prices after the war left the farmers with two possible choices: to go back to subsistence agriculture and lose the high standard of living created by the war or quit farming in favor of another occupation and continue to enjoy their new standard of living and even improve it. The forest industry, which was facing a very strong demand and was extending its annual period of operations to face a diminution of labor, was the only one which could offer the type of employment needed in the rural areas. Prevented from looking for other sources of employment in the urban centers because of their lack of skills and formal education and unable to find suitable jobs in the rural villages, most of the farmers realized that logging was the only practical alternative left to them. Those among them who tried to carry actively both farming and logging were to find out that this had become very difficult and increasingly more so as logging operations were extended to the summer months. Progressively they discontinued to farm as the farm became less and less profitable while they were spending more and more time working outside to maintain their income if not to increase it in order to satisfy the growing material aspirations of their families.

Under these circumstances, to become a full-time woodsworker was not chosen with enthusiasm.[632] The social status of the lumberjack was inferior to the status of the farmer, the work was hard, working conditions poor and workers were separated from their families for long periods of time. A great deal of responsibilities had to be assumed by their wives and this contributed to strain the social, emotional and even physical fabric of the family. Consequently, there was a great deal of dissatisfaction with logging work. Woodsworkers did not wish the same occupation for their children. In a study of a typical rural parish, Fortin found that only 20 per cent of his informants advised logging jobs for their children. Most of his informants recommended rather the learning of a trade and 50 per cent suggested that young people should migrate to the cities.[633]

This negative attitude regarding logging was translated into chronic occupational and geographical instability. Fortin found that woodsworkers were the most unstable among the different occupational groups in the rural parish which he studied. This situation was simply confirming the general problem of instability which the logging

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[632] Fortin, op. cit., pp. 101 and following.

[633] Idem., pp. 106-107.

companies had faced since the late 1940's[634] and which led them in 1956 to initiate and finance a study by a group of social scientists from Laval University (including Fortin himself) to analyze the problem and suggest some solutions. In the only report which the group produced as a preliminary result of the study in 1957,[635] the problem is described in some of its most important aspects. Among other findings, the report revealed that the turnover was abnormally high by comparison to the usual rate observed in other industries. In the logging industry, that rate reached an average of close to 8 per cent per week in 1951-52 (see Table 77).

TABLE 77

Average Weekly Rate of Turnover,
Quebec Logging Industry, 1949-1956

Year	Average weekly rate of turnover	Range of variations
1949-50	4.6%	0.0 - 16.2
1950-51	7.6%	0.3 - 18.5
1951-52	7.8%	0.1 - 25.5
1952-53	6.2%	0.0 - 16.2
1953-54	5.6%	0.1 - 18.5
1954-55	5.8%	0.0 - 20.3
1955-56	7.0%	0.0 - 22.5

SOURCE: Gosselin *et al.*, *op. cit.*, p. 61.

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[634] There are reasons to believe that the logging labor force was not very stable even before the war, but instability became a problem only when the total supply of labor did not satisfy the growing demand created by the after-war expansion in the industry (Koroleff *et al.*, *op. cit.*, pp. 14 and following).

[635] The group lost its financial support from the sponsoring industrial association (the Q.F.I.A.) before terminating its study.

Gosselin and his associates believed that these rates were artificially inflated for a number of reasons[636] but considered them significantly high enough to need a serious analysis. They found that the rate of turnover increased with the size and the duration of an operation and the operations which tended to be carried on a year round basis. They also found out that, irrespective of the previous relations, the rate of turnover increased or decreased from year to year with increases or reductions in the annual total production of pulpwood. They explained this important relation in terms of the demand and supply of labor.

> Other things being equal, the total demand for workers can be assumed to correspond closely to the total physical production. The more wood there is to be cut, the greater the number of workers will be needed to cut this wood. It thus appears that a high total demand of workers in the whole industry corresponds to a high turnover in the whole industry. One explanation of this fact would be that the supply of workers is not extensible as is the demand and that the actual supply merely meets the lowest possible demand. Indeed, <u>when the demand is greater than the supply, the worker is sure</u>

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[636] They singled out five reasons: (a) "The practice of not taking into account the various cycles of operations." (b) Transfers from one camp to another within the same company counted as a separation and a hiring. (c) Accounting practices in the case of some daily wage workers which are quite mobile from one camp to the others. (d) Absenteeism being improperly labelled turnover. (e) Labor practice which consists of creating conditions such that cutters quit their job at the end of the cutting period rather than in laying them off (Gosselin <u>et al</u>., <u>op. cit</u>., p. 62).

> to find employment anywhere. If working conditions in one operation do not satisfy him, he can quit and try somewhere else. The worker is not dependent on a single operation, and can be very mobile from one operation to the other.[637]

They observed also that an increase in the demand for pulpwood during the seven year period 1949-1956 led to an increase in the duration of the operations. Increases in productivity due to mechanical hauling and the adoption of the chain saw were not enough to offset the diminution in the labor force which they estimated at about 10,000 workers between 1950-51 and 1955-56 (from 50,000 to 40,000 workers). Consequently, the only alternative left to the companies was to prolong the duration of their operations.

Higher productivity per man had also the effect of lowering the rate of turnover. Gosselin *et al*. did not explain why, but one can speculate that the workers were more satisfied due to the increase in their income generated by higher productivity and longer operations.

Finally, their analysis rested on the conclusion that basic changes had taken place in the supply of labor and workers had become predominantly professional woodsworkers.

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[637] *Idem*., p. 65. Italics mine. The straight piecework system which makes income so dependent on local working conditions contributed to increase labor mobility. Good and experienced woodsworkers refused to work in poor stands and used to go elsewhere unless given an average or better than average cutting chance. Inexperienced and not so good workers could not make satisfactory wages in poor or even average chances, soon became discouraged and used to look elsewhere for better conditions or quit the job. With the institution of the minimum wage, companies did not use to keep employees who did not produce at least the equivalent value of the minimum wage.

> It is quite possible that two assumptions that used to be made about the forest workers are no longer as true as they were ten or twenty years ago. The first of these was that forest workers were full-time farmers who could spend in the forest only a few weeks a year. The second assumption was that even if forest workers wanted to become professional they could not because of the structuring and functioning of forest operations. Now, the behaviour of the workers during the years of maximum production indicates that they can spend many months in the forest industry, and that *they consider forest work as their main source of income*, that is, *that they are in fact professional forest workers*.[638] (...) Indeed, the interviews show that for the great majority the forest workers get their main income from the forest and that very few of them get an appreciable revenue from farming.
>
> It must be remembered that *it is the workers*, *or their shortage, who forced the operators to create the new pattern of longer operations, and not the operators who forced this pattern on the workers*. Indeed, all our findings suggest that it is the operators who have adapted their policies to a new labor situation and not the other way around. If the shortage of workers still increases further adaptation shall be necessary. Both the operators and the workers would gain if the adaptation were a long term and a more rational one.[639]

The new labor situation or new labor market was characterized firstly by its extreme fluidity due to changes in management policies and the economic structure of the communities where workers were recruited.

> On the one hand, the depressed state of agriculture has pushed the majority of the able men toward non-agricultural work. Being no longer tied to a farm cycle, the majority of the local workers find themselves in an extreme state of fluidity. They can now work for any period of time

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[638] *Idem.*, p. 70. Italics mine.

[639] *Idem.*, p. 71. Italics mine.

> during the year, at any period of the year, and for whatever employer offers them work suited to their personal capacities, and meeting their economic and social expectations. Moreover, it must be remembered that for the majority of these people only non-farm work can provide them with the income they need for a living. In such a context the concurential or non-concurential character of the demand for labor and the nature of that demand, plays an important role in the allocation of the local labor force among various types of employers. The personal characteristics of the individuals and the other dominant social forces in the community largely determine which occupation appears to be more suitable to the individual, his family and the community.[640]

The labor force had also become a wage-earning rather than a self-employed one.

> We find that in the communities from which our informants come, the forest operators are the major employers and receive very little competition from the other sectors of the economy. (...) To all practical purposes, working in the woods becomes the only real opportunity for cash and ready income for the majority of the local labor force. Now the type of operations that are carried in the woods plus the local economic forces have transformed the local population into a fullfledged salaries or wage-earning class, whereas years ago it was a population whose principal characteristic was, in the main, to be self-employed on the local farms.[641]

What had emerged was a specialized and professionalized labor force. Indeed, "management policies [had] *accelerated* the movement of the local labor force toward a wage-earning status and toward professionalization...[since] most large operators now call[ed] for a more diversified labor force."[642] On the one hand, the company camp

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[640] *Idem.*, p. 109.

[641] *Idem.*, p. 110.

[642] *Ibidem.* Italics mine.

system which was slowly replacing the jobber system had the effect of introducing "many levels of supervision of which only the last one [was] still identified with the community" but which jobs were almost all year round ones. On the other hand, the growing mechanization had increased the demand for a specialized labor force recruited in the rural areas. The above observation stemmed from interviews in which,

> it appears clearly that these people are most precious to the companies and that in fact they find employment for themselves, very often with their own machines, working almost year round for forest operators. Moreover, with the advent of the spring and of the summer cut, the elongating of the woods operations makes it possible for a man, if he is reasonably good, to work for as long as he wants, at least on the cutting operations. And if the work stops too early, or if the working conditions are not too good, the relatively easy communication facilities make it possible for a man to move rapidly from one company to another.[643]

The creation of a "forest-oriented wage-earning class" had deep effects on the community life and on the families as well as on the development of new tastes and habits.

> On the other hand, the woodsman in most cases has altogether abandoned the idea of farming now or in the future. Though he remains attached to his community or "rang" [row], he wants to live more or less as the city wage-earners do. That means that his pay check and his period of employment becomes his sole security and he is likely to ask, as all wage-earners do for more security at home and at work; better pay, better wood, better working or living conditions, improved supervision.[644]

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[643] Ibidem.

[644] Idem., p. 110.

On the other hand,

> local tastes are changing: the woodsmen have now adopted many of the spending habits of the city people. They want a car, a well-equipped home, and they want to enjoy the amenities of life. They want the store, the movie house, the bar and the church close to their home. The proliferation of the rural villages may well be an indication of an "urban" trend in the areas. In that fashion, a tremendous pressure builds up at home to earn more and more in order to attain a higher standard of living and to maintain it.[645]

Finally, they considered the fact that new spending habits, an increased tax burden and the cost of the new mechanical equipment required to work in logging operations created financial charges which could not be supported by the workers without enough guarantees in terms of wages and employment security. In the long run, the industry could attract a large enough stable labor force only if it could compete with the other industries on that basis. They believed that the perspective of success were rather limited in view of the dwindling of the labor force in the past few years.

D. The Middle Sixties. More of the Same: High Labor Turnover and More Mechanization

The prediction made by Gosselin and his associates proved to be quite right almost a decade later. Labor shortage and high turnover rates continued to plague the industry despite further progress in mechanization and in productivity. High turnover was one of the most pressing problems. According to the Dominion Bureau of Statistics:

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[645] <u>Idem</u>., p. 111.

> for every 100 persons on forestry payrolls in Eastern Canada during an average year, about 400 are hired in that year. The separation rate for the industry is typically about double the separation rate in construction, the next highest industry. In 1963-64, about 7.1 per cent of all workers on forestry payrolls left each week, as compared to figures of 3.8 per cent in construction and 1.4 per cent for all the industries covered.[646]

Two studies[647] completed in 1964 in different areas and in a different context showed that not much progress had been done concerning the labor supply even if in the words of one specialist "some of the problems are now clearer than they were even 10 years ago."[648] Indeed, according to him, "much remains to be done in this field before we, in eastern Canada at least, can boast of a stable, contented labor force."[649] A third study[650] done a few years later on the mobility of the woodsworkers contributed to document the need for further action. Before reviewing the situation described by Latraverse's study, we will consider the main conclusions of Ferragne's and Legendre's studies.

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[646] Campbell and Power, op. cit., p. 37.

[647] R. Ferragne, "The 1964 woodsworkers of the St. Maurice Valley operations," unpublished study of Consolidated Paper Corporation employees on the company's Lower Mattawin operations, 1964; C. Legendre, "Etude de la mentalité des travailleurs forestiers," unpublished work report for the Bureau d'Aménagement de l'Est du Québec, 1964, p. 51.

[648] Ferragne, "Sociological Aspects of Woodlands Manpower Problems."

[649] Idem., p. 385.

[650] Comité d'étude de la main-d'oeuvre forestière, "Inventaire et prévisions de la main-d'oeuvre: Recommendations du comité" (Quebec: December 1970). Since the author of the research and the report was S. Latraverse, I will refer to it later as the Latraverse's study. The data used for the study were for the year 1966-67.

Ferragne, a sociologist, interviewed in their homes a sample of 90 woodsworkers representing 6.6 per cent of the labor force of a woodlands district of Consolidated-Bathurst, where he is an industrial relations specialist. In his study, Legendre interviewed at home a group of 40 woodsworkers from typical logging communities[651] of the Lower St. Lawrence and Gaspe areas. Both studies could not lend themselves to extensive statistical treatment, but they constituted serious attempts to understand workers' attitudes toward their work and to evaluate the changes which could have taken place since the middle 1950's.

Ferragne and Legendre found that the few years which had elapsed had contributed to accentuate the characteristics of the labor force described by Gosselin and his associates. Generally, woodsworkers were still overwhelmingly coming from rural communities where agriculture was rapidly declining or in real difficulty. The majority of them had no involvement in farming activities any more (even in the cases where they were still living on a farm) and considered themselves primarily woodsworkers. Moreover, their traditional identification with agricultural life was increasingly remote and giving way to life aspirations centered on the possession of a trade and residence in a small town. The urban standards of living and style of life had penetrated more deeply and more extensively raising the level of social

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[651] Similar to the ones studied by Gosselin, Fortin et Tremblay. See reference to these studies above.

and economic aspirations.[652] Rural youth entered the labor market from the new school system better educated, used to excellent facilities and good living, and possessing a better social development.

Facing permanent economic and occupational insecurity, rural labor continued to choose logging occupations despite their drawbacks as the only alternative for the time being, always hoping for something else better in the village or in town. According to Ferragne, rural workers entered wood harvesting activities for the lack of education and training to get other jobs, the lack of employment opportunities elsewhere due to economic fluctuations, the lack of experience and the possibility of learning by themselves given by the piecework system, the absence of direct supervision which corresponds to their special notion of "freedom," and because of their residential location close to the logging operations.[653] Rural workers were likely to stay in the wood harvesting field for other reasons such as the freedom of movement in and out of the working area and their ineligibility for social security benefits.

Usually, whenever they could find the same or a minimum of economic security elsewhere, workers were likely to move out of logging activities.

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[652] Fortin and Tremblay found that, for instance, 12 per cent of the annual income of rural wage earners was spent on debt payment. See M.A. Tremblay and G. Fortin, Les comportements économiques de la famille salariée du Québec (Québec: Les Presses de l'Université Laval, 1964).

[653] Ferragne, "Sociological Aspects of Woodlands Manpower Problems," p. 381.

> The reasons for labor leaving the woods have not changed for years and have been outlined by many people. Most blame the industry for not providing year-round employment with the average stay on the job about 35 days in Quebec and the total employment period per employee about 65 days per season. Isolation and lack of social and recreational amenities in camps, favoritism in assignment of cutting areas, high cost of hand tools, and low social status of most forest jobs are other reasons. Unemployment insurance is also a contributing factor. Many workers would rather collect insurance than work during the winter. When winter work projects are available, workers are unlikely to move long distances away from friends and local institutions to obtain short-term employment. Other employment opportunities also play a part. A study by a Quebec company showed that up to 38 per cent of woods employees left voluntarily to engage in other employment.[654] A Consolidated Paper study in 1965-1966 showed out of 8,000 men who left, 23 per cent gave autre emploi as their reason.[655]

Using Maslow's human motivation theory, Ferragne came to the conclusion that the logging industry did not offer to the workers much opportunity to fulfill their human needs.[656] Physical needs were less well satisfied by logging than by most other industries. Only fishing and farming were paying less than logging in 1961.[657] Loggers' standard of living[658] was inferior to the one enjoyed by most workers in industrial communities. Social needs were still very

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[654] Price Company Limited, "Mémoire présenté au comité sur le chômage saisonnier du Conseil d'Orientation Economique du Québec," 1964.

[655] Ferragne, "Sociological Aspects of Woodlands Manpower Problems," p. 381.

[656] Idem., pp. 381 and following.

[657] Economic Council of Canada, "Towards sustained and balanced economic growth," Second Annual Review (Ottawa: Queen's Printer, 1965).

[658] As indicated by such items like housing, social environment, taxation, eating habits, clothing and furniture.

poorly dealt with. Life in logging camps isolated workers from their families and from any meaningful social involvement in their communities.

Woodsworkers found no pride in their trade outside the work place. They rarely expressed any proud feelings in front of their families and they did not want their sons to become woodsworkers. They rather liked them to learn a trade and to live in a small town.[659] Woodsworkers were also poorly integrated in logging organizations. They did not understand very well how logging organizations functioned and considered that they were "mistreated compared with the mill employee."

Logging provided little security (physical, economic and emotional) to the woodsworkers. The major aspect of this insecurity was the economic one expressed in terms of wages.

> The more an employee depends on his wages for satisfaction of needs, the more pressing is the need to make those wages. Woodsworkers are not yet assured of working security so they do not make a definite final choice when they enter the field but continue to look for other employment. Not only is the work still seasonal (eight or nine months a year), but day-to-day earnings are dependent on many factors -- weather, health, wood size, ground hazards, forestry requirements, tools, vehicles, walking distances, transportation, team work, etc.[660]

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[659] Legendre, "Etude de la mentalité des travailleurs forestiers."

[660] Ferragne, "Sociological Aspects of Woodlands Manpower Problems," p. 384.

Ferragne mentioned also woodsworkers' self-dependence in the face of such hazards as sickness and the results of a union survey showing that 80 per cent of them had no life insurance.[661] Living in a consumption oriented society, woodsworkers were the easy victim of mass media pressure for more goods and material comfort. So far, the logging industry had not satisfied their growing economic aspirations.

Examining motivational needs, Ferragne came to the conclusion that logging occupations did not offer much in terms of self-realization, achievement, and recognition. His own survey showed that 58 per cent of the workers were not interested in promotion. Interviewees realistically believed that better educated and trained newcomers had better chances of filling the better jobs of the future. According to them, their job was not important and "the strength of [their] back [was] a worthwhile commodity only until the employer [found] a better way to do the work," that is, a machine or a technical device of some sort. With reason, woodsworkers believed that they did not receive any recognition from a society where muscle work was much devalued.

However, their occupation gave them some sense of responsibility which they appreciated very much. The piecework system left them free on the job and woodsworkers, as self-made men, had developed more trust in their own method than in anyone else's.[662]

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[661] Ibidem.

[662] Ibidem.

Continuous problems with labor mobility and the rapid transformation in the occupational needs of the industry due to the rapid mechanization of its operations led to the decision to conduct a more extensive survey of the situation in the late 1960's.[663]

The survey covered 90 per cent of the woodsworkers[664] employed by the pulp and paper companies for the year 1966-67 (the latest year for which statistics were available) including the four companies subject of the present dissertation. What was the general picture which emerged from Latraverse's study? Basically, his study showed that things had not changed much since the early 1950's in terms of labor mobility. Latraverse found that the pulp and paper logging organizations had a labor reservoir of 40,000 men to fill 16,500 jobs at the peak of their activities.[665] In any industry other than logging, this would have been called a "healthy" labor supply and personnel management would have been "choosy" in its selection and hiring policy. Not so for logging companies. They needed 70,000

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[663] The survey was sponsored by the "Comité d'étude de la main-d'oeuvre forestière," organization set up to bring together all the parties directly interested in the present and future situation of the industry: employers, unions and governments. They were: the Quebec Forest Industries Association; l'Association des Manufacturiers de Bois de Sciage du Québec; the Canadian Federation of Pulp and Paper and Forest Workers (C.N.T.U.); the Quebec Federation of Forest Workers (U.P.A. (U.C.C.)); the woodsworkers and Sawmill Workers Union (U.B.C.J.A.); the Federal Department of Manpower and Immigration; and the Provincial Department of Labour and Manpower.

[664] Were excluded from the survey the following occupational groups: scalers, supervisory personnel above the rank of seasonal foreman, all non strictly logging truckers and clerical staff.

[665] Latraverse, _op. cit._, pp. A-28 and A-44. Compare this with the previsions made by Gosselin _et al._ in 1957 (see page 471 above).

hirings to fill the required occupations. Figures in Table 78 indicate that job instability in logging was still very high in 1966-67, especially among the production workers.

For instance, there were more than two men to fill every pulpwood cutter job and cutters kept their job for an average of only 61 calendar days. During that period, the industry still experienced a shortage of labor. The high level of instability was further substantiated by the number of hirings per individual in the different occupations. Once more, production workers were much more mobile than the other ones. Table 79 shows that 46 per cent of the cutters had two and more hirings compared to only 35 per cent of the laborers. Latraverse found out that more than 25 per cent of the total labor force (or 10,500 workers) had moved from one location to another within the same or between forest operations.[666] During the same 1966-67 season, 58 per cent of the woodsworkers changed their employers. Almost 25 per cent of them quit their jobs on their own choice every month.[667]

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[666] Latraverse, op. cit., p. A-73.

[667] E.F. Boswell reported an average weekly turnover of 5 per cent for Quebec in 1964-65. Compare these figures with the figures reported by Koroleff and those analyzed by Gosselin et al. (see pages 461 and following above) (E.F. Boswell, "Regional rate of development and implications in Quebec," Pulp and Paper Magazine of Canada, Convention Issue 1966, pp. WR-103-106).

TABLE 78

Various Labor Statistics for Different Logging Occupations, Pulp and Paper Industry, Quebec, 1966-67

Occupation	Number of required men[a] #	Number of required men[a] %	Peak of employment[b]	Number of hirings[c]	Number of individuals	Average length per hiring (in calendar days)[c]
1) Pulpwood cutters	10,100	63.1	10,400 (mid-Oct.)	44,465	23,386	61
2) Machine operators (skidder & small tractor)	1,200	7.5	1,300 (Jan.)	5,171	2,723	71
3) Truck drivers	800	5.0	1,400 (mid-Jan.)	4,400	2,260	59
4) Drivers (water)	320	2.0	1,000 (end of May)	2,078	1,593	60
5) Laborers	1,630	10.2	1,800 (Nov.)	6,917	4,072	69
6) Cooks	700	4.4	700 (Sept.)	2,342	1,421	90
7) Maintenance workers	560	3.5	620 (Sept.)	1,401	885	125
8) Mechanics	270	1.7	320 (Feb.)	644	459	152
9) Foremen	420	2.6	460 (Sept.)	894	588	156
Total	16,000	100%	--	68,312	37,387	--

[a]Figures from Table 6, p. A-33. This represents an average.

[b]Figures from Chapter 3.

[c]Figures from Table 9, p. A-47.

SOURCE: S. Latraverse, op. cit.

TABLE 79

Number of Hirings per Worker in Different Logging Occupations, Pulp and Paper Industry, Quebec, 1966-67

Occupation	Number of hirings in % 1	2	3-4	5-9	Total
1) Pulpwood cutters	54	23	18	5	100%
2) Machine operators	58	22	16	4	100%
3) Truck drivers	57	23	16	4	100%
4) Drivers	52	24	18	6	100%
5) Laborers	65	20	12	3	100%
6) Cooks	70	19	13	2	100%[a]
7) Maintenance workers	69	19	12	1	100%[b]
8) Mechanics	78	14	6	1	100%[b]
9) Foremen	67	23	8	1	100%[b]
10) All	57	22	16	5	100%

[a]Error in the figures given by Latraverse.

[b]Total does not add up to 100 due to rounding.

SOURCE: Latraverse, op. cit., p. A-73.

The number of hirings and their short duration meant that a large number of men, again mostly among production workers, were employed in the logging industry for a short period of the year. In fact, half of the labor force worked less than three months and only 7 per cent were employed more than ten months (see Table 80). One third only stayed with the industry more than five months. When the occupational distribution was examined, the study showed that pulpwood cutters had an annual average length of employment of only 113 days and that the majority of them (52 per cent) spent no more than three months in the industry (see Table 81).

All of this added up to the conclusion that half of the labor force accounted for only 15 per cent of the production done, while the other half accounted for 85 per cent of it.

TABLE 80

Length of Total Employment, All Logging Occupations,
Pulp and Paper Industry, Quebec, 1966-67

Length of employment	Average length (in days)	Number of workers	Per Cent of labor force	Cumulative per cent of labor force
Less than 1 mo.	14	8,970	24.1	
Between 1 mo. & 2 mos.	45	5,637	15.1	39.2
Between 2 mos. & 3 mos.	75	4,226	11.3	50.5
Between 3 and 4 mos.	105	3,208	8.6	59.1
Between 4 and 5 mos.	135	2,632	7.1	66.2
Between 5 and 6 mos.	165	2,398	6.4	72.6
Between 6 and 7 mos.	195	2,208	5.9	78.5
Between 7 and 8 mos.	225	1,900	5.1	83.6
Between 8 and 9 mos.	256	1,761	4.7	88.3
Between 9 and 10 mos.	286	1,749	4.7	93.0
Between 10 and 11 mos.	315	1,298	3.5	96.5
Between 11 and 12 mos.	350	1,295	3.5	100.0
Total	120	37,282	100.0	100.0

SOURCE: Latraverse, _op. cit._, p. A-55

TABLE 81

Length of Total Employment, Logging Occupations, Pulp and Paper Industry, Quebec, 1966-67

Occupation	Annual average (in days)	1 to 3 months	4 to 8 months	9 to 12 months	Total
1) Pulpwood cutters	113	52%	34%	14%	100%
2) Machine operators	129	50%	28%	22%	100%
3) Truck drivers	104	60%	27%	13%	100%
4) Drivers (water)	--[a]	48%	39%	13%	100%
5) Laborers	112	54%	32%	14%	100%
6) Cooks	142	46%	28%	26%	100%
7) Maintenance workers	186	30%	31%	39%	100%
8) Mechanics	--[a]	29%	26%	45%	100%
9) Foremen	234	16%	28%	56%	100%
10) All	--[a]	51%	33%	16%	100%

[a]Figures not given by Latraverse.

SOURCE: Latraverse, *op. cit.*, p. A-58 to A-59.

In an attempt to interpret these findings, Latraverse concluded that the absence of a labor policy in the logging industry was to blame to a large extent.

> On the one hand, the piecework system of remuneration makes possible the achievement of high earnings. On the other hand, the hiring practices of the companies leave open for any individual with a minimum of qualifications, the possibility of trying to make it in logging. The combination of these two factors consequently contributes to attract an excessive number of workers of which the majority does not have any real hope of earning a normal income and of establishing a career in this industry. The latter thus creates false opportunities and in the long term prevents the industrial and geographical mobility of this under-employed labor force.[668]

Thus, despite increased productivity,[669] the industry was unable to solve its problem of labor mobility and shortage. This was all the more remarkable since it benefited from a constant influx of labor from agriculture since the late 1940's up to the mid-1960's. Indeed, the reduction in the agricultural labor force proceeded at an annual rate of 4.5 per cent between 1946 and 1965 (see Table 82) and affected mostly non-remunerated family workers (5.6 per cent annually) in comparison to 3.6 per cent for heads of exploitations and 1.6 per cent

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[668] Latraverse, op. cit., p. A-61. My translation.

[669] See Chapter 3, pp. 148 and following, and the second part of this chapter below, pp. 499 and following.

TABLE 82

Labor Force in Agriculture, Including Self-Employed People, Monthly Averages, Quebec, 1946-1965

Year	Labour force in agriculture ('000)	Per cent of total Quebec labor force
1946	277	20.7
1947	253	18.6
1948	246	17.7
1949	242	17.0
1950	255	17.8
1951	229	15.7
1952	209	13.9
1953	203	13.2
1954	214	13.7
1955	172	10.8
1956	165	10.2
1957	171	10.2
1958	162	9.3
1959	155	8.8
1960	135	7.5
1961	138	7.6
1962	132	7.1
1963	124	6.5
1964	114	5.8
1965	116	5.7

SOURCE: Labor Force, Cat. #71-001, Supplement to the report of March 1965. In Lebel *et al.*, *op. cit.*, p. 122.

for salaried agricultural workers. This reduction in agricultural labor was related to a high increase in productivity and to low agricultural incomes.[670] Both factors contributed to push labor out of agricultural activities. Since agricultural labor was unskilled and had previous training and experience in logging, it naturally found temporary (if not permanent) employment in logging operations while waiting or looking for more attractive opportunities in other industries.[671]

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[670] The increase in productivity averaged 6.6 per cent per agricultural worker per year compared to an average rate of 1.9 per cent for the whole economy (Gilles Lebel et al, L'évolution de l'agriculture et le développement économique du Québec, 1946 à 1976 (Québec: Rapport de la Commission Royale d'Enquête sur l'Agriculture au Québec, 1967), p. 25). However, productivity in agriculture is still lower than in the other sectors of the economy (idem., p. 31). On the other hand, the average agricultural income in Quebec represented only about 40 per cent of the average non-agricultural income (see Table 83). Furthermore, while characterized by wide fluctuations, the average agricultural income increased much less rapidly than the average non-agricultural income. The rate of increase of the former was only 0.9 per cent annually against 1.7 per cent for the latter. Thus, notwithstanding the rapid increase in agricultural productivity, the gap in income between agricultural workers and non-agricultural workers did not diminish due mostly to the relative deterioration in agricultural prices (idem., p. 43). More recent figures (1971 Census) indicate that rural incomes, especially farm incomes, are still very much below urban incomes in the country in general (see Table 84) and within the province of Quebec in the areas where logging companies recruit most of their labor force (see Table 85).

[671] According to a manpower specialist, Quebec experienced a particularly sharp decline in the rural male labor force between 1951 and 1961. For him, this meant labor supply problems for the logging industry (Dawson, op. cit.).

TABLE 83

Comparative Evolution of Average[a] Agricultural and Non-Agricultural Incomes, Quebec, 1946-1965

Year	Agricultural income[b] $	Index	Non-agricultural income[b] $	Index
1946	805	100.0	2,126	100.0
1947	881	109.4	2,167	101.9
1948	1,019	126.6	2,072	97.5
1949	884	109.8	2,012	94.6
1950	822	102.1	2,067	97.2
1951	925	114.9	2,059	96.9
1952	944	117.3	2,134	100.4
1953	881	109.4	2,245	105.6
1954	768	95.4	2,268	106.7
1955	953	118.4	2,265	106.5
1956	900	111.8	2,468	116.1
1957	911	113.2	2,471	116.2
1958	986	122.5	2,371	111.5
1959	920	114.3	2,421	113.9
1960	960	119.3	2,429	114.3
1961	926	115.0	2,516	118.4
1962	993	123.4	2,612	122.9
1963	958	119.0	2,644	124.4
1964	986	122.5	2,760	129.8
1965	1,168	145.1	2,872	135.1
1946-1965 average	930	--	2,349	--
Rate of variation[c]	0.9	--	1.7	--

[a]Average income = income per active person.

[b]Corrected in order to take into account the cost of living in each sector.

[c]Rate of variation annually compounded.

SOURCE: Service de Développement Economique, Bureau de Recherches Economiques, Ministère de l'Industrie et du Commerce, Québec (juin 1967). Quoted in Lebel *et al.*, *op. cit.*, p. 36.

TABLE 84

Male Population 15 Years and Over, by Income Groups and Residence (Urban and Rural), Quebec, Ontario and Canada, 1971

Group	Income (in dollars)					
	Quebec		Ontario		Canada	
	Average	Median	Average	Median	Average	Median
	(all persons with income)					
Urban regions	5,199	4,303	5,634	4,625	5,317	4,288
5,000 - 9,999	4,608	3,848	5,063	4,048	4,847	3,844
under 5,000	4,516	3,686	4,870	3,751	4,540	3,462
Rural regions	3,776	2,910	4,512	3,371	3,952	2,804
non-farm	3,850	2,983	4,671	3,651	4,090	2,975
farm	3,536	2,724	4,067	2,715	3,561	2,389

SOURCE: Census of Canada, Volume III, Part I, Cat. #94-709, Table 29.

TABLE 85

Male Population 15 Years and Over, by Income Groups and Residence (Urban and Rural) for Selected Census Divisions, Quebec, 1971

Division	Income (in dollars)					
	Urban		Rural non-farm		Rural farm	
	Average	Median	Average	Median	Average	Median
	(all persons with income)					
Abitibi	6,355	6,107	4,822	4,617	4,645	4,027
Beauce	4,982	4,425	4,045	3,534	3,402	2,842
Bellechasse	4,361	3,713	4,130	3,394	3,557	3,104
Bonaventure	6,162	5,621	3,967	3,220	3,315	2,502
Champlain	6,067	5,855	4,625	4,100	3,620	3,191
Chicoutimi	6,478	6,466	5,047	4,953	4,339	3,621
Dorchester	4,963	4,457	4,016	3,415	3,456	2,948
Gaspe (east)	4,433	3,588	3,720	3,099	2,980	1,958
Hull	6,684	6,433	6,004	5,589	6,432	5,650
Lac St-Jean (east)	5,915	5,837	4,543	4,347	3,826	3,142
Matane	5,045	4,504	3,837	3,308	3,889	3,152
Saguenay	7,750	7,734	4,794	3,834	4,119	3,267
Temiscamingue	6,546	6,320	4,739	4,379	4,691	3,892
Temiscouata	4,425	3,959	3,785	3,325	3,324	2,715
Total Quebec	6,691	5,961	4,637	4,067	4,041	3,279

SOURCE: Census of Canada, Volume III, Part I, Cat. #94-709, Table 30.

E. The Situation in 1972-73[672]

Despite dramatic reductions in labor content (up to 25 per cent for certain phases of the operations)[673] and more attractive working conditions (see the second part of this chapter), the problem of labor shortage has not been resolved.[674] In certain parts of Quebec, especially those where labor had to be imported from other areas (for instance, the Lower St. Lawrence North Shore area),[675] a serious shortage was experienced to the point where production targets were not met in the recent years. This was quite unexpected by the industry.

In its report of December 1970 (the Latraverse Report), the "Comité d'étude de la main-d'oeuvre forestière" forecasted the elimination of 8,000 jobs by 1975, or a diminution from 20,500 to 12,900 employees between 1966-67 and 1974-75. To fill the 20,500 jobs

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[672] This assessment of the situation is based mostly on a survey sponsored by the "Conseil de main-d'oeuvre de la forêt" which results were published in Etudes sur la pénurie de travailleurs forestiers au Québec (Octobre 1973) and on conversations with some people in the industry.

[673] Mechanical slashing alone reduced the labor content by 23.6 per cent at Consolidated-Bathurst (see Legault, "Mobile Mechanical Slashers...", p. 91).

[674] Occupational and geographical mobility is still relatively high and affects mostly piecework workers which comprise half of the total labor force (Le Papetier, 10, 5 (Décembre 1973), p. 5). For instance, the newly established ITT-Rayonier is reported to have lost 50 per cent of the 300 logging operators which it trained in the two-year period 1972-74 (G. McLeish, "Gears meshing in Rayonier woods operations," Pulp and Paper Magazine of Canada, 75, 9 (September 1974), p. 31).

[675] Quebec North Shore Paper was one of the companies most affected by labor shortages.

available in 1966-67, the industry hired 37,500 workers. The committee was thus predicting that between 1970 and 1975, several thousand workers would be obliged to look for work elsewhere and was not worried about finding a sufficient supply of labor.[676]

However, only two years later, in the fall of 1972, the industry faced a dramatic shortage of labor. While it had only 12,000 jobs to fill, it could only get 11,000 men despite doing its best to recruit the 1,000 missing men in a very favourable period of high unemployment.[677] A year later (in September 1973), it was estimated that 1,600 men were missing throughout the province in order to operate according to schedule despite the fact that the number of workers in the operations had increased from 11,500 to 13,500 for the same period a year earlier.[678]

The industry and other concerned agencies, like the government and the unions, wanted to know what had happened (why workers had abandoned their employment and foregone their security rights and where were they going). The "Conseil de main-d'oeuvre de la forêt" set out to do another study in 1972-73 to find an answer to these

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[676] Latraverse, _op. cit._, p. B-2.

[677] The unemployment rate was 7.1 per cent for the province as a whole, but as high as 12.4 per cent in the Lower St. Lawrence, Gaspesia and North Shore areas where the industry is a major source of industrial employment.

[678] _Le Papetier_, 10, 5 (Décembre 1973), p. 5.

and other questions.[679] The study was concentrated in the Lower St. Lawrence, Gaspe and North Shore areas where the shortages were particularly bad.[680] Using the employees lists of the seven major companies of the areas, the "Conseil" found that 1,515 workers had quit their jobs between December 1970 and November 1972 and that most of them (about 75 per cent) were cutters and operators of skidders on the piecework system. The study revealed also that 70 per cent of them were between 20 and 40 years of age and that surprisingly, half of those who were working at the time of the survey were still working in forest activities, but mostly for small businesses.[681]

The survey, which included interviews with 12th and 13th grade highschool students and young unemployed workers (between 18 and 22 years of age) as well as with former and active woodsworkers, showed that there still existed a negative image of logging occupations quite similar from one group to the others. Four major categories of factors accounted for it: (a) social and familial reasons; (b) financial insecurity (unsatisfactory net income due to the relatively high tool and personal expenses related to logging employment; (c) hardships related to the nature of logging work; and (d) lack of training given to newcomers.

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[679] The study was under the direction of Roger Ferragne, director of industrial relations (woodlands) at Consolidated-Bathurst.

[680] These areas represent 38 per cent of the total employment in the large logging companies of Quebec. The labor shortage was up to 9 per cent there against 7 per cent in the province of Quebec as a whole (Conseil de main-d'oeuvre de la forêt, op. cit., p. 1).

[681] Nine per cent were found working in the building industry and only 12 per cent living off social welfare (idem., pp. 4 and 5).

A too low and uncertain net income and hard working conditions were the factors most often given, especially by former and active workers (see Table 86 for more details). These workers were also particularly aware of the lack of training and professional education given to young people, their difficulties to stay with the industry and the consequent aging of the labor force.

Conclusion

The characteristics of the woodsworkers described in this first part are not particular to Quebec labor supply by all means. A recent study in British Columbia indicated that forest workers received "an early orientation toward independence" from their self-employed fathers (farming, contract logging). This fostered the dominant work value of freedom.

> Freedom on the job included the ability to set one's own work pace, and in some cases, hours of work. It meant the absence of close supervision, so that one could exercise some choice in the use of work methods and tools. It meant being able to "move around" on the job, and not to be restricted closely to a work station. These factors appeared to outweigh disadvantageous aspects of the work, such as physical effort, exposure to weather, and environmental hazards. Such freedom was not usually unique to particular employers or jobs, but to the nature of woods work itself.[682]

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[682] P.L. Cottell, "Why Work in the Woods?", paper presented at the 54th Annual Meeting of the Woodlands Section, Canadian Pulp and Paper Association, Montreal, 1973, p. 18.

TABLE 86

Summary of the Major Factors Given to Explain the Shortage of Woodsworkers, Lower St. Lawrence, Gaspesia and North Shore Regions, Quebec, 1972-73

Factor[a]	Number of Mentions						
	(1) High school students (132)b	(2) Unemployed youth			(3) Former woodsworkers (116)b	(4) Active woodsworkers (116)b	TOTAL 2B-3-4
		A Without experience in logging (75)b	Total (A+B)	B With experience in logging (87)b			
A-Social, Familial and Personal Factors							
1) Young people are better educated now--want a better education--are discouraged from going in the woods	45	7	(17)	10	41	55	106
2) Does not like life in the woods because of isolation and distance	35	18	(38)	20	37	32	89
3) Unemployment insurance	45	14	(27)	13	20	21	54
4) Social welfare	19	10	(16)	6	22	19	47
5) Laziness (can live without working).	35	9	(22)	13	7	22	42

Table 86 (continued)

Factor[a]	(1) High school students (132)[b]	(2) Unemployed youth: A Without experience in logging (75)[b]	Total (A+B)	B With experience in logging (87)[b]	(3) Former woodsworkers (116)[b]	(4) Active woodsworkers (116)[b]	TOTAL 2B-3-4
B-Income and Remuneration							
1) Too many tool expenses	15	10	(39)	29	57	66	152
2) Too many personal expenses	12	5	(24)	19	41	54	114
3) Net earnings too uncertain	30	6	(26)	20	51	23	94
4) Pay too low	--	0	(6)	6	--	44	50
5) Good and bad "chances" paid at the same rate	--	--	(--)	--	21	24	45
6) Building industry pays better	4	5	(14)	9	21	13	43
C-Working Conditions							
1) Work is too hard	--	--	(--)	--	20	63	83
2) Mosquitos, cold, snow, health, etc.	18	17	(43)	26	--	52	78
3) Favoritism in the distribution of logging chances	5	2	(25)	23	31	20	74
4) Work is too hard in the snow[c]	16	9	(36)	27	39	(see[a])	66
5) Hours of work are too long	7	7	(11)	4	16	38	58
6) Employment is too unstable. Priority given to seniority	17	8	(17)	9	18	23	50

Table 86 (continued)

Factor[a]	(1) High school students (132)[b]	(2) Unemployed youth: A Without experience in logging (75)[b]	(2) Unemployed youth: Total (A+B)	(2) Unemployed youth: B With experience in logging (87)[b]	(3) Former woodsworkers (116)[b]	(4) Active woodsworkers (116)[b]	TOTAL 2B-3-4
7) The lads are always working too hard ("à la planche")	--	--	(--)	--	--	44	44
D-Training							
1) Young people do not have the chance to be trained any more because of team work	7	5	(16)	11	46	21	78
2) Young people are fed up because they are not given the chance to learn the trade. Those who do not make the minimum wage are fired	--	--	(--)	--	19	42	61

[a]The list presented here includes less than half of all the reasons mentioned in the original table. Only the top reasons have been selected for this table. However, they are very much representative of the full list.

[b]Number of persons who were interviewed.

[c]This reason received more mentions because most of the interviews were conducted during the winter.

SOURCE: Conseil de la main-d'oeuvre de la forêt, op. cit., pp. 47-50.

But besides this attraction for independence, Cottell found that woodsworkers showed strong concern for income. Unfavourable current incomes were an important cause of instability of employment. However, in an unstable and seasonal industry, mobility was for the workers their means to reach security.

> Security for these men lay in their mobility itself -- the ability to find work with whatever industry or company it was available, and so be employed for as much of the year as possible. They took pride in the portability and variety of their skills, an ability to "do anything" and be a "jack of all trades." It was frequently said that: "I could quit here Friday night and have another job to go to Monday morning."[683]

Even if, in the case which interests us here, the large pulpwood logging organizations provide more stable employment now and thus a greater security, Quebec's woodsworkers have not yet shed this "security through mobility" and this "jack of all trades" mentality completely. However, they know that they are very vulnerable in an economy where specialization and qualification are in high demand. For most of them, logging remains the best source of employment which they can realistically expect. Besides their limitations in education and training which close other sources of employment, their family background frequently associated with agricultural and forestry work predisposes them toward outdoor, operative occupations. Furthermore, they usually live in areas where the forest industry constitutes one of the few important alternatives of employment.[684] In summary, the

[683] Idem., pp. 20-21.

[684] Idem., p. 21.

industry is left with a labor force which has not much of a choice. For most woodsworkers, logging offers few positive factors of attraction and many more reasons to quit. Many woodsworkers just do that even if they must survive on unemployment benefits. The other ones stay because they are more realistic or influenced by a stronger work ethic.

II. The Demand for Labor

During the period under scrutiny, the demand for labor underwent considerable changes in volume as well as in nature.

A. A Diminishing Demand for Labor

The total volume of labor employed in the pulpwood logging industry decreased considerably between 1950 and 1970. Depending on the statistical source used, this reduction in labor varies between 50 and 60 per cent or more for the period. Data from the Quebec Bureau of Statistics and the Council of Pulp and Paper Producers of Quebec show that between 1952 and 1972, the number of forest employees decreased from 35,025 to 12,500 (see Chapter 3, Table 5, p. 123). The reduction appears to have been more severe after 1965 than at any other period before. The index of employment shows that while employment in 1965 was at the same level as that of 1961, and even higher in 1967 than in 1961, it took a sharp downward turn in 1968 and continued to decline since with a low of 61.1 in 1971 (see Tables 87 and 88).[685]

The logging industry did not follow the general upward trend and was the only major activity to show such a decline. It can be understood, however, in terms of the greater annual length of logging operations,[686] and especially the sharp increase in productivity created by technological innovation.[687] Part of the sharp downward trend beginning in 1968 is certainly related, for instance, to the

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[685] Upward fluctuations in 1965, 1966 and 1967 can be explained by a stronger demand for pulpwood. "La demande de bois s'étant accrue dans les années 1965, 1966 et durant la première moitiée de 1967, le marché du travail en forêt offrit des emplois abondants, en dépit de l'accélération de la mécanisation par l'introduction de nouveaux types de machines.
La reprise des opérations, au printemps de 1968, a cependant été moins spectaculaire que par les années précédentes, mais l'industrie a absorbé progressivement presque toutes ses réserves de travailleurs réguliers et stables. En effet, à la mi-juillet 1968, la force ouvrière en forêt était inférieure de 5. p. 100 à peine à ce qu'elle était en 1966 et 1967; elle était supérieure de 10 p. 100 à celle de 1965 et à peu près égale à celle qu'elle était en 1965" (Ferragne, "La stabilité d'emploi en forêt," p. 9).

[686] Gosselin's study indicates that operators started to extend the period of operations in 1950, 1951 and 1952 because of a shortage in the supply of labor (Gosselin et al., op. cit., p.23). "It must be remembered that it is the workers, or their shortage, who forced the operators to create the new pattern of longer operations, and not the operators who forced this pattern on the workers. Indeed, all our findings suggest that it is the operators who have adapted their policies to a new labor situation and not the other way around. If the shortage of workers still increases further adaptation shall be necessary. Both the operators and the workers would gain if the adaptation were a long term and a more rational one" (idem., p. 71).

[687] For instance, a division (Dolbeau) of a major company (Domtar) could reduce its labor requirements by half between 1961 and 1971 while maintaining the same volume of production through the introduction of mechanical skidding and slashing (1961 production: 135,000 cunits and 565 men; 1971 production: 128,000 cunits and 228 men) (letter from M.J. Rouse, assistant manager, Domtar Woodlands).

TABLE 87

Index of Employment, Forestry and Other Major Industries, Quebec, 1951-52

(1949 = 100)

Industry	1951	1952	1953	1954	1955	1956
Forestry	139.8	133.7	103.3	96.8	108.0	125.0
Manufacturing	107.5	110.2	113.1	107.1	108.0	113.2
Paper Products[a]	108.9	107.7	106.1	112.2	117.5	124.1
Construction	109.5	127.7	114.5	108.6	117.6	133.7
Transportation	106.7	109.6	109.6	108.3	112.6	120.6
Storage & Communications						
Trade	106.2	108.8	113.0	115.1	119.7	126.9
Services	103.9	111.2	111.1	110.5	111.6	123.5
Industrial Composite	109.2	113.4	112.8	109.2	112.5	120.1

Industry	1957	1958	1959	1960	1961	1962
Forestry	109.7	83.0	86.9	86.4	71.6	70.4
Manufacturing	113.7	108.4	109.5	109.3	108.6	111.8
Paper Products[a]	121.9	116.4	117.8	118.1	116.9	117.6
Construction	139.0	133.0	133.4	131.7	128.5	129.6
Transportation	122.2	119.0	117.0	115.0	114.4	114.5
Storage & Communications						
Trade	133.0	134.1	136.6	138.4	140.9	145.7
Services	129.6	133.6	139.6	144.6	150.2	160.7
Industrial Composite	121.5	117.0	118.5	118.6	118.3	121.6

[a]Pulp and paper mills are generally above the average of this category by between 1 to 3 points although they were under the average in 1961 and 1962 by up to 2.2 points in the latter year.

SOURCE: Quebec Yearbook, 1963, pp. 458-459 [from Employment and Payrolls, (72-002), Dominion Bureau of Statistics].

TABLE 88

Index of Employment, Forestry and Other Major Industries, Quebec, 1965-1971

Industry	(1961 = 100)						
	1965	1966	1967	1968	1969	1970	1971
General Index	112.9	118.1	119.4	117.7	120.2	119.2	118.6
Forestry	100.5	103.3	106.2	86.4	78.4	73.7	61.1
Mines	108.1	110.1	107.6	103.7	102.5	104.7	101.4
Manufacturing	111.8	117.0	117.0	116.3	118.3	116.2	113.5
Construction	119.8	124.0	103.8	93.2	89.2	84.2	87.3
Services	127.5	140.5	161.0	155.1	165.1	167.7	175.0

SOURCE: Annuaire du Quebec, 1973, p. 434. These figures come from Statistics Canada, Employment and Average Weekly Wages and Salaries (Publication 72-002).

introduction of a major laborsaving process like mechanical slashing.[688] According to Boswell, cutting productivity in Quebec increased from 1.55 cunits per man-day in 1953-54 to 2.56 cunits per man-day in 1964-65.[689] His forecasts for 1979-80 included a doubling of general productivity every eight years between 1963-64 and 1979-80 (see Table 89).[690]

The present reduction of employment can be seen as part of a historical movement during which the volume of employment increased steadily during the period ending in the early 1950's when it reached its peak and then started to decline up to now (see Table 90 and Chapter 3, Table 5).

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[688] At Consolidated-Bathurst, it was found that labor productivity was increased by 30.8 per cent in one such mechanized operation, from 2.14 cunits per man-day to 2.80 cunits per man-day (Legault, "Mobile Mechanical Slashers...", p. 191).

[689] Boswell, op. cit., p. 103. These figures should be compared with pre-war figures. For instance, G.E. LaMothe, then chief logging engineer at Price, reported that the productivity in the Saguenay operations was 0.68 cords per man-day in 1939-40 and that he estimated this level of productivity to have been the same since 1925. No steady trend up or down had been noted within that 15-year period (Koroleff et al., op. cit., p. 59)

[690] Another illustration of these changes is provided by Abitibi Power and Paper Company at its four Ontario divisions.

	1951-52	1961-62	1971-72[a]
No. of employees/1,000 cords	1,958	603	187
Time worked/year (in days)	69	126	203
Man-days of wood labor/cord at camp level	1,192	.640	.346

[a] Forecast. Job opportunities were reduced by 69 per cent between 1951-52 and 1961-62.

SOURCE: E. E. Grainger, "What are the consequences of total mechanization?", 1963.

TABLE 89

Manpower Requirements for Limit Pulpwood Production (from stump to mill blockpile), Quebec, 1963-1980

	Productivity: No. of cunits/ man-day (all hands)	Limit pulpwood production ('000 cunits)	Per cent increase over 1963-64	Number of days in operating year	Manpower required
1963-64	1.33	3,205		150	16,000
1971-72	2.45	4,338	35%	150	11,800
				200	8,850
1979-80	2.45	5,708	79%	200	11,650
	3.00			200	9,500
	5.00			200	5,700

SOURCE: Boswell, op. cit., p. 104.

B. Changes in the Occupational Structure

Not all occupations were equally affected by the reduction in employment. As could be expected, occupations directly related to production where the impact of technological change has been felt most were the most affected (see Table 91).[691] However, the difference between production workers and maintenance and service personnel is not

[691] Reductions in labor requirements at the production level does not mean necessarily reduction in overhead employment. The experience at Consolidated-Bathurst showed in 1970 that the introduction of mechanical slashing did not reduce the number of overhead employees because the savings in commissary labor were offset by higher requirements for supervision. "Mechanical slashing also affects labor requirements at the district level, mainly scaling, accounting and mechanical services. Effects on these services compensate on the average" (Legault, "Mobile Mechanical Slashers...", p. 191). According to management personnel at Domtar, there has been a reduction in the demand for forestry specialists (especially forest engineers) because of the mechanization of forestry techniques and methods, the completion of the large inventories and surveys and the takeover by the Department of Lands and Forests of most of the field survey and aerial photography work. See also Acres Québec Ltée, op. cit., pp. 68-69.

TABLE 90

Numerical and Percentage Distribution of the Male Labor Force
15 Years of Age and Over, Logging Industry,
Quebec, Ontario and Canada, 1911-1961

	1911		1921		1931		1941		1951		1961	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Quebec	10,972	2.0	10,292	1.6	14,827	1.8	29,981	3.2	34,485	3.1	31,816	2.5
Ontario	10,145	1.2	7,540	0.8	8,718	0.8	14,228	1.2	16,369	1.1	11,872	0.7
Canada	41,396	1.8	36,602	1.4	42,030	1.3	78,710	2.3	101,146	2.4	79,557	1.7

SOURCE: Census of Canada, SL-1, 18-3-1966, Cat. #94-551, Table 5.

TABLE 91

Occupational Structure of the Pulpwood Logging Industry, Quebec, 1956-1965

Occupation	1956 No.	1956 %[a]	1957 No.	1957 %	1958 No.	1958 %	1959 No.	1959 %	1960 No.	1960 %
Total non-office employees	37,149	100.0	23,516	100.0	26,933	100.0	26,810	100.0	27,791	100.0
Production workers	28,175	75.9	18,784	79.9	21,650	80.4	22,164	82.7	19,724	71.0
Pulpwood cutter[b]	19,867	53.5	13,259	56.4	17,028	63.2	16,767	62.5	13,952	50.2
Truck driver[c]	773	2.1	666	2.8	623	2.3	695	2.6	903	3.3
Log-truck driver	773	2.1	666	2.8	623	2.3	695	2.6	807	3.0
Heavy truck driver	--	--	--	--	--	--	--	--	63	0.2
Light truck driver	--	--	--	--	--	--	--	--	33	0.1
Tractor driver	510	1.4	410	1.7	479	1.8	579	2.2	504	1.8
Teamster	3,566	9.6	2,038	8.7	1,784	6.6	1,769	6.6	2,471	8.9
Scaler	217	0.6	208	0.9	141	0.5	125	0.5	249	0.9
Loader	648	1.7	611	2.6	473	1.8	460	1.7	593	2.1
Roadman and swamper	2,594	7.0	1,592	6.8	1,122	4.2	1,769	6.6	1,052	3.8
Laborer, production[d]	--	--	--	--	--	--	--	--	--	--
Maintenance & service personnel	3,578	9.6	2,073	8.8	2,132	7.9	2,313	8.6	3,094	11.1
Cook, cookee & choreboy	2,251	6.1	1,333	5.7	1,308	4.8	1,321	4.9	1,186	4.3
Mechanic	310	0.8	194	0.8	216	0.8	257	1.0	172	0.6
Laborer, non-production	--	--	--	--	--	--	--	--	1,138	4.0
Other maintenance & service personnel[e]	1,017	2.7	546	2.3	608	2.3	735	2.7	598	2.2
Unspecified occupations[f]	5,396	14.5	2,659	11.3	3,151	11.7	2,333	8.7	4,973	17.9

Table 91 (continued)

Occupation	1961 No.	1961 %	1962 No.	1962 %	1963 No.	1963 %	1964 No.	1964 %	1965 No.	1965 %
Total non-office employees	22,445	100.0	19,885	100.0	18,763	100.0	17,296	100.0	16,294	100.0
Production workers	15,472	68.9	13,583	68.3	12,754	68.0	13,224	76.5	11,949	73.3
Pulpwood cutter[b]	12,312	54.9	10,508	52.8	9,388	50.0	9,706	56.1	8,791	53.9
Truck driver[c]	249	1.1	315	1.6	577	3.1	661	3.7	537	3.3
Log-truck driver	--	--	209	1.0	475	2.5	549	3.1	442	2.7
Heavy truck driver	196	0.9	53	0.3	71	0.4	89	0.5	87	0.5
Light truck driver	53	0.2	53	0.3	31	0.2	23	0.1	8	0.1
Tractor driver	639	2.8	736	3.7	818	4.4	887	5.1	947	5.8
Teamster	815	3.6	630	3.2	509	2.7	464	2.7	345	2.1
Scaler	263	1.2	297	1.5	335	1.8	338	2.0	342	2.1
Loader	280	1.2	302	1.5	258	1.4	274	1.6	128	0.8
Roadman and swamper[d]	711	3.2	652	3.3	664	3.5	618	3.6	600	3.7
Laborer, production	203	0.9	143	0.7	205	1.1	276	1.6	259	1.6
Maintenance & service personnel	1,892	8.4	1,963	9.9	1,519	8.1	1,761	10.2	1,503	9.2
Cook, cookee & choreboy	1,015	4.5	917	4.6	881	4.7	893	5.2	791	4.9
Mechanic	150	0.7	154	0.8	141	0.8	154	0.8	164	1.0
Laborer, non-production	337	1.5	410	2.1	145	0.8	390	2.3	298	1.8
Other maintenance & service personnel[e]	390	1.7	482	2.4	352	1.8	324	1.9	250	1.5
Unspecified occupations[f]	5,081	22.6	4,339	21.8	4,490	23.9	2,311	13.4	2,842	17.5

[a]Percentage figures may not add up to 100.0 because of rounding.

[b]Includes chopper and cutter.

[c]From 1956 to 1959, only "Log-truck driver" was requested. In 1961, "Log-truck driver" was reported as "Heavy truck driver."

Table 91 (continued)

[d] From 1956 to 1959, laborers were not requested. In 1960, "General Laborer" was asked for and is shown under non-production laborers. From 1961 to 1965, however, a breakdown by production and non-production was available and is shown as such in the table. Watchman and cleaner have been included with non-production laborers.

[e] Includes blacksmith, carpenter, electrician, handyman, machinist, sawfiler and welder.

[f] From 1960 to 1965, this residual category includes probationary, temporary and part-time employees, learner, apprentice, beginner and trainee. In addition, for all years, the following are included: supervisory personnel, female employees, mechanical pulp harvester operator, skidder operator (some, however, are taken into account under "tractor driver"), power trucker and grader operator.

SOURCE: Canada Department of Labour, Economics and Research Branch, Returns to the Wage Rates, Salaries and Hours of Labour survey, 1956-1965. Quoted in Campbell and Power, *op. cit.*, pp. 114-115 and 118-119.

as pronounced as one would have expected. Due to the important qualifications with which Table 91 must be read, it is very difficult to draw any other firm conclusion from it.

There appears to be a contradiction between Table 88 and Table 91. While the first one indicates that employment remained the same between 1961 and 1965, the latter one shows a marked decrease in the number of non-office employees. Since the number of office employees did not increase to make up for this diminution, we have to explain the difference by another factor. The reason for the difference could be in the fact that the first table includes all forestry and logging activities while the other table deals only with the pulpwood logging industry, especially the large organizations which have been more rapidly affected by technological changes.

Other figures taken from the census indicate also that the number of foremen increased in the last two decades despite a reduction in employment in the industry (see Table 92). These figures are too crude, however, to lead to further interpretation.

Changes in the demand for various occupations have been related to a major transformation in logging organizations: the greater differentiation of their occupational structure. A comparison between the occupational structure of a division of Consolidated-Bathurst in 1952-53 and the same occupational structure

TABLE 92

Male Forest and Logging Labor Force by Occupation, Quebec, 1951, 1961 and 1971

Occupation	1951	1961	1971[a]
Logging foremen	1,185	1,352	1,515
Forest rangers and cruisers	1,630	2,338	1,240
Lumbermen including laborers in logging	31,732	28,192	17,120
Total	34,547	31,882	19,870

[a]The occupational classification was done differently in the census of 1971 and the figures given here do not correspond exactly to those for 1951 and 1961, particularly the number of forest rangers and cruisers which, in fact, must be higher than it appears in this table.

SOURCE: Census of Canada, Vol. IV, "Labour Force," Table 4, 1951; Vol. III, Bulletin 3.1-3, Cat. #94-503, Table 6, 1961: Vol. III, Part II, Bulletin 3.2-3, Cat. #94-717, Table 2, 1971.

in 1970-71 reveals the extent of the change (see Table 93). While one could identify 40 different occupations and positions in Les Escoumains district in 1952-53, there were 74 of them in 1970-71. Some occupations, such as blacksmith, barnman (or stableman) and saw filer did not exist anymore in 1970-71 while others, like mechanic, machine driver and operator and clerk, had become much more specialized.

C. Change Away from Seasonality

Logging has been traditionally one of the most seasonal activities. Irving[692] quotes figures showing that for the period 1946

[692]H.J. Irving, Labour Management Relations in the Logging Industry with Particular Reference to Conditions in Eastern Canada (Fredericton, N.B.: unpublished M.S.F. Thesis, University of New Brunswick, 1953).

TABLE 93

Changes in the Occupational Structure of a Logging Operation,
Consolidated-Bathurst, Les Escoumains Division, 1952-53, 1961-62 and 1970-71

List of occupations

A. In the bargaining unit

1952-53	1961-62	1970-71	
Cook	Cook	Cook	Pay Clerk
Assistant Cook	Assistant Cook	Assistant Cook	General Clerk
Choreboy	Choreboy	Choreboy	First Aid Clerk
	Cookee	Cookee	Garage Clerk: junior
			senior
Barnman	Stableman		Assistant Garage Clerk
Hauler	Hauler		Drive & Improvement
Carpenter	Carpenter	Carpenter	Clerk: Class A
Blacksmith	Blacksmith		Class B
Filer			Radio-Telephone Operator
Dynamite Man	Dynamite Man	Dynamite Man	Secretary Dactylo: junior
Truck Driver	Truck Driver	Truck Driver	senior
Mechanic	Mechanic	Mechanic: Class A	
		Class B	
		Class C	
			Office Clerk: without experience
			junior
	Big Tractor Operator	Heavy Tractor Operator	Camp Janitor
Tractor Operator	Small Tractor Operator	Light Tractor Operator	Bus Driver
Motor Man	Motor Man	Motor Man	Fire Ranger
			Grader Operator
Drill Man		Laborer	Handyman
Laborer	Laborer		Front-end Loader Operator
Apprentice	Apprentice		
"Déserteur"			

Table 93 (continued)

List of occupations

A. In the bargaining unit

1952-53	1961-62	1970-71	
Driver	Driver	Driver	Small Pulpwood Loader Operator
Dam Keeper	Dam Keeper	Dam Keeper	Large Pulpwood Loader Operator
Cutter	Cutter	Cutter	"J-5" Operator
Assistant Clerk	Store Assistant Clerk	Camp Clerk: in training	Bucker
	Specifications Clerk	Class A	
	Assistant Paymaster	Class B	
			Rubber-tired Skidder Operator
			Slasher Operator
	Big Saw Operator		Big Saw Operator
	Grader Operator		Line Saw Operator

B. Excluded from the bargaining unit

1952-53	1961-62	1970-71
Head Field Clerk	Head Field Clerk	Chief Camp Clerk
Storekeeper	Storekeeper	Warehouse & Store Supervisor
Head Store Clerk	Head Store Clerk	
Camp Clerk	Camp Clerk	
Chief Scaler	Chief Scaler	Chief Scaler
Scaler	Scaler	Scaler
Assistant Scaler	Assistant Scaler	Assistant Scaler
Supervisor	Supervisor	Supervisor
Cut Inspector	Cut Inspector	
Inspector-Verificator	Verificator	Verificators
Assistant-Verificator	Assistant Verificator	
Security & Hygiene Inspector	Hygiene & Safety Inspector	Security & Training Inspector
"Localisateur"	"Localisateur"	"Localisateur"

Table 93 (continued)

List of occupations

B. Excluded from the bargaining unit

1952-53	1961-62	1970-71
		Chief Fire Ranger
		Communication Officer
	Paymaster	Paymaster
		Forest Limit Gate Keeper
		Assistant Forest Inspector
	Trespass Inspector	Forest Inspector
		District Superintendent Secretary
		Assistant District Accountant
District Accountant	District Accountant	District Accountant
		District Accountant Secretary
District Forester	District Forester	District Forester
General Supervisor	General Supervisor	
Sub-contractor	Sub-contractor	Sub-contractor
Contractor	Contractor	Contractor
		Assistant District Superintendent
District Superintendent	District Superintendent	District Superintendent
	District Agent	

SOURCE: Convention collective de travail pour la forêt entre Consolidated Paper Corporation (Consolidated-Bathurst) et le Syndicat national des travailleurs de la pulpe et du papier, section du bois, Les Escoumains, Saguenay, 1952-53, pp. 2 and 9; 1961-62, pp. 2 and 10 (operations) and pp. 2 and 9 (base); and 1970-71, pp. 1, 43 and 49.

to 1949, woods employment had the highest seasonal amplitude (ratio peak/average employment) of any major non-agricultural industry (see Table 94). Its average was 47.8 for that period as compared to 6.8 for all non-agricultural industries.[693] However, it should be remembered that it contributed to stabilizing the total employment picture because of its reverse seasonality with other highly seasonal industries.

> It should be remembered that the peak of employment in logging occurs at the season when other seasonal industries, especially agriculture, are at their lowest or on the downward trend, in employment. Thus logging plays an important part in relieving unemployment for some of those workers who are employed for part of the year in such industries as agriculture, construction and fishing.[694]

Not only has woods employment been characterized by high seasonal fluctuations, but there have also been wide variations from year to year due to variations in production levels. Irving reports a fluctuation of 75 per cent between 1949-50 and 1950-51 in Eastern Canada and points out that fluctuations of 20 to 30 per cent were not uncommon.[695]

Since the early 1950's, this gloomy employment picture has been altered substantially. The seasonality of employment has been considerably reduced through the extension of the yearly period of

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[693] _Idem_., p. 45.

[694] _Ibid_. Annual seasonal fluctuations were also related to the operation cycle with different peaks in employment corresponding to the cutting, the hauling and the driving seasons.

[695] _Idem_., pp. 43-44. See also Koroleff _et al_., _op. cit_., p.14.

TABLE 94

Seasonal Variations in Non-Agricultural Employment, Canada, 1946-1949

Industry	Seasonal amplitude[a]
Manufacturing	3.3
Textile Products	6.4
Mining	3.9
Logging	47.8
Non-Metallic Mineral Products	6.2
Non-Ferrous Metal Products	2.6
Pulp and Paper Products	4.3
Lumber and Products	10.3
Services	6.8
Construction and Maintenance	30.1
Trade	8.8
Transportation	7.3
All Industries	6.8

[a]Seasonal amplitude is the difference between peak and trough employment expressed as a percentage of the peak.

SOURCE: "Seasonal Variation in Employment," Labour Gazette, February 1951, p. 164. Reported in Irving, op. cit., p. 46.

operations and the simultaneous execution of all logging phases (cutting, skidding, hauling and transportation). Not only did it diminish the volume of labor needed at any point in time, but it created a much more stable demand and source of employment for the labor. Tables 95 and 96 summarize the situation concerning the extension of yearly operations (that is, the trend toward a nine to ten month period of employment) and the decrease in seasonal fluctuations (that is, the ratio peak/average employment) for the period 1952 to 1965 (for which data were readily available). These figures indicate that in the early 1950's, operations were concentrated within a period of five to six months (from September to February). Fourteen years later, in 1964-65, operations were then

TABLE 95

Non-Staff Pulpwood Logging Employment, Quebec Original CPPA Series, June 1951-May 1965

Year	Jan.	Feb.	March	April	May	June (number)	July	Aug.	Sept.	Oct.	Nov.	Dec.
1951	--	--	--	--	--	18,196	17,279	18,320	28,258	41,574	47,976	45,938
1952	45,636	41,346	18,854	5,799	17,271	16,423	13,496	15,548	27,305	36,938	39,598	30,447
1953	30,044	20,998	7,078	5,892	12,738	12,958	10,830	11,699	23,302	36,530	36,209	25,660
1954	25,356	16,255	5,093	2,882	11,708	13,653	12,594	13,653	25,517	36,332	40,689	33,943
1955	28,641	16,666	4,754	3,201	13,227	16,286	13,554	15,565	27,427	36,410	38,804	35,493
1956	32,302	21,512	10,123	7,160	16,889	18,410	17,729	16,686	25,398	33,170	35,347	34,431
1957	30,010	22,491	7,330	2,821	15,475	19,449	16,396	12,667	21,663	28,483	23,184	19,726
1958	19,318	12,906	3,791	2,117	10,676	15,830	13,093	11,629	18,444	24,961	24,226	22,126
1959	16,793	9,272	4,472	2,934	10,175	16,640	15,708	14,816	21,279	26,581	26,744	24,047
1960	19,935	12,749	4,899	1,701	8,800	16,119	18,044	18,300	22,675	28,030	25,658	20,031
1961	17,185	8,998	2,130	1,470	10,562	18,482	18,315	16,820	20,112	21,831	19,235	16,893
1962	15,354	8,950	2,478	1,650	8,399	15,102	15,728	16,692	18,619	19,938	18,535	16,847
1963	12,523	6,677	1,828	845	6,769	13,583	15,986	16,179	18,296	19,617	18,879	15,500
1964	12,558	8,018	3,310	1,957	9,697	17,283	18,380	17,647	18,770	18,877	17,609	15,164
1965	12,802	9,486	4,019	1,936	8,664	--	--	--	--	--	--	--

SOURCE: Campbell and Power, *op. cit.*, p. 128

TABLE 96

Non-Staff Pulpwood Logging Employment, Quebec, Final Seasonal Components,[a] June 1951-May 1966

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1951	--	--	--	--	--	.6453	.5978	.6870	1.2511	1.7209	1.8768	1.5169
1952	1.4207	1.0696	.3515	.2111	.6134	.6648	.6024	.6829	1.2516	1.7287	1.8835	1.5196
1953	1.4173	1.0186	.3372	.2081	.6253	.6983	.6191	.6900	1.2533	1.7278	1.8747	1.5302
1954	1.4086	.9682	.3241	.2045	.6449	.7510	.6544	.7007	1.2588	1.7277	1.8344	1.5224
1955	1.3874	.9283	.3146	.1941	.6644	.8182	.7059	.7184	1.2593	1.7169	1.7756	1.5166
1956	1.3554	.8963	.3048	.1834	.6814	.8911	.7713	.7488	1.2682	1.7038	1.7030	1.4923
1957	1.3042	.8658	.3010	.1709	.6765	.9515	.8462	.8023	1.2802	1.6893	1.6471	1.4617
1958	1.2541	.8320	.2882	.1572	.6705	1.0065	.9279	.8676	1.3038	1.6821	1.5979	1.4118
1959	1.2096	.7870	.2661	.1416	.6565	1.0493	1.0067	.9519	1.3275	1.6621	1.5649	1.3766
1960	1.1710	.7343	.2365	.1268	.6480	1.0907	1.0868	1.0465	1.3604	1.6326	1.5312	1.3350
1961	1.1277	.6805	.2172	.1187	.6367	1.1231	1.1633	1.1458	1.3914	1.5961	1.5000	1.2995
1962	1.0843	.6458	.2073	.1134	.6381	1.1612	1.2340	1.2211	1.4188	1.5631	1.4608	1.2520
1963	1.0402	.6277	.2097	.1142	.6392	1.1894	1.2830	1.2753	1.4366	1.5349	1.4313	1.2184
1964	.9967	.6200	.2206	.1193	.6388	1.2120	1.3191	1.3067	1.4490	1.5152	1.4142	1.1882
1965	.9589	.6180	.2377	.1259	.6349	1.2233	1.3372	1.3224	1.4552	1.5054	1.4057	1.1731
1966	.9400	.6170	.2463	.1292	.6330	--	--	--	--	--	--	--

[a]"The sum of the seasonal components in any one year is 12, and the average therefore is 1.0. Thus a month with a component of 1.6 is a month which tends to have employment 60 per cent higher than average. A decline in the seasonal component for a month shows that there is a tendency for a smaller share of the year's employment to occur in that month" (Campbell and Power, op. cit., p. 32).

SOURCE: Campbell and Power, op. cit., p. 132.

carried on during an eight-month period.[696] Since then, the average period of operations has been extended by at least another month and we can say that the minimum nine-month year is now the rule.

Despite these improvements, employment seasonality in logging remains much higher than in manufacturing and the very stable service industries.

In attempting to analyze the factors which contributed to the decline in employment seasonality, Campbell and Power concluded that there was no simple explanation.

> The impact of mechanical and other innovations on productivity, labor costs and the occupational structure is fairly clear and direct. With regard to seasonality, however, the chain of causality is much less evident. An increase in overhead costs caused by the introduction of machinery should tend to exert pressure for a decrease in seasonality. This, however, has by no means been the only influence at work. Changes in transportation systems and work methods have also probably played an important role and it is possible that a major share of the credit lies in changes in the nature of the labor supply. The gradual freeing of logging from dependence on agriculture for its labor supply has probably tended to reduce seasonality to some degree.[697]

Another interpretation is given by Gosselin *et al*. according to which seasonality would have been decreased, at least at the beginning, as a means to satisfy the demand of labor in periods of

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[696] In their analysis, Campbell and Power found that Quebec had the worst record in seasonality during that period in comparison to the other provinces (Campbell and Power, *op. cit*., p.32).

[697] *Ibidem*.

high production. Their analysis of the situation in the first half of the 1950's led them to the conclusion that the companies had to increase the size and the duration of their operations in order to meet their production targets because of a shortage of labor, created partly by high turnover and also by a declining reserve of labor.[698]

> In years of high production we find more large operations. We find also that the operations tend to last longer and that their ratio peak/average tend to be lower. The total demand seems not only to influence directly turnover in permitting more mobility to the workers, but also to influence it indirectly through its action on size and duration of the operation.
>
> The duration of the operations is particularly interesting to study more at length, since it seems to be directly related to the relationship existing between labor demand and supply. Indeed, if we assume that the supply does not meet the demand, the duration of the operation will have to be increased if the desired production is to be reached. This is particularly true when the demand is desired to be of short duration. This is the case in the forest industry. A given production is wished to be cut by a maximum number of workers within a minimum period of time. If the available number of workers is smaller than the maximum desired, and if the same production is to be attained, the only solution is to increase the time period.[699]

Their hypothesis was confirmed by the facts. The theoretical labor demand at the peak was almost never met. In some years, the difference between the theoretical demand and the level of employment was as high as 9,000 workers. They observed also that between 1951-52 and 1955-56, the industry saw the supply of labor diminish from

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[698] Gosselin *et al.*, *op. cit.*, pp. 23 and 65 and following.
[699] *Idem.*, p. 66.

50,000 to 40,000 workers. This diminution coupled with higher production obliged the companies to lengthen their operations even if they increased productivity by mechanizing (chain saw and mechanical hauling -- small tractors and J-5). Indeed, according to their analysis, by 1956 mechanization had not increased productivity enough to compensate for the lack of labor. They forecasted that the scarcity of labor was likely to continue to be a major problem of the forest industry in the future.[700]

This interpretation is generally supported by Ferragne, a specialist of industrial relations who has been with the industry for two decades.

> En période de rareté de main-d'oeuvre, les employeurs commençaient leurs opérations forestières plus tôt et les prolongeaient à la fin de la période de coupe afin de procurer aux ouvriers forestiers, souvent à des coûts très élevés, le plus long emploi possible. Quand le marché de la main-d'oeuvre devenait abondant, les employeurs embauchaient plus que le besoin réel afin de ne pas decevoir les travailleurs disponibles. Cela avait pour effet de racourcir la durée de l'emploi et de décourager quand même le travailleur par la venue d'un chômage plus hâtif et plus long.[701]

However, with the rapid mechanization of the 1960's,[702] the parameters of the labor market were modified. The logging industry needed to stabilize its specialized and better-trained labor force.

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[700] Idem., pp. 67 and 68.

[701] Ferragne, "La stabilité d'emploi en forêt," p. 9.

[702] According to him, management turned its attention toward mechanization and greater productivity in order to offset increasing labor costs (and other expenses) created by union pressures.

This contributed to the development of a new approach to labor management relations on the part of the companies, a more open and far-sighted attitude, according to Ferragne.

> Depuis l'introduction de la mécanisation en forêt, ce jeu de l'offre et de la demande a fait place à plus d'objectivité dans les méthodes de recrutement. L'industrie, ayant vite réalisé que l'efficacité des nouveaux types de véhicules lourds étaient étroitement liée à la stabilité des opérateurs a commencé à leur porter plus d'intérêt. Par différents moyens, elle a réussi à stabiliser ces travailleurs en leur offrant, entre autres, une période d'emploi plus longue et une formation technique plus poussée, de sorte que plusieurs d'entre eux sont devenus des mécaniciens forestiers et jouissent maintenant du prestige de l'homme de métier.
>
> [...] A fin de stabiliser les nouveaux venus et les travailleurs déjà à son emploi, l'employeur consentit des bénéfices aux ouvriers manifestant le plus d'intérêt au travail forestier et désirant travailler régulièrement, plutôt que de consentir les concessions à la masse des travailleurs forestiers sans distinction des groups stables et instables.
>
> Cette attitude de l'industrie est assez récente et elle a débuté en période de rareté de main-d'oeuvre. Elle lui a permis d'apprécier les travailleurs stables, anciens et nouveaux, véritablement intéressés au travail en forêt, alors que les instables ont profité d'offres d'emplois ailleurs.[703]

In summary, it seems that the labor market stage was dominated at the beginning of the 1950's by pre-industrial conditions characterized by a highly seasonal and fluctuating demand and a large reserve of labor which was declining in size, very unstable and poorly qualified. The major problem was an adequate supply of labor in a period of high demand. The recourse to mechanization

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[703] *Ibidem*.

created industrial conditions[704] and forced the industry to regularize its operations and stabilize its employment and its labor force. The demand then became much less seasonal and less fluctuating and the labor supply much smaller and a little more stable.

D. Changes in Qualifications

Major technological changes obviously contribute to modify the basic characteristics of the jobs which are affected. A description of such modifications of logging jobs can be based on four major characteristics:[705] conditions, effort, responsibility and skills.

1. Conditions

Environmental conditions were not changed by the adoption of the new technology. Operations are still conducted in extreme temperatures and under hazardous conditions. However, mechanization has made work in general safer and working conditions increasingly better by insulating machine operators from the difficult conditions of the outside environment. It is certainly much nicer now to sit

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[704] See T. Caplow, The Sociology of Work (New York: McGraw-Hill, 1964), pp. 157 and following.

[705] A job characteristics is defined here "as any element, factor or feature of a job which influences the job's relative worth or value and provides a basis for the selection, training, placement and compensation of a workman, regardless of the level of occupation" (D.C. Mason, "The Effect of Changing Woodlands Operating Techniques on the Basic Job Characteristics of Woods Labour," Pulp and Paper Magazine of Canada, Convention Issue, 1966, p. WR-114). I rely much on his discussion of this topic in the following paragraphs.

in a warm insulated cab (with outside temperatures at 25 to 30 degrees below zero or more than three feet of snow) and, by manipulating levers and pedals, to fell trees, limb them, buck them, pile the bolts and skid them to roadside than to work in a traditional manual/horse cut-and-skid operation.

2. Effort[706]

Naturally, the great advantage of mechanization in this respect has been the elimination of much of the large amount of physical effort which was required from woodsworkers in traditional operations. However, the amount of mental effort has been almost correspondingly increased. Operative jobs are much more demanding in terms of the amount of attention and coordination required.[707]

3. Responsibility

If one refers to this factor as indicating the various obligations carried by the employee (responsibility for equipment, tools and materials, safety of others and accuracy of work, etc.), one must recognize that the amount of responsibility has also increased considerably with the mechanization of logging operations. This is true for the workers who now control a $100,000 or $150,000 machine as well as for the supervisor who is under pressure to produce more with fewer men.

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[706] Refers to the energy, both mental and physical, which is expended by an employee.

[707] Sitting in the cab of a recent model of a rubber-tired tree-harvester while visiting an operation, I had the impression of sitting in the pilot seat of a jetliner so complex was the system of levers, pedals, switches, lights and buttons which had to be tended and watched and so similar was their distribution and design.

4. Skills

This factor includes all the aspects of "both the knowledge and abilities which the employee must either bring to a given job or develop while on the job." Mason distinguishes between the educational requirements[708] of a job, its training requirements[709] and the employee's aptitudes.[710]

Concerning the first group of requirements, the situation has changed but with wide variations according to the different occupational groups. In general, educational requirements for all non-production employees and for some production groups such as scalers and machine operators have been raised and at least some high school education is now required from the prospective employee.

As Mason put it in 1966:

> ...the demand for workers of greater education, skills and adaptability will rise sharply as mechanization progresses. It will be brain and not brawn that will be a prerequisite in future employment practice. The machine operator in the future must have the necessary schooling equivalent to be able to understand and appreciate what happens when he presses Button A or pulls Lever C. He will have to be able to interpret simple wiring, hydraulic and other system diagrams, and must have a certain degree of mechanical aptitude.[711]

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[708]These measure the mental and general intelligence of the employee (expressed in terms of schooling), his ability to absorb and utilize knowledge, and his intellectual capacity necessary to acquire average job ability (<u>ibidem</u>.).

[709]Express as the minimum amount of time required to learn techniques for average performance in the specific job situation (<u>ibidem</u>.).

[710]These include dexterity, automaticity, ingenuity, initiative, resourcefulness, and judgement (<u>ibidem</u>.).

[711]Mason, <u>op. cit</u>., pp. 114-116.

This has certainly been the case. The same conditions would have applied to the rest of the production occupations except that companies were so hard pressed to recruit and keep production workers, especially pulpwood cutters, that they have either completely put aside any formal educational requirements or watered them down considerably.

So far, the lack of education of the work force has contributed to maintain the negative image which has been associated with logging employment, to lower security standards and to keep ecological preoccupations at a minimum.[712] Its major drawback, however, has been to create serious difficulties for the companies in their program of mechanization. Workers' negative attitudes toward technological change, no doubt, have been related to the insecurity of employment due to their lack of education and occupational skills but also to the difficulty in understanding these changes and to adopt the new requirements. The result has been called "over-mechanization" by one industrial publication.

> ...mechanization is not a panacea for all harvesting problems. Mechanization is critical to production only when it is operating in conjunction with other variables (e.g. supervision). [...] it is the opinion of the writers that there may be some optimum range of mechanization. Given the background and limited education of any members of the labor force currently working in the woods, it is possible that "over-mechanization" could actually be detrimental in that equipment is misused and production is retarded.[713]

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[712] Interview with the general manager of logging operations (Domtar).

[713] American Pulpwood Association, Technical release No. 70-R-1, p. 8. As I mentioned earlier in Chapter 6, the lack of formal education has been particularly felt in the lower management levels.

A great deal of the so-called "over-mechanization" problems are related to the second group of skills, that is, training requirements. In this respect, the situation has changed considerably. Mechanization has generally increased training requirements for most of the production occupations[714] and for some of the non-production occupations related to maintenance and repairs, such as mechanics. Specific training programs have been established in cooperation with the Federal Department of Labor and the Provincial Department of Education and, as of July 1972, they covered the following occupations: heavy truck driver, mechanic (car, heavy machinery, diesel engine, and electricity, carburation and tune-up), loader operator, skidder operator, chain saw operator[715] and finally, slasher operator.[716]

The training function has been taken over from the family which was performing it in the traditional system by the companies and governmental agencies. The reasons for such a change are already evident. While logging equipment was used and working techniques were learned on the farm in the traditional system, they have become increasingly specialized and designed for large scale logging operations during the mechanization process. The result is that training and learning by experience cannot but take place within

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[714] Exceptions include, for instance, tractor driver and light truck driver.

[715] A woodsworker needs to know some mechanics in order to be able to maintain his tools in good condition and to perform at least minor repairs even when professional mechanics are available.

[716] Letter and documentation received from Martin Poulin, Service des programmes et examens, Direction générale de l'éducation permanente, Ministère de l'Education, Québec, July 26, 1972.

the boundaries of logging organizations. Moreover, since mechanization entailed a greater specialization of occupations, much less training could be provided by members of the same family working for the same organization. The only occupation for which traditional training remained the major form of training is pulpwood cutter. But even in this case, complaints about inadequate training or absence of any training at all[717] indicate that a large number of cutters are left on their own to learn without the guidance of a relative.

Despite its recognized importance and the existence of programs, training did not receive the practical attention it deserved.[718] Companies have been reluctant to spend money on training programs, even if they knew very well that good training was necessary to lower their cost of operations. A major reason for this behaviour has been the high turnover of the labor force, especially production workers. Companies did not want to train, at their own expense, employees who were going to work for other logging companies or in other different industries.[719]

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[717] See the first part of this chapter on the labor supply, pp. 492-496.

[718] One reason for this absence of practical attention has been the lack of expertise within the industry. "In the early 1960's there was no backlog of experience to give proper training to drivers, mechanics and supervisors. As a direct result of this change from the low level of mechanized logging of the 1950's to a relative high level of mechanization in the latter part of the 1960's decade, the cost of repairs and maintenance have been too high and the level of machine utilization too low, in general. Many companies, privately, report that the cost of repairing and maintaining logging equipment are as high as $4.00 a cunit" (Hughes, op. cit., p. 234).

[719] There is a vicious circle here. The lack of training was mentioned as one of the major reasons why new employees do not remain with the logging industry (see the results of the study done by the Conseil de main-d'oeuvre de la forêt reported in the first part of this chapter).

Finally, mechanization has contributed to shift the emphasis to new aptitudes. Besides the aptitudes mentioned earlier, such as dexterity and judgement, the new production systems require mechanical aptitudes from workers as well as supervisors, that is, a natural predisposition to understand mechanics and cope with it.[720]

> He [the machine operator] must possess a large measure of dexterity and automaticity in order to operate efficiently and productively. He will have to have (possibly to a greater degree than the woodsman of today), the capacity and self reliance to work on his own, and he must have initiative and judgement. He will have to be able to adapt himself readily as new equipment comes along.
>
> As an example, there is on the market today, a machine valued in the area of $60,000-$100,000, capable of processing in a 24-hr. period approximately 80 to 100 or more cords of tree-length. It would in operation be anywhere from 50 to 200 ft. or more from another unit. It requires one operator, employs mechanical and hydraulic components and could conceivably in the future utilize electronic and/or pneumatic systems. To complete one cycle of operation, the operator utilizing both hands, and both feet, goes through some twenty-two distinct but coordinated movements. This is completed in approximately 15 seconds, and it has been calculated that on this basis and including machine moves and downtime that the operator does in one shift complete some 15,000 sequenced movements.[721]

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[720] This was mentioned to me in several interviews. A former general manager for Domtar who had a long experience in logging with workers from different ethnic backgrounds in Ontario indicated that French Canadian workers possessed mechanical aptitudes to a higher degree than others and that this contributed to ease the transition to mechanized operations in his company.

[721] Mason, op. cit., p. 116.

E. Change in Working Conditions

Working conditions can be divided into two categories: wages and salaries and other working conditions including such items as paid vacations and holidays, food and logging, pension fund, etc. Not surprisingly, an examination of the evolution of working conditions shows that they have much improved in the last two decades.[722] In fact, working conditions in logging are now better than in many other industrial activities. However, they are not as good as in pulp and paper manufacturing and inferior in Quebec in comparison with other provinces, such as Ontario. What is more important, working conditions in the logging industry have not been improved enough to overcome the negative image which has been associated with the industry in the past.

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[722] According to Ferragne and other representatives of management, labor unions, especially in their first years of existence, created an upward pressure on wages and salaries and contributed to considerable progress in hygienic conditions, lodging and hours of work (Ferragne, "La Stabilité d'Emploi en Forêt"). I don't think, however, that this influence of the labor unions has been mostly felt in the early and middle 1950's as Ferragne suggests here. Indications are that it is rather in the late 1950's and early 1960's that the influence has been the most effective (see the following discussion on working conditions). See also, F.A. Harrison, "Technical Change and its Consequences on Woods Operations," Pulp and Paper Magazine of Canada, 1963. "The demands, on the part of Labour, for ever increasing levels of remuneration and services in the woods have not been unreasonable in the light of the standard of living enjoyed by urban industrial workers. On the other hand, these same demands have been a contributing factor, although by no means the only one, to the competitive plight the industry finds itself in today and have thus served as an incentive to adopt mechanization. It is because the raw material extraction process offers the greatest potential for cost reduction that industry has been forced to strive towards the development of logging methods involving the least possible degree of manual labour" (idem., p. 172).

1. Wages and Salaries

Wages and salaries are probably the working condition which improved the most in the last two decades. Statistics are indeed very impressive. Between 1951 and 1971, average wages and salaries in forestry increased almost four-fold, from $44.32 to $155.45 (see Table 97). Most of that increase took place in the second decade, that is between 1962 and 1971. While wages and salaries were still at the relatively low level of $67.00 in 1962, they climbed to $82.98 in 1963 and almost doubled between 1963 and 1971. During the same period, the traditional gap between forestry and paper products manufacturing (in particular pulp and paper) narrowed down considerably. While forestry wages and salaries were 30.9 per cent below those in paper products manufacturing in 1951, and even down by 33.6 per cent in 1961, they improved so rapidly in the following decade that by 1971 the gap was only 5.1 per cent (see Table 97).

A comparison with other major industrial groups and economic sectors shows that wages and salaries in forestry are not as high as those in mining and in construction ($155.45 against, respectively, $160.92 and $179.58 in 1971) but compete advantageously with most of the manufacturing industries, the less technical and professional sectors of transportation and communications, trade, finance and services. In fact, since 1963, forestry average weekly wages and salaries stand above the general index.[723]

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[723] According to one source, in 1952-53, logging offered the lowest hourly rates of any of the major industries except probably the service industry (see Irving, op. cit., p. 43).

TABLE 97

Average Weekly Wages and Salaries, Forestry and Other Major Industrial Groups, Quebec, 1951-1971

Industry	Weekly wages in dollars								
	1951	1952	1953	1954	1955	1956	1957	1958	1959
Forestry	44.32	50.78	53.01	53.81	55.14	59.45	62.93	62.69	58.45
Manufacturing	47.86	52.25	55.10	56.81	59.23	62.43	65.26	67.89	70.55
Paper Products[a]	63.39	66.99	69.60	71.68	74.14	79.27	82.39	83.74	87.41
Construction	45.07	51.93	54.81	57.45	58.96	64.89	69.03	71.23	74.77
Transportation, Storage & Communication	54.67	56.41	61.77	63.69	65.93	68.43	72.84	76.23	81.90
Trade	41.69	44.67	47.11	49.28	50.92	52.96	56.14	59.28	62.60
Services	30.72	33.01	37.18	39.42	41.37	44.04	48.02	48.27	49.82
Industrial Composite	47.37	51.66	54.55	56.40	58.62	61.86	65.18	67.79	70.56

Industry	1960	1961	1962	1963	1964	1965	1966	1967	1968
Forestry	61.17	62.80	67.00	82.98	89.77	94.24	111.13	116.51	123.56
Manufacturing	73.11	75.64	77.93	81.38	84.54	88.15	94.40	100.29	107.40
Paper Products[a]	90.83	94.76	97.44	101.80	105.62	109.38	118.52	124.30	132.40
Construction	78.06	79.36	84.79	94.42	100.57	107.80	119.27	134.48	139.16
Transportation, Storage & Communication	84.16	87.53	90.55	89.77	93.78	99.80	106.06	111.05	123.59
Trade	64.55	66.21	68.82	67.95	70.57	73.14	76.47	80.89	87.50
Services	53.20	55.74	57.56	59.81	62.63	67.23	72.73	80.61	81.91
Industrial Composite	73.00	75.33	77.99	80.99	84.46	88.62	94.83	101.16	107.92

Table 97 (continued)

Industry	1969	1970	1971
Forestry	132.24	132.32	155.45
Manufacturing	114.67	122.82	131.99
Paper Products[a]	142.16	151.44	163.95
Construction	145.84	158.78	179.58
Transportation, Storage & Communication	127.84	140.61	152.66
Trade	94.66	101.69	107.90
Services	85.80	91.93	99.33
Industrial Composite	114.24	122.38	132.08

[a] Pulp and paper mills are generally above the average of this category by between \$5 and \$7.

SOURCE: Quebec Yearbook, 1973, Table 15, pp. 460-461 (from Review of Employment and Payrolls (72-201), Dominion Bureau of Statistics).

The rapid raise in wages and salaries since 1962 is no doubt due to a large extent to the gains in productivity made by the industry through mechanization and the upward pressure on wages and salaries created by the shortage of labor. The great surge between 1962 and 1971 coincided with the adoption of two major labor-saving improvements: the rubber-wheeled skidder and the mechanical slasher, the first one in general use by 1964-65 and the second one by 1970-71.[724]

Quebec logging wage rates followed a general trend in this industry in Canada. In Table 101, one observes for the country as a whole the same rapid increase in wage rates between 1961 and 1972, especially after 1964. In fact, the only major industrial sector in which wage rates increase at a faster pace during this period is the construction industry. Figures in the table indicate also that logging wages have risen faster in Eastern Canada than in the country as a whole and faster than any other major industrial sector except construction.

Quebec wages and salaries have been historically lower than in the other provinces (see Table 102). Despite their exceptional increase in the last decades, they have generally remained inferior to wages in other provinces. With few exceptions, daily earnings for

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[724] Price Company estimated that between 1961 and 1967, one man-day production increased by 68 per cent while piecework salaries increased by 90 per cent (Trait d'Union, mars-avril 1967). Tables 98, 99 and 100 indicate the important gains in productivity and savings realized by the industry through mechanization and the adoption of new systems of production.

TABLE 98

Imbalance Between Wages and Productivity in the Old Basic "Cut and Pile" Method, Quebec, 1961-1970

Year	Average daily earnings	Production/man-day
1961-62	$15.87	2.60 cunits
1960-70	$27.02	2.79 cunits

SOURCE: The Competitive Position of the Quebec Pulp and Paper Industry, p.53.

TABLE 99

Comparative Productivity of Different Logging Systems, Quebec, 1969-70

Logging method	No. of cunits	% of volume cut	Average volume/ man-day
1) Cut and pile	165,685	4.26	2.79
2) Cut and swing or bunch 4'	549,319	14.14	2.78
3) Cut and swing or bunch 8'	369,463	9.51	3.29
4) Cut, skid and pile 12'-16'	81,998	2.11	2.68
5) Cut, skid, bunch and pile (tree-length)	1,227,621	31.60	3.50[a]
6) Cut, skid and buck by slasher (tree-length)[b]	1,451,248	37.36	5.61[c]
7) Other methods	39,514	1.02	3.17
	3,884,848	100.00	

[a]The introduction of mechanical skidding improved productivity by 25 per cent.

[b]According to A. Legault, results following the introduction of mechanical slashing showed a reduction of 23.6 per cent in labor content (Legault, "Mobile Mechanical Slashers...", p. 191).

[c]The addition of mechanized slashing doubled the man-day productivity of the labor intensive methods (1 to 4 inclusively).

SOURCE: The Competitive Position of the Quebec Pulp and Paper Industry, p. 54.

TABLE 100

Comparison of Conventional Short-wood Operations With the Koehring Harvester Operation, Quebec, 1972

Item	100% conventional cut and bunch method		100% mechanized Koehring harvester	
	Cunits/ man-day	Cost/cunit $	Cunits/ man-day	Cost/cunit $
Manual felling, branching and bucking to 4'	2.87	9.73	--	--
Forward to roadside with J-5's	7.65	5.32	--	--
Fell, bunch, buck to 8' and forward with Koehring harvester	--	--	17.85	11.76
Sub-total -- To roadside	2.04	15.05[a]	17.85	11.76[a]
Loading	153	6.00	230	4.12
Hauling -- 30 miles	30		51	
Slashing (8' to 4')	--	--	102	1.18
Sub-total -- to dump	1.87	21.05	11.13	17.06
Other costs at camp level		3.93		2.94
Total at camp level	1.53	24.98	6.12	20.00
Fringe and overhead costs directly related to camp costs		3.23		1.47
Total camp costs		28.21		21.47
Productivity	1.28		5.10	
Total wood cost		44.10		35.28

[a]Direct cost roadside including fringes is estimated at $16.46/cunit for conventional operation and $12.35/cunit for a mechanized operation.

SOURCE: The Competitive Position of the Quebec Pulp and Paper Industry, p. 54.

TABLE 101

Index Numbers of Average Wage Rates for Canada, Non-Office Occupations by Industry Division, 1961-1972[a] (1961 = 100)

Year	Logging		Mining	Manufacturing			Con-struc-tion	Transport-ation, etc.	Trade	Service	Local Gov't	General Index[b]
	Canada	Eastern Canada		All Mfg.	Durable Goods	Non-Durable Goods						
1961	100.0	--	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	103.9	--	104.0	102.7	102.1	103.3	105.0	103.1	103.5	101.9	103.3	103.1
1963	110.1	--	107.0	106.0	105.1	106.7	109.1	106.0	107.9	106.6	107.4	107.0
1964	117.5	--	109.6	109.7	108.9	110.5	113.9	109.8	111.0	111.7	111.5	110.9
1965	126.4	--	113.3	115.0	114.4	115.5	119.8	114.3	116.9	118.4	118.1	116.5
1966	140.2	--	122.7	121.6	121.2	121.9	129.8	122.3	123.9	125.5	124.6	124.0
1967	156.0	160.7	130.2	130.5	130.0	131.0	142.0	132.8	132.5	133.9	136.9	133.4
1968	162.5	165.9	138.9	140.6	139.7	141.4	154.9	143.4	144.5	141.8	146.7	143.8
1969	179.8	184.6	146.2	151.2	149.7	152.5	167.0	154.9	155.2	154.0	163.4	155.1
1970	192.3	198.8	159.4	162.9	162.3	163.2	195.5	166.2	166.1	166.4	183.3	167.8
1971	212.3	219.6	169.9	176.3	175.7	176.9	223.7	183.8	178.9	178.0	200.2	182.3
1972	226.1	252.0	190.1	190.8	190.1	191.5	239.9	196.6	195.7	191.7	217.2	197.4

[a]Index numbers of average wage rates for certain main industries for the period 1901 to 1965, with 1949 as base year appear in the report Wage Rates, Salaries and Hours of Labour, 1965. Report No. 48, pp. 30-31.

[b]General Index derived from industries in Table A.

SOURCE: Wage Rates, Salaries and Hours of Labour, 1972, Report No. 55, Surveys Division, Economics and Research Branch, Canada Department of Labour, Ottawa, Table B.

TABLE 102

Annual Average Weekly Wages and Salaries in Forestry and Pulp and Paper Mills, Quebec and Selected Provinces, 1951-1963

Year	Newfoundland			Quebec			Ontario			British Columbia		
	Fores-try	Pulp & paper mills	% excess	Fores-try	Pulp & paper mills	% excess	Fores-try	Pulp & paper mills	% excess	Fores try	Pulp & paper mills	% excess
1951	44.74	70.63	57.9	44.32	68.88	55.4	49.54	69.69	40.7	62.22	65.16	4.7
1952	49.45	76.53	54.8	50.78	72.24	42.3	57.28	71.35	24.6	72.90	76.70	4.5
1953	53.24	77.73	46.0	53.11	75.16	41.5	59.30	74.57	25.8	75.10	79.13	5.4
1954	52.66	82.39	56.5	53.68	76.62	42.7	62.92	77.55	23.3	76.53	84.71	10.7
1955	50.88	84.34	65.8	55.14	78.82	42.8	65.27	81.40	24.7	77.86	87.51	12.4
1956	55.83	89.72	60.7	59.45	84.43	42.0	73.04	85.82	17.5	81.85	91.05	11.2
1957	63.20	103.26	63.4	62.93	87.87	39.6	79.58	89.57	12.6	85.44	92.64	8.4
1958	65.51	95.60	45.9	62.69	88.94	41.9	85.68	91.93	7.3	87.05	98.46	13.1
1959	64.24	101.54	58.0	58.45	93.06	59.2	87.53	94.68	8.2	95.89	101.73	6.1
1960	69.15	107.93	56.1	61.17	97.61	59.6	88.54	98.57	11.3	99.00	105.20	6.3
1961	78.76	113.73	44.4	62.80	102.29	62.9	91.81	102.61	11.8	99.43	107.75	8.4
1962	78.49	115.76	45.6	67.00	105.51	57.5	94.45	105.84	12.1	106.81	109.59	2.6
1963	81.63	118.00	44.6	75.88	109.33	44.1	92.43	108.25	17.1	109.41	113.91	4.1

SOURCE: Peters, op. cit., pp. 76 and 179. His figures come from Review of Employment and Payroll, 1958, Table 20, and 1962, Table 9. Figures for 1963 are calculated from his Appendix X, Table 7.

piece or incentive work in 1972 were lower in Quebec than in Ontario and New Brunswick for a longer work week (see Table 103). Wage rates per day and per hour for time work were also generally lower in Quebec than in Ontario, although they exceeded wage rates in New Brunswick in this case (see Table 104). But again, the work week was longer in Quebec. A possible explanation for these differences may be the variations between provinces in the average yield per acre which affect piecework production.[725]

In summary, wages and salaries in Quebec logging industry have risen very fast in the 1960's and early 1970's despite the fact that the industry was lowering its labor requirements. Union pressures and labor shortages account for most of the improvement. The industry had no choice but to make a greater effort than most other industries to continue to attract enough labor with interesting wages and salaries to solve its labor shortages. As we know, it did not succeed completely. One possible explanation is that the industry has been less competitive than other industries with regard to the other working conditions, some of which, related to the physical environment, have been difficult to improve significantly, if at all.

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[725] R.D. Peters, "The Social and Economic Effects of the Transition from a System of Wood Camps to a System of Commuting in the Newfoundland Pulpwood Industry," unpublished M.A. Thesis, Memorial University, 1965, p. 75. According to him, British Columbia is far ahead in this respect followed by Ontario (40 cords per acre) and much lower down by Newfoundland (14 cords per acre). No figure is given for Quebec.

TABLE 103

Piece or Incentive Work Earnings per Day, Logging Industry, Eastern Canada and Selected Provinces, October 1, 1972

Occupation	Straight-time earnings per day										
	Eastern Canada		Newfoundland		New Brunswick		Quebec		Ontario		
	Employment	Average $	Average $	Predominant range $	Average $	Predominant range $	Average $	Predominant range $	Average $	Predominant range $
1) Chopper & cutter	1,820	37.98	--	--	40.06	25.00-51.98	35.60	26.00-47.00	42.99	30.00-64.04
2) Loader	33	37.08	--	--	--	--	31.56	--	--	--
3) Log truck driver	--	--	--	--	--	--	--	--	--	--
4) Pulpwood cutter	3,118	39.26	--	--	27.06	20.00-30.00	37.97	29.00-51.18	48.03	31.70-71.50
5) Skidder operator	1,210	39.72	--	--	38.29	24.98-48.60	37.67	27.50-53.72	44.36	32.00-57.00
6) Teamster	67	28.30	--	--	31.10	28.70-35.00	27.03	20.00-35.00	--	--
7) Tractor driver	39	31.02	--	--	--	--	25.00	19.00-30.00	--	--
Standard hours per week	18,418	43.7	45.0	--	43.6	40.0-45.0	45.0	--	41.1	40.0-45.0

SOURCE: Wage Rates, Salaries and Hours of Labour, 1972, Report No. 55, Surveys Division, Economic and Research Branch, Canada Department of Labour, Ottawa, Table 1.

TABLE 104

Time-Work Daily Rates, Logging Industry,
Eastern Canada and Selected Provinces, October 1, 1972

Occupation	Eastern Canada		Newfoundland		New Brunswick		Quebec		Ontario	
	Employment	Average $	Average $	Predominant range $	Average $	Predominant range $	Average $	Predominant range $	Average $	Predominant range $
Chopper and cutter	1,007	34.98	--	--	29.09	20.00-36.46	36.37	28.00-40.02	35.80	23.84-51.30
Choreboy	197	24.67	--	--	21.78	21.24-22.50	23.87	20.00-27.04	28.33	18.00-29.52
Cook	224	30.01	--	--	26.61	24.00-29.00	30.35	25.60-35.28	34.10	24.24-35.52
Cookee	178	24.96	--	--	21.62	15.00-25.00	25.48	20.50-29.70	27.80	24.00-28.16
Loader	181	29.39	--	--	26.10	22.50-28.34	29.82	25.00-31.50	33.02	26.46-35.00
Log truck driver	1,189	30.27	--	--	23.43	21.00-25.00	29.84	26.54-32.84	32.94	31.52-33.36
Pulpwood cutter	1,206	20.83	--	--	31.95	24.56-38.36	31.53	24.36-41.30	30.13	17.60-32.00
Roadman and swamper	177	25.95	--	--	--	--	25.78	23.00-30.14	30.88	--
Scaler	433	32.72	--	--	28.87	24.00-35.38	32.88	27.92-39.94	34.69	25.80-30.68
Skidder operator	665	33.09	--	--	25.71	22.50-27.00	35.32	25.20-41.30	34.31	32.00-43.20
Teamster	57	30.70	--	--	22.86	20.00-30.00	--	--	--	--

Table 104 (continued)

Occupation	Eastern Canada		Newfoundland		New Brunswick		Quebec		Ontario	
	Employ-ment	Aver-age $	Aver-age $	Predomin-ant range $	Aver-age $	Predomin-ant range $	Aver-age $	Predomin-ant range $	Aver-age $	Predomin-ant range $
Tractor driver	778	31.22	--	--	28.23	22.94-31.04	30.64	27.88-32.84	32.26	30.00-35.52
Carpenter, maintenance	95	3.58	--	--	2.90	2.30-3.15	3.44	2.80-4.08	4.11	2.50-4.59
Mechanic, maintenance	892	3.96	--	--	3.51	2.65-4.30	3.70	3.28-4.25	4.53	4.15-4.83
Standard hours per week	18,418	43.7	45.0	--	43.6	40.0-45.0	45.0	--	41.1	40.0-45.0

Wage rate per day (spanning header over the regional columns).

SOURCE: Wage Rates, Salaries and Hours of Labour, 1972, Report No. 55, Survey Division, Economics and Research Branch, Canada Department of Labour, Ottawa, Table 1.

2. Other Working Conditions

Logging has been generally considered in the past as one of the least interesting industries in terms of its conditions of employment. Not only were wages and salaries relatively low by comparison to other industries, but its working conditions were minimal. As one writer put it in 1953, labor in the bush is still a commodity.[726] This hard judgement which reflected quite accurately the situation of that time should be revised today, at least in its narrow sense even if in some respect someone with a different perspective could continue to argue with success[727] that labor is still a commodity. In general, working conditions have been improved considerably and woodsworkers are now getting the same attention and consideration which industrial workers in the pulp and paper mills receive from their common employers. Our examination of the situation reveals that improvements have been most important in the conditions over which companies had most control. Consequently, a great deal of the inconveniences and hardships due to the physical environment characteristics are still an important negative factor of logging employment today. Because of this factor and some others, working conditions are not the same for the major groups of employees. Generally, working conditions for office employees and other white-collar workers and for skilled workers have been better than for production workers. This is not particular to logging since this

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[726] Irving, op. cit., p. 52 and following.

[727] The manager-owner of a small but prosperous lumber company once told me that the food service of his logging operations received particular attention because his men were like horses. If you wanted a good day of work from a horse you had to feed it properly and well. This was in 1965.

difference has been observed very often in other industries but its discriminating aspect in logging has been more visible. However, the difference has been reduced in the recent years and is likely to be further reduced in the future under the impact of mechanization and changes in management and union policies.

a) The Situation in 1950 in Quebec and in Relations to Other Provinces

In 1950, there were slightly more than 5,000 bush-workers unionized in Quebec. This represented only 10 to 15 per cent of the workers employed in forestry as compared to approximately 47 per cent of all workers employed in logging in Canada.[728] Since then, the situation has improved considerably and in 1968, 78.5 per cent of the forest workers were unionized or 15,798 out of a total of 20,107.[729] Quebec woodsworkers were unionized later than those in British Columbia, Ontario and Newfoundland. This explains the fact that the terms of agreement in 1950-51 were relatively poor from the point of view of the employees and inferior in some respects to the conditions

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[728] Irving, op. cit., p. 78. Most of the loggers in British Columbia, Ontario and Newfoundland were covered. In Quebec, most of the 5,000 workers or so were employed by one large pulp and paper company and part of the same bargaining unit. It was probably the workers of Price Company (Saguenay-Lake St. John Division).

[729] Taux du syndicalisme au Québec (Québec: Service de la recherche, Ministère du Travail et de la Main-d'oeuvre, 1972). This rate compares well with the rate of unionization in the manufacturing sector: 72.9 per cent for paper and paper products and, within this broad category, 92 per cent for pulp and paper (idem., p. 42).

established for workers in the other provinces. For instance, the work week was respectively between 40 and 44 hours long in British Columbia, 48 hours long in Ontario, 54 in New Brunswick, but 60 hours and more in Quebec. Contrary to the labor agreements in British Columbia and Ontario, those in Quebec did not include any provision for statutory holidays.[730]

For several years, the major terms of agreement did not change much. As can be seen from Table 105, despite the fact that several other unions were established and the proportion of unionized woodsworkers increased, the work week remained the same at 60 hours at least up to 1957. At the same time, most agreements did not provide for any paid holiday, three had no provisions for vacations and all existing agreements maintained straight wage rates for overtime.

b) Evolution Since 1952

An excellent source of information to trace the evolution of working conditions since the early 1950's are the collective agreements negotiated between unions and employers.[731] In Table 106, the major

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[730] Irving, op. cit., pp. 78 to 86. This information comes from Collective Agreements in the Logging Industry, an unpublished report prepared by the Economics and Research Branch, Department of Labour, Canada, at the request of Irving himself.

[731] As mentioned in Chapter 4, unions became active in Quebec during that period.

TABLE 105

Comparison of Main Clauses of Typical Woods Labor Agreements, Quebec, Ontario and British Columbia, 1957

	Quebec[a]	Ontario[b]	British Columbia[c]
1) Hours of work	Mostly as per Ordinance No. 39; 60 hrs/week, 10 hrs/day (exception for kitchen help et al.)	48 hrs/week, 8 hrs/day (exception for kitchen help et al.)	40 hrs/week, 8 hrs/day
2) Vacations	No vacation (3) Seasonal: mostly 2 per cent after 75 days work within 4 mos. (11) 1, 2, 3 weeks for 1, 5, 15 years of service (1). Special provisions for kitchen help et al. (5). Special provisions for pieceworkers (2).	2 per cent for more than 30 days but less than 750, 4 per cent for 750 to 2,500 days, 6 per cent for 2,500 days and more. Kitchen help et al.: 4 days with pay each month after one month's employment.	Up to 5 years' service, 2 1/2 per cent. After 5 years, 5 per cent. Cookhouse and bunk-house employees, 1 week for 6 mos. continuous employment.
3) Paid holidays	None (11) One (1): Labor Day Two (1): Labor Day and December 8. Credit 1 per cent of gross wage in lieu of paid holidays (1)	Labor Day, Christmas Day, Dominion Day, Thanks-giving Day, Sept. 1/5 per cent, Victoria Day.	Empire Day, Dominion Day, Labor Day, Armistice Day, Thanksgiving and Christmas Days. Either Good Friday or Easter. New Year's Day.

Table 105 (continued)

	Quebec[a]	Ontario[b]	British Columbia[c]
4) Overtime rate	Straight rate (14)	Time and a half, except for certain classifications under different conditions.	Time and a half except casual workers on maintenance, Sat. and Sun., straight time.

[a]Based on 14 different agreements for 14 different company divisions, including divisions of Price, Domtar, Q.N.S.P. and Consolidated-Bathurst companies.

[b]Covering major operating companies.

[c]Based on coastal logging companies.

SOURCE: Quebec Forest Industry Association, April 1, 1957 . Made available to me on special request by the Department of Labour, Ottawa.

TABLE 106

Comparison of Main Clauses, Labor Agreements
Covering Consolidated-Bathurst Logging Operations,
Les Escoumains Division, 1952-1953, 1961-62 and 1970-71[a]

Clause	1952-53	1961-62	1970-71
1) Union security	No provisions	Voluntary revocable check-off.	Compulsory membership (check-off dues).
2) Hours of work	Six-day work week (hours as already established by management, no precisions).	Fifty-four-hour work week (6 nine-hour days) for salaried workers. No details for piece-work workers.	Forty-five-hour work week (5 nine-hour days).
3) Vacation provisions	Salaried employees: a) 1 to 5 years: 1 week (2%); b) 5 to 15 years: 2 weeks (4%); c) 15 years and more: 3 weeks (6%). No provisions for piecework workers.	Same Piecework workers: within 4 mos. employment in the same camp. a) for between 50 and 75 cords: 2%; b) for between 75 and 100 cords: 2% of first 50 cords plus 3% of extra cords; c) over 100 cords: 2% of first 50 cords plus 3% of 51st to 75 cords plus 4% of extra cords.	Seniority rules for all employees: a) Less than 8 years: 2 weeks (4%); b) 8 to 18 years: 3 weeks (6%); c) 18 to 25 years: 4 weeks (8%); d) 25 years and more: 5 weeks (10%).

Table 106 (continued)

Clause	1952-53	1961-62	1970-71
4) Paid holidays	No provisions.	Confederation Day.	Nine days: Confederation Day.
5) Lay-off indemnity	No provisions.	No provisions.	No provisions.
6) Paid absence in case of relative's death	No provisions.	No provisions.	Three days: close relatives except grandparents and in-laws other than father and mother.
7) Group insurance	No provisions.	No provisions.	Health and life insurance and salary insurance.
8) Period of pay	At the end of the employment term with possibility of an advance.	At the end of the employment term with possibility of advances based on estimated earnings.	Every week (Thursday afternoon).
9) Technological change	No provisions. Recognized as part of management rights.	No provisions.	Provisions regarding wage rate and salary adjustment.

[a] The 1952-53 agreement dealt very briefly and mostly in very general terms with union security, grievance precedures, various working conditions (like transportation and first aid), hirings, promotions and firings. For instance, job security received two short paragraphs. "Dans les cas de congédiements ou de promotions, la Gérance du District prendra en considération la durée du service et la statut familial. Lorsqu'on aura besoin de main-d'oeuvre, les travailleurs locaux ayant les aptitudes et l'expérience nécessaire, de même que les pères de familles, auront la préférence pour l'emploi. Les absences autorisées par la Gérance du District pour fins de maladies, accidents, congés, ou toutes autres raisons, n'altèreront pas les droits d'ancienneté" (Chapitre XII, Embauchage, Promotion, Congédiements, etc., p. 6). On the contrary, disciplinary measures received twice the amount of space and a total of 18 infractions were described in detail. Among them were the following: "1. Blasphème; 2. Indécence grossière; 3. Jeux à l'argent; (...) 8. Malhonnêteté; 9. Conduite préjudiciable au bon ordre; 10. Cruauté envers les animaux; 11. Propagande subversive; etc." (Chapitre IX, Discipline, p. 4).

Table 106 (continued)

In the 1970-71 agreement, the difference is striking. The text is a lengthy document which covers extensively matters and procedures related to seniority, transfers and promotions, recalls, union security, grievances, work week, temporary assignments, hours of work and overtime, machine breakdowns, various working conditions (such as the authorized use of personal vehicle, security clothes, etc.), salary scales and wage rate schedules.

SOURCE: Convention Collective de Travail pour la forêt entre Consolidated Paper Corporation Ltd. et le Syndicat National des Travailleurs de la Pulpe et du Papier, Section du Bois (Les Escoumains) et la Fédération Nationale des Travailleurs de la Pulpe et du Papier (C.S.N.), Les Escoumains, Québec, 1952-53 et 1961-62; Convention Collective de Travail entre Consolidated-Bathurst Limitée et le Syndicat National des Travailleurs en Forêt de Rivière-Portneuf, le Syndicat National des Travailleurs de la Pulpe et du Papier, Section du Bois (Les Escoumains), le Syndicat National des Travailleurs de la Pulpe et du Papier, Section du Bois (Ste-Anne-de-Portneuf) et la Fédération Canadienne des Travailleurs des Pâtes et Papiers (C.S.N.), Les Escoumains et Rivière-Portneuf, Québec, 1970-71.

terms of the first collective agreement signed between Consolidated Paper (now Consolidated-Bathurst) and the union in 1952-53 are compared to those of the 1961-62 and 1970-71 agreements. This comparison spans a period of two decades or so during which most of the technological and organizational changes which are analyzed in this dissertation have taken place. The table indicates eloquently that in the 1952-53 agreement, most of the major clauses of a typical industrial agreement were left without any provision (six out of the nine clauses listed). Moreover, major problems such as union security and job security were given almost no consideration at all. On the contrary, the 1970-71 agreement included provisions for all major clauses except one, lay-off indemnity, and conditions had improved sharply.[732] Furthermore, each item was given detailed and extensive coverage in most of the clauses of the agreement.

(i) Seniority and Job Security

Both are fully recognized now and extensive procedures have been worked out to solve problems of seasonality, employment fluctuations, transfers, promotions, temporary assignments, recalls, lay-offs, etc.

(ii) Paid Vacations, Holidays and Absences for Relatives' Deaths

Employees received very good coverage now while they hardly had any 20 years ago. Administrative problems related to the seasonality of employment have been ironed out with respect to this matter.

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[732] A much more limited comparison of two agreements at Price (Saguenay-Lake St. John) confirm the same general conclusion (see Table 107).

TABLE 107

Comparison of Main Clauses, Labor Agreements Covering Price Logging Operations, Saguenay-Lake St. John Division, 1950-51, 1957 and 1972

Clause	1950-51	April 1957	April 1972
1) Union security	No data	Voluntary irrevocable check-off.	Compulsory revocable membership.
2) Hours of work	60 hrs/week; 6 ten-hour days	60 hrs (standard work week of Ord. 39): 6 ten-hour days.	45 hrs: 5 nine-hour days
3) Vacation provisions	2% after 75 days within 4 months in the sub-division covered by the agreement.	Seasonal: 2% after 75 days within 4 months on proof by employee. In addition, after 3 months of continuous employment (1 month at union's request)	Seasonal: for continuous employment: 40 to 265 days: 3%; 266 to 1,399 days: 4%; 1,400 to 3,149 days: 6%; 3,150 days and more: 8%
4) Paid holidays	None	None	9 days: New Year's Day, Good Friday, St. John Baptist, Confederation, Labor Day, Thanksgiving Day, Christmas Eve, Christmas Day, New Year's Eve.

SOURCE: Convention de Travail entre la compagnie Price Limitée et le Syndicat des Travailleurs Forestiers du Saguenay-Lac St.-Jean (U.C.C.), Chicoutimi, Québec, 1969-72; Quebec Forest Industry Association, 1957.

(iii) Welfare

In most cases, employees and their families are protected against illness and death by comprehensive programs, the cost of which is shared by the employers.[733] There was nothing twenty years ago.

However, due to the relatively recent institution of these plans and to the distinctive characteristics of logging employment, the benefits are not as good as those made available to manufacturing employees. With the practical elimination of seasonality and the greater stabilization of employment, companies have a tendency to offer comparable (if not the same) pension and group insurance plans to their different groups of employees. This is the case with Domtar, for instance.

(iv) Security at Work

Since both employers and employees are financially, if not otherwise, affected by the frequency of accidents and more so with highly mechanized operations, a greater effort is being done to increase security at work. Equipment is provided (gloves, pads, pants, hats, shoes, etc.) and its use made compulsory.

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[733] The cost of fringe benefits were established at about 12 per cent of the total labor cost for one large company's operation in 1970 (cf. Legault, "Mobile Mechanical Slashers...", p. 196). This estimate excluded commissary losses absorbed at the camp level.

However, logging remains one of the worst industries in terms of the frequency of accidents (see Table 108) despite the progress made in prevention.[734] This situation has to do largely with bad environmental conditions (such as slippery and windy conditions, falling dead branches and dead trees, etc.), the use of dangerous powered tools (such as the chain saw) and the manipulation of heavy material.

TABLE 108

Accident Frequency Index,
Ten Highest Industries, Quebec, 1973

Industry	Index
Mining	189.3
Scrap metals, etc.	117.8
Foundries, drilling, etc.	116.2
Slaughtering houses, etc.	115.8
Bricks, cement blocks, etc.	110.5
Logging operations, sawmills, etc.	99.1
Shipbuilding, heavy machinery, structural steel, etc.	94.9
Steel structure, cheminy construction, etc.	90.9
Wood products, etc.	89.3
Road bridge, sewage, tunnel construction, etc.	88.2

SOURCE: Commission des Accidents du Travail du Québec, private correspondence, August 1974.

[734] Between 1952 and 1967, the number of accidents decreased from 3,153 to 1,575 while the number of fatal accidents diminished from 38 to 18 during the same period (cf. R. Taschereau, "L'équipement protecteur est nécessaire au travailleur forestier," Le Papetier, Vol. 5, No. 6 (Décembre 1968), p. 3).

(v) Security of Income and Earnings

The insecurity and instability of income and earnings has been one of the most important problems for woodsworkers in the past. It was not only due to the seasonality and fluctuation of employment, but also to bad weather conditions, variations in logging chances and terrain which were not compensated for in the straight piecework system. Here is how one writer described the situation in 1953.

> Weather is at times so severe that work cannot be carried on. At such times neither workers on daily or piecework rates received any compensation for their time although they are at the job and available for work. Piecework rates in logging are usually straight piecework with no guaranteed base rate a practice which is generally not acceptable to the unions in other industries.
>
> Piecework rates in logging are generally set for an average condition without regard for local variations in conditions. Thus it is quite possible for two cutters of equal skill and each working with equal zeal to have daily productions and therefore earnings which vary by as much as 100 per cent due to different stand conditions.[735]

The situation is quite different now. Fluctuations and seasonality of employment have been greatly reduced. Changes in the remuneration system have contributed also to diminish the impact of the physical environment and variations in the raw material. With mechanization, a greater proportion of the production employees are on hourly

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[735] Irving, op. cit., pp. 46-47. Several studies have shown that tree size and density of stand were two of the most influencial factors on productivity. Irving, for one cited the finding of a research done by the U.S. Forest Service in its Northeastern Forest experimental station in relation to tree size. 5.83 man-hours were required to produce a cord of pulpwood (in stump cutting rough spruce) in a stand of 5-inch D.B.H. as compared to 2.85 man-hours for a 12-inch D.B.H. stand. In this particular study, tree size was the most influential factor.

wages rather than piecework.[736] The piecework system has also been modified and made more flexible to adapt to the various stand conditions. Thus, rates usually vary according to different categories of stand (determined by factors such as stand density per acre, average tree size, branchiness, terrain, etc.).[737] Collective agreements contain clauses determining ways and compensations to eliminate loss of earning due to machine breakdown, bad weather, illnesses, temporary assignments, etc. In summary, if the companies have not eliminated the insecurity of income inherent to piecework, several modifications to the system have contributed to reduce it significantly.

(vi) Technological Change and Employment

Reductions in employment and modifications in the occupational structure are two direct consequences of technological change which have particularly affected the logging industry in the 1960's and the early 1970's. Surprisingly, collective agreements contain very few provisions dealing with lay-offs due to technological change. The general provision stipulates that employees will be affected

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[736] For instance, this is the case usually of the workers on mechanical slashing operations (cf. Legault, "Mobile Mechanical Slashers...", p. 181).

[737] For instance, in most collective agreements, piece rates for tree-length operations are established according to the diameter of each tree measured in inches. This diameter rate is further differentiated for 2 or 3 classes of wood determined by the working conditions, terrain quality, location of the piles, forest density and skidding distance all factors which affect directly workers' productivity and consequently their gains. See, for instance, the collective agreement between Domtar and its employees at Lebel-sur-Quévillon, 1968-1971, Appendix A (cf. Table 109 below).

TABLE 109

Piecework Rates for Pulpwood Cutters, Domtar, Lebel-sur-Quévillon Division, 1971[a]

Diameter	Rate per tree according to wood classification[b]		
	Group 1	Group 2	Group 3
4 inches	$ 0.140	$ 0.140	$ 0.140
5 "	$ 0.222	$ 0.223	$ 0.245
6 "	$ 0.264	$ 0.275	$ 0.298
7 "	$ 0.312	$ 0.323	$ 0.346
8 "	$ 0.342	$ 0.364	$ 0.411
9 "	$ 0.419	$ 0.442	$ 0.488
10 "	$ 0.528	$ 0.564	$ 0.644
11 "	$ 0.626	$ 0.660	$ 0.775
12 "	$ 0.759	$ 0.804	$ 0.874
13 "	$ 0.910	$ 0.957	$ 1.105
14 "	$ 1.075	$ 1.132	$ 1.270
15 "	$ 1.219	$ 1.300	$ 1.494
16 "	$ 1.389	$ 1.504	$ 1.664
17 "	$ 1.593	$ 1.726	$ 1.868
18 "	$ 1.825	$ 1.986	$ 2.188
19 "	$ 2.054	$ 2.239	$ 2.422
20 "	$ 2.285	$ 2.491	$ 2.800
21 "	$ 2.536	$ 2.765	$ 3.143
22 "	$ 2.801	$ 3.272	$ 3.695
23 "	$ 3.075	$ 3.786	$ 4.257
24 "	$ 3.370	$ 4.311	$ 4.828
25 "	$ 3.669	$ 4.827	$ 5.389
26 " and more	$ 0.297 per additional inch	$ 0.482 per additional inch	$ 0.643 per additional inch

[a]Including the following operations: felling, branching, topping at 3-inch diameter, skidding to truck road and piling with skidder.

[b]Wood classified in 3 groups according to the following factors: a) working conditions; b) terrain roughness; c) location of piles; d) forest density; and e) distance of skidding. A team of workers to be composed of two cutters and one operator of skidder. Earnings of the team to be equally divided among its members.

SOURCE: Convention de Travail entre la Société Forestière Domtar Limitée et le Syndicat national des travailleurs forestiers du Nord-Ouest Québécois (C.S.N.) et la Fédération des travailleurs des pâtes et papiers et de la forêt (C.S.N.), Lebel-sur-Quévillon, Québec, 1968-1971.

differently according to their seniority but nowhere else is there any mention of lay-off indemnity than in the collective agreement at Lebel-sur-Quévillon (Domtar). In this agreement, the compensation is established at one per cent of the employee's total earnings for his last continuous period of active employment.[738]

(vii) Camp Facilities and Services

Camp facilities and services have been improved considerably in the past two decades: better quality and variety of food, better and much cleaner living quarters providing for privacy, improved recreational facilities (including television), better communication facilities, etc. These improvements are not always traceable to collective agreement terms. They were mostly the results of new governmental regulations, constant union pressures and the desire of the employers to eliminate causes of employees' dissatisfaction and turnover.

Irving's description of the living conditions in the camps in 1952-53 gives us a basis to compare the progress made in this respect although his favorable description of the quality of food could be questionable at a time when, in Quebec, jobbers were known to try to cut corners on food services.

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[738] See Convention de travail entre la Société Forestière Domtar Limitée et le Syndicat National des Travailleurs Forestiers du Nord-Quest Québécois (C.S.N.), Lebel-sur-Quévillon, Québec, 1968-1971, pp. 15-16.

> In general food is good and well prepared. Most of the larger companies have a commissary department which has the aim, not only of satisfying the men and reducing costs, but also of providing a scientifically balanced diet.
>
> (...) Nearly all lumberjacks sleep on either single or double deck steel bunks equipped with springs and mattresses. Sheets and single beds are becoming more and more common in Ontario and are gradually appearing in Quebec. Yet a dormitory of from 10 to 50 men, not under military discipline, tends to become very unsatisfactory in respect to tidiness and cleanliness. Though washrooms and drying rooms are usually provided and are required by law in Ontario and Quebec, wet clothes are habitually left hanging around the main sleeping quarters, causing dampness and unpleasant odours.
>
> Though physically living conditions are much improved, camp life is far from ideal in providing opportunities for the satisfaction of a man's social and spiritual needs in his leisure time. It is at best an unnatural environment. No privacy is possible. Lights are turned off on a set schedule so that a man's leisure time must be regulated to that of his companions. Only rarely is any sort of reading room provided. Newspapers and books are very difficult to obtain. Few camps have any adequate place for a worker to store his clothes and personal belongings. A man cannot live happily for long unless he has some outlet for his social instincts. If entirely confined to basic animal activities of working, eating and sleeping he soon becomes the victim of boredom. (...) No normal family life is possible. (...) Rather than the physical conditions, it appears to be the limited social and psychological environment which the worker finds difficult to endure for long periods.[739]

If I quoted Irving extensively here, it is because his description represents fairly well the living conditions in a

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[739] Irving, op. cit., pp. 48, 49 and 50.

logging camp, not only in the early 1950's, but also in some of the camps which I visited or at which I spent several weeks in 1964 and 1965. This suggests that conditions did not change that rapidly after 1953, at least not everywhere, but more rapidly after 1965.

Now dormitories have almost completely disappeared as well as the double deck bed. Men are rather sleeping in small two-bed bedrooms often in electrically heated buildings with many other amenities and a great deal more privacy. Food services are carefully organized and controlled. However, the basically isolated and unnatural character of the camp environment has not been modified substantially and remain one of the major sources of dissatisfaction of logging employment.[740]

(viii) Physical Conditions

Mechanization has considerably reduced the physical hardship associated with most logging occupations. We get a good idea of the changes when we realize that the manual manipulation of the wood, physically the most tiring operation, has been practically completely eliminated. Irving described the situation in 1953 in the following terms:

> Logging is hard physical work especially in the pulpwood operations of Eastern Canada where much of the felling, bucking and piling is still done manually. The use of chain saws shows great

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[740] In fact, the degree of instability has been found to be directly related to the distance between the place of work and the place of residence (cf. C. Legendre, L'entreprise d'exploitation forestière et l'instabilité de la main-d'oeuvre (Mont-Joli, Québec: Bureau d'Aménagement de l'Est du Québec, Annexe technique No. 15, mai 1966), pp. 83-84 and 85).

> promise of reducing the physical effort involved in felling and bucking. Many types of loaders have been tried for handling four foot pulpwood but have not come into general use and the usual practice is to do this operation by hand. Logging is at present one of the hardest jobs, physically in Canadian industry. Boganing of four foot pulpwood is a good illustration of how much physical effort is required in some logging jobs. In boganing a production of ten cords per day is common. One man handles this ten cords twice, once to the sled and once on to the pile. This is the equivalent of handling 20 cords once, which, at two tons to the cord, is 40 tons per day.[741]

One type of condition which the industry has been less successful in dealing with is the extreme weather conditions under which logging is carried on generally without the protection of artificial cover or temperature control. Workers suffer from rain, snow and cold in winter and from flies and heat in the summer. However, with mechanization, this difficult problem is in the process of being partially eliminated with machine operators working in cabs which provide them with artificial cover needed to shield them from extreme environmental conditions.

c) Differences in Working Conditions Between Occupational Groups

In logging as well as in other industries, white-collar and trade occupations have generally benefited from better working conditions and a higher status in the organization than production

[741] Idem., pp. 45-46. A four-foot bolt weighs between 20 and 200 pounds.

workers (see Table 110). In the past, this higher status was indicated in logging camps by such things as separate and usually better lodging quarters, different meal times, separate TV rooms, etc. These differences were not only due to the fact that outside of logging organization in the social environment these occupational groups had a higher social status but also to their older and better organized unions, their much greater stability of employment with the industry, etc. In fact, companies had two different personnel policies: one for the production workers and another for staff employees.[742]

The evolution created by mechanization has not completely altered this situation. Despite the important gains made by production workers in their working conditions, they remain in many respects, if not in income, below the standards established for other occupational groups.[743] As indicated in Tables 111 and 112, staff groups enjoy such advantages as longer paid vacations, shorter hours of work (office employees), better paid absence in case of relatives' deaths, lay-off indemnity, floating paid holidays, juror pay, better group insurance and higher company contribution to them.

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[742] In the past, production workers were not considered members of the organization basically because of the great seasonality of employment. Very few of them were part of the organizational core. Thus companies did not feel much obligated toward them. However, the new conditions created by the mechanization and the prolongation of the operations are forcing companies to revise their attitude.

[743] However, the gap seems to be narrowing considerably between them.

TABLE 110

Comparison of Main Clauses, Labor Agreements Between Price Company, Production and Mechanical and Skilled Workers, 1957

Clause	Production workers	Mechanical and skilled workers
1) Union security	Voluntary irrevocable check-off	Voluntary revocable check-off
2) Hours of work	Standard week of Ordinance 39 (that is, 60 hours--6 days) except for kitchen help and stablemen	50 hours--9 hours a day
3) Vacations	Seasonal: 2% after 75 days within 4 months on proof by employee. In addition, after 3 months continuous employment (1 month at union's request, allowance proportionate). Cooks and assistants will receive 7 days, kitchen help and stablemen 3 paid holidays.	2% after 1 year, 1 week and 2% after 5 years. 2 weeks and 2% after 15 years.
4) Paid holidays	None	After 30 working days, choice of St. Jean-Baptiste, Confederation, Labor Day. After 1 year, employee entitled to at least 1 week will have right to one mobile extra holiday.
5) Base rates	$ 0.86 to $ 0.92 per hour	$1.27 per hour

SOURCE: Quebec Forest Industry Association, April 1957.

TABLE 111

Comparison of Main Clauses, Labor Agreements Covering Office and Production Employees, Domtar, Dolbeau Division, 1971

Clause	Office employees (U.C.C.)	Production employees (U.C.C.)	Scalers and forest rangers (C.S.N.)
1) Union security	Compulsory membership	Compulsory membership	Compulsory revocable check-off.
2) Hours of work	32:25 hours: 5 days per week	45 hours: 5 nine-hour days.	45 hours: 5 nine-hour days.
3) Vacation	12 to 95 mos.: 2 weeks max. 96 to 215 mos.: 3 weeks 216 to 299 mos.: 4 weeks 300 mos. and more: 5 weeks	less than 175 days: 2%; 176 to 1,199 days: 4% (2 weeks); 1,200 to 2,999 days: 6% (3 weeks); 3,000 days and more: 8% (4 weeks)	1 to 8 years: 2 weeks 8 to 18 years: 3 weeks 18 to 25 years : 4 weeks 25 years and more: 5 weeks.
4) Paid holidays	10 days: New Year's Day, Good Friday, Easter Monday, St. Jean-Baptiste, Labor Day, Thanksgiving Day, Christmas, the day following Christmas and New Year's Day and half a day on Christmas and New Year's Eve.	9 days: same, except Good Friday and Easter Monday and full day on Christmas Eve and New Year's Eve.	9 days: same, except Good Friday.
5) Lay-off indemnity	None	None	None

Table 111 (continued)

Clause	Office employees (U.C.C.)	Production employees (U.C.C.)	Scalers and forest rangers (C.S.N.)
6) Paid absence in case of relative's death	Close relatives except grandparents.	Close relatives except grandparents, sisters, brothers, and in-laws.	Close relatives except grandparents, but including in-laws.
7) Technological change	None	Provision for new classification and wage rate notice.	None
8) Group insurance	Company contribution.	Company contribution.	Company contribution.
9) Overtime	Paid 1 1/2 regular wage rates.	Same.	Regular wages or company in time and a half.

SOURCE: Convention de Travail entre la Société Forestière Domtar Limitée et le Syndicat des travailleurs forestiers du Saguenay-Lac St-Jean (U.C.C.), section employés de bureau, Dolbeau, Québec, 1970-1972; Convention de Travail entre la Société Forestière Domtar Limitée et le Syndicat National des Mesureurs, Assistants-Mesureurs, Gardes Forestiers et Forestiers du Québec (C.S.N.) et la Fédération Canadienne des Travailleurs des Pâtes et Papiers et de la Forêt (C.S.N.), Dolbeau, Québec, 1969-1971. Convention de Travail entre la Société Forestière Domtar Limitée et le Syndicat des Travailleurs Forestiers du Saguenay-Lac St.-Jean (U.C.C.), Dolbeau, Québec, 1970-1972.

TABLE 112

Comparison of Main Clauses in Labor Agreements Covering Different Groups of Employees, Price, Saguenay-Lake St. John Division, 1971

Clause	Production (U.C.C.)	Office (A.F.L.-C.I.O.)	Sawmill (C.S.N.)	Maintenance and repair shop (C.S.N.)	Scalers and forest rangers (C.S.N.)
1) Union security	Compulsory revocable membership.	Compulsory check-off.	Compulsory check-off.	Compulsory check-off.	Compulsory check-off.
2) Hours of work	45 hrs: 5 nine-hour days.	35 hrs: 5 seven-hour days.	45 hrs: 5 nine-hour days.	45 hrs: 5 nine-hour days	45 hrs: 5 nine-hour days.
3) Vacation	Seasonal: for continuous employment: 40 to 265 days: 3%; 266 to 1,399 days: 4%; 1,400 to 3,149 days: 6%; 3,150 days and more: 8%.	1 to 7 years: 2 weeks; 8 to 17 years: 3 weeks; 18 to 24 years: 4 weeks; 25 years and more: 5 weeks.	2 weeks after 1 year continuous employment; 4% if less than 60 months, 5% if more than 60 months.	1 to 3 years: 1 week; 3 to 8 years: 2 weeks; 8 to 18 years: 3 weeks; 18 to 25 years: 4 weeks; 25 years and more: 5 weeks.	1 to 8 years: 2 weeks; 8 to 18 years: 3 weeks; 18 to 25 years: 4 weeks; 25 years and more: 5 weeks.
4) Paid holidays	9 days: New Year's Day, Good Friday, St. John Baptist, Confederation, Labor Day, Thanksgiving Day, Christmas Eve, Christmas Day, New Year's Eve	8 days: same except Good Friday	8 days: same except Good Friday.	7 days: same except Good Friday and Thanksgiving Day.	9 days: same.

Table 112 (continued)

Clause	Production (U.C.C.)	Office (A.F.L.-C.I.O.)	Sawmill (C.S.N.)	Maintenance and repair shop (C.S.N.)	Scalers and forest rangers (C.S.N.)
5) Lay-off indemnity	None	2% of total continuous earnings.	None	1% of total continuous earnings	1% of total continuous earnings
6) Floating paid holidays	None	2 days/year	None	2 days/year	None
7) Paid absence in case of relative's death	None	Close relatives including grandparents.	Close relatives excluding grandparents.	Close relatives excluding grandparents but including in-laws	Close relatives excluding grandparents but including in-laws
8) Technological change	None	Notice and training	None	Notice and training	Notice and training
9) Group insurance	Company contribution	Company contribution (highest for this group)	Company contribution	Company contribution	Company contribution

SOURCE: Convention de Travail entre la Compagnie Price Limitée et le Syndicat des Travailleurs Forestiers du Saguenay-Lac St.-Jean (U.C.C.), Chicoutimi, Québec, 1969-72; Convention de Travail entre la Compagnie Price Limitée et le Syndicat National des Employés de la Scierie Price (Shipshaw) Limitée (C.S.N.), Chicoutimi, Québec, 1970-73; Convention de Travail entre la Compagnie Price Limitée et le Syndicat National des Travailleurs des Ateliers Price de Chicoutimi (C.S.N.) et la Fédération Canadienne des Travailleurs des Pâtes et Papiers (C.S.N.), Chicoutimi, Québec, 1968-71; Convention de Travail entre la Compagnie Price Limitée et le Syndicat National des Mesureurs, Assistants Mesureurs, Gardes Forestiers et Forestiers du Québec (C.S.N.), Chicoutimi, Québec, 1968-71; Convention de Travail entre la Compagnie Price Limitée et l'Union Internationale des Employés Professionnels et de Bureau (A.F.L.-C.I.O.), Local 399, Chicoutimi, Québec, 1970-1973.

For instance, an examination of the various collective agreements at Price Company indicates that the company's contribution to the welfare program was $17.00 and $9.00 respectively for married and single staff employees (that is, office, shop and scaling bargaining groups) but only $7.00 and $3.00 respectively for its married and single production workers.[744]

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[744]The higher contribution of the company can be explained either by the fact that the welfare program for staff employees was originally better or that these employees were able to bargain for a more generous contribution from the company.

CHAPTER 8

TECHNOLOGY AND THE ORGANIZATIONAL WEB

I set out, at the beginning of this study, with the general hypothesis that production technology had a determinant impact on the organizational structure of logging organizations. Since pulpwood logging consists of the mass production of a simple and uniform product and that the change in technology was in the direction of intensive mechanization, it was suggested, on the basis of previous studies, that logging organizations had become "industrial bureaucracies". However, the previous chapters in which I detailed the recent evolution of the industry indicate that the large pulpwood logging organizations have remained below the expected level of bureaucratization. It was suggested that an explanation of this situation can be found in the nature of the raw material and the physical environment in which these organizations operate and in the larger socio-economic environment from which the industry gets its supply of labor. Both groups of factors have been characterized by wide and largely unpredictable variations which prevented these organizations from establishing with precision the results of their day-to-day, week-to-week or even month-to-month production activities. These factors prevented them also from reaching the level of centralization, formalization and standardization that one finds in organizations with a similar type of production technology. These conditions suggest that logging companies will not be able to become fully bureaucratized in a foreseeable future, even if they are likely to push forward with

their effort of rationalization by increasing their level of technological sophistication and the stability of their labor force. They will have to guard themselves against what Perrow called "premature rationalization"[745] if they want to avoid problems in which some mining firms got bogged down.[746]

This brings us back to the question of the impact of technology. At this point, we need to sort out the various factors or variables involved and their relationships and to try to map them out into a model which will indicate the exact role of technology. In doing so, I will distinguish between the causes of mechanization, its direct and indirect effects and finally, the reciprocal effects ("feedback effects").[747] In the discussion on the relationships between technology and structure, I will take the following considerations into account. First, a great deal of the changes in the structure cannot be directly traced to a particular change in technology but rather to an accumulation of "demands" or "necessities" created by several changes in technology. Once the accumulation has reached a critical point, the pressure on the organization is such that it must adapt

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[745] Charles Perrow, Organizational Analysis: A Sociological View, pp. 47-48.

[746] Trist and Bamforth, op. cit., Gouldner, Patterns of Industrial Bureaucracy.

[747] By causes of mechanization, I mean those factors or conditions which directly lead the companies to mechanize their operations. Direct effects are those effects which are directly and immediately traceable to mechanization. Indirect effects are the effects not immediately traceable to the cause (mechanization). In other terms, they are related to the primary cause (mechanization) through an intermediary or secondary cause which is itself directly affected by mechanization. The degree of determination of the primary cause is likely to be less strong in their cases.

itself in order to release the tension. For instance, changes in the style of supervision and in the educational and technical requirements of supervisors cannot be delayed anymore, once the organization has reached a high level of mechanization. Otherwise, production costs increase and administrative controls are deficient. Machine operator qualifications constitute another example. Companies neglected for a while to adapt the labor force to the new requirements of mechanization to find out, in the late 1960's, that maintenance and repair costs had unduly reached a very high level which could not be tolerated anymore.

Second, there are only a few instances in which specific technological changes have had an immediate impact on the structure of logging organizations. For instance, the introduction of the chain saw did not result in any immediate changes in the structure of the organization. Its effects were limited to increasing man-day productivity. Again, the introduction of small tractors and J-5's in the skidding phase and of trucks in the hauling phase did not generate any immediate structural reorganization. Truck hauling added a new dimension to the operations by making it possible to reach wood far from the rivers and by eliminating the drive on small creeks. However, the basic production system remained unchanged and these modifications did not affect the organization of the camp and the sequence of operation.[748]

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[748] It did, however, increase the need for mechanics and better equipped maintenance and repair facilities at the camps, and better administrative controls all along the chain of command. Moreover, it affected the scheduling of operations since hauling became feasible in the summer and fall.

The introduction of the wheeled skidder, the mechanical slasher and the tree harvester (mechanical feller) was another matter altogether for these machines had an immediate impact on the structure. In the first case, it meant a new system of production from the stump to the road, new work groups and a new system of remuneration (work group remuneration), not only the possibility of year-round operations but of simultaneous ones. Mechanical slashing not only increased the level of work flow integration, but it extended teamwork to slashing and hauling, brought the introduction of hourly wages into the production process, a new style of supervision and greater planning. The more recent introduction of the mechanical feller (harvester) contributed to push these changes further.

In many respects, it is difficult to isolate the impact of technology from the impact of other factors, such as unionization, labor market competition, etc., when they are all working in the same direction, that is, in this case, toward better and different working conditions and a differenty style of supervision. However, it is sure that, despite the pressure of many of these other factors, changes either would not have been introduced at all, or would have been implemented later or differently if mechanization had not increased productivity and made them possible by transforming the existing conditions, for instance, by permitting and requiring the extension of logging operations on a year-round basis and the simultaneous execution of the various phases of operations.

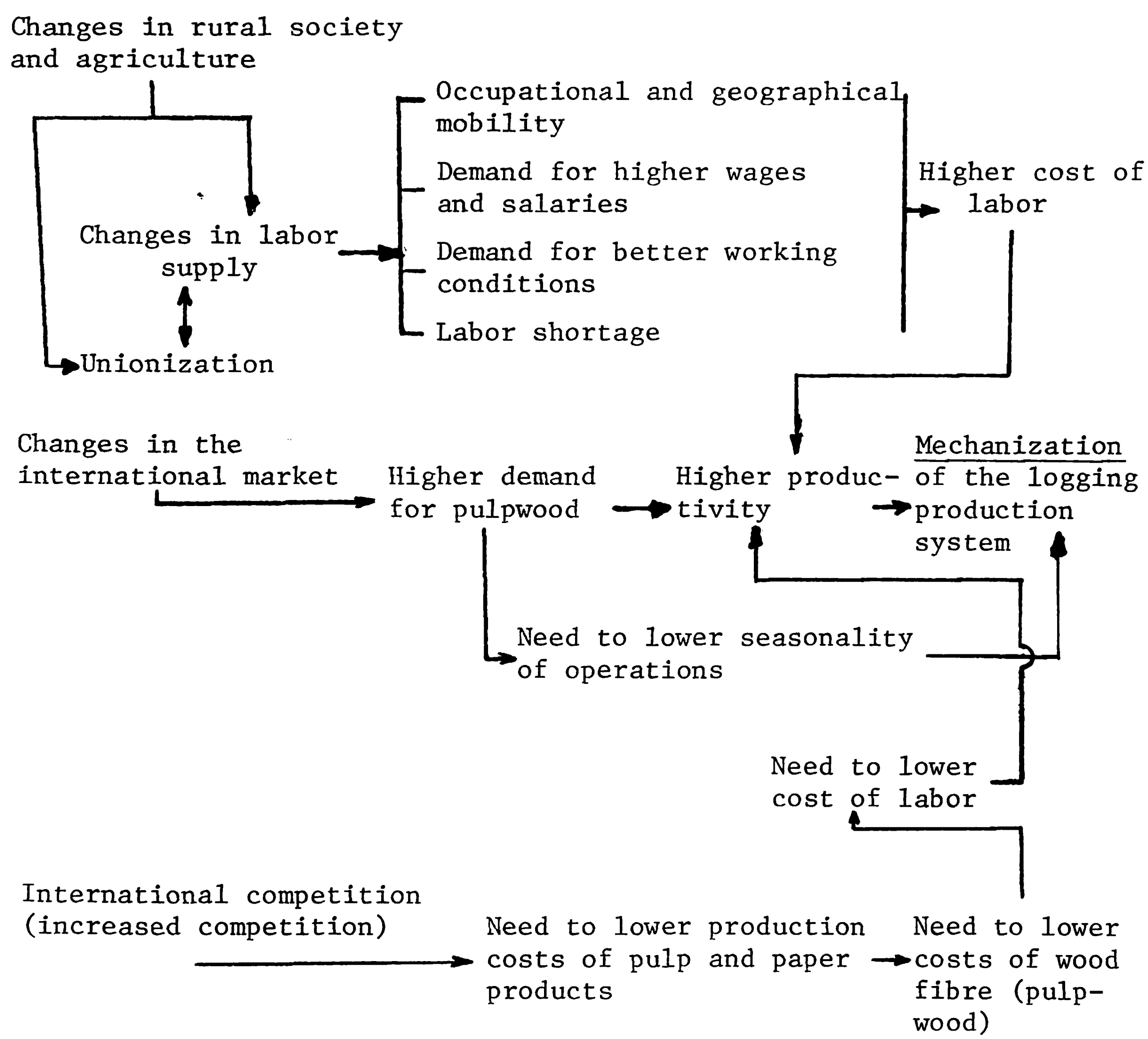
I. The Causes of Logging Mechanization

Mechanization was the answer to a number of external problems which were threatening the capacity of the pulp and paper companies to get a satisfactory supply of pulpwood (or wood fibre) at an acceptable cost (see Figure 27). At the beginning of the period, that is, the 1940's and most of the 1050's, the problem was more a matter of facing increasing requirements of pulpwood due to a higher demand for pulp and paper products and a deficient supply of labor due to socio-economic changes in agriculture and in the rural society in general. The first solution tried by the companies was to extend the period of operations. This solution soon appeared unable to cope with the problem because of technological and socio-economical limitations. The other alternative was to raise productivity through mechanization.

During the second part of the period, in the late 1950's, in the 1960's, and the early 1970's, production costs, especially labor costs, became the dominant problem while the labor supply problems remained in the background (if not in the foreground from time to time in certain areas). Rising wages and salaries, and better and, of course, costlier working conditions obtained under the growing pressure of the unions and sparked by the rise of socio-economic aspirations in the rural population, especially during the Quiet Revolution, created an irreversible push for greater and greater productivity and a reduction in labor needs. In the late 1960's and the early 1970's, greater international competition contributed furthermore to persuade the pulp and paper companies that the wood supply costs were the only possible source of major economies if they wanted to improve their competitive position

FIGURE 27

Factors Causing Logging Mechanization



and profits which, according to them, were dangerously sagging. Later, the greater reluctance to take to the woods showed by the younger and older workers only added to the pressure toward achieving ever greater productivity and reductions in labor requirements and costs.

It should be noted that mechanization was introduced at an increasing pace throughout this period, first relatively slowly and without major disruptions in the existing system of production in the 1950's, and then at a much faster rate and with much greater impacts in the 1960's. Besides the fact that once an organization has been engaged on the road to technological sophistication, it is difficult to imagine an early stop halfway, the rapidly increasing costs of labor in the 1960's certainly contributed to the acceleration of the process.

II. Direct and Indirect Effects of Mechanization

The identification of the direct organizational effects of mechanization (see Figure 28) is not as simple a task as the identification of its causes. Some effects which, at first consideration appear to be direct effects, are in fact indirect effects. A more difficult task is to group them in a meaningful way and avoid a mere listing of them. Thus, we must deal with both types of effects at the same time because they are related in a sequential, if not a causal, way.

The first set of direct effects are those related to the production system itself and the organization of work. The greater integration of the operations, the teamwork and the programming of activities incorporated in the increasingly more complex machines contributed to diminish the physical and social isolation at the work place but also workers' job control. This situation affected several other

FIGURE 28

Direct and Indirect Effects of Mechanization

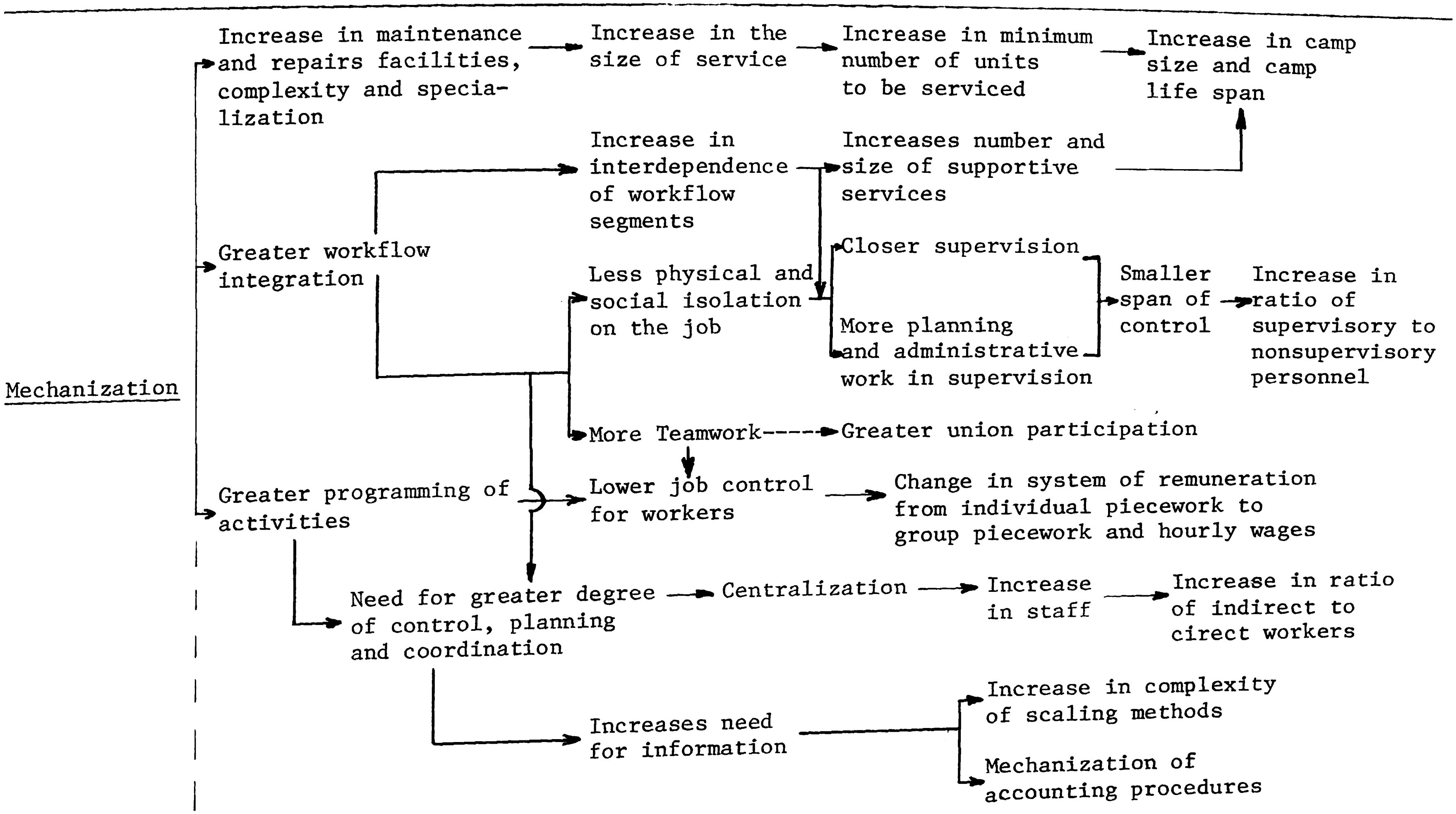


FIGURE 28 (cont'd)

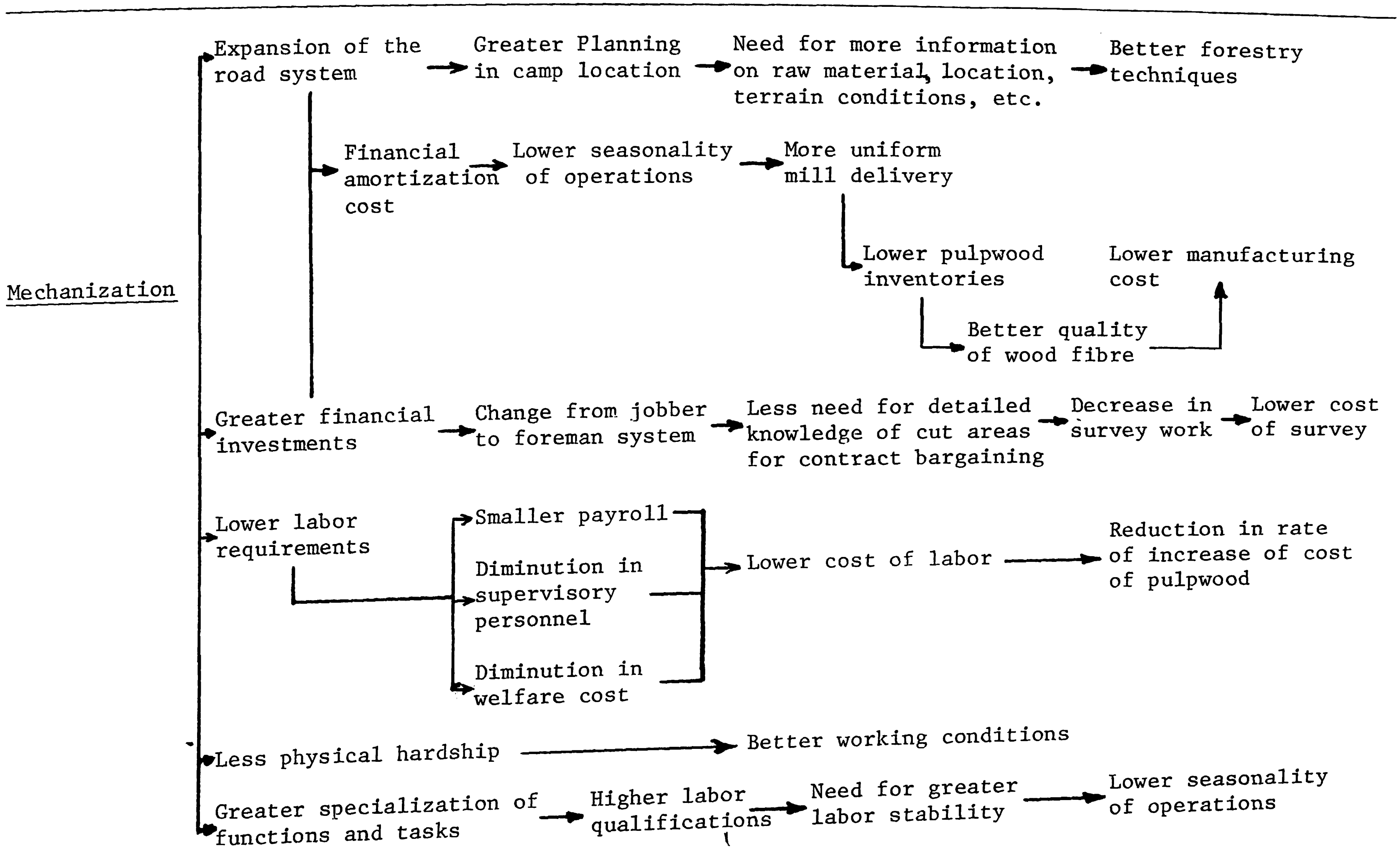
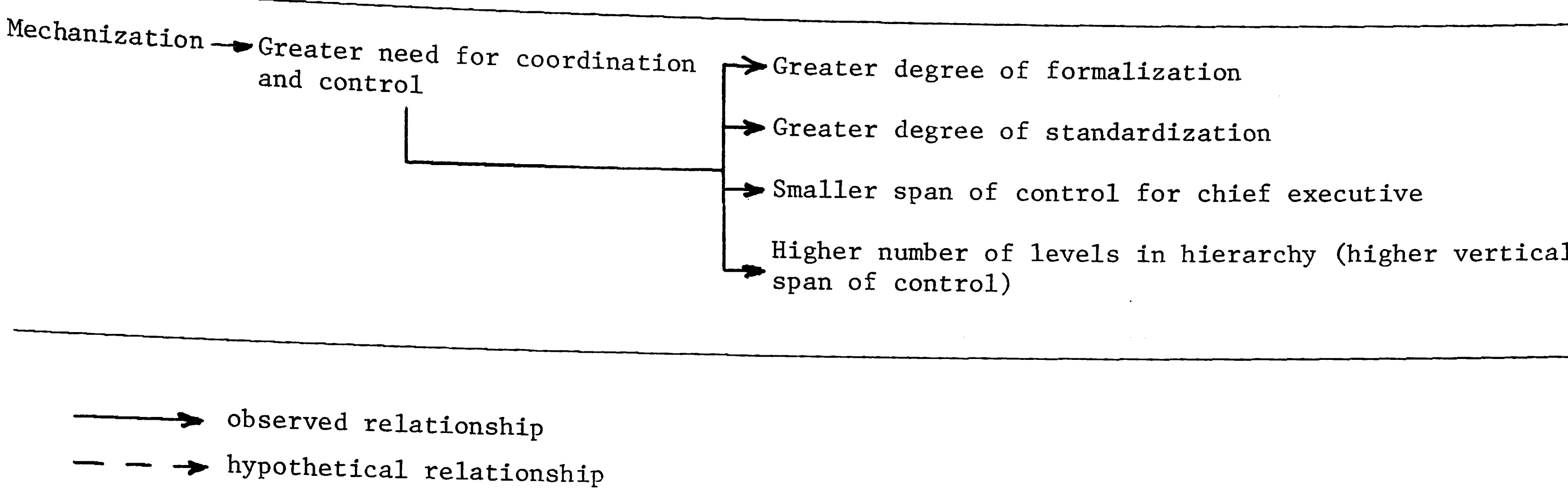


FIGURE 28 (cont'd)



aspects of the organizational system. Easier and closer supervision became possible and at the same time necessary. Supervision involved also much more planning and administrative work than the simple function of watching. This meant a smaller span of control for first line supervisors. It contributed to increase the ratio of supervisory personnel to non-supervisory personnel despite the fact that the important reduction in labor diminished the requirements in supervisory personnel and that the greater ease of communication due to the much improved road system favored the maintenance of a relatively large span of control for lower management supervisory personnel.[749] Straight piecework remuneration on an individual basis was replaced in most cases by either group piecework, hourly wages plus production bonus, or straight hourly wages. It is likely also, though there is no hard evidence to support this, that union participation and involvement which increased in the 1960's may have been helped by the greater interaction and cooperation between workers involved in the team work created by mechanization.

The second set of direct effects are those concerning the characteristics of the structure such as the level of specialization, formalization, etc. The greater complexity of the division of labor is indicated in the creation of new tasks, the fragmentation and reorganization of certain traditional tasks, and in the establishment of new departments to handle functions which are altogether new or were

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[749] It was not possible to obtain clear evidence concerning this question. I was told by a career management official that there were less supervisors in today's operations than in the ones carried thirty years ago. This may be possible for the reasons already mentioned and in view of the fact that men now work in teams of three or more members.

not separately set up before. For instance, maintenance and repair works have become a crucial part of the efficiency of the organization and their importance has been growing in direct function of the increase in mechanization (volume and complexity of the equipment). As a result, most companies have established a maintenance and repairs department. Development and planning are another example. The changing technology, the much greater consequences of organizational mistakes, the high cost of the sub-structural equipment (road systems, camps and basic services such as water supply, communications, etc) and the large increase in the volume of inter-organizational exchanges have all contributed to the greater importance of planning and development. In many companies, a planning or development department (or quasi-department) has been added to the structure.

Standardization has consisted mainly in the great increase and uniformization of administrative procedures and the controls of production, time, materials and equipment. Roles and communications have been formalized by the establishment of organizational charts and job descriptions and by increasing the volume of reports, memos, and forms of all sorts. These were all steps needed to operate efficiently with the new technology. A greater degree of centralization was part of the answer to the pressing needs for planning, coordination and control. At the same time that these needs required more specialized and supervisory personnel to be satisfied, administrative and maintenance personnel wered also more in demand. Combined with the reduction in the number of required production workers, these changes in personnel resulted in an increase in the rations of supervisory/non-supervisory

personnel, indirect/direct employees and maintenance/production workers.

Another series of variables is associated with the considerable expansion of the road system (in length as well as in quality or type of road) made necessary by the direct use of the truck (and other more recently adopted machines) and the adoption of new production systems (for instance, the tree-length system). The high costs involved in the development of this complex road system created a pressure toward a more careful and extensive planning of the operations especially of the location of camps. Thus, a much more detailed knowledge of the terrain and the distribution of the raw material was needed which could be provided only by new forestry techniques such as aerial photography and photo-analysis. The better road system was also associated with the decline in seasonality. Indeed, it meant not only the possibility of carrying on with logging operations during unfavorable seasons, like the summer and the early fall, but also an incentive to do so because of the financial pressure to use the important investments made as efficiently as possible.

The increase in productivity generated by mechanization was to lower labor requirements and thus to decrease labor costs: a smaller payroll, savings in the corresponding diminution in supervision and in welfare costs, such as lower frequency of industrial accidents, etc. Since labor costs were the most important ones in the total cost, this was to result in either reducing the absolute cost of pulpwood or in reducing its rate of increase. In fact, we know now that it is the latter which happened. Indeed, the cost of pulpwood went up for several

reasons. For one, the diminution of labor requirements was offset by an increase in wages and salaries and other labor costs in general. Other significant increases in costs were related to mechanization itself.

Mechanization brought with itself new occupational requirements, not only in terms of a new distribution of occupations as was indicated earlier, but in terms of the qualifications demanded from the labor force. In part, the industry needed a generally better educated and better trained labor force which as a result had to become more stable. In fact, we know that this was achieved only partially and that labor mobility has been generally a problem for the industry up to now. On the other hand, mechanization directly contributed to the improvement of working conditions by eliminating a great deal of the physical effort required in traditional logging occupations and by protecting some of the production workers from some of the most undesirable conditions of the physical environment (for instance, rain, snow, cold weather, mosquitos, wet ground, rough terrain, etc.). The much greater production capacity and mobility of the mechanical equipment was associated also with the concentration of production and of production facilities. This led to a considerable increase in camp size and in the life span of logging camps. As a consequence, camps could be provided with better and more attractive living features, such as TV and other recreational facilities. These improvements in working and living conditions contributed to eliminate some of the causes of the dissatisfaction among the workers associated with the high rates of turnover.

Finally, mechanization increased considerably the need for control and coordination and thus for information because of the greater integration of the workflow, the greater emphasis on long term planning, the importance of research and development, and the increase in capital investments. The latter led to the change in ownership of the means of production (the large sum of capital involved in mechanization forced companies to pick up the tab). The amortization of this capital put pressure in favor of a more intensive use of the equipment and thus against seasonality. In turn, the greater need for more readily available, more detailed and more accurate information led to the mechanization of administrative services, an increase in their centralization, standardization, specialization and a diminution in their labor requirements. Traditional scaling methods were also replaced by new ones for the same reasons. The greater need for coordination and control resulted also in maintaining a relatively high number of levels in the management hierarchy and a relatively small span of control for the chief executive.

Greater workflow integration and lower seasonality resulted in a drastic decrease in pulpwood inventories and a much more uniform mill delivery program which contributed to an improvement in the quality of wood fibres used at the mill and lower manufacturing production costs. Of course, one of the most important changes associated with these factors and others as well was the shift from the jobber system to the foreman system of organization. One consequence of this change was that the companies did not need anymore detailed field knowledge of the timber stocks to bargain contract prices with their jobbers.

This meant practically that from then on, aerial photography supplemented by some ground work could be relied upon without the extensive and expensive ground survey work which was traditionally executed in the past.

III. Reciprocal Effects

In a complex web of factors, like the one which I have been describing, there is always some interaction between these factors, especially over a long period of time such as the period covered by the present study. Interaction provides much of the dynamism which is involved in changes, such as the ones described in the preceding chapters. If we keep the focus on technology (mechanization), two systems of interaction seem to have been particularly important in the recent evolution of the logging industry.

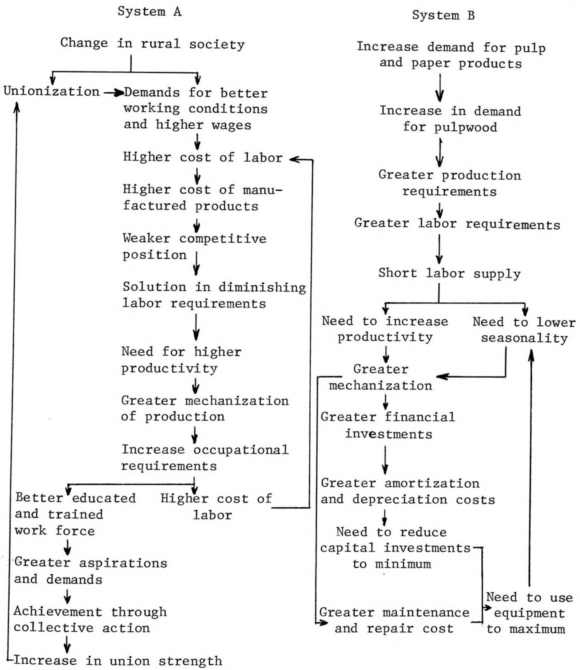
The first system concerns more directly the factor labor (see Figure 29, System A). Changes in the rural society (such as the "urbanization" of the aspirations and life style of its population) and the unionization of the labor force created demands for higher wages and salaries and better working conditions. The resulting increase in the cost of labor was reflected in the higher cost of pulpwood and a weakening of the competitive position of the industry because of higher input costs at the manufacturing level. While trying to keep the increase in the cost of labor to a minimum, the industry could lower or at least try to stabilize its total labor cost by reducing its labor requirements. This could be done only by increasing its labor productivity through technological improvement (mechanization).

However, mechanization had the effect of changing and increasing occupational requirements and thus to create a demand for a better trained and educated work force. Not only was this labor force a more costly one because of increased competition with other industries in the labor market, but also one which had higher aspirations and demands. Their satisfaction could be achieved through greater union pressure on wages and salaries and other working conditions. And back again in the system with spiraling production costs, mechanization, etc.

The other system involved many of the same factors but was centered on the seasonality of the operations (see Figure 29, System B). Faced with a higher demand for pulpwood, companies needed to expand their labor force. They could not do it to the point which they needed and were forced to increase production either by increasing productivity through mechanization or by employing the available labor force over a longer period of time. However, on the one hand, to operate during certain seasons of the year was not possible with the traditional technology. Companies had to mechanize. On the other hand, mechanization represented costly investments and thus capital amortization which was economically feasible only if the equipment needed was reduced to a minimum and used intensively and constantly. This created a pressure toward operations continuity and lower seasonality. Mechanization was also associated with increasing costs in maintenance and repairs (personnel requirements as well as facilities and equipment) reflected in higher overhead costs. In order to limit these overhead costs, the stock of machines had to be limited and those in

FIGURE 29

Reciprocal Effects of Mechanization



hand more intensively used (thus again, lower seasonality). And back again with more mechanization in a spiraling process.

These are certainly not the only reciprocal systems of relationships observed. Within the organizational structure, I have already mentioned, for instance in Chapter 6, that there has been some seesawing taking place between the need for greater control and coordination leading to a greater degree of centralization and the need to respond rapidly and efficiently to changes in the physical and social environments of the operations which necessitated a greater degree of decentralization and deconcentration of basic services at the divisional and local levels.

However, there is no need to expand further the description and analysis of reciprocal effects as long as their existence and their importance have been demonstrated. In the next chapter, I will draw some conclusions related to the complexity of the organizational network of causes and effects.

CHAPTER 9

CONCLUSION:
SUMMARY OF THE FINDINGS AND CONTRIBUTION OF THE STUDY TO THE SOCIOLOGY OF ORGANIZATIONS

After the rather lengthy description and analysis of the logging organizations and industry which precede, the point has been reached where a conclusion must be drawn. The discussion will proceed with a brief summary of the findings in relation to the four companies which were the object of the study. Similarities and differences between them will be underlined and a set of hypotheses for further study will be established on the basis of the generalizations and questions which emerge from the discussion.

In Chapter 2 above, I indicated that I originally wanted my study to be a comparative analysis of four organizations. However, I cannot claim that I did such a comparative study.[750] It is rather four case studies of logging organizations which I consider representative (although without scientific claim to their representativity) of the large pulpwood logging industry in Quebec. These four organizations are representative of the process of technological and structural change which transformed the industry after World War II, a period which I used to examine the relationships between technology, environment and organizational structure.

At times, there has been a shift in the unit of analysis. Besides

[750]Unless, again, comparative is defined in a very broad sense.

the four woodlands divisions, I focused also on the four parent companies and on the pulp and paper industry as a whole. This shift was necessary to look at contextual variables and various other dimensions of the environment. At other times, I gave the impression that I was dealing with an abstract logging organization. This was done to avoid repetitions when the same situation was common to all four companies or when the description of the technology, the environment or the organizational features applied equally well to the four of them.

In fact, however, I really had four case studies all along. The same basic information was gathered in following the same procedures and in using the same instruments for the four of them. This information varied in quality from one organization to another and that explains that at some points in my analysis I had to use the best information coming from one of them to illustrate the discussion or to carry it further. But always I considered them as four separate instances of a process of change which it was my task to describe, analyze and explain.

I. Similarities and Differences Between the Four Organizations

In the analysis of the relationships between technology, environment and the structure of organization, the observation of similarities and differences between the four logging companies is the key. It is on this basis that generalizations can be made from which hypotheses for further studies can be formulated. In the following pages, I will briefly review the major similarities and differences found in the logging companies.

A. Contextual Variables and Environment

The four companies have a good deal in common in this respect but also important differences. They are all large private organizations operating within the same socio-cultural environment. Exception made for QNSP with regard to marketing competition, they are all submitted to the same economic conditions and inter-organizational context. QNSP is a more secure organization because of its vertical integration with the parent publishing company. On the other hand, it faces a more difficult labor supply because of its location in a sparsely populated area.

Two of the four organizations, Consolidated-Bathurst and Domtar, are bigger and have more widely spread logging operations. The degree of product diversification of the parent company varies also considerably. In this respect, Domtar is the most diversified company and QNSP the least diversified one since it is limited to the production of newsprint paper only.

The four companies are different also in their origin and historical development. It is important to mention that Domtar's and Price's origins go back to the middle of the nineteenth century when both companies started as family concerns. Consolidated-Bathurst and QNSP were established later, after the turn of the century, when large sums of American and Canadian capital were invested in the development of the pulp and paper industry. Their subsequent development varied also. QNSP largely expanded and grew naturally while Price, Consolidated-Bathurst and Domtar got their present size and shape through numerous mergers.

Their greatest similarities are probably found in the technology which they use in their logging operations. As described earlier in Chapter 5, they have adopted basically the same dominant system of production (the semi-mechanized tree-length system) and the same type of machinery, buying most of it from a small number of manufacturers. However, contrary to the other two companies, Consolidated-Bathurst and Price produce also timber logs for their sawmills in some of their operations. Due to certain local conditions, Domtar is the company with the bigger variations in its technology of production: it has at the same time the most advanced system in one of its divisions (Quévillon) and the least advanced system of the four companies in another division (Jacques-Cartier).

B. Organizational Structure

As described in Chapter 6, similarities between the four companies are also dominant with respect to their organizational structure. They all obtain comparable scores measuring the degree of specialization (see Tables 113 and 114), formalization (Table 115), standardization (Table 116) and centralization (Table 117). The scores which they obtain on the degree of role and functional specialization are relatively high, well above the average score obtained by Pugh *et al.* in his previous study (Tables 113 and 114). The breakdown by items of role specialization indicates that logging organizations constantly show a higher score in such items as welfare and security, maintenance, accounts, production control, inspection and methods. This can only be interpreted as an indication of the bureaucratization which has

TABLE 113

Degree of Functional Specialization in the Four Companies' Woodlands Divisions

Item[a]	Score[b]			
	Domtar	Consolidated-Bathurst	Price	QNSP
1. Public relations and advertising	(done by parent company)			
2. Transport	x	x	x	x
3. Employment	x	x	x	x
4. Training	x	x	x	x
5. Welfare and security	x	x	x	x
6. Buying and stock control	x	x	x	x
7. Maintenance	x	x	x	x
8. Accounts	x	x	x	x
9. Production control	x	x	x	x
10. Inspection	x	x	x	x
11. Methods	–	x	x	x
12. Design and development	x	x	x	x
13. Organization and methods	–	x	x	x
14. Legal	(done by parent company)			
Total[c]	10	12	12	12

[a]Sales and Service, and Market Research were eliminated from the original list because they do not apply in logging.

[b]A high score means high degree of functional specialization.

[c]The mean score obtained by Pugh <u>et al</u>. for 52 organizations was 10.19.

TABLE 114

Degree of Role (Occupational) Specialization in the Four Companies' Woodlands Division

	Maximum score possible		Mean scores obtained	Scores[a]			
	This study	In Pugh et al. study	in Pugh et al. study	Domtar	Consol-Bath.	Price	QNSP
1. Transport	7	7	2.60	3	3	3	3
2. Employment	6	6	2.58	2	3	2	2
3. Training	5	6	1.85	4	4	4	4
4. Welfare and security	10	10	3.35	5	5	4	5
5. Buying and stock control	8	8	4.04	3	3	2	4
6. Maintenance	11	10	4.29	6	5	5	5
7. Accounts	11	11	4.51	9	10	10	10
8. Production control	5	5	2.55	4	4	5	4
9. Inspection	7	7	3.07	5	6	6	5
10. Methods	8	8	2.84	0	6	5	7
11. Design and development	7	7	3.00	1	1	2	2
12. Organization and methods	5	5	2.18	0	1	3	2
Overall role s cialization	90	90	31.77[b]	42	51	51	53

[a]High score means high degree of role specialization.

[b]The standard deviation obtained by Pugh *et al*. was 19.90.

TABLE 115

Degree of Formalization in
the Four Companies' Woodlands Divisions

Item	Score[a]				
	Maximum score possible	Domtar	Consol-Bath.	Price	QNSP
1. Role definition	10	8	7	8	8
2. Information passing	13	11	8	11	7
3. Recording of role performance	12	11	10	11	11
4. Miscellaneous	5	3	3	3	4
Overall degree of formalization	40	33	28	33	30

[a]A high score means a high degree of formalization.

TABLE 116

Degree of Standardization in the Four Companies' Woodlands Division

Item	Maximum score possible	Score[a]			
		Domtar	Consol-Bath.	Price	QNSP
1. Inspection	13	12	11	11	11
2. Stock control	6	3	5	--	6
3. Operational control	16	14	14	14	14
4. Financial control	16	12	12	12	12
5. People control	19	18	16	16	19
6. Communication	5	0	0	2	2
7. Ideas	10	4	6	6	6
8. Materials	9	8	9	8	8
9. People: recruiting	22	10	9	12	10
10. People: training	9	6	8	8	7
11. Activities	20	9	8	12	10
12. Miscellaneous	7	6	6	5	6
Overall degree of standardization	156	102	104	106	111

[a]A high score means a high degree of standardization.

TABLE 117

Degree of Centralization in
the Four Companies' Woodlands Divisions

	Minimum score possible	Maximum score possible	Score[a]			
			Domtar	Consol-Bath.	Price	QNSP
Total[b]	0	136	105	103	99	102
Per item	0	4	3.1[c]	3.0[c]	2.9[c]	3.0[c]

[a]Scored as following on the basis of five levels of management. If decision taken at:

(a) vice-president and Woodlands headquarters level: 4 points
(b) joint headquarters and logging divisions levels: 3 points
(c) divisional manager and divisional level: 2 points
(d) joint divisional, district and camp levels: 1 point
(e) camp supervisor and camp supervisory levels: 0 points.

[b]Based on 34 items.

[c]Average.

accompanied the mechanization of logging operations.

Logging organizations have also achieved a fair amount of formalization as the scores indicate in Table 115. Again, they seem to be very similar to each other in this respect, exception made for Consolidated-Bathurst and QNSP regarding "information passing". The same similarity exists also in the degree of standardization. The scores are particularly consistently high on such items as inspection, operational control, people control, materials and people training. This suggests again, together with the high scores obtained on the recording of role performance (in the measurement of formalization), the existence of fairly bureaucratized forms of production controls in the four organizations.

Finally, the scores obtained by the four companies on the degree of centralization show also great similarities between them.[751] At the same time, the average scores per item support the suggestion made earlier in Chapter 6 that the divisional headquarters are an important level of centralization in logging organizations. Differences in the number of hierarchical levels were reported earlier in Chapter 6 and explained by factors such as the conditions created by recent moves to concentrate logging operations, mergers, the dispersion of

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[751] Although here, the instrument might not have given as valid a measure of centralization as the one obtained for the other characteristics of the structure. Centralization appears to me to be more difficult to measure adequately. I believe that there are important differences between these logging organizations which were not revealed here but which would have been shown if there had been a greater focus on this dimension of organizations.

operations, featherbedding, differences in the size of logging camps, and the need to train young management members.

Quebec North Shore was shown to be a more innovative company in its attempt to rationalize controls in developing new planning techniques, while Price remained more conservative in keeping many independent contractors to produce a large percentage of its production and in having a fair amount of the equipment owned outside the company.

An important aspect of this consideration of similarities and differences between companies is the fact that they all went through similar changes. In previous chapters, I described the technological and organizational systems which characterized logging operations before World War II and which were used by the four companies at that time. From that point on, the four companies' technological and organizational systems moved along in a similar direction and at about the same pace on the paths to mechanization and bureaucratization under the pressure created by changing environmental conditions. Companies had to follow the greater mechanization of their logging operations with a corresponding increase in the bureaucratization of their logging organizations.

As a result, in the early 1970's, these logging organizations corresponded very closely to the "nascent full bureaucracy" type of organization described by Pugh and his colleagues.[752] As mentioned earlier, they characterized this type as having a relatively[753] high

[752] Pugh et al., "An Empirical Taxonomy of Structures of Work Organizations", pp. 120-124.

[753] By comparison with the "full bureaucracy" type.

structuring of activities, a relatively high concentration of authority, a relatively high workflow integration, a relatively high standardization of procedures (especially regarding the selection of personnel and its advancement), a relatively high degree of line control of workflow. Logging organizations would not fit exactly this description on three counts. Their structure of authority is not as concentrated and their workflow is broken down into separated segments in time and space which prevent the high level of integration which one finds in more highly mechanized and automated production systems. Consequently, the line control of the workflow is not as high as predicted in the model.

Furthermore, the study supports most of the more specific characteristics which are usually associated with the greater bureaucratization of organization which is related to technological rationality. Thus, I found the following changes:

> (a) An increase in the number of levels in the management hierarchy. However, it was a relative increase. By that I mean that the number of levels did not increase absolutely (in fact, it seems to have decreased slightly) but it increased in relation to the size of the organization (defined in terms of the number of employees). In this sense, the number of hierarchical levels did not decrease proportionately as much as the number of employees.
>
> (b) I also observed an increase in the horizontal span of control of the chief executive (vice-president woodlands) with the greater bureaucratization.
>
> (c) There has been a decrease in the ratio of non-supervisory to supervisory personnel.
>
> (d) The ratio of direct or productive to indirect or non-productive labor also clearly decreased.

(e) Labor statistics indicated also a decrease in the ratio of production employees to maintenance workers.

(f) There has been an increase in the required level of education as a condition of employment even if these new requirements were overlooked very often in the case of production workers because of a soft labor supply.

(g) Due to a greater emphasis on education and professional as well as technical qualifications in the selection of management and staff personnel, there has been a greater tendency to hire from outside the organization although priority has been given to promoting from within.

(h) It was impossible to ascertain whether the span of control of first line supervisors has increased or not. On the one hand, the greater facility and rapidity of movement possible with the new road system and the fact that production workers are now grouped in teams of three or more contributed to increase the span of control. On the other hand, the greater complexity of the task which the supervisors now perform (more coordination, more administration, etc.) and the greater physical dispersion of line production activities increased the time which the supervisors must devote to supervision per man and reduced the number of workers which they could properly be responsible for.

As bureaucratization and functional differentiation increased, the impact of the change in operations technology on the structure of organization seems to have been declining. Putting aside for a moment the fact that functions such as accounting and forestry experienced their own technological "revolution", the most important adjustments through which the staff functions went during this period took place in the 1950's and the first half of the 1960's, especially when the companies changed their systems of operations from the short-wood to the tree-length and adopted the rubber-tired skidder and decided to switch to the foreman type of camps. This coincided with the first

great pressure toward rationalization of the administration process (better material and financial control, more detailed, accurate and frequent information, better and more detailed planning and follow-up, etc.). These needs certainly precipitated the technological changes which modified substantially certain functions such as accounting (new methods, new equipment such as computers, etc). These new methods and equipments would have been used eventually anyway since the companies were already using them in their manufacturing divisions or were aware of their availability. But their involvement in the mechanizations of their operations and other demands created by the unionization of the labor force and outside agencies, such as governmental bureaucracies, pushed them more rapidly in that direction.

However, once the companies had established these basic organizational "instruments", they did not need to modify them later as mechanization continued to progress, at least not to a substantial extent, since the next steps in the mechanization and in organizational rationality were in the same direction and only made it more likely that these instruments would be more fully used. One should not neglect the fact that, once the structural reorganization involved in the takeover by the companies of all logging activities was completed, each department was on its own and developed largely according to its own rationality and autonomy despite its clear subordination to the production function.

II. Contribution of the Study: Issues and Problems

A number of issues and problems of organizational theory were raised and discussed in the second chapter. Some of them should

receive further condiseration here.

The first one concerns the influence of size. As mentioned previously, size was found by many students of organization, especially the Aston group, to be the most important factor influencing organizational structure. For instance, in the Aston study, size was directly related to increase in the structuring of activities. In logging, I found that while the size of the organizations had decreased considerably over the period of observation, the degree of structuring had considerably increased. These apparently contradictory findings need some explanation. I would like to suggest two.

First of all, there seems to be some confusion in the definition of the casual relationship between size and organization. While the relation found by the Aston group and others such as Blau make sense theoretically, one should not conclude that the causal relationship is a necessary one.[754] That is, size may cause structuring but other factors may cause it too. Thus, while size stays stable or decreases, structuring of activities may still increase because of the action of these other factors. In the case of logging, technology is one of them.

Secondly, there is a lot of confusion created by the various definitions and measures of size used in the literature. The most common one is obviously the number of members or employees in an organization. However, an organization's size can also be measured

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[754] See, for instance, Mario Bunge, Causality: The Place of the Causal Principle in Modern Science (New York: The World Publishing Co., 1963).

Following [illegible]

[illegible] many aspects of [illegible]

the most important [illegible]

[illegible], in the [illegible]

in the [illegible] [illegible]

size of the [illegible]

of observation, the [illegible]

[illegible] these [illegible]

[illegible] life [illegible]

to be [illegible] the [illegible]

between [illegible]

by its material assets, its volume of production, etc. and these various dimensions of size may vary independently from each other. Thus, while the number of employees declines, and organization may increase its production and its assets such as did the logging companies in this study. Furthermore, one must clearly indicate at which level(s) of the organizational structure his measure of size applies. Different segments of the organization may be affected by opposite variations in size with different consequences. Thus, in the logging industry, while the number of employees of the entire organization of the parent company increased, it decreased in the woodlands division. And while it was decreasing in the woodlands division as a whole, it was increasing in the local units of production (camps). As I pointed out, the increase in the number of employees per camp was a very important factor of structural change (in coordination and control) and an important consequence of mechanization.

In sum, so far comparative and cross-sectional studies of organizations relying on such a crude measure of size as the total number of employees or members of the organization have not been able to handle adequately the issue of the impact of size on organizations. More carefully done analyses are needed.

There has been a tendency in recent years to criticize the importance given in the theory as well as in the empirical works to structural factors such as technology, size and environment.[755] According

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[755] See, for instance, Child, "Organizational Structure, Environment..."; D. Silverman, "Formal Organizations or Industrial Sociology: Towards a Social Action Analysis of Organizations," Sociology, 2, 2 (May, 1968): 221-238; Miles et al., "Organization-Environment: Concepts..."; Teulings, "Modèle de croissance et de développement...".

to this view, instead of focusing so much on structural factors, students of organizations should seek explanations in the direction of social actors, particularly in the direction of "dominant coalitions",[756] to analyze the various choices available to them and those which they strategically opt for. These writers refuse, I believe rightly so, structural determinism. At the end of this study, I find myself much in sympathy with this point of view. I wondered at times, with Child, if a research strategy based on structural factors such as technology was not a deadend.[757] However, I do not believe so.

Management's perceptions of the situation and its decisions are certainly important to understand organizational behavior and structure especially in periods of rapid change. This was made clear to me in many ways during this research. For instance, the management at Price decided to keep some jobbers despite the shift to direct control by the company of its logging camps and a large part of its logging operations. Price's managment believed this to be a more efficient way of operating.

In another company, managment's decision was even more extreme. Operating close to Quebec North Shore Company's territory is another company of comparable size, Anglo-Canadian Pulp and Paper. Both companies operate within a very similar environment, physical as well as social, in particular, isolated logging operations accentuating

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[756] Child, _op. cit._, p. 17.
[757] _Ibidem._

the problems of recruiting and keeping the required labor force. Yet, while managment at QNSP opted for a complete takeover of its operations from the jobbers and a complete program of mechanization in order to solve its labor supply problems, and was in many respects an innovator in the industry, managment at Anglo-Canadian Pulp and Paper decided in favor of a different policy: to keep its jobbers for as long as possible and to mechanize at a very slow pace by staying basically at the pre-1960 level of mechanization, waiting to see how the new technological developments would work elsewhere.[758] It is only much later that the company finally decided that the time was ripe and embarked upon a massive program of modernization of its operations.

Nonetheless, while accepting the importance of managment intervention, one should certainly not forget that the range and nature of the choices which are available to managment are circumscribed by structural factors which point out the direction of the most probable choices.[759] In the case of Anglo-Canadian Pulp and Paper, the decision

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[758] In adopting such a policy, the company was partly motivated by the desire to let others pay the costs of experimenting with the newly designed equipment which was the object of frequent modifications during this period of rapid mechanization. Moreover, by making its move all at once at the end of this period of technological change, the company seemingly avoided the problem of carrying the financial and organizational liability of the intermediary stages of mechanization.

[759] To quote Perrow: "Goals can influence structure, which can then influence the type of technology that will be adapted. An executive may choose to organize nonroutine work as if it were routine, or routine work as if it were nonroutine..(...) But in the long run and over a sample of a large number of organizations, these and other sources of variability should wash out. By and large, it is assumed the technology must fit the structure, or the organization will pay a heavy price in terms of efficiency" (Complex Organizations, p. 176. My emphasis.).

of managment was only one of postponing certain changes which eventually became unavoidable and were in essence very similar to those accomplished earlier in other logging companies.

In sum, this study supports the view expressed by Miles <u>et al.</u> that "organizations must and do adjust their strategies, technologies, structures, and processes to meet changing environmental demands", but "that current theories fail to clearly indicate how environmental conditions place constraints on adjustment alternatives and how each adjustment decision constrains those that follow". In the previous chapters, but more explicitly in Chapter 8, I have tried to point out the contraints which applied in the case of the pulpwood logging industry. While admitting with him that "within these constraints there frequently exists the opportunity for managers to exercise considerable decision-making discretion (e.g. a variety of organizational structures and/or processes may meet the demands of a particular strategy or technology, and the choice among these is an exercise in managerial judgement)," I believe that this study shows that the range of discretion is limited in the logging industry. As a result, my efforts to find linkages between "technology and a particular structural form" have not been frustrated and did not result in the "unwarranted conclusion that no relationship exists."[760]

Certainly the present study indicates that to focus on the technology of the production system is a good strategic approach to unravel the threads of the changing organizational web. But, at the same time,

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[760] Miles <u>et al.</u>, <u>op. cit.</u>, pp. 263-264.

it shows the complexity of the interdependent relationships existing between different parts, dimensions, characteristics and elements of organizations and points out the need to avoid a premature simplification of determinant factors. The image of causality which emerges from my discussion is that of the convergence and the congruence of a series of factors among which the technology of production, to support one of Perrow's contentions, is one of the most central ones. The technology of production limits the number of organizational alternatives as I showed in the case of logging with the new forms of integration and control which had to be established following the mechanization of operations. On the other hand, the characteristics and attitudes of the labor force and ecological conditions limit also the number of organizational alternatives.

Although I can conclude at the end of this study that the technology of the production system has a determinant effect on the structure of the organization and I have indicated in detail how the various dimensions and characteristics of the structure have been influenced by it, further studies are needed for various reasons. First there is a need to evaluate more precisely the difference in the impact of the various dimensions of technology. As I showed earlier in Chapter 8, mechanization does not necessarily have the same impact all the time and the impact of technology varies according to the nature of the relationship between its different dimensions.

But production technology is not the only one to be considered. This study suggests also that the technologies of other major functions of the organization have their own independent effect on the structure.

This was the case with changes in the technology of accounting, planning and forestry. They influence the structure, for instance, in reducing the size of the labor force, in permitting new modes of renumeration, in producing occupational changes, and in permitting and/or requiring new forms of coordination, control and supervision. Changes in the technology of production may act as a pressure to initiate certain technological changes in these functions, as I suggested earlier in Chapter 8, but it is possible to imagine that they, in turn, influence changes in the technology of production. It may even turn out in some organizations that the technology of a major function other than production might be the determinant one if the former function (for instance, research and development) is the most strategic one for the organization.[761] There appears to be a need to investigate this problem more systematically.

The somewhat unusual case of logging confirms also the necessity of putting the analysis of organizational phenomena within a larger context than the organization itself. Few years ago, Turner and Lawrence's study of job satisfaction was welcomed by a well-known industrial sociologist as an interesting study because its authors, for one thing, did not hesitate to use factors external to the industrial "milieu" to explain workers' attitudes toward work, more precisely, their rural-urban origins and their religious and ethnic backgrounds. In the case of logging organizations, not only would we be unable to understand the attitudes and behaviors of woodsworkers if we were not to situate them in the socio-economic context of the changing rural

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[761] Woodward, <u>Industrial Organization: Theory and Practice</u>.

French Canadian society and of Quebec society in general, but it would be impossible to adequately explain certain structural aspects of logging organizations without the same considerations. For example, contrary to accepted theory and previous empirical evidence,[762] woodsworkers in Quebec have demonstrated a traditional lack of union militancy. There has been only one major strike in Quebec's logging industry in the post World War II period. It affected the Saguenay-Lake St. John division of Price for several weeks in 1965. This lack of militancy becomes, however, better understood once it is analyzed in the unstable socio-economic context described in Chapter 7.

The importance of the environment should not be over-emphasized since it seems well accepted now by students of organizations although still surprisingly neglected especially in large-scale studies. This study has, however, contributed to bring into focus another dimension of the environment which had fallen in disrepute with students of organization and sociologists in general until recently, that is, the physical environment. The situation in the logging industry indicates that it would be erroneous to explain particular features of the structure of logging organizations by the human factor or by conditions faced by any organization which is going through a period of major changes, such as the process of "industrialization" through which the logging industry went in the last decades. Many of the structural features observed are clearly associated with the characteristics

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[762] Clark Kerr and A. Siegel. "The Inter-industry Propensity to Strike. An International Comparison," in A. Kornhauser, R. Dubin and A. Ross (eds.), Industrial Conflict (New York: McGraw-Hill, 1954), pp. 189-212.

of the physical environment and are likely to remain permanent features of logging organizations as long as the physical environment remains the same. The influence exercised by the physical environment on the organization of logging operations is so central that it points out the need for further research in other harvesting activities such as farming, fishing and mining to examine more closely the impact of different dimensions of the physical environment on organization as well as the forms taken by the organizational answer to this environmental pressure.

The analysis presented in the previous chapters suggests also that the rational model of organizations which give a large place to such concepts as rationality, uncertainty, contingency, etc. is particularly useful to study organizational structure and its relationships with technology and environment. Thompson's version of this model seems to apply particularly well to the behavior of logging organizations in their dealing with their complex environment. For instance, some of his propositions are clearly supported by the dispersion of operations and the concentration of organizational resources and expertise at the camp and division levels which were described earlier. As Thompson put it:

> Organizations will tend to elaborate and subdivide units that cope with the more problematic or uncertain sectors of their environments.[763]

> When the range of task-environment variations is large or unpredictable, the responsible organization component must achieve the necessary adaptation by monitoring that environment and planning responses, and this calls for localized units.[764]

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[763] Thompson, Organizations in Action, p. 100.

[764] *Idem.*, p. 72.

His model should be more systematically tested in future empirical studies.

This study raises also interesting questions concerning control and coordination in organizations. As a result of their research, Pugh and his associates found that line control was associated with low concentration of authority. According to them, this is related to a historical trend.

> With line control, control is exercised by workflow personnel themselves and their line superordinates rather than by impersonal procedures. Again, it is possible to see that as industry has changed so the occupational distribution in society has changed; that more and more people are engaged in controlling and recording tasks in industry instead of production tasks (Miller and Form, 1964). Woodward (1965), Touraine (1962), and Blauner (1964) have all outlined classifications of technology which they see as developmental, arising from a long-run trend to increasing mechanization and increasing standardization of products. With these changes, there is increasing impersonality as control passes from the individual production worker and his direct supervisors, to the procedures dictated by standardization and the new specialists who devise the procedures.[765]

The situation observed in logging is different as I mentioned earlier in Chapter 6. The degree of centralization varies between major functional departments with a greater centralization in staff departments. Management uses a mixture of impersonal and personal forms of control and relies on a mixture of planning (programming) and feedback procedures to coordinate and control. Some writers suggest that this should be be seen as unusual because organizations do not behave

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[765] Pubh _et al._, "An Empirical Taxonomy...", p. 124.

in stereotypical fashion. For one, Child does not agree with the organic-mechanistic stereotypes advanced by Burns and Stalker. He claims that "there would seem to be no reason why one should not find combinations of supposedly organic features (such as a network pattern of communications) with certain other non-antithetical mechanistic ones (such as a precise definition of roles). Indeed, an arrangement combining these two structural characteristics might well allow for a rapid circulation of information while retaining a measure of individual accountability."[766]

As far as logging organizations are concerned, features of their environment, as I suggested before, certainly force them to be more flexible and to empirically find the combination of procedures of coordination and control which seems to work best in their situation. This is not to deny that, overall, there has been a trend toward a greater centralization and toward impersonal mechanistic procedures of coordination and control in so far as, to use Thompson's terms, "the range of variation presented by the task-environment segment" was known. But, because the range of variation was generally unknown during the period of technological and organizational change described in this study, upper management levels closely monitored the evolution of the situation at the division and camp level because of the now much higher financial and organizational commitments of the logging companies. In this respect, an important shortcoming of this study is the absence of an explicit analysis of the structure of power in logging

[766] Child, "More Myths of Management Organizations," pp. 378-379. See also Miles et al., op. cit., p. 255.

organizations in relation to the problem of centralization and concentration.

The differences in centralization and control between functional departments observed in this study reflect broader internal differences in organizations which have been noted in many other studies. Following Litwak,[767] Lawrence and Lorsch[768] and Lynch[769] among others, this research supports the view that organizational structures should not be treated as monolithic wholes. Although the structure as a whole may be characterized as more or less "organic" or "bureaucratic" in any given case, differences between vertical and horizontal segments (departments, etc.) must be recognized. Some of these segments, because of their environment or even the nature of the organizational function which they perform, may be more or less bureaucratized than others as seems to be the case in logging between production and staff departments. This situation raises some doubts about the soundness of many findings obtained in comparative studies where the necessary distinctions are not always done.

At the beginning of the study, I decided to make an extensive use of the Aston group's research framework and instruments. I believe that it was a wise decision since this remains probably the most exhaustive and detailed instrument available to date, one which was relatively easy to use, had been tested and had generally been proven valid and reliable. However, it was designed for large scale comparative studies

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[767] Litwak, op. cit.

[768] Lawrence and Lorsch, op. cit.

[769] Lynch, op. cit.

and nothing indicated that it would be as good in a smaller scale longitudinal study. In fact, it was found quite satisfying, except for two important reservations. First, it is not sensitive enough to be used alone in comprehensive studies such as this one. This is especially true in the measure of centralization, formalization and standardization. One needs a more refined instruemtn which is able to identify less superficial differences.

This dissatisfaction with the instrument is in part due to the fact that I could not use the statistical procedures followed by its previous users. In a small scale study such as this one, statistical figures would be meaningless. At the most, some crude scores can be calculated to give a broad indication but one must rely much more on "qualitative" analysis than "quantitative" analysis. This is expecially true when, as I found out, it is difficult to find comparable data on organization over a long period of time. Consequently, in the absence of a sophisticated statistical instrument, another method must be used in order to provide some rigor to the research process. The use of the typological method may be a good answer to this problem. Besides providing some direction to the analysis, it strengthens its theoretical foundations. The typological approach appears particularly attractive for, as well as adapted to, longitudinal studies. Its lack of quantitative content and precision can be partly offset by using well designed operational measurements such as the ones developed by the Aston group. This is what I did to a large extent in the present study.[770]

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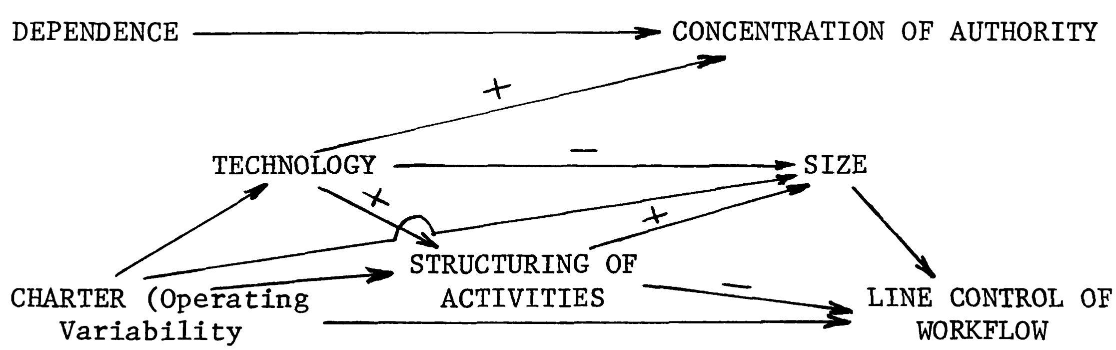
[770] I do not believe that this procedure introduces any theoretical or methodological problems if the "type" is seen as a hypothetical device of high heuristic value.

Because of its historical nature, this study is particularly relevant to the establishment of models of organizational growth and development. One such model elaborated in reference to the Aston studies by Aldrich[771] proposes a central role for technology (see Figure 30). As such, it merits some attention.

FIGURE 30

Aldrich's Model of Organizational Development



Basically, Aldrich's model suggests the following relationships between technology (workflow integration) and the structural variables:[772]

(a) "a direct causal impact" on the structuring of activities with increase in the rigidity of the workflow;

(b) a negative impact on size (number of employees);

(c) a positive impact on the concentration of authority (although a negative impact for highly automated firms which are more decentralized).

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[771] Howard E. Aldrich, "Technology and Organizational Structure...", op. cit.

[772] Idem., pp. 37-38.

However, the effects of the direct negative impact of technology on size are somewhat reduced by the positive impact of the structuring of activities on size "because the more highly structured firms, with their greater degree of specialization, formalization and monitoring of role performance, simply need to employ a larger work force than less structured firms."[773] This is an interesting hypothesis which my study tends to support with the observed increase in the relative number of specialists and staff personnel of all sorts employed by logging companies since they mechanized their operations.

Although Aldrich's model does not suggest any direct relationship between technology and line control of workflow, it is possible to conclude on the basis of his previous relationships that it would be a negative relationship. Indeed, the rigidity of the workflow, constraining "the work force toward specialization and standardization," does, without doubts, limit the direct control of line management over the production operations. This study supports such an hypothesis as well as the above propositions. However, again, because of the uncertainty introduced by the environment, these trends are modified to a large extent as we have seen earlier.

In sum, Aldrich's model offers an interesting hypothesis for further testing in future longitudinal studies. Many writers have expressed the need for such studies to establish causal models and test the existing ones. Despite its imperfections, the present study supports the need expressed by these writers.

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[773] Ibidem.

It has demonstrated also the value of a theoretical framework which integrates the three major levels of analysis in organizations: the individual, the work group and the organization. Without such a framework, it would have been difficult if not impossible to explain, for instance, the existence of certain forms of organizational control such as piecework remuneration and distinctive aspects of supervision in logging operations.

APPENDICES

APPENDIX A

Measurement of the Structural Variables[1]

Specialization[2]

1. Public Relations and Advertising
   Activities: develop, legitimize and symbolize the organization's charter
   a. Publicity staff
   b. Public relations
   c. Customer relations
   d. Display
   e. Publicity by product
   f. Overseas relations

2. Transport
   Activities: carry outputs and resources from place to place

   a. Drivers
   b. Dispatchers
   c. Administration and planning
   d. Drivers by vehicle or product
   e. Dispatch specialized by product
   f. Travel and excursions
   g. Planning and administration specialized by product

3. Employment
   Activities: acquire and allocate human resources

   a. Role specialized for part of organization
   b. Role specialized for whole of organization
   c. Role specialized by type of employee or process
   d. Administration/records
   e. Interviewers
   f. Role specialized by type of employee and process

4. Training
   Activities: develop and transform human resources

   a. Operative training
   b. Apprentice training
   c. General Education
   d. Clerical training
   e. Management training

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[1]From Pugh *et al.*, "Dimensions of Organizational Structure," pp. 91-105. With my own adaptations.

[2]"The division of labor within the organization, the distribution of official duties among a number of positions."

5. Welfare and Security
   <u>Activities</u>: maintain human resources and promote their identification with the organization

   a. Security staff
   b. Nurses
   c. Canteen staff
   d. Welfare officer
   e. Safety officer
   f. Fire service
   g. Sports and social
   h. Other medical
   i. Magazine editor
   j. Suggestions officer

6. Buying and Stock Control
   <u>Activities</u>: obtain and control materials and equipment

   a. Storekeepers
   b. Storekeepers specialized by product or material
   c. Buyers
   d. Buyers specialized by product or material
   e. Stock controllers
   f. Stock controllers specialized by product, material, or process
   g. Administrators
   h. Administrators specialized by particular material, product, or process

7. Maintenance
   <u>Activities</u>: Maintain and erect buildings and equipment

   a. Engineer
   b. Machine maintenance
   c. Building maintenance
   d. Electrial maintenance
   e. Machine maintenance specialized by process, product, or material
   f. New works force
   g. Surveyor or architect
   h. Instrument maintenance
   i. Research into maintenance
   j. Electrical maintenance specialized by process, products, or material
   k. Road maintenance

8. Accounts
   <u>Activities</u>: record and control financial resources

   a. Wages clerk
   b. Costs clerk
   c. Ledgers clerk
   d. Cashier
   e. Financial accounting
   f. Costing specialized by product, services, etc.

g. Financial data processing
h. Salaries payment
i. Auditing
j. Budgeting
k. Cost follow-up

9. Production Control
Activities: control workflow

a. Progressing
b. Planning and scheduling
c. Progressing specialized by process, product, or material
d. Scheduling specialized by process, product or material
e. Machine loading

10. Inspection
Activities: control quality of materials, equipment, and outputs

a. Product inspection
b. Product inspection specialized by stages
c. Raw material control
d. Laboratory test of product
e. Division of raw material
f. Inspection standards
g. Policy and administration of inspection

11. Methods
Activities: assess and devise ways of producing output

a. Work study
b. Work study specialized by process
c. Methods
d. Policy and administration
e. Process planning
f. Production engineering
g. Layout
h. Draftsmen

12. Design and Development
Activities: devise new outputs, equipment and processes

a. New product research
b. Drawing office
d. Process and equipment research
d. New product research by product
e. Division into mechanical and electrical
f. Pure research
g. Administration of research

13. Organization and Methods
Activities: develop and carry out administrative procedures

a. Statistics clerks
b. Organization and methods

c. Subdivision of statistics
d. Filing and post
e. Committees and policies

14. Legal
<u>Activities</u>: deal with legal and insurance requirements

a. Legal or insurance
b. Share registrar
c. Legal section subdivision
d. Legal inquiries

Standardization[3]

1. Inspection

a. Frequency:
-none
-haphazard
-random sample
-100%

b. Range:
-none
-some
-all new
-all

c. Method:
-none
-visual
-attributes
-measurement

d. Type:
-none
-one of raw materials, process, or final inspections
-process and final inspection
-raw materials, process, and final inspection

e. Special inspection process: e.g., statistical quality control

2. Stock Control

Stock taking:
-never taken
-yearly
-semi-annually
-quarterly
-monthly
-weekly
-daily

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[3]"Standardization of procedures...(that is) an event that has regularity of occurrence and is legitimized by the organization."

3. Operational Control

a. Firm plans:
- -one day
- -one week
- -one month
- -one quarter
- -one year
- -over one year
- -permanent

b. Scheduling:
- -as needed
- -monthly
- -weekly
- -daily
- -continuous

c. Progress checking:
- -none
- -irregular
- -regular

d. Maintenance:
- -no procedure
- -breakdown procedure
- -mixed
- -planned maintenance
- -programmed replacements

4. Financial Control

a. Type:
- -whole firm, historical
- -job costing
- -budgeting
- -standard costs
- -marginal costs

b. Range:
- -whole firm
- -one product
- -some products
- -all products
- -all activities

c. Comparison with budgets:
- -none
- -yearly
- -half-yearly
- -quarterly
- -monthly
- -weekly
- -continually

5. People Control

a. Definition of operative's task:
- -custom
- -apprenticeship or profession
- -manuals
- -rate fixing
- -time study
- -work study
- -work study and task description

b. Work study:
- -none
- -some direct workers
- -all direct workers
- -all direct workers and operatives, e.g. Maintenance, etc.
- -all direct workers, operatives, clerks

c. Job evaluation
d. Discipline (set offenses)
e. Discipline (set penalties)
f. Discipline (procedure for dismissing staff)
g. Salary and wage review
h. Personal reports by supervisors
i. Staff establishment
j. Labor budgets

6. Communication

a. Decision seeking:
- -as needed
- -semi-standardized
- -standardized
- -project justification

b. Decision conveying:
- -as needed
- -semi-standardized
- -standardized

7. Ideas

a. Research and development:
- -none
- -development as needed
- -development department
- -development program
- -research and development department
- -research and development program

b. Obtaining ideas (number that the organization does:
- -conference attending
- -conference reporting
- -periodicals circulation
- -periodicals reporting
- -suggestion scheme

8. Materials

a. Ordering procedures: -as needed
   -production plans
   -datum stocks
b. Buyer's authority over what to buy (limited)
c. Buyer's authority over whom to buy from (limited)
d. Buyer's authority over how much to buy (limited)
e. Procedure for buying non-standard items
f. Procedure for notifying head office of purchases, etc.
g. Bidding procedure
h. Contracts procedure

9. People Recruiting

a. Promotion procedure: -as needed
   -grade and qualification
   -internal advertisement and selection

b. Selection of operatives: -interview by superior
   -interview by personnel officer
   -grading system or interview board
   -testing procedure
   -outside appointer

c. Selection of foreman: as for selection of operatives

d. Selection of executives: -interview by superior
   -interview by personnel officer
   -grading system or selection board
   -outside appointer

e. Recruitment policy
f. Central recruiting procedure
g. Central interviewing procedure
h. Standard procedure for getting increase in staff
i. Standard procedure for getting increase in works (activities)

10. People Training

a. Apprenticeships
b. Day release (that is, operators and managers allowed to attend courses at a technical college for one day in each week)
c. Block release (that is, managers allowed to attend courses outside the organization for a specified period, full time)
d. Operator training
e. Evening classes encouraged
f. Courses arranged for management
g. Courses arranged for supervision
h. Management trainees
i. Graduate apprentices

11. Activities:

a. House journals:
- -none
- -irregular
- -regular

b. Ceremonies:
- -none
- -irregular
- -regular

c. Trademarks

d. Sports and social activities:
- -none
- -irregular
- -regular

e. Participation in display and exhibitions:
- -none
- -irregular
- -regular

f. Conference attendance:
- -none
- -irregular
- -regular

g. Introduction courses:
- -no employees
- -few
- -many
- -all

h. Handbooks provided for employees:
- -for none
- -for few
- -for many
- -for all

i. Uniforms provided for employees:
- -for none
- -for few
- -for many
- -for all

12 Miscellaneous

a. Personnel reports and statistics: (number of areas covered from among):
- -sickness
- -timekeeping
- -absence
- -labor turnover
- -accidents

b. Operation research

c. Central discipline procedure

Formalization[4]

1. Role definition

    a. Who has written contracts of employment (includes legal contract, formal letter of appointment, and terms of engagement or rules signed by employees)
    b. Proportion of employees who have handbooks
    c. Number of handbooks
    d. Organization chart
    e. Written operations instructions available to direct worker
    f. Written terms of reference or job description
    g. Manual of procedures or standing orders
    h. Written policies (exclusing minutes of governing bodies)
    i. Workflow ("production") schedules or programs
    j. Research programs or reports

2. Information Passing

    a. Management approval in writing required for certain decisions
    b. Suggestion scheme
    c. Memo forms
    d. Notification of engagement of direct workers
    e. Minutes for senior executive meeting (that is, centralization level 2, personnel)
    f. Conference reports
    g. Agenda for senior executive meeting (that is, centralization level 2, personnel)
    h. Agenda for workflow ("production") meeting
    i. Minutes for workflow ("production") meeting
    j. Written reports submitted for workflow ("production") meeting
    k. Welfare documents for direct workers on engagement
    l. Dismissal form or report recroding or communicating the dismissal
    m. House journal

3. Recording of Role Performance

    a. Record of inspection performed (e.g., report, certificate, quality card, etc., recording both positive and negative results, not merely a rejection slip)
    b. Work assessment record (work study)
    c. Record of maintenance performed on workflow ("production") equipment
    d. Record of direct worker's work
    e. Record of direct worker's time
    f. Document stating tasks done or to be done on unit of output (e.g., batch dockets, route tickets, etc.)

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[4]"The extent to which rules, procedures, instructions, and communications are written."

g. Petty cash voucher, authorizing and/or recording petty expenditure
h. Written application for, or sanction against, spending $1,000
i. Requisition for engagement of direct worker
j. Application or engagement form for direct worker
k. Frequency of records of direct worker's work
l. Requisition form for materials, parts, etc.

4. Miscellaneous

a. Appeal form against dismissal
b. Document identifying units of output (e.g., batch card, work ticket, sales checks or tickets in a retail store, etc.,)
c. Dispatch note communicating dispatch of unit of output
d. Written trade union procedures for negotiation, raising grievances, etc.
e. Written history of the organization

Centralization[5]

1. Labor force requirements

2. Appointments to direct worker jobs

3. Promotion of direct workers

4. Representing the organization in labor disputes

5. Number of supervisors

6. Appointment of supervisory staff from outside the organization

7. Promotion of supervisory staff

8. Salaries of supervisory staff

9. Spending of unbudgeted or unallocated money on capital items

10. Spending of unbudgeted or unallocated money on revenue items

11. Selection of type or brand for new equipment

12. Overtime to be worked

13. Delivery dates or priority of orders

14. Costing (that is, to what costing system, if any, will be applied)

---

[5]"The locus of authority to make decisions affecting the organization."
Note: Refer to the chart of the organization in order to record the information given for each question.

5

15. Inspection (that is, to what items, processes, etc., inspection system, if any, will be applied)

16. Operations that will have work studies made of them

17. Plans to be worked on

18. Outputs to be scheduled against given plans

19. Dismissal of operatives

20. Dismissal of supervisors

21. Methods of personnel selection

22. Training methods

23. Buying procedures

24. Suppliers of materials to be used

25. Methods of work to be used (not involving expenditure), that is, how a job is to be done

26. Machinery or equipment to be used for a job

27. Allocation of work among available workers

28. Welfare facilities to be provided

29. Price of the output

30. Altering responsibilities or areas of work of functional specialist departments

31. Altering responsibilities or areas of work of line departments

32. Creation of a new department (functional specialist or line)

33. Creation of a new job (functional specialist or line, or any status, probably signified by a new job title)

34. Who takes over in the chief executive's absence

Traditionalism[6]

Formula:

$$\frac{\text{Score on standardization items - score on formalization items x 100}}{\text{Score on formalization items}}$$

Configuration[7]

Definition used

1. Chief executive's span of control:
   Number of subordinates who report directly to chief executive with no intervening level, irrespective of the status of the subordinates
2. Subordinate ratio:
   Number of workflow subordinates (direct workers) per first-line supervisor (that is, the lowest job that does not include prescribed direct work)
3. Height of the structure:
   Number of jobs in the longest "line" between direct worker and chief executive (inclusive of both), excluding assistants to, and secretaries
4. Workflow subordinates:
   All employees in supervisory or managerial jobs responsible for work on outputs, with assistants and deputies, but excluding supervisors whose jobs include prescribed direct work
5. Non-workflow personnel:
   All employees with no direct or supervisory responsibility for work on the outputs
6. Clerks:
   Employees whose main prescribed task is writing and recording (including records in other than written form), and who have no subordinates other than typists

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[6] "Population of customs in an organization...and of bureaucratic procedures...explicitly legitimized by commitment to written form in rules, instructions, and other forms."

[7] "The shape of the role (position) structure." Two dimensions: the vertical and the horizontal structures.

APPENDIX B

Model of Analysis

Technology

A. Operations Technology	
1. Level of work-flow rigidity	* No waiting time possible (vs. yes) * Single-purpose equipment (vs. multi-purpose) * Production or service line (vs. no set line) * No buffer stocks and no delays possible (vs. yes) * Single-source input (vs. multi) * No rerouting or work possible (vs. yes) * Breakdown stops all workflow immediately (vs. not all workflow) * Breakdown stops some or all workflow immediately (vs. no workflow stops)
2. Level of automation I (automaticity mode)	1. Hand tools and manual machines 2. Powered machines and tools 3. Single-cycle automatics and self-feeding machines 4. Automatic: repeats cycle 5. Self-measuring and adjusting: feedback 6. Computer control: automatic cognition
3. Level of automation II (automaticity range)	Highest scoring piece of equipment
4. Interdependence of workflow segments	1. Segments duplicated in different locations, same final outputs 2. Segments different outputs, not inputs of other segments 3. Segments outputs become inputs of other segments
5. Specificity of criteria of quality evaluation	1. Personal evaluation only 2. Partial measurements of some aspects(s) of the output(s) 3. Measurements used over virtually the whole output to compare against precise specification (the 'blueprint concept')
6. Operations continuity	1. Weekdays only 2. 24 hours a day 3. 12 months a year

7.	Variety of sequences	1. Short-wood 2. Tree-length 3. Full-tree
8.	Uniformity of equipment	Range of types and their characteristics for each piece of equipment
9.	Throughput cycle	Unit of time per unit of output
10.	Throughput rate	Output per unit of time

B. Materials Technology

1. Hardness
2. Uniformity
3. Size
4. Heaviness
5. Slipperiness

Workers' and Work Groups' Behavior

A. Control dimensions:	1.	Tools and Machines:	a. Type (automation I) b. High or low control c. Individual or collective control
	2.	Workflow and amount of control:	a. Line, transfer, none b. High or low control
	3.	Pace of work and control:	a. Machine or time determined b. High or low control
	4.	Operation cycle:	a. Variability b. Duration c. Amount of control

B.	Task differentiation:	a. High or low b. Dependent or independent
C.	Work attention requirements:	a. Surface or detailed b. Brief or long
D.	Technological interdependence:	Some or none
E.	Technically permitted interation:	a. Frequency b. Duration

F. Technically permitted cooperation: Some or none

G. Spatial constraints and type of spatial boundaries
1. Small or large space
2. Confined or not
3. Fixed or loose boundaries

H. Source of influence:
a. Semi-technical
b. Technical
c. Extra-technical

I. Communication:
1. Duration
   a. Intermittent
   b. Incomplete
2. Type
   a. Talking
   b. Shouting
   c. Signs

<u>Organizational Structure: Characteristics</u>

A.	Formal Structures:	1. Specialization of functions 2. Standardization of procedures 3. Formalization of routines 4. Centralization of authority 5. Configuration of roles 6. Flexibility	1. Structuring of activities 2. Concentration of authority 3. Line control of workflow
B.	Occupational Structure:	1. Relative size of supportive component 2. Distribution of occupation	

APPENDIX C

Levels of Automaticity According to Amber and Amber[8]

1. Hand tools and manual machines
2. Powered machines and tools
3. Single-cycle automatics and self-feeding machines
4. Automatic: repeats cycle
5. Self-measuring and adjusting: feedback
6. Computer control: automatic cognition

[8] G.H. Amber and P.S. Amber. Anatomy of Automation (Englewood Cliffs, N.J.: Prentice-Hall, 1962).

APPENDIX D

Operational Dimensions of the Environment

A. Origin and History

Three aspects:

1. Impersonality of origin
2. Age
3. Major historical changes and developments up to the period of study

B. Ownership and Control

Two dimensions:

1. Public accountability:
   * non-quoted on the stock exchange
   * quoted on the stock exchange
2. Ownership and control:
   * concentration of voteholdings (percentage of equity owned by top twenty shareholders)
   * voteholdings of individuals (percentage of individuals among top twenty shareholders)
   * directors among top twenty voteholders (percentage of directors among top twenty shareholders)
   * directors' voteholdings (percentage of equity owned by all directors combined)
   * percentage of directors who are executives
   * interlocking directorships (percentage of directors with other directorships beyond owning organization)

C. Size

1. Number of employees
   * of the head organization
   * of the woodlands division
2. Net assets

D. Charter

Pugh et al. distinguished between output and ideological aspect. Since I do not expect any significant variations in the output, I will be concerned with the ideology. In a period of technological change and reorganization, we might observe a shift in the principles of organization (for instance, from traditional to bureaucratic) and an emphasis on the qualities of the organization and its concern for the preservation of the natural resources and for the well-being of the local populations. This would be emphasized in their relationships with regulatory agencies (like local and provincial governments) and in the public opinion treatment.

E. Location

Logging operations usually take place in remote geographical areas. However, these areas are located in the zone of influence of different social and economic communities or regions: some are still very much rural, others are very much industrialized, still others are under-developed, etc. These differences may account for some of the variations in authority relationship patterns, for the problem of hiring qualified personnel, etc.

Moreover, the number of operating sites and their patterns of location are likely to influence the structural dimensions of the organizations.

F. Dependence

Two general dimensions:

1. Dependence on the parent organization
   * relative size of the organization in relation to parent organization (principal unit, subsidiary unit, head branch, branch unit)
   * degree of representation on policy making bodies
   * number of specializations contracted out by the organization to the parent organization
2. Dependence on other organizations

Since the parent organization is the sole outlet for the product of the organization, we will be concerned here with its own suppliers, with the other suppliers of the parent organization in competition with the woodlands division in terms of ownership and supply ties.

The influence of the unions will also be considered. Usually this pressure is felt in the direction of a greater bureaucratization of the organization.

G. Physical Environment

Three dimensions of measurement

1. The tree stand (species, age, density, size, etc.)
2. The terrain (slope, swamp, etc.)
3. The rain and snow precipitations

APPENDIX E

List of Members of the Four Companies Which Were Formally Interviewed[9]

DOMTAR

Vice-President Woodlands
Director of Forestry
Manager of Woodlands Operations
Assistant-Manager of Woodlands Operations
Assistant to the Vice-President Woodlands
Woodlands Operations Manager (former director of industrial relations)
Division Manager (Dolbeau)
Personnel Supervisor (Dolbeau)
Forest Engineer (Dolbeau)
Division Manager (Lebel-sur-Quévillon)
Assistant Division Manager (Level-sur-Quévillon)
Personnel Supervisor (Lebel-sur-Quévillon)
Other Members of the Personnel During the Field Trips

PRICE

Director of Logging Operations (Saguenay-Lake St. John Division)
General Logging Superintendent (same)
Divisional Accountant (same)
Superintendent of Mechanized Logging Equipment (same)
Engineer in charge of Resource Development (Company)
District Supervisor (Dolbeau Sub-Division)
First Aid Officer (Dolbeau Sub-Division)
Assistant General Foreman of Mechanic (Dolbeau Sub-Division)
Assistant Superintendent of Industrial Relations (Saguenay-Lake St. John Division)
General Supervisor of Forest Operations (Shipshaw Sub-Division)
Other Members of the Personnel During the Field Trips

CONSOLIDATED-BATHURST

Vice-President Woodlands
General Manager Logging Operations (Chaleur & Bathurst Divisions)
Director of Industrial Relations (Woodlands)
Manager of Special Projects (Woodlands)
Manager of Logging (St. Maurice Division)

QUEBEC NORTH SHORE PAPER

Vice-President Woodlands
Assistant General Manager Logging Operations (Baie-Comeau)
Cost Analyst (same)
Manager of Logging Operations (same)
Director of Personnel (same)
Assistant Director of Personnel (same)
Forest Engineer (same)
Other Members of the Personnel During the Field Trips

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[9] Does not include people met during previous work in the middle 1960's and other people related to the industry at large.

APPENDIX F

Description of a Super Logging Camp at Price Company in the Late 1960's[10]

Personnel:

Total: around 500 men
Woodsworkers: 210 cutters
70 operators of skidders

Services:
food: 16 cooks and helpers
mechanics: 13
scaling: 11 teams of two

Territory: 135 m^2

Production: Total: 1,600,000 cords
Annual: 170,000 cords

Destination of Shipments: Sawmill: 52 per cent
Pulp and Paper Mill: 48 per cent

Number of Jobbers: 4 still at work for the company

Capital Investment: $2,250,000 in buildings and equipment

Equipment:

Skidders: 80
Trucks for general use: 12
Pulpwood trucks: 12
Logs trucks: 12
Loaders for general use: 3
Pulpwood Loaders: 4
Graders: 2
Towing trucks: 5
Other machines such as tractors, etc.

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[10] SOURCE: Trait d'Union, Novembre-Décembre 1968.

APPENDIX G

Glossary of Pulpwood Harvesting Terms[11]

Articulated	- With reference to a machine, such as a wheeled skidder, means hinged at the center.
Backcut	- Final cut in felling a tree. Made on the side away from the direction fall.
Back-line	- A line marked by blazed or painted trees indicating the boundary of a cutting area. See also Haulback Line.
Bank	- Number or volume of logs cut or skidded above daily required production and held over to be reported when daily quota is not reached. See Landing.
Barking	- Operation by which bark is removed from a tree.
Binder	- A chain or wire rope used to build a load of logs. Syn. Wrapper.
Blaze	- To mark trees with a shallow ax cut to indicate those to be cut or the course of a boundary, road or trail. Syn. Spot.
Blowdown	- See Windfall.
Bolt	- Any short log, as a pulpwood bolt or pulpwood stick.
Branch	- See Limb.
Brancher	- See Limber.
Branching	- See Limbing.
Brand	- See Mark.
Brow	- See Landing.
Brush	- See Slash.
Brush cut	- To clear away brush from a trail, survey line or around a tree before felling.

[11] Adapted from W.S. Bromley (ed.), Pulpwood Production (Danville, Ill.: The Interstate Printers and Publishers Inc., 1969), pp. 243-255; and Campbell and Power, op. cit., pp. 143-147.

Brush a road	- To cover mudholes, swampy places, etc., in a logging road to make it passable for vehicles.
Buck	- To saw felled trees into shorter lengths.
Bucker	- One who saws felled trees into the desired lengths, i.e., logs, bolts and sticks.
Bucking	- Cutting tree lengths into logs or bolts of desired length.
Bummer	- A small truck or dolley with two low wheels and a short pole, used in skidding logs. Syn. Dolly, Drag cart, Self-loading skidder.
Bunch	- To gather logs or tree lengths into groups or small piles for subsequent skidding by other equipment.
Butt	- The base of a tree or the big end of a log.
Butt hook	- A hook used to attach chokers to the end of mainline or to a skidder. Syn. Bull hook.
Butt off	- (1) to cut off a piece of a log because of a defect. Syn. Jump butt, Long butt. (2) to square the end of a log.
Caterpillar	- Trade name for a make of track-type tractor. Used commonly to refer to any track-type tractor.
Chance	- Strictly, any unit of operation in the woods; with many and varied applications, of which the most familiar is "logging" or "cutting" chance, a logging or pulpwood operating unit. Syn. Show.
Check scaler	- One who re-scales pulpwood or logs in order to detect errors on the part of a scaler.
Chipper	- Machine used to reduce pulpwood to chip size for use in the pulping process.
Chipping	- Operation by which tree lengths, log lengths, or bolts of pulpwood are reduced to chip form.
Choker	- A short length of wire rope that forms a noose around the end of a log to be skidded and is attached to the skidding vehicle or to the butt rigging in wire rope logging systems.

Chokerman	- Assembles tree lengths or bundles of logs or bolts in self-tightening loops of wire rope (chokers) which are attached to cables from skidder or yearder for forwarding to the landing.
Clearcut	- All merchantable trees are cut and removed.
Concentration yard	- An area at a railroad siding where large quantities of wood are piled for loading on rail cars, usually by mechanical means. These yards may be operated by a large dealer or company and many producers deliver their wood to them.
Cord	- A stack cord is nominally 4 feet x 4 feet x 8 feet or 128 cubic feet. It usually contains approximately 85 cubic feet of solid wood.
Cords per man-hour	- The quotient derived by dividing the total cords produced by a crew by the number of man-hours required for that production.
Crook	- An abrupt bend in a log or tree.
Cruise	- (1) a survey of forest land to locate timber and estimate its quantity by species, products, size, quality, etc. (2) the estimate obtained in such a survey.
Cull	- Logs or bolts which are rejected, or volumes deducted in measurement because of defect.
Cunit	- A unit of stacked pulpwood containing 100 cubic feet of solid wood. (Does not include bark or air volume).
Cut	- A season's output of logs.
Cutter	- One who bucks, limbs or tops trees.
Cutting	- (1) the process of felling trees. Syn. Falling, Felling. (2) an area on which the trees have been, are being or are to be cut.
DBH	- Diameter at breast height (4' 1/2 feet from ground level)
Dealer	- An intermediate agent who buys wood from producers and resells it to a pulpmill.
Deck	- (1) a pile of logs on a landing. (2) area or platform on which wood is placed. See Landing.

Dolly	- See Bummer.
Estimate	- See Cruise.
Estimator	- See Cruiser.
Face	- (1) The side of a hill or mountain being logged. (2) One side of tree, log or cant.
Faller	- One who fells trees. Syn. Cutter, Feller, Flathead, Sawyer, Stumper.
Falling	- Act of cutting down a tree. Syn. Cutting, Felling.
Falling wedge	- A wedge used to throw a tree in the desired direction by driving it into the backcut.
Feller	- See Faller.
Felling	- See Cutting and Falling.
Flume	- A trough of water used to convey wood.
Forwarder	- A machine which transports bolts of pulpwood from the stump area to a landing area.
Forwarding	- Transporting of bolts of pulpwood from the stump area to a landing area.
Full tree	- Tree with branches and top still attached.
Full-tree methods	- Varying ways in the full-tree system of pulpwood logging in which full trees, i.e., trees with branches still attached, can be transported from the stump area to a landing.
Full-tree system	- A system of pulpwood logging where felling only is performed in the stump area and where full trees are forwarded from the stump area to a landing.
Grapple	- (1) A device at the working end of a line or boom and used to pick up and hold the load. (2) Two small iron dogs joined by a short chain and used to couple logs end to end when skidding.
Ground skid	- See Skid.
Hardwood	- Generally, one of the botanical group of trees that have broad leaves rather than needle-like leaves; also wood produced by such trees.

Haul - (1) Using a truck or other vehicle to carry wood from loading to unloading point. (2) istance the wood is hauled.

Hauling - The act of transporting pulpwood sticks, multiple stick lengths or tree lengths from the loading site in the woods to a mill, mechanized wood yard or unmechanized rail siding. Hauling begins when the primary hauling vehicle leaves the loading site and ends when it returns.

Heel boom - In loading, a type of loader that picks up a log near the end and braces it against the boom to control and carry it.

Hot logging - A logging operation where the logs are not stored or decked after they are taken from the stump until they arrive at the mill or wood yard. When wood is loaded on a truck as soon as it is delivered to a landing.

Integrated logging - A logging system that makes best use of all wood products. It removes in one cutting all timber that should be cut, and sorts out the various timber products for distribution to the industry that can use them to the best advantage.

Jackpot - A contemptuous expression applied to an unskillful piece of work in logging. Particularly in felling where several trees are lodged and/or criss-crossed.

Jobber - A logging contractor or sub-contractor (New England term). Syn. Gypo.

Landing - An area where logs are brought by skidding or forwarding units for subsequent loading and hauling. Syn. <u>Bank</u>, <u>Brow</u>, <u>Deck</u>, <u>Log Dump</u>, <u>Rollway</u>.

Landing, final - Point where the long distance movement of pulpwood by rail or water to the mill begins.

Landing, roadside - A term often used as equivalent to intermdiate landing.

Limb - To remove limbs from a felled tree. Syn. <u>Branch</u>, <u>Knot</u>, <u>Lop</u>.

Limber - One who removes the limbs from a felled tree. Syn. <u>Brancher</u>, <u>Knotter</u>.

Limbing - The process of removing limbs from a felled tree.

Loader	- Machine or person used to load pulpwood into a carrier.
Loaderman	- One who operates a loader.
Loading	- The process of placing pulpwood, in the form of bolts, sticks, multiple stick lengths, logs or tree lengths on a hauling vehicle.
Log	- A tree segment suitable for subsequent processing into lumber, pulpwood or other wood products.
Log dec	- A pile of logs on a woods landing or stored on a mill yard or wood yard awaiting loading or conversion to a specific product.
Log dump	- See Landing.
Logger	- One engaged in the production of logs or pulpwood. Syn. Lumberjack.
Logging operation	- The stump to final landing phase of the pulpwood production process (includes river drive where applicable). See Pulpwood Logging.
Lumber	- To log or to manufacture logs into lumber, or both.
Lumberjack	- See Logger.
Machine rate	- Defined in accordance with standard engineering methods, the rate is composed of fixed costs (depreciation, interest, taxes and insurance and license fees where applicable) and variable costs (fuel consumption, component repair and replacement costs). The wage of the machine operator is generally not included.
Man-hour	- The unit of work performed by one man in one hour.
Mark	- (1) A letter or sign indicating ownership which is stamped on the end of logs. Syn. Grand, End Mark, (2) Selecting trees to be cut or left. Syn. Spot.
Marker	- (1) One who marks the end of logs. (2) One who measures and marks for bucking cuts.
Marking	- In timber, selecting and indicating by a blaze or paint spot, the trees to be cut or left in a cutting operation. Syn. Spotting.

Measuring - The process of apportioning the merchantable stem into segments or specified lengths for the purpose of bucking.

Merchantable - Refers to that portion of trees or stands which can be profitably marketed under given economic conditions.

Notch - To make an undercut in a tree preparatory to felling it to govern the fall direction and prevent splitting. Syn. Box, Undercut.

Operating hour - Includes machine time and paid idle time. Machine time is the effective time during which the machine is actually running and paid idle time is the machine idle time during which direct labor continues to receive a wage.

Payload - The gross weight of a loaded vehicle less the weight of the vehicle and holding bunks or frame.

Prehauling - An intermediate hauling operation in which the stick, bundle or load is not in contact with the ground. The load is usually hauled on a secondary hauling vehicle such as a pallet, cart, etc. and is normally pulled by a crawler or rubber-tired tractor. However, prehauling may be performed by utilizing the primary hauling vehicle to carry a partial load.

Pre-piling - Making small piles of short-wood in the cutting area for convenience in loading onto a prehauler.

Processing - Comprises the operations of felling, limbing, topping, bucking, scaling, barking and chipping.

Producer - An individual who operates or manages a pulpwood harvesting crew, owns pulpwood harvesting equipment and sells pulpwood either directly to a pulp mill or to a pulpwood dealer.

Production - The operations necessary for the production of pulpwood consists of those functions required to cut the wood from the stump and deliver it to a concentration yard.

Pulpwood - Wood cut or prepared primarily for manufacturing into wood pulp, for subsequent manufacture into paper, fibre board or other products, depending largely on the species cut and the pulping process.

Pulpwood logging - Consist of all operations performed on pulpwood trees from the standing tree in the stump area to the final landing or to the mill in some direct truck hauls or where water transportation is used.

Sawyer	- One who fells, limbs, tops and bucks trees with a saw.
Scale	- To measure or weigh the volume of a log or load.
Scaler	- One who determines the volume in a log or load.
Scaling	- Operation where company markings are placed on bolts of pulpwood for clear identification and individual cutters production is recorded separately for payment.
Self-loading skidder	- See Bummer.
Short-wood methods	- Varying ways of pulpwood logging in which short wood, i.e., 4-, 8-, and 12 -foot pulpwood, can be moved from a stump area to a landing area.
Short-wood system	- A system of pulpwood logging where the processing operations of felling, limbing, topping, bucking and possibly barking are performed in the stump area and where short wood (4-, 8- and 12-foot pulpwood) is transported from the stump area to a landing.
Sighting	- Determining the direction a tree will fall.
Skid	- To pull or drag logs from the stump to a landing. Syn. Snake, Twitch, Yard.
Skidder	- A rubber-tired or tracked vehicle which drags trees or logs from a stump area to a landing, generally semi-suspended.
Skidding	- The process of dragging tree lengths, logs, multiple stick lengths or pulpwood sticks from the stump to a landing or concentration point, part of the tree being in contact with the ground.
Skid road	- a road or trail built for or caused by skidding units.
Slash	- The debris left after logging, such as limbs, tops, culls, and knocked-down trees. Syn. Brush.
Slash (verb)	- To cut tree lengths into pieces or bolts of desired length, generally by powered saw or gang saw at a landing.
Slasher	- A machine equipped with saw(s) or shear(s) used to cut long wood or tree lengths into short pulpwood sticks.
Softwood	- Generally, one of the botanical group of trees that in most cases have needle or scale-like leaves; the conifers; also the wood produced by such trees.
Spot	- See Blaze and Mark.

Spotting	- See Marking.
Strip	- In cutting, the area assigned to one cutter. Used to determine volume cut or recording such when cutter is paid on a per cord basis.
Stump area	- Area where standing tree is felled.
Stumpage	- The value of timber as it stands uncut in the woods; or, in a general sense, the standing timber itself.
Swamping	- Clearing an area of brush, limbs and other obstructions for a working area.
Swamper	- One who swamps an area.
Swing	- To aim and control the felling of a tree.
Tandems	- Sets of dual rear wheels on a truck. "Live" indicates they are powered. "Dead" means they are not powered.
Timber	- A term loosely applied to forest stands or their products, often to wood in form suitable for heavy construction, as for houses, ships and bridges. Specifically, sawed lumber 4 x 4 inches or more in breadth and thickness.
Timber contract	- See Timber title.
Timber deed	- See Timber title.
Timber right	- See Timber title.
Timber title	- A term used to denote purchase or ownership of standing timber, without acquisition of title to the land. Syn. Timber contract, Timber deed, Timber right.
Top	- To cut off the unmerchantable portion of the tree.
Top loader	- A member of the loading crew who places and positions logs or bolts on the road.
Transportation	- Movement of wood from the stump area to the final landing, but generally used in reference to the movement between intermediate and final landing or mill.
Tree harvester	- A multi-process machine which limbs, tops, fells and bunches tree lengths in the stump area.
Tree length	- An entire tree, with the exception of the unmerchantable top and limbs, suitable for lumber, pulpwood or other wood products.

Tree-length methods - Varying ways of pulpwood logging in which tree lengths can be transported from a stump area to a landing.

Tree-length system - A system of pulpwood logging where the processing operations of limbing, topping and felling are performed in the stump area and where the tree length is moved from the stump area to a landing.

Turn - (1) A single trip to the stump and return made by a skidding unit in bringing logs to a landing. (2) One load of logs brought in by a skidding unit. Syn. Drag.

Turn around time - The time it takes for a truck from the time it arrives at the mill or yard to get scaled, unloaded and start back to the woods. Also, the time it takes for a truck to arrive at the landing, get loaded and leave.

Turnout - A wide area in a single track road to allow vehicles to pass.

Undercut - See Notch.

Undercutting - Where the bucking operation is started at the underside of the log.

Unloading - The process of removing wood from the primary hauling vehicle. Unloading begins when the primary hauling vehicle arrives at the wood yard or rail car siding and ends when it leaves.

Wedge - In felling, to drive a wedge into a saw cut to direct the fall of the tree or to keep the saw from binding in the cut.

Windfall - Trees which have been blown over by wind action. Syn. Blowndown.

Woodhook - A short, sharp-pointed hand-held hook used to handle shortwood.

Woodlot - An area of land covered with trees where the owner produces pulpwood for sale generally to a pulp or paper mill.

APPENDIX H

General Procedures and Questions Used in the Different Interviews

A. Concerning the Measurement of Structural Variables

After the answer to each question for the present, follow this procedure:

1. If informant cannot answer the question, ask him who can in the organization.
2. Ask if the present situation has been existing for the past twenty years. If not: which changes took place, modification or innovation?
   If modification: which modifications were done? when? for which purpose? what were the consequences?
   If innovation: which innovations were done? when? for which purpose? what were the consequences?

Check this especially for each position, occupation or role, regulation, etc. Obtain written information whenever possible.

B. In Interviews with People

Identification of their task, position, responsibilities, functions, etc.

Relations with other departments.

Changes which have taken place in their position and department in the last twenty years.

Major policies of the organization: on mechanization, organizational structure and organizational environment:
- what these policies are
- when were they established and implemented
- why were they established and what were the consequences.

Obtain written documentation to support these verbal informations and to get further information.

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