A COMLPLEX CYBERNETIC MODEL OF INTERPERSONAL COMMUNICATION

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ABSTRACT

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By

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A dynamic and cybernetically-oriented model of interpersonal communication is developed which takes into account both stability and growth dimensions of interpersonal processes. It is argued that most system perspectives emphasize homeostatis and equilibrium rather than growth and change, and that such an emphasis is inimical to the success and longevity of any system, in particular interpersonal systems. A balance between stability and flexibility (the stable-positive case mathematically) is assumed to insure satisfaction and longevity in interpersonal communication systems.

Because the methods for treating simultaneous stability and flexibility in cybernetic systems are not well-developed in the social sciences, the necessary conditions for stability-flexibility are derived. Given causal loop structures among variables in a model, it is found that the conditions for flexibility-stability can be readily applied. However, the analysis of the nature of interpersonal communication systems strongly implies the adoption of a cybernetic model. To accomplish both ends, a transformation is presented which permits cybernetic systems to be modeled in a linear causal framework.

The model of interpersonal communication to which the above methods are applied begins with the assumption that individuals seek to coordinate their activities interpersonally and that this coordination necessitates the transfer of symbolic information. With these assumptions and an extended version of the coorientation model, a set of eight interrelated propositions are generated. These constitute the heart of the model. Under certain assumptions, the set of propositions can be rewritten as a mathematical system of first-order, linear differential equations with constant coefficients. Applying the flexibility-stability conditions to these equations results in a pair of system hypotheses whose validity depends on the validity of the model as a whole. They are that the effects of communication will be to increase actual consensus and perceived consensus more in high than low satisfaction groups. There is a similar hypothesis for high and low predicted longevity groups.

The hypotheses were tested by self-administered questionnaires on a self-selected sample of 32 married couples. The results indicated certain errors in one of the underlying propositions and hence, the hypotheses failed. Upon correction of the model and reformulation of the derived hypotheses, it was found that the best fit for the data was obtained under conditions of overall stability rather than flexibility-stability. Consequently, some doubt is cast on the assumption of the importance of stability and flexibility in interpersonal communication systems.

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To my parents whose life-long encouragement has in no small way made this work possible.

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In addition, many fruitful hours of brainstorming and mind-picking were spent with a colleague and friend, Peter Monge. Much of my initial thinking on dynamics of systems was spurred by him. Lastly, my wife, Elena, must be included. It was she who first interested me in communication, and it was her insistence on relevance which kept this topic from becoming more and more esoteric. Further, her many hours of typing and editing, and her careful reworking of much of the questionnaire with me cannot be easily repaid.

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INTRODUCTION

Within the developing communication sciences, the terminology, concepts, and approaches of systems theory and of one of its special cases, cybernetics, have become part and parcel of the intellectual tools of the practitioners of theory and research. However, even a cursory review of the attempts to apply systems approaches to the phenomenon of communication (see Monge, 1972) reveals either superficial applications involving little more than terminological translations or purely theoretic discussions which stop short of actual application. The primary purposes of this essay shall be to develop a modified cybernetic modeling technique, to apply the technique to modeling long-term interpersonal communication situations, and finally to empirically test the hypotheses derived from this procedure.

In accomplishing these ends, several other propositions shall be demonstrated which are pointed out below for the purposes of emphasis. It shall be shown that:

1. Causal models are well-suited to the development of conditions of growth and stability.

2. Cybernetic relationships differ markedly from causal relationships.

3. The nature of interpersonal communication systems necessitates a cybernetic modeling approach.

4. Under certain conditions, a cybernetic model can be transformed into a causal model.

5. The nature of interpersonal communication systems suggests an information-theoretic modeling approach.

6. The problems of information theory are circumvented through the coorientational paradigm.

7. The necessary conditions for the application of the coorientational paradigm can be satisfied by choosing "procedural rules" as the objects of coorientation.

8. A systemic hypothesis concerning interpersonal communication systems can be derived and tested, which is identical in form to the more usual reductionist two-variable hypotheses.

With regard to format, Chapter I shall bear the burden of analysis and proof as it focuses on Propositions 1 through 6, and the derivation of the systemic hypotheses. Chapter II will focus on Proposition 7 and the methodology surrounding the test of the systemic hypotheses. Chapters III and IV will present results of the test and the interpretation of those results respectively. The final chapter will investigate implications of the earlier discussion and of the empirical results for theory construction, explanation, and the current understanding of interpersonal communication systems.

CHAPTER I

A CYBERNETIC MODEL OF GROWTH AND STABILITY IN INTERPERSONAL COMMUNICATION SYSTEMS

The Problem of Morphostasis and Morphogenesis

Perhaps the most unfortunate result of the adoption of various system approaches within the social sciences has been an overemphasis on permanence and preservation of the status quo, rather than on growth, change, and alteration. Monge (1972, p. 116) has reviewed the three most influential systems perspectives--cybernetics, structural-functionalism, and general systems theory--as they have been applied to problems in human communication, and concluded that

> Any description of a communication system which accounts only for structural preservation is insufficient. This emphasis on change is important because it permits the study of communication as a complex adaptive system rather than a static enduring structure.

The structural-functional approach, which grew out of Merton's and Parson's writings, attempts to provide techniques for analyzing the mechanics within a system which maintain the goal-state of the system within a certain acceptable range. These procedures and methods were severely criticized by other sociologists such as Gessous (196) for failing to account for social change and societal development. Reactions to this approach, for example, by Coser (1956), have sought to emphasize the functional nature of apparently dysfunctional social conflict. The obvious point of these reactions

to pure equilibrium analyses of society is that society continues to exist not only because a set of mechanisms maintain a certain goal-state despite disturbances, but also because societal systems change and alter themselves in reaction to disturbances. Within the interpersonal area, Jackson (1957) and Watzlawick, Beavin and Jackson (1967) have described family systems based directly on cybernetic principles and mechanisms for achieving and maintaining homeostasis. This approach also has an equilibrium emphasis in that it fails to account for change and alteration in healthy families. Speer (1970) in reviewing various theories of family systems, has argued that purely morphostatic or structural analyses, like Jackson's, are insufficient for understanding, predicting, or counseling family behavior. Rather, morphogenetic or growth-oriented considerations must also guide the development of theory in family systems.

Clearly, the problem of accounting for morphostasis as well as morphogenesis in modeling social and social-psychological systems is not a new one. However, the few methods for dealing with both growth and stability simultaneously have shown persistent problems.

One such method has been provided by Maruyama (1963). His approach applies only to relationships which can be assumed to be mutually causal and which form loop structures, so that no one variable can be labeled as the exogenous variable. The sign of the correlation between each pair of variables is established either empirically or theoretically. If the product of the correlation coefficients around a loop is positive, the loop is deviation-amplifying; if negative, then it is deviation-counteracting.

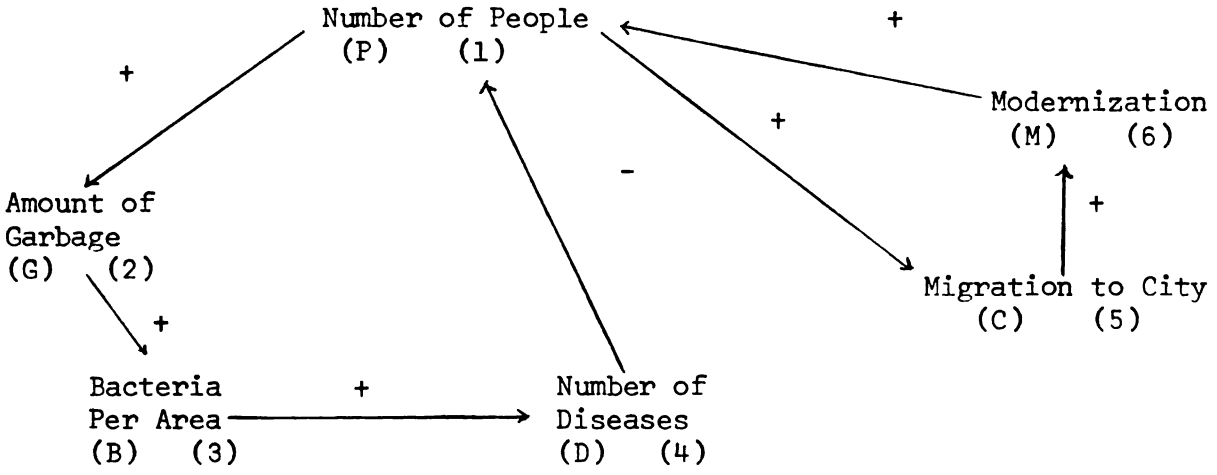

Figure 1. A Mutual Causal Analysis of Population Growth

For example, in Figure 1 the loop "population ⟶ garbage ⟶ bacteria ⟶ disease ⟶ population" is deviation-counteracting, so that an initial increase in population leads to an eventual decrease in population. However, Maruyama's most important insight concerns deviation-amplifying loops. In a system of several closed loops, unless at least one loop is deviation-amplifying the system described by the loops cannot grow or alter its behavior; such a system must be homeostatic. This conclusion is obvious since if all loops are deviation-counteracting, then any disturbance will be countered by a force whose direction is such as to reverse the effect of the disturbance.

Although a detailed critique of Maruyama's methods need not concern us here, a discussion of two shortcomings will serve our interests. First, Maruyama fails to distinguish between types of deviation-amplifying and deviation-counteracting loops. This is crucial since both amplifying and counteracting loops can be stable or unstable. If we are interested in the conditions under which systems exhibit overall stability as well as

growth, then the type of deviation amplification or counteraction of the loops cannot be ignored. From Blalock (1969, p. 82), the following situations indicate all the mathematically possible alternatives and provide the necessary distinctions:

I. Deviation-amplifying

   A. Unstable positive feedback

      1. With an initial increase leading to eventual explosion
      2. With an initial decrease leading to eventual decay

   B. Stable positive feedback

      1. With an initial increase leading to a new stability point at a higher value
      2. With an initial decrease leading to a new stability point at a lower value

II. Deviation-counteracting

   A. Unstable negative feedback

      1. With an initial increase leading to eventual decay
      2. With an initial decrease leading to eventual explosion

   B. Stable negative feedback

      1. With an initial increase leading to restoration of initial value
      2. With an initial decrease leading to restoration of initial value

Second, under the assumption that the "first cybernetics" has dealt only with deviation-counteraction and control, Maruyama presumes to call his methods the "second cybernetics." This is unfortunate, not because Maruyama fails to handle growth in addition to control, but because his analysis is based on the assumption of mutual causal loop structures. According to Buckley (1967, p. 63), for a system to be cybernetic it must include:

1. A goal parameter or referent signal set in a control center
2. Information on the current state or action of the system
3. A test or comparison between the referent signal and the current state of the system, resulting in
4. An error signal based on the comparison which determines the direction and magnitude of the
5. Action taken by a control mechanism.

The mutual causal assumption satisfies 2 and 5 but certainly not 1, 3, or 4. Thus, while attempting to take cybernetics a step further with an analysis of growth in addition to control, Maruyama's cybernetics has suppressed the goal-seeking behavior of truly cybernetic systems. This difference is more than a semantic quibble over the "real" meaning of cybernetics. If one wishes to model real systems which are goal-seeking and at the same time take advantage of the insights into growth processes that Maruyama provides for mutual causal systems, then one must account for this difference.

The reason Maruyama was forced to the mutual causal assumption is significant. With the mutual causal condition, some rather straightforward conditions for deviation-amplification and deviation-counteraction could be derived. If all of the above conditions for a cybernetic relationship had to be satisfied, the conditions for deviation-amplification and deviation-counteraction are not simple deductions. However, if a set of conditions can be found for transforming cybernetic relationships into a form amenable to mutual causal analysis, then growth and stability conditions in goal-seeking systems would be a possibility. That is, if the phenomena to be modeled are purposive and goal-directed, then the logic best suited to those phenomena is that of cybernetic systems as defined above. However, the most powerful logics are found in causal analyses. Thus, if cybernetic relationships can be transformed to fit the causal framework, then we can

develop a modeling technique which has the deductive power of causal systems but the "fit" of cybernetic relationships to goal-directed, purposive phenomena.

Casting Cybernetic Relationships in Causal Frameworks

In order to obtain relatively precise and analytic answers to questions concerning growth and change in complex systems, it is necessary to develop and employ mathematical formulations of the dynamics of the system under investigation. Without this step the higher-order deductions required concerning system dynamics would be impossible. However, since much of the theorizing and proposition generation of the social sciences is within the verbal realm only, it is necessary to investigate the strategies available for transforming sets of verbal propositions into systems of mathematical equations. Fortunately, Blalock (1969) has already made a significant step in this direction. The key problem (prior to the question of mathematization) is the degree of precision which verbal propositions manifest. If we are to be capable of mathematizing our verbal theories (or, in fact, to develop useful scientific theories of any form), then our propositions must be analytically precise. Blalock provides several useful guidelines, but Zetterberg's (1965, pp. 69-72) criteria for verbal propositions are more definite. According to Zetterberg, every proposition must be stated such that it is clear that the proposition is

1. Reversible or irreversible
2. Sequential or coextensive
3. Deterministic or stochastic
4. Necessary or substitutible
5. Sufficient or contingent.

Thus, every verbal proposition must be able to be characterized by five binary choices if it is to manifest the precision necessary for mathematization.

Now, if the propositions are to be cast in a mathematical formulation of linear differential or difference equations, then we must assume that the relationship between the variables is sufficient and deterministic. Though such assumptions may not be valid with certain propositions, they must be made for the sake of the mathematical formulation. The hope is that the power of the mathematical formulation will far outweigh the error introduced in possible violations of the assumptions. In addition, the reader might wonder if the propositions must be cast into a linear system and if the equations must be differential (or difference) in form. The answer to both of these questions is definitely NO! However, the most significant problem with mathematical modeling is generally found in the assumptions which are made. The greater the number and extent of the assumptions, the more powerful the deductions and the lower the likelihood of meeting the assumptions empirically. Thus, by making a limited number of simple assumptions, the deductive power of our methods is decreased but errors due to unmet assumptions are also decreased. Furthermore, (1) the theory of linear equations is well-developed, well-known, and the simplest theory of equations available mathematically, (2) most mathematical modeling which is in its early stages adopts first-order (linear) approximations rather than higher-order approximations, and (3) the linear model is readily adapted to linear measurement (statistical) models (for example, path analytic) for the purposes of testing and verification. Finally, the only reason differential or difference equations need to be employed is that the problem to be answered concerns the dynamics of the system, and hence the time rate of change of the variables.

Once the set of theoretically important variables has been determined and the relationships among them specified in terms of precise verbal propositions indicating direction and sign, it is simple to transform these propositions into a set of linear differential equations. For example, assume that the relationships of the schematic Figure 1 are the translations from verbal propositions. Since there are six variables, we write six equations in the form:

1. $dP/dt = a_{11}P + a_{12}G + a_{13}B + a_{14}D + a_{15}C + a_{16}M$
2. $dG/dt = a_{21}P + a_{22}G + a_{23}B + a_{24}D + a_{25}C + a_{26}M$
3. $dB/dt = a_{31}P + a_{32}G + a_{33}B + a_{34}D + a_{35}C + a_{36}M$
4. $dD/dt = a_{41}P + a_{42}G + a_{43}B + a_{44}D + a_{45}C + a_{46}M$
5. $dC/dt = a_{51}P + a_{52}G + a_{53}B + a_{54}D + a_{55}C + a_{56}M$
6. $dM/dt = a_{61}P + a_{62}G + a_{63}B + a_{64}D + a_{65}C + a_{66}M$

where the coefficients a_{ij}, $i \neq j$, represent the amount of covariation in variable i attributable to variable j. Clearly, those a_{ij} will be zero for which no link exists between variables j and i. This is the case with a_{12}, a_{13}, a_{16}, a_{23}, a_{24}, a_{25}, a_{26} among others. The correct set of equations is:

1. $dP/dt = a_{11}P + a_{14}D + a_{15}C$
2. $dG/dt = a_{21}P + a_{22}G$
3. $dB/dt = a_{23}G + a_{33}B$
4. $dD/dt = a_{34}B + a_{44}D$
5. $dC/dt = a_{55}C + a_{56}M$
6. $dM/dt = a_{61}P + a_{66}M$

The coefficients a_{ii} are always included, since as Blalock (1969, p. 95) indicates:

> $[a_{ii}]$ summarizes our ignorance of the details of the feedback process, and ... the term $[a_{ii}x_i]$ stands as a surrogate for other terms that could be brought into the equation explicitly in order to explain the feedback process .... the notion that 'x_1 causes x_1' might be used to substitute for a causal argument involving one or more feedback loops, as for example, $x_1 \longrightarrow x_2 \longrightarrow x_3 \longrightarrow x_4 \longrightarrow x_1$.

Of course, as our ability to explain the variation in x_i increases, then the value of a_{ii} will become smaller since the loops feeding back on x_i will have become explicit.

Once having set down the system of linear differential equations, there are basically four types of analysis that one can undertake (Simon, 1957, p.128):

1. An explicit solution of the equations can be obtained, giving the time path that any one variable would follow from some set of initial conditions.

2. The equilibrium positions can be determined and predictions made as to the behavior of the system at or near equilibrium.

3. The conditions for stability can be obtained and predictions made as to the susceptibility of the system to external and internal perturbations.

4. Alterations in equilibrium and stability conditions can be determined as a function of changes in system constants and exogenous variables. This is known as the method of comparative statics.

Since our main concern in this paper is with the dynamics of complex cybernetic systems cast in causal formulations, options 1, 2, and 3 are of most interest. We have already argued that equilibrium in and of itself is not the most significant nor the most useful descriptor of complex systems; rather, the stability of those systems overall and their simultaneous capacity for growth are our major concerns. The necessary conditions for stability

of a set of n linear differential equations are presented by Blalock (1969, p. 107) to be:[1]

$$\sum_{i=1}^{n} a_{ii} < 0 \qquad (1)$$

$$\|a_{ij}\| > 0 \quad \text{if n is even} \qquad (2)a$$

$$\|a_{ij}\| < 0 \quad \text{if n is odd} \qquad (2)b$$

where $\|a_{ij}\|$ is the determinate of the system.

The ability or inability to satisfy these conditions can provide useful hypotheses about the system under analysis. We shall see how this works with our model.

However, the stability conditions alone do not provide information as to the kind of stability: negative, indicating equilibrium or homeostasis, or positive, indicating growth and change. This situation is particularly unfortunate for we are searching for descriptors of systems which are stable but exhibit potentialities for growth; that is, "stable-positive" systems. The conditions under which the system manifests stable-positive, stable-negative, or unstable feedbacks can be determined if we were to take Simon's option 1 above and explicitly solve the set of linear differential equations to obtain their time paths. This is very simple in the case of a few variables, but for several variables the situation is much like that for the

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[1] Since these conditions are necessary but not sufficient, their satisfaction allows us to conclude nothing about the stability of the system. However, since an exhaustive list of necessary conditions constitutes sufficiency, we can at least conclude that satisfaction of the necessary conditions increases the probability of stability. Sufficient conditions are available (see W. J. Baumol, Economic Dynamics, New York: MacMillan Co., 1959, pp. 118-122), but are so complex as to be useless when one is dealing with algebraic rather than numerical solutions. Thus, as estimates of the a_{ij} are obtained, sufficient conditions can be applied.

sufficient conditions for stability; that is, analytic solutions are available[2] in principle for any set of n variables, but as n increases the practicality decreases very rapidly. Once again, if numerical estimates of a_{ij} were available, explicit solutions of the time paths would be readily available (with computer aid) and, hence, the precise nature of the stability available also.

Fortunately, all is not lost since we can once again specify at least necessary conditions for stable-positive feedback. Since well-defined conditions for system stability are available, the set of alternative conditions which result in overall system stability is established. Within this range of alternatives leading to stability, some or none of the loops will be deviation-amplifying. If no loops are deviation-amplifying, then the system cannot be stable-positive overall since every alteration in the value of a variable will initiate a response which returns that variable to its initial value (stable-negative). Furthermore, as the number of deviation-amplifying loops increases while maintaining overall stability, the probability of achieving stable-positive feedback also increases. Thus, the presence of deviation-amplifying loops is a necessary condition to insure stable-positive systems. It is not sufficient however, since even with overall stability the mere presence of deviation-amplifying loops could still result in a stable-negative condition.

Having stipulated and derived the necessary conditions for stable-positive mutual causal systems, we are now in a position to develop conditions

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*For example, see Coleman, "The Mathematical Study of Change" in Methodology in Social Research, H. M. Blalock and A. B. Blalock (New York: McGraw-Hill, 1968).

for transforming cybernetic relationships into mutual causal relationships. Let us proceed inductively from the rather simple (and hypothetical) example represented schematically in Figure 2. In this example, perceived

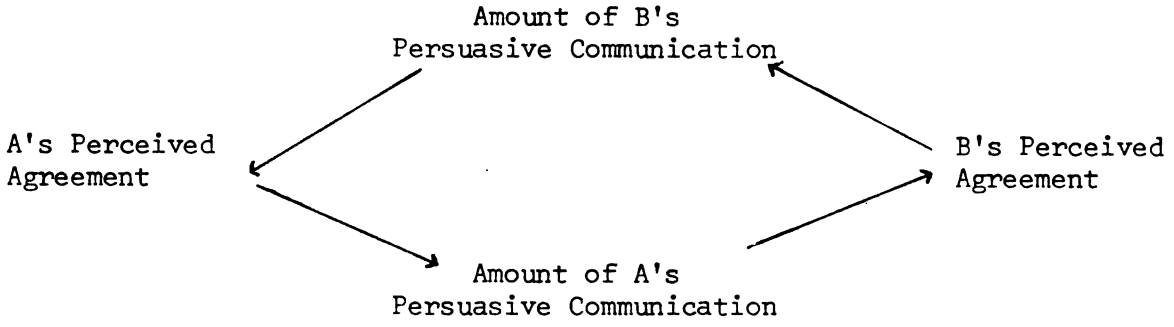

Figure 2. A Simple Mutual Causal Loop Involving Communication and Agreement.

agreement is nothing more than how much A thinks B has similar cognitions to his own; similarly for B. According to the criteria for cybernetic relationships set down earlier, the loop is mutual causal and not cybernetic. However, suppose on theoretic or empirical grounds one argued that the nature of the phenomena represented by this loop was purposive and goal-directed rather than purely causal. For example, one might argue: the fact that B thinks he and A disagree on some topic does not necessarily imply that he will actively seek to persuade A of his position. Rather, the importance of agreement on the topic to the successful continuation of the relationship between B and A, in addition to the amount of disagreement, determine whether B will seek to persuade A. Hence, in Figure 3, a modified loop is presented in which the amount of communication depends on the discrepancy between importance of agreement on some topic and the individual's perception of the amount of agreement.

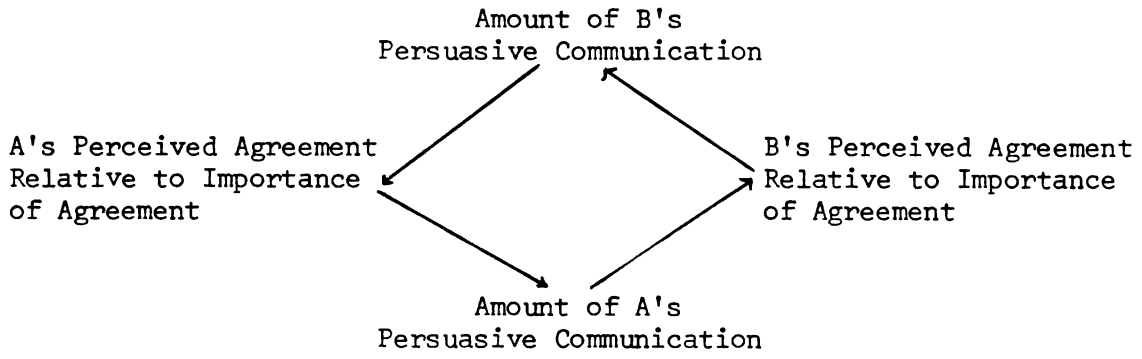

Figure 3. A Modified Mutual Causal Loop Involving Communication and a Discrepancy Variable.

In the modified case, the relationship between the variables is still causal, but there are several important differences between the case of Figure 3 and that of Figure 2: (1) The definition of the variable "perceived agreement" has become a discrepancy between some current state of the system (an individual's perception of agreement) and a goal state (the magnitude of required agreement). (2) The generation of persuasive communication depends not on the value of perceived agreement but on the magnitude and direction of the difference between that value and the goal state. (3) Persuasive communication acts to control not merely the correlation between perceived agreement at time t and at time t + 1, but also to control the relationship between perceived agreement and the goal of required agreement. All of these differences together indicate that the modified causal loop of Figure 3 is cybernetic in its most important sense; its logic is isomorphic to a purposive and goal-directed empirical phenomena.

Before setting down the principles for transforming cybernetic relationships to mutual causal ones, we need to recognize an important point. The process that we have just gone through is quite the reverse of that normally carried out in theory construction. That is, beginning with a

causal model, we sought to transform it to a cybernetic one. Rather, one should begin with empirical and theoretic justification for the nature of the phenomena being modeled and then seek out a logic which best fits the conceptualization. The point of our example is that a phenomenon essentially goal-directed need not compromise that goal orientation for the sake of a causal logic. Rather, cybernetic relationships can be cast into a causal framework without too much loss of power when:

1. At least one variable in the loop is a "comparator variable" whose value is determined by either the ratio or difference of two other variables: one being the referent variable (or goal state), the other being the action variable (or current state) of the system.

2. The comparator variable is one variable in the causal loop so that its value at one point in time ultimately affects its value at a later point in time.

3. The value of the comparator variable, which shall be termed the error signal, determines the value of some control variable.

4. The function of the control mechanism is to alter the error signal by increasing it if the loop is deviation-amplifying, or by decreasing it if the loop is deviation-counteracting. This can be accomplished by altering the action signal, the referent signal or both.

5. The comparator variable and the control variable together constitute the control center of most cybernetic models.

Now, when conditions are such that cybernetic relationships can be cast into mutual causal loops, the loops can be cast into mathematical formulations amenable to analysis for conditions of stability and growth. That is, since conditions for growth and stability can be established for mathematical systems, the above technique represents a method for analyzing growth and stability in <u>cybernetic</u> systems when the nature of the phenomena require a cybernetic logic.

However, the method just developed has certain shortcomings. For one thing, the comparator variable can be changed by alteration of either

the action state or the goal state. By including both in one variable, it is impossible to determine which state changes and, hence, important information on the behavior of the system is lost. It is our hope that this loss of information will be far outweighed by the logical and analytic power of the methods developed herein.

A further shortcoming is the limitation on the type of growth and change with which we can deal. In his analysis of social change, Applebaum (1970, pp. 7-8) distinguishes three dimensions of change: magnitude or scale, time span, and effect on the changing unit. The magnitude of the change can be large or small and can be distinguished by the size and centrality of units affected, the proportion of the units affected, the degree of alteration involved, and the suddenness of the change. The duration of the change can be long or short term. And, most importantly, the effects of the change can be processual, which are merely alterations in the output of substructures, or structural, which involve alteration of the very relationships among substructures, or the disappearance of old substructures. Clearly, our methods have dealt only with processual change and the degree of alteration. In no sense has a comprehensive theory of change been presented and, in fact, our position rests on the assumption of continuing structural identity rather than structural change.

Before applying these methods to interpersonal communication systems, it would be useful to summarize the ground we have covered. A set of necessary conditions for the overall stability of causal feedback loops as well as necessary conditions for stable-positive loops have been stipulated. These conditions include the satisfaction of certain mathematical conditions (equations (1), (2)a, and (2)b) on the set of linear differential equations

describing the system of causal interactions while maintaining the maximum number of deviation-amplifying loops. In addition, the conditions for transforming cybernetic relationships into mutual causal relationships was established, thereby making possible the analysis of conditions for growth and stability in cybernetic systems.

The Nature of Interpersonal Communication Systems

The first step in developing an understanding of interpersonal communication systems should be to distinguish among types of systems which consist of two or more people engaging in the transfer of symbolic information. In a certain broad sense, a family, a dating couple, the local Elks Club executive committee, and an assembly line crew at General Motors could each be conceived to constitute an interpersonal communication system. However, at the current stage of development of communication theory, any attempt to include such diverse situations under one model would at best be very generic. Rather, a very precise and limited definition of an interpersonal communication system will be offered in order to construct a more specific, and, hopefully, more powerful model.

Whenever two or more individuals are present to each other and in some sense interdependent, they will need to be capable of predicting one another's actions if they are to coordinate their activities and remain interdependent. One basis for distinguishing among these interpersonal-interdependent systems is in terms of the type and source of information which the individuals use to make predictions about the behavior of the other. If the type and source of information is attainable only through direct observational or symbolic interaction with the other, then this information shall be termed

"interpersonal." Clearly, information predictive of the other's behavior is often obtained indirectly (for example, through a third party) or on the basis of the other's membership in some class of individuals with accepted characteristics (role, stereotype, cultural types). Because of the indirectness of these sources of information, the directness of the communicative link with the other is removed and the commitment concomitant with that link is also absent. That is, if the source of information is indirect, coordination among the individuals is possible but limited only to the types in which individuals from the same statistical classes would be interchangeable.

If the source of information is provided directly by one person, but its nature is normative, conventional, or stereotypic, then, once again, the types of coordination possible are very limited. Miller, Nunnally, and Wackman (1971) suggest that three types of information are crucial when individuals interact: topic, person, and relationship statements. Topic statements refer to items of general interest but peripheral to the relationship between the individuals. Person statements refer to the self or to the other person in the relationship. Relationship statements refer to both individuals as a unit. Each of these information types can be normative, conventional, and stereotypic, or idiosyncratic and highly individuated, making possible different levels of coordination. Adapting Miller, Nunnally, and Wackman's position somewhat, I contend that when topic, person, and relationship statements have a high (as opposed to low) disclosure potential[3] and a

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[3]Disclosure potential is defined as the "amount of information provided by a statement and/or the amount of information potentially elicited from another person by a statement" (Miller, Nunnally, and Wackman, 1971, p. 67).

high risk[4] or uncertainty, then those statements are interpersonal. That is, when the task facing a pair (or more) of individuals is such that to coordinate activities on that task requires types and sources of information which have been labeled interpersonal above, then that situation will be called an interpersonal communication system regardless of whether the information transmitted is actually stereotypic or idiosyncratic. Thus, we have carved out for analysis as interpersonal communication systems those situations requiring a level of coordination on tasks attainable only through certain types of information transfer. This definition does not exclude from analysis those interpersonal situations which are incapable of coordinating on these crucial tasks, but rather includes them as objects of analysis.

There are three immediate implications of this orientation to interpersonal communication systems: (1) It is eminently a communication perspective since it focuses on the origin and content of messages. (2) Because of the source and type of the messages required, it suggests that the nature of interpersonal communication relationships is highly idiosyncratic and individualized and, hence, manifests a high variability of interpersonal styles. (3) The necessary goal of overall coordination plus the variability of interpersonal styles suggest that the specific goals and styles of achieving them are themselves highly variable and individualized. If this last implication is valid, then the attempt to model an interpersonal communication system cannot impose goals from without, but

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[4]Risk is defined as "the degree to which responses elicited by a statement are predictable ... the range of responses afforded the listener is minimal" (Miller, Nunnally, and Wackman, 1971, p. 70).

rather must discover the goals and incorporate that discovery into the characterization of the system. In a broader framework, Toulmin (1969) has argued that any action which is purposive and goal-directed cannot have categories imposed upon it without destroying the essential nature of the phenomenon. Thus, our analysis must incorporate the distinction between discovery and imposition.

Furthermore, that which must be discovered are the goals of the interpersonal system. To remain interdependent the system must coordinate, but what to coordinate on and how to achieve that coordination is determined by the individuals involved. Therefore, because of the goal-directed nature of interpersonal systems, a cybernetic model which does not impose goal-states would seem to preserve the nature of interpersonal communication systems. That is, the isomorphism between the phenomena and the model would be upheld if the logic of the model did not violate the goal-directedness and choice of goals which seem characteristic of interpersonal communication systems.

The antecedents to coordination

Coordination is nothing more than the ability of each individual in the system to behave so as to insure the solution of problems, the completion of tasks, and the removal of exigencies facing the system. Such an ability can be understood by attributing to each individual a set of alternative behaviors which are physiologically, psychologically, and socially possible for him, and by associating a probability with each alternative determined by the task-situation and by the need for coordination. In such a conception, coordination is possible if and only if

each person can predict the most probable alternative of the other and can be assured that the other can predict his choice. Furthermore, these predictions are possible only through the transfer of symbolic information since without such information accurate predictions at an interpersonal level would be highly improbable. If this analysis of the nature of interpersonal situations is correct, then accurate prediction at an interpersonal level would be impossible with information gathered through observation of similar others.

Allport (1962) has termed the development of correct predictions of the behavior of others the "complementarity of expectations." If person A does not know what to expect from B and cannot be sure what B expects from him, the chances of A and B coordinating actions at anything other than minimal tasks are highly unlikely. Thus, our first proposition for interpersonal systems becomes:

Proposition 1: The greater the complementarity of expectations, the greater the ability to coordinate activities.

Because the complementarity of expectations is conceptualized in terms of a set of alternatives and probabilities for those alternatives, an information-theoretic measurement model would seem most applicable. If such a model were adopted, two glaring difficulties would be immediately confronted: (1) the determination of the set of behavioral alternatives for A and B, and (2) the determination of the subjective probabilities for each alternative. However, the coorientational paradigm of Newcomb (1953), Chaffee and McLeod (1968), Chaffee, McLeod and Guerrero (1969), Scheff (1967), and Laing, Philipson, and Lee (1965) allows us to circumvent both of these problems by directly determining the accuracy of

predictions. As shall be shown below, the coorientational approach will allow us to retain our conception of interpersonal systems and to avoid the problems found with an information theoretic analysis. The remainder of this section shall be concerned with laying out and modifying the coorientational approach to fit the nature of interpersonal systems as they have been conceived.

Newcomb (1953) began the study of coorientation with his balance model of interpersonal systems. This model suggested that individuals simultaneously oriented themselves not only to the other, but also to the other relative to some object, X, where X is anything to which the individual can refer. The key variables in Newcomb's model included (1) agreement or the similarity between person A's orientation to X and person B's orientation to X, and (2) perceived agreement or the similarity between A's (or B's) orientation to X and A's (or B's) perception of B's (or A's) orientation toward X. For example, if X is "where to spend our vacation" and if Mrs. A thinks "Visiting my mother" and Mr. A thinks "Fishing in the mountains," then Mr. and Mrs. A disagree. But if Mr. A thinks that Mrs. A thinks "Fishing in the mountains," then he perceives agreement. On the other hand, if Mrs. A predicts Mr. A. will say "Fishing in the mountains," then she perceives disagreement.

Newcomb predicted that there would develop a strain toward symmetry in the event that the set of orientations (A to B), (B to A), (B to X), and (A to X) were in imbalance. Balance or imbalance of the dyad is determined by the products of the valences (+ or -) of the four orientations, and is balanced if the product is positive and unbalanced if negative. With the assumption of strain toward symmetry (balance), Newcomb

predicts that in an unbalanced system one or both individuals will act so as to reintroduce balance. In this analysis, communication becomes one possible response to system imbalance and functions to re-establish balance by changing the other's cognitions. That is, communication serves a persuasive function. Quoting an earlier article by Festinger (1950), Newcomb (1953, p. 399) is careful to hypothesize that it is "perceived symmetry, viewed as an independent variable, which is obviously a determinant of instigation to symmetry-directed communication" (emphasis added). Thus, it is an intrapersonal variable which predicts individual behavior and, by analogy, it must be interpersonal variables which predict system variables (as is the case with Proposition 1).

Newcomb's classic work provides an overall framework for interpersonal communication systems (the coorientation paradigm) and provides our second proposition:

Proposition 2: Given some pressure to agree, the greater the perceived agreement, the less the amount of persuasive communication.

This proposition shall be modified slightly in the following section.

Now, Chaffee and McLeod (1968) and Chaffee, McLeod, and Guerrero (1969) have a more general coorientation strategy. In addition to characterizing interpersonal systems by agreement and perceived agreement, they emphasize a second-order perception which is defined as one individual's prediction of the other's orientations. When this prediction is correct (as determined by the other's actual orientation), the individual is accurate. For example, Mrs. A of our earlier situation was accurate in perceiving disagreement while Mr. A was inaccurate in perceiving agreement.

Chaffee and McLeod recognized that communication could increase accuracy as well as increase agreement. In fact, a comparative study by

Wackman and Beatty (1971) showed greater increases in accuracy (rather than in agreement) as a result of communication. In other words, communication can function to increase the accuracy of A's predictions about B's most probable alternatives. Unfortunately, while recognizing this information function of communication, Chaffee and McLeod failed to provide antecedent conditions to communication as information as Newcomb provided antecedent conditions for communication as persuasion. Actually such antecedents are unavailable within the coorientational strategy as presented thus far. A third order perception is needed. However, the emphasis on the interpersonal variable, accuracy, is crucial since it is a precise formulation of a second dimension of the complementarity of expectations and, hence, will be related to the system variable coordination according to Proposition 1.

The third-order perception necessary for developing antecedent conditions for informative communication was developed and used by Laing, Philipson, and Lee (1965) and Scheff (1967), although for other purposes. It is defined as person A's prediction of person B's prediction of A's orientation to X. A person's third-order perception in combination with the other's second-order perception is termed <u>realization</u>, and is defined as one individual's ability to predict the other's accuracy. In other words, if A can predict what B will predict about A, then A <u>realizes</u> whether or not B is accurate. For example, if Mrs. A says "Mr. A thinks that I want to go fishing in the mountains," then she realizes what Mr. A thinks because she has correctly predicted his second-order perception. Conversely, if she says "Mr. A thinks that I want to visit my mother," then she fails to realize what Mr. A thinks because she has <u>in</u>correctly predicted his second-order perception.

As Scheff points out, this spiraling reciprocity can go on indefinitely although certain logical and semantic problems arise with fourth and higher order perceptions. However, these higher orders are not necessary since linking the third-order perception to the first-order perception yields perceived accuracy, which then becomes an antecedent condition to informative communication.[5] That is, if A perceives B to be inaccurate, then A will generate symbolic information whose purpose is to inform B of A's true orientation. Back to Mrs. A: If she says "Mr. A thinks that I want to go fishing in the mountains," then she perceives Mr. A. to be inaccurate because she already knows what she actually thinks. Now, because she feels that Mr. A does not know what she thinks, she will inform him of her wishes. Hence, our third proposition becomes:

Proposition 3: Given the pressure to be accurate, the greater the perceived accuracy, the less the informative communication.

Like Proposition 2, this one will also be modified slightly in the next section.

Thus, this highest order perception is necessary since it provides, on the one hand, one of the components for an antecedent variable to informative communication, and on the other, an additional dimension of the complementarity of expectations which should be a powerful indicator of the ability to coordinate. This latter claim needs some explanation. In reviewing the development of the coorientational paradigm, two classes of variables, intrapersonal and interpersonal, were separated. The former should be predictive of individual behavior within the dyad (Propositions

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[5]Note the similarity to perceived agreement as an antecedent condition to persuasive communication.

2 and 3) and the latter predictive of system variables (Proposition 1). The interpersonal variables agreement, accuracy, and realization were suggested as dimensions of the complementarity of expectations. Why are these dimensions important in predicting coordination?

Perhaps an analogy can help argue the claim. Suppose that a computer programmed to play chess is competing with a human opponent. In order for the human to win, he must correctly predict the next move or series of moves of his machine opponent and foil the machine's predictions of his own moves. Without knowledge of the programming instructions, including evaluation criteria, depth of search, etc., the human will probably be very unsuccessful. However, if he has learned and stored the computer's programmed instructions, his chances improve. The reason is that if the criteria for choice among alternative moves are the same for the human and the computer (that is, agreement) if the human knows this (that is, accuracy), then it is a simple task to predict the computer's next move. Furthermore, if the human knows what the computer's prediction for his criteria for choice among alternatives is (that is, realization), then the human can foil the computer's predictions simply by violating his own criteria. Thus, in this competitive situation, success is contingent upon agreement, accuracy, and realization. In a cooperative situation, success is once again contingent on agreement, accuracy, and realization except that realization allows the fulfillment, rather than the frustration, of the other's expectations of self.

In summary, then, the characteristics of interpersonal communication systems must include:

1. Agreement, denoted AGR
2. Accuracy for A and B, denoted ACCA and ACCB respectively

3. Realization for A and B, denoted RELA and RELB respectively

4. Perceived Agreement for A and B, denoted PAGRA and PAGRB respectively

5. Perceived Accuracy for A and B, denoted PACCA and PACCB, respectively

These nine values are derived from three orders of perception:

1. 1st-order perceptions of X for A and B, denoted P_1A and P_1B respectively

2. 2nd-order perceptions of X for A and B, denoted P_2A and P_2B respectively

3. 3rd-order perceptions of X for A and B, denoted P_3A and P_3B respectively.

Table 1 summarizes these definitions and their relationships.

Table 1. Summary of Three Orders of Perceptions and Their Relationship to Coorientation Variables.

$$AGR = P_1A - P_1B$$

$$ACCA = P_2A - P_1B \qquad ACCB = P_2B - P_1A$$

$$RELA = P_3A - P_2B \qquad RELB = P_3B - P_2A$$

$$PAGRA = P_2A - P_1A \qquad PAGRB = P_2B - P_1B$$

$$PACCA = P_3A - P_1A \qquad PACCB = P_3B - P_1B$$

The system state vectors

Earlier in this chapter, it was argued that while the overall goal of coordination characterized interpersonal communication systems, the specific objects of coordination were determined by the individual system and, hence, needed to be discovered rather than imposed. Juxtaposing this claim with the proposed relationship between coordination and agreement, accuracy, and realization, the question becomes: "What goals has the interpersonal system set for itself with regard to the amount of agreement, accuracy, and realization required for coordination?" If our analysis of the nature of interpersonal communication systems is correct, then any

attempt to establish these goals a priori by an outside observer must be doomed to failure. In order to avoid this problem, three other perceptions must be introduced:

1. Perceptions of the agreement required on X for A and B, denoted G_1A and G_1B respectively
2. Perceptions of the accuracy required on X for A and B, denoted G_2A and G_2B respectively
3. Perceptions of the realization required on X for A and B, denoted G_3A and G_3B respectively.

With these goal-perceptions characterizing each system, the intrapersonal and system variables defined earlier can be redefined so as to develop cybernetic relationships from our causal propositions. The intrapersonal variables change from PAGR and PACC to:

1. Perceived agreement relative to the amount of required agreement, or $\emptyset_2 = G_1 - PAGR$, and
2. Perceived accuracy relative to the amount of required accuracy, or $\emptyset_2 = G_2 - PACC$.

The system variables change from AGR, ACC, and REL to

1. Agreement relative to required agreement, or $\Psi_1 = (G_1A - AGR, G_1B - AGR)$
2. Accuracy relative to required accuracy, or $\Psi_2 = (G_2A - ACCA, G_2B - ACCB)$
3. Realization relative to required realization, or $\Psi_3 = (G_3A - RELA, G_3B - RELB)$.

Table 2 presents a summary of these new system and intrapersonal variables.

It should be noted that Ψ_1, Ψ_2, and Ψ_3 are two dimensional vectors since we have implicitly assumed a two-person system. Two advantages of a vector notation are that the number of persons in the system can be incorporated directly into the dimensionality of the vector, and that maximal information can be retained with a relatively simple notation.

Table 2. Intrapersonal and System Variables Redefined.

Intrapersonal

$\emptyset_1 A = G_1 A - PAGRA$ $\qquad$ $\emptyset_1 B = G_1 B - PAGRB$

$\emptyset_2 A = G_2 A - PACCA$ $\qquad$ $\emptyset_2 B = G_2 B - PACCB$

System

$$\Psi_1 = (G_1 A - AGR,\ G_1 B - AGR)$$
$$\Psi_2 = (G_2 A - ACCA,\ G_2 B - ACCB)$$
$$\Psi_3 = (G_3 A - RELA,\ G_3 B - RELB)$$

Because vector notation may be unfamiliar, making interpretation difficult, Appendix A presents a more thorough explanation and a worked example using this notation.

It should be now be obvious that the scalar $1/|\Psi|^2$, derived from the state vector $\Psi = \Psi_1 + \Psi_2 + \Psi_3$, is a measure of the system's "complementarity of expectations." The greater the value of $1/|\Psi|^2$, the greater the complementarity of expectations. In order to avoid future possible confusion, we shall refer to $1/|\Psi|^2$ as the degree of actual system consensus. Similarly, we shall refer to $\emptyset_1$ and $\emptyset_2$ as perceived individual agreement and perceived individual accuracy respectively; or, when referring to both simultaneously, simply as perceived individual consensus. Although this multiplies the terminology, it will help in distinguishing these variables from earlier ones.

Rewriting Propositions 1, 2, and 3 to include the redefined variables, we have:

Proposition 1': The greater the degree of actual system consensus, the greater the degree of coordination.

Proposition 2': The greater the degree of perceived individual agreement, the less the amount of persuasive communication.

Proposition 3': The greater the amount of perceived individual accuracy, the less the amount of informative communication.

In discussing the work of Newcomb, Chaffee and McLeod, and Wackman and Beatty, no propositions about the effects of the amount of communication on intrapersonal or system variables were offered. This was done not because those authors failed to provide such propositions, but rather because this author maintains that the sheer amount of communication (measured in terms of number of words, length of time talking, length of association, or whatever) should not necessarily result in greater perceived individual consensus or greater actual system consensus. We are not arguing that accurate information transfer or effective persuasive styles could not accomplish these ends, but rather that such a crude measure of communication as the amount of this or that symbolic form bears no relationship to the intrapersonal or system variables defined above. There is some empirical evidence for this contention. A study by Udry, Nelson, and Nelson (1961) found no significant correlations between various measures of the amount of communication and agreement, understanding, or perceived agreement.

As a result, the following propositions will relate amount of communication to the variables of interest:

Proposition 4': The greater the amount of communication generated within the system, the greater or lesser the amount of actual system consensus.[6]

Proposition 5': The greater the amount of persuasive communication, the greater or lesser the amount of perceived individual agreement.[6]

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[6]These propositions imply either a negative linear or a positive linear relationship. This linear relationship cannot reasonably hold over the entire range in the negative case. If it did, then it would be possible for an essentially negligible amount of communication to produce large amounts of perceived and actual consensus. This is completely at odds with all that we have argued thus far. To circumvent this problem, we assume that the negative relationship is linear only after a certain threshold has been reached and that these propositions apply only within that range. Figure 4 should make this clear.

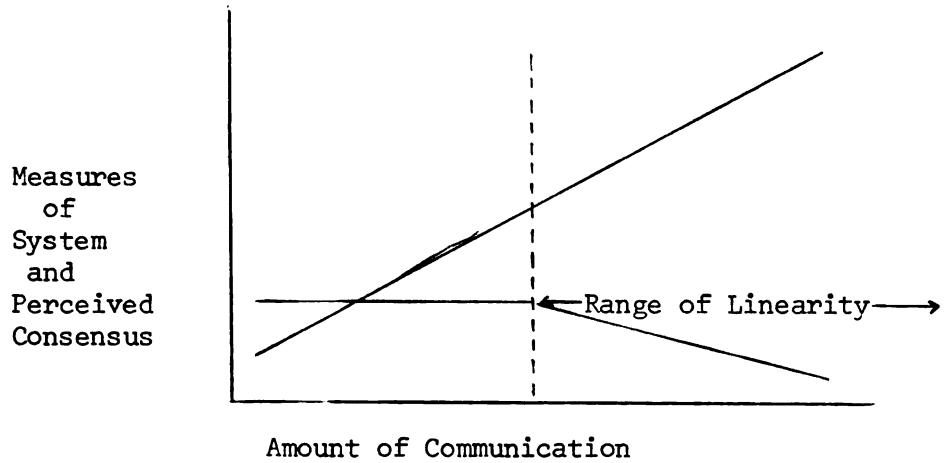

Figure 4. Range of Applicability of Propositions 4' and 5'.

Proposition 6': The greater the amount of informative communication, the greater or lesser the amount of perceived individual accuracy.

Essentially, these three propositions treat relationship between "amount of communication" and the various consensus states as variable and, as we shall see, predictions about the behavior of the system will be determined from various values of this variable relationship.

A final proposition will close our system of variables. The ability to actually solve a problem, complete a task, respond to an exigence, or, in general, to physically coordinate activities should produce positive changes in perceived individual consensus. Hence, we have:

Proposition 7': The greater the degree of coordination, the greater the degree of perceived individual agreement.

Proposition 8': The greater the degree of coordination, the greater the degree of perceived individual accuracy.

Assuming these propositions to be causal, a schematic model linking the ten variables with one another according to the propositions can be developed, as in Figure 5. Furthermore, assuming the propositions to be linear in addition to sequential and sufficient, the schematic model can be represented in an isomorphic set of ten linear differential

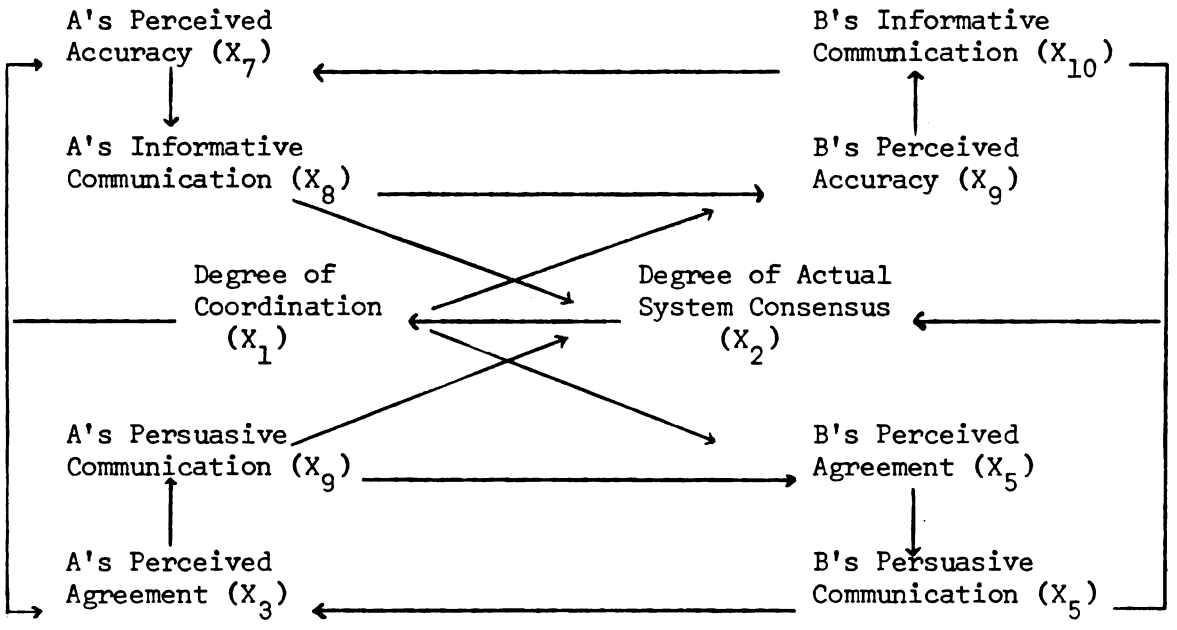

Figure 5. A Schematic Representation of Propositions 1' - 8'.

equations according to the techniques suggested earlier in this chapter.

The set of equations are:

1. $dX_1/dt = a_{11}X_1 + a_{12}X_2$ (3)

2. $dX_2dt = a_{22}X_2 + a_{24}X_4 + a_{26}X_6 + a_{28}X_8 + a_{210}X_{10}$ (4)

3. $dX_3/dt = a_{31}X_1 + a_{33}X_3 + a_{36}X_6$ (5)

4. $dX_4/dt = a_{43}X_3 + a_{44}X_4$ (6)

5. $dX_5/dt = a_{51}X_1 + a_{54}X_4 + a_{55}X_5$ (7)

6. $dX_6/dt = a_{65}X_5 + a_{66}X_6$ (8)

7. $dX_7/dt = a_{71}X + a_{77}X_7 + a_{710}X_{10}$ (9)

8. $dX_8/dt = a_{87}X_7 + a_{88}X_8$ (10)

9. $dX_9/dt = a_{91}X_1 + a_{98}X_8 + a_{99}X_9$ (11)

10. $dX_{10}/dt = a_{109}X_9 + a_{1010}X_{10}$ (12)

This set represents a first-order approximation of the time rate of change of interpersonal communication systems as we have defined and analyzed them, and it shall be our object of analysis for the remainder of the chapter.

What remains to be shown is that this model is a cybernetic representation of a set of what appear to be causal relationships. The reasons are threefold: (1) the redefinitions of the intrapersonal and system variables, (2) the control function that is played by communication, and (3) the relationships between (a) perceived individual agreement and persuasive communication and (b) perceived individual accuracy and informative communication. First, the definitions of perceived individual consensus and actual system consensus differ from earlier definitions of conceptually similar variables in that they are expressed as differences from some expected or desired value, the goal state G_i. This value is the "referent signal" of most cybernetic analyses and is the value against which perceived levels of consensus are compared. Second, because the relationship between communication and perceived individual consensus and actual system consensus has been left variable,[7] that relationship controls the overall time rate of change of the interpersonal system. This relationship becomes the "control mechanism" of most cybernetic systems except that the mechanism need not be homeostatically oriented but can be deviation-oriented--a significant departure from the emphasis on control in cybernetics. Third, because perceived individual agreement and perceived individual accuracy have been defined as difference variables,

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[7] If the relationship is positive, then discrepancies from goal states are decreased; if negative, then discrepancies are increased.

their values are discrepancies or errors from the goal states; and it is these errors which determine the generation of communication. Thus, these two intrapersonal variables serve the "comparator function" of most cybernetic systems which, in turn, activates the control mechanism, persuasive and informative communication. Therefore, the conditions for transforming cybernetic relationships into mutual causal ones have been satisfied and the essentially purposive and goal-directed phenomenon--interpersonal communication-- has been modeled with a cybernetic logic adapted to fit causal frameworks.

Derivations from the Consensus Model of Interpersonal Systems

In this section we shall analyze the conditions for positive-stable feedback for our cybernetic model. This shall be accomplished according to the techniques discussed in the second section of this chapter. In order to make our already complicated analysis a bit more tractable, we shall restrict the mathematical analysis to only the first six variables of equations (3) through (12) of the previous section. This restriction modifies the schematic representation of the model as in Figure 6, but it does not in any way invalidate the model since A's perceived individual

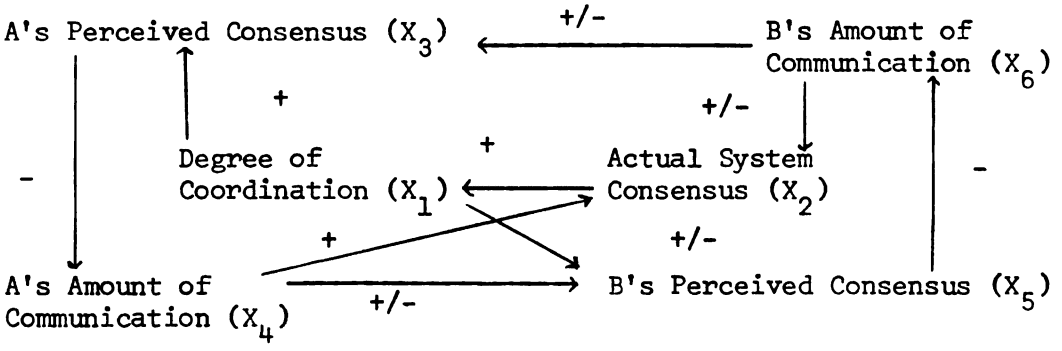

Figure 6. A Schematic Representation of the Restricted Model.

agreement and A's perceived individual accuracy can be summated to A's perceived consensus; this can also be done for B and for persuasive and informative communication. Such a summary reduces the number of variables and equations to:

1. $dX_1/dt = a_{11}X_1 + a_{12}X_2$

2. $dX_2/dt = a_{22}X_2 + a_{24}X_4 + a_{26}X_6$

3. $dX_3/dt = a_{31}X_1 + a_{33}X_3 + a_{36}X_6$

4. $dX_4/dt = a_{43}X_3 + a_{44}X_4$

5. $dX_5/dt = a_{54}X_4 + a_{51}X_1 + a_{55}X_5$

6. $dX_6/dt = a_{65}X_5 + a_{66}X_6$

Thus, the necessary conditions for stability become

1. $\sum_{i=1}^{6} a_{ii} < 0$ and (1)

2. $\|a_{ij}\| > 0$ since n = 6. (2a)

Unfortunately, there is little else that can be done with condition (1) except to hope that it is satisfied. This is accomplished if <u>each</u> a_{ii} is less than zero or if some combination of a_{ii} terms less than zero is greater in absolute value than the remaining a_{ii} terms. Otherwise, we can hope that most of the variability in any one variable is already explained by the variability in other real variables so that each a_{ii} is essentially zero. This latter situation seems unreasonable given the present state of the art in the social sciences. So, in order to proceed let us assume that each a_{ii} is less than zero.

Condition (2a) can be investigated by evaluating the determinant a_{ij} through standard techniques.[8] The details of the technique for this case are presented in Appendix B. The results are:

$$\begin{aligned}\|a_{ij}\| = {} & a_{11}a_{22}a_{33}a_{44}a_{55}a_{66} \\ & - a_{11}a_{22}(a_{43}a_{36}a_{65}a_{54}) \\ & - a_{33}a_{44}(a_{12}a_{26}a_{65}a_{51}) \\ & - a_{55}a_{66}(a_{12}a_{24}a_{43}a_{31}) \\ & - a_{12}a_{24}a_{43}a_{36}a_{65}a_{51} \\ & - a_{12}a_{26}a_{65}a_{54}a_{43}a_{31}\end{aligned}$$

which must be greater than zero for overall system stability. For the purposes of later reference let us label

1. $a_{11}a_{22}a_{33}a_{44}a_{55}a_{66} = t_1$
2. $- a_{11}a_{22}(a_{43}a_{36}a_{65}a_{54}) = t_2$
3. $- a_{33}a_{44}(a_{12}a_{26}a_{65}a_{51}) = t_3$
4. $- a_{55}a_{66}(a_{12}a_{24}a_{43}a_{31}) = t_4$
5. $- a_{12}a_{24}a_{43}a_{36}a_{65}a_{51} = t_5$
6. $- a_{12}a_{26}a_{65}a_{54}a_{43}a_{31} = t_6$

We also see that because we assumed that each a_{ii} is less than zero, t_1 must be greater than zero and $a_{11}a_{22}$, $a_{33}a_{44}$, $a_{55}a_{66}$ are each greater than zero. What remains to be determined, then, are the signs of the

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[8] Marcus, M. and Minc, H. Introduction to Linear Algebra, MacMillan Co., New York, 1965, Chapter 2.

three terms in parentheses in t_2, t_3, and t_4 and the signs of the two six-element terms, t_5 and t_6.

For the purposes of interpretation, it should be noted that in Figure 6 there are three four-variable loops corresponding to terms t_2, t_3, and t_4, two six-variable loops corresponding to t_5 and t_6. Each of the six variables appears in four of the loops. Hence, the effects of any variable on itself at a later time is due to the combined effects of four different loops. The overall effect of any variable on itself is determined by the sum of the products of the correlation coefficients around the loops in which the variable appears. For example, X_1 appears in t_3, t_4, t_5, and t_6 but not in t_2:

$$t_6: \quad X_1 \longrightarrow X_3 \longrightarrow X_4 \longrightarrow X_5 \longrightarrow X_6 \longrightarrow X_2 \longrightarrow X_1$$

$$t_5: \quad X_1 \longrightarrow X_5 \longrightarrow X_6 \longrightarrow X_3 \longrightarrow X_4 \longrightarrow X_2 \longrightarrow X_1$$

and the parenthetical terms of

$$t_4: \quad X_1 \longrightarrow X_3 \longrightarrow X_4 \longrightarrow X_2 \longrightarrow X_1$$

$$t_3: \quad X_1 \longrightarrow X_5 \longrightarrow X_6 \longrightarrow X_2 \longrightarrow X_1$$

but not

$$t_2: \quad X_4 \longrightarrow X_5 \longrightarrow X_6 \longrightarrow X_3 \longrightarrow X_4.$$

Obviously, Maruyama was not far afield in his analysis. It is also worth noting that condition (2a) would be greatly simplified if either a_{11}, a_{33}, a_{55} all were equal to zero, or if a_{22}, a_{44}, a_{66} all equalled zero or were negligibly small. In either case only t_5 and t_6 would remain. Thus, it appears valuable to have variables whose values are influenced by as few other variables possible, which is equivalent to saying that the stability conditions will be greatly simplfied when some obviously sufficient relationships are included.

The immediate question, however, is the conditions under which $\|a_{ij}\|$ will be greater than zero. As yet, we have not applied the proposed sign relationships on a_{31}, a_{43}, a_{65}, a_{51}, and a_{12}, and we need not since stability conditions can be developed without this constraint. However, one of the purposes of this analysis is to take advantage of "known" relationships to deduce other hypotheses representative of a whole system of interrelationships. That is, certain assumptions about the internal relationships among variables (the propositions) are made in order to derive hypotheses about overall system characteristics. So, assuming the proposed relationships on a_{31}, a_{43}, a_{65}, a_{51}, and a_{12}, hold in Figure 6, we are left to specify only four other signs: a_{54}, a_{36}, a_{24}, and a_{26}. Since each of these four terms can take on only two values, + or -, then there are 2^4 or sixteen possible situations detailed in Table 3.

Table 3. The Sixteen Possible Situations Based on Different Communication Styles.

	1	2	3a	3b	4	5	6a	6b	7a	7b	8a	8b	9a	9b	10a	10b
a_{24}	+	-	-	+	-	+	+	+	-	+	+	-	-	-	+	-
a_{54}	+	-	-	+	+	-	-	+	+	+	-	-	+	-	-	+
a_{36}	+	-	+	-	+	-	+	-	+	+	-	-	-	+	+	-
a_{26}	+	-	+	-	-	+	+	+	+	-	-	+	-	-	-	+

It should be noted that of the sixteen possibilities, only ten are truly different. Six are degenerate due to the interchangeability of person A and person B. In turn, this interchangeability implies that $a_{65} = a_{43}$ and $a_{31} = a_{51}$.

Now if we assume that the proposed relationships hold, and

1. if $a_{24}, a_{54}, a_{36}, a_{26} > 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_4 + t_3| > |t_2 + t_5 + t_6|$;

2. if $a_{24}, a_{54}, a_{36}, a_{26} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1| > |t_2 + t_3 + t_4 + t_5 + t_6|$;

3a and 3b. if $a_{54}, a_{24} > 0$ and $a_{26}, a_{36} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_2 + t_3 + t_5 + t_6| > |t_4|$;

4. if $a_{54}, a_{36} > 0$, $a_{24}, a_{26} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_5 + t_6| > |t_2 + t_3 + t_4|$;

5. if $a_{54}, a_{36} < 0$, $a_{24}, a_{26} > 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_3 + t_4 + t_5 + t_6| > |t_2|$;

6a and 6b. if $a_{24}, a_{26}, a_{36} > 0$, $a_{54} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_2 + t_3 + t_4 + t_6| > |t_5|$;

7a and 7b. if $a_{24} < 0$, $a_{26}, a_{36}, a_{54} > 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_3 + t_6| > |t_2 + t_4 + t_5|$;

8a and 8b. if $a_{24} > 0$, $a_{26}, a_{36}, a_{54} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_3 + t_6| > |t_2 + t_4 + t_5|$;

9a and 9b. if $a_{24}, a_{36}, a_{26} < 0$, and $a_{54} > 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_2 + t_5| > |t_3 + t_4 + t_6|$;

10a and 10b. if $a_{24}, a_{36} > 0$ and $a_{54}, a_{26} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_2 + t_4| > |t_3 + t_5 + t_6|$.

Before attempting to provide some specific interpretation to this mass of results, some general remarks on the nature of a_{ij} can be made. If terms t_1 through t_6 were positive, then certainly a_{ij} 0 and

condition (2a) would be satisfied. However, to meet the condition in this fashion, all the loops would have to be deviation-counteracting (that is, negative, since each is multiplied by a minus) and, hence, no "growth" or deviation-amplifying loops would be present. Thus, the system would be stable-negative or homeostatic overall. This result is general and implies that growth and stability are competitive processes--an intuitively obvious point now made rigorous. Blalock (1969, p. 119) supports the above argument indirectly when he indicates the general stability condition for a single k-variable loop:

$$a_{11}a_{22}\cdots a_{kk} + (-1)^{k-1}a_{21}a_{32}a_{43}\cdots a_{kk-1}a_{1k}.$$

If k is even the above term must be greater than zero (condition (2a)), but $(-1)^{k-1}$ will be odd so that $a_{21}a_{32}\cdots a_{1k}$ must be less than zero or deviation-counteracting. If k is odd the above term must be less than zero, but $(-1)^{k-1} = 1$ so that $a_{21}a_{32}\cdots a_{1k}$ must again be less than zero or deviation-counteracting.[9] The conclusion, both for the general case and for our particular example, is that to simultaneously satisfy conditions for both growth and stability will require not only the signs of the products representing the causal loops but also the relative magnitude of those products.

In interpreting the results presented in Table 3 we find that certain of the situations need not be considered because they are empirically implausible; they include situations 5, 6, 8, and 10. These situations are implausible because each posits for A or B or both that communication

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[9] It is important to note that this analysis assumes that $|a_{11}a_{22} \cdots a_{nn}| < |a_{21}a_{32} \cdots a_{1n}|$.

can simultaneously increase discrepancy values for perceived individual consensus while decreasing discrepancy values for actual system consensus. While it is possible to conjure examples of these situations, it would be difficult to defend any of them as representative of persistent and long-term communication styles within interpersonal relationships. Thus, although predicted through the logic of enumeration, these situations must be rejected on empirical grounds.

Situations 4, 7, and 9, on the other hand, represent empirical situations in which A or B or both adopt communication styles which reduce discrepancies in perceived individual consensus but amplify discrepancy values for actual system consensus. These situations are akin to interpersonal relationships which attempt to "keep the peace" rather than resolve perceived disagreements and misunderstandings. Mathematically, each of these situations can achieve simultaneous growth and stability if the necessary conditions indicated earlier are satisfied. Once again, though, situations 4, 7, and 9 represent unusual communication styles and, as a result are difficult to exemplify or imagine. The more common situations are those in which communication styles act similarly on both actual and perceived discrepancies. These are represented by situations 1, 2, and 3; let us examine each in turn.

Situation 2 is the most readily interpretable. If the communication styles of A and B always increase discrepancy values for perceived individual consensus, then the system can achieve an overall stability only if the magnitude of t_1 is greater than the sum of the magnitudes of the other five loops--a highly improbable state of affairs. Because of the improbability of stability, this system could exhibit high levels of

coordination and consensus if the direction of the initial kick was toward more coordination or greater intrapersonal or system consensus; that is, the system is growth-oriented with five deviation-amplifying loops. However, because of its instability, this system is highly susceptible to decay and disintegration.[10]

Situation 3 represents the case in which only one of the participants adopts a communication style which seeks to reduce discrepancies. It should be noted that this need not be the same individual from time unit to time unit since A and B are interchangeable. What is of particular interest in situation 3 is the high probability of stability due to the four deviation-counteracting loops; and this results from a relationship in which only one of the participants seeks to reduce discrepancies. Of course, as a result of the high probability of stability, the number of deviation-amplifying loops is one and probability of growth minimal. Hence, situation 3 is the direct opposite of situation 2, exhibiting high probability of stability rather than growth.

Situation 1 can be viewed as the optimal system state somewhere between situations 2 and 3. In this case, all communication acts to reduce discrepancy values for perceived individual consensus and actual system consensus. The probability of achieving overall stability is greater than that of situation 2 but less than that of situation 3, while the chances for a stable-positive system (growth-oriented) is less than that of situation 2 but greater than situation 3. Thus, we are confronted once again with the competitive nature of growth and stability processes

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[10] In the present case, decay and disintegration mean very low levels of coordination and little intrapersonal or system consensus.

and the obviously sensitive balance which must be maintained between the two if a system is to survive the instabilities of growth and decay and escape the rigidity of unaltering homeostatis.

Having completed the analysis and interpretation, we can now draw some general conclusions and state a specific hypothesis for this model of interpersonal communication systems. First, the mathematically astute reader may be unsatisfied with the rigor with which the necessary conditions for stable-positive feedback were developed and applied. As was pointed out in the second section of this chapter, more precise conditions could be used if numerical estimates of the a_{ij} coefficients were available. Given the rather rough and intuitive state of verbal propositions about interpersonal communication systems, such estimates are not available and if they were probably ought not be trusted. Hence, we have attempted to compromise tight logical requirements with empirical constraints. Bailey (1971, p. 69) upholds this approach to theory building, concluding his discussion of empirical versus logical requirements with the maxim: "Surely imperfect theory is better than no theory at all."

Second, given numerical estimates of a_{ij}, a first-order approximation of the degree of stability of the system can be obtained by determining how much greater than or less than zero $\|a_{ij}\|$ is and how much greater than or less than 0 $\sum a_{ii}$ is. This approximation can then be used as a predictor of the susceptibility of the relationship to rigidity (no growth) or to disintegration (no stability).

Third, throughout this chapter, there has been an implicit assumption that all systems must establish and maintain mechanisms which insure overall stability as well as the capability of adaptation to the random disturbances which impinge on the system. Many systems' theorists have argued

this position (for example, Buckley (1967). Furthermore, Speer's (1970) critique and review of theory in interpersonal situations intimated that, both in therapy for disturbed families and in prescriptions for increasing the longevity and success of "normal" families, growth as well as stability ought be emphasized. Granting the (untestable) postulate,

Proposition 9': The longevity and success of complex systems depends on the maintenance of mechanisms for overall stability and mechanisms insuring the capability of growth,

the following hypothesis on communication styles can be derived:

Hypothesis: The greater the correlation between the amount of communication and perceived individual consensus, and the greater the correlation between the amount of communication and actual system consensus for both A and B, the greater the probability of system longevity and success.

This result is basically a statement of the conditions of situation 2 and can be viewed as a hypothesis relating a certain communication style (as measured by the correlation coefficients) to system longevity and success. In the next chapter, we turn to questions involving the test of this hypothesis.

Summary and Implications for Theory Construction

Because of the length and complexity of the foregoing discussion, it might be wise to summarize the ground that has been covered thus far and to make explicit the general implications of the techniques developed. To summarize the major developments in one sentence: Given a set of variables related in causal loop structures, then the methods of this chapter can be used to derive communication hypotheses dependent upon the particular system of variables and their structural characteristics. That is, system hypotheses can be derived and tested with communication as the system parameter of primary interest.

This method for developing such hypotheses can be summarized as follows:

1. A set of verbal propositions is developed either through a review of pertinent literature, or through reasoning to a set of plausible postulates. This set must be closed, assumed to be causal, and specific enough to indicate the direction of relationship between variables in all propositions.

2. The propositions are transformed into a schematic representation (such as that of Figure 6, page 35) so that the number and interconnection of the loops can be clearly identified.

3. From the schematic diagram, the rate of change of any one variable (say X) is assumed to vary linearly and additively with all other variables which have causal arrows pointing to X. The rate of change of each X_i, $^{dXi}/dt$ can then be written as a first-order, linear differential equation with constant coefficients by equating each $^{dXi}/dt$ with a linear sum of all other variables which have arrows pointing to X_i.

4. Evaluate the determinant of coefficients, $\|a_{ij}\|$, for the set of conditions which lead to stability, and within each condition determine the number of deviation-amplifying loops.

5a. If the theorist assumes that stability alone is the fundamental necessary condition for system success, satisfaction, or longevity, then the relationship between the stability conditions and the output measures becomes the system hypothesis to be tested.

5b. If it is assumed that an optimal balance between flexibility and stability is the fundamental necessary condition for system success, satisfaction, or longevity, then the relationship between the flexibility-stability conditions and the output measures becomes the system hypothesis to be tested.

If it can be also shown or assumed that the relationship between the amounts of communication and other dependent variables is itself variable across output levels (as in Propositions 4', 5', and 6'), then communication becomes the parameter which determines the stability or stability-flexibility characteristics of the system. With this added assumption, the derived, testable hypothesis will always relate communication as the parameter of stability or flexibility-stability to the output measures of satisfaction, successfulness, or longevity.

The technique described above has certain advantages over the more common approaches to theory construction which characterize communication study. First, the hypotheses generated are clearly systemic hypotheses in that they depend upon the set of verbal propositions and the interrelation among the members of the set. If the causal arrows of Figure 6 or the signs associated with those arrows were altered, the same derived hypotheses could not be obtained. That is, the hypotheses are derived about the system described by the propositions and their interrelation. In this way, a system's analysis is much more than a purely theoretic analysis with no pragmatic import and cannot be subject to the usual criticism that the analysis is a mere verbal translation of standard techniques. Second, the derived hypotheses cannot be deduced through the loose syllogistic reasoning (Zetterberg, 1965; Costner and Leik, 1964) typically used for making deductions in social theory. Rather, the derived hypotheses depend upon first, the mathematization of the verbal theory and, then, upon certain powerful theorems from the theory of simultaneous, first-order linear differential equations, Hence, the results cannot be obtained through simpler deductive procedures. Third, the technique developed makes possible a qualitative analysis of the dynamics of social systems without the difficult methodological problems associated with over-time data gathering. Obviously, this method is not equivalent to gathering data on each variable over time but it is a significant improvement over the usual static, "point-in-time" hypotheses which characterize social research. Fourth, the method is relatively flexible since it can meet the assumptions of mutual causal systems (as described by Maruyama) or the assumptions of modified cybernetic

systems (as described on pages 15 through 17), and since the theorist can opt for stability only or stability plus flexibility conditions. Furthermore, the method can be applied to any content area for which the assumptions of causal loops among variables, a closed system of variables, and linear, additive relationships among variables can be met. On the other hand, the approach provides enough of a "cookbook" style to permit even the mathematically unsophisticated to apply the methods to substantive problems.

Although we have focused solely on the implications for theory construction in this summary of Chapter I, the significance of the model of interpersonal communication should not be underplayed. However, we shall refrain from comment on the implications of the model itself for interpersonal communication until the final chapter when a data-based appraisal can be offered.

CHAPTER II

METHODS AND PROCEDURES

This chapter presents the procedures, operationalizations, and methods of statistical analysis developed for putting the model of Chapter I to an empirical test. Although the discussion here will be primarily descriptive, three issues of general concern will be argued. The first concerns the testing of synthetic versus explanatory deductive theories. The second concerns the characteristics of the general class of objects of coorientation (the X's of Chapter I) which can rightfully be chosen for the model. Third, certain of the difficulties arising in interpreting coorientational data will be treated.

Testing Synthetic Deductive and Explanatory Deductive Theories

The recent sociological literature is giving considerably more attention to the techniques and problems of theory construction and validation than in the past (Blalock, 1969; Bailey, 1971; Costner and Leik, 1964). One issue of concern to this study involves the pros and cons of testing deduced hypotheses of a theory versus testing the propositions underlying those hypotheses. We shall argue that the model presented here is best tested through testing the deduced hypotheses.

Bailey (1971, p. 58) distinguishes two general classes of theory: synthetic deductive and explanatory deductive. The two are different

in terms of their method of formulation and in terms of their testability. Explanatory deductive theories take "known" empirical generalizations and seek to set down postulates from which empirical generalizations can be deduced. Usually the postulates are themselves untestable. On the other hand, synthetic deductive theories take propositions (both empirically established and stipulated) and deduce testable hypotheses from them. The propositions, themselves, may or may not be testable.

Now, the model which has been developed here is not a pure example of either type of theory. It has elements of the synthetic deductive theory since the underlying propositions are, themselves, testable. Also, elements of the explanatory deductive type are present at two levels. To deduce the derived hypotheses, a postulate about system stability and growth is necessary (Proposition 9'). Without this postulate, the deduction would not follow. This constitutes an untestable postulate characteristic of explanatory deductive theory. At another level, the testable, but largely unverified, propositions which constitute the structure of the model (see Figure 5) are themselves derived from unspecified assumptions. For example, it is assumed that the accurate transfer of symbolic information is a necessary and sufficient condition for interpersonal predictability.

Thus, it appears that there are two levels at which the model of Chapter I can be tested: at the level of the underlying propositions and at the level of the deduced hypotheses. The former level represents the explanatory deductive aspects of the model and serves primarily as a test of the reasoning (from the non-explicit postulates) on which the propositions are based. The latter level represents the synthetic deductive aspects of the model and serves primarily as a test of the

underlying propositions and the postulate on which it is based. Let us consider the merits and demerits of each approach.

To adequately test the model of Figure 5 or even the simplified model of Figure 6 requires not merely a test of the eight propositions each in isolation, but also of their overall interrelation. This interrelation, as represented in equations (3) - (12), is very complex because it relates the time rate of change of each variable to the value of the other variables. Classical design methodologies (Campbell, 1963) are not suited to this complex situation. Although the techniques of path analysis applied to panel data suggest themselves as a method (see for example, Heise, 1971), they too are inadequate. The model even in its simplified form is neither recursive nor block-recursive (as required by path analysis) and, hence, cannot be attacked with that methodology. There has been some effort within econometrics to treat over-time data in non-recursive systems (Koopmans, 1949), as is the case here, but developments are limited and relatively unknown among the other social sciences. Thus, although the individual propositions can be readily tested, their overall interrelationship cannot.

For this reason, validating the underlying propositions would not constitute validation of the derived hypotheses given the postulate.[11] On the other hand, a test of the derived hypotheses is at least an indirect test of the entire model. It is only an indirect test because even if the derived hypotheses are validated, then any set of propositions

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[11] Actually, even if the model were validated, the derived hypotheses would not be since the conditions for stability and growth are only necessary and not sufficient conditions. Hence, the truth of the propositions does not insure the truth of the consequences of the propositions.

leading to the same hypotheses would also be validated. As the number of variables increases, the number of possible models consistent with the derived hypotheses also increases. In a similar fashion, failure of the hypotheses does not necessarily indicate that the theory is false in its entirety but can mean that one or other of the propositions is in error.

On more pragmatic grounds, simply testing the propositions in isolation would require three separate studies, whereas one study would suffice for both derived hypotheses. Thus, for practical, theoretic, and methodological reasons, we will seek to test the model by testing the derived hypotheses. In so doing we are obtaining indirect evidence on the validity of the model as a whole.

The Necessary Conditions for Coorientation

Throughout the earlier discussion of coorientation, no attempt was made to explicate what persons in the interpersonal situation coorient about. Obviously, not any X can be input as an object of coorientation if we expect the propositions to be predictive. For example, let person A be a department chairman and B a graduate student in A's department. If X is "Country music," then high levels of system consensus could not possibly predict coordination on the tasks normally carried out by graduate students and their chairmen. Furthermore, low levels of perceived consensus on this X would be very unlikely to eventuate in communication activity designed to reintroduce consensus. Thus, for this particular model of coorientation the first criterion for choice among possible objects of coorientation is that they be objects which are pertinent to the general set of tasks carried out in interpersonal situations.

For example, if one chooses to study married couples, then the objects of coorientation chosen must be pertinent to the tasks requiring coordination in marriage (decision-making, handling quarrels, role-distribution, etc.). If the criterion of pertinence, as I shall call it, is not met then our predictive propositions are likely to fail.

Chaffee (1971, pp. 3-4) has developed other criteria which are more general than the pertinence criterion and also necessary conditions for the application of the coorientation strategy. When one or several of these criteria are not met, then the possibility of generating "pseudo-data" (as Chaffee calls it) is greatly enhanced. The criteria include:

1a. Person A is simultaneously oriented to B and to some object X.

1b. Person B is simultaneously oriented to A and to some object X.

2. The elements of X perceived by A are identical to those in B's orientation to X.

3. The cognitive and affective dimensions of judgment of X in A's orientation are identical to those in B's orientation to X.

4a. A is oriented toward B, cognitively and affectively.

4b. B is oriented toward A, cognitively and affectively.

5a. A is oriented toward P_1B.

5b. B is oriented toward P_1A.

6a. A sees P_1B as relevant to P_1A and his A-B orientation.

6b. B sees P_1A as relevant to P_1B and his B-A orientation.

7a. P_1B must be communicable to A.

7b. P_1A must be communicable to B.

With some obvious modifications to include the third order perceptions[12], these seven plus the pertinence criterion provide the rule for choosing among possible objects of coorientation. Criteria two and three can be satisfied by careful design and question construction. Criterion four can be satisfied by a judicious choice of dyads. In the present study, married couples will be used and it will be assumed that they are indeed oriented toward one another, cognitively and affectively.

Yet even within these constraints, there exist several classes of X's satisfying the remaining criteria: 1, 5, 6, and 7. For example, role prescriptions and role expectations (Levinger and Breedlove, 1966), or relational statements (Laing, Philipson, and Lee, 1966) would suffice but attitude items on topics of general interest would not. The point is that those classes of X's which satisfy Chaffee's criteria and the pertinence criterion can be used without fearing the generation of psuedo-data.

Procedural Rules as Objects of Coorientation

The pertinence criterion suggested above evaluates items as objects of coorientation relative to the tasks in which couples normally engage. The primary nature of these tasks is symbolic in that they generally involve coming to agreements, resolving disagreements, clarifying misunderstandings, making decisions, and the like. In short, the ability

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[12] 8a. A is oriented toward P_2B.
8b. B is oriented toward P_2A.
9a. P_2A must be communicable to B.
9b. P_2B must be communicable to A.
10a. A sees P_2B as relevant to P_1A and his A-B orientation.
10b. B sees P_2A as relevant to P_1B and his B-A orientation.

to coordinate activities in marriage necessitates completion of a set of tasks which are essentially symbolic. A recent position put forward by Cushman and Whiting (1972) argues that conjoint, combined, and coordinated human action is facilitated by the transfer of symbolic information when that symbolic information itself is governed and guided by content and procedural rules. A rule is a prescription for action which indicates what ought, must, or might follow in a specific set of circumstances. In particular, procedural rules are those implicit contracts which govern and guide the _way_ interactants carry out their communication activities. Procedural rules are meant to govern not the meaning of the messages generated but, for example, how or when messages might be sent, what sequences are permitted, what responses are acceptable, and the like. In principle, then, procedural rules fit the criteria for objects of coorientation quite well. That is, they meet the pertinence requirement by permitting coordination on the symbolic tasks of marriage, and Chaffee's requirements by virtue of the fact that they govern and guide the _relationship_ between A and B.[13]

Within the interpersonal communication literature itself, Miller, Nunnally, and Wackman (1972) have argued that consensus on the _what_ or _why_ of communication is much less important than consensus on the _how_ of communication. In fact, in their interpersonal training for married couples, they teach that requiring interpersonal consensus on a broad range of "what's" (such as political attitudes, interests, etc.) can be detrimental by stifling individual autonomy. Rather, the _way_ in which

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[13]Several studies in organizational communication have recognized at an intuitive level the importance of agreement, accuracy, and perceived agreement on procedural rules of communication (Russell, 1972; Berlo, _et. al._, 1971).

problems are to be handled, how decisions are to be made and interactions carried out require consensus. In other words, the rules governing interaction are the primary objects of consensus. However, the actual specification of such rules is at a very elementary level in their work. Nevertheless, the applicability of procedural rules as objects of coorientation cannot be disputed. As a class they satisfy the criteria for objects of coorientation provided above. In addition, they are closely tied to the theoretic framework of Chapter I in that the criteria for choosing among operationalizations is dictated by the theory. This latter bonus is of utmost importance in empirical research since the operationalization of a variable or concept can be achieved in numerous ways. The choice among alternative ways should be dictated by criteria other than happen-stance or ease. When the choice is guided by theory, then a stronger test of the theory is possible in that failure cannot be explained away by appealing to the inappropriateness of the operationalizations. Just as the measurement of mass became possible only after Newton's laws were established, so any operationalization is best carried out in the context of the theory for which it is relevant.

General Method and Procedures

The derived hypotheses were tested in a nonexperimental setting on a self-selected sample of married couples. The sole source of data was self-report in form, obtained through self-administered questionnaires. The five sections of the questionnaire sought to tap system and perceived individual consensus on rules, marital satisfaction and a prediction of marital longevity, and amount of communication generated by the husband and by the wife.

Pre-testing

A small, and relatively homogeneous group of graduate student couples served as subjects for a pre-test of an earlier form of the questionnaire. Because of the length and complexity of the questionnaire, results were used primarily to shorten and simplify the questions of sections I, IV, and V. The final form of the questionnaire is presented in Appendix C. At the time of the pre-test only one subject pair indicated any discomfort or anxiety concerning the information sought.

Sampling

The final sample consisted of 35 married couples from Madison, Wisconsin, and Lansing, Michigan, who volunteered to participate in the study. The subjects were run between mid-November, 1972 and mid-February, 1973. They were solicited from church groups (one in each city), from university housing in Madison, from a low-to-middle income housing cooperative in Lansing, and from undergraduate communication courses at the University of Wisconsin, Madison, and at Michigan State University, East Lansing. A copy of the leaflet circulated to the university housing in Madison and to the housing cooperative in Lansing are included in Appendix D.

Of the 35 dyads, three sets of questionnaires were not included in the final data analysis, leaving the final sample size at 32. One questionnaire had inadvertently left out section V in the collating process. In the other two sets, one of the partners failed to complete a significant number of questions in sections I and IV. It was felt that the data for these pairs could not be validly salvaged through the usual missing-data techniques.

Although the sample appears to represent a broad range on age and years married, and a less broad but variable range on socio-economic status, the self-selecting nature of the sample places severe limitations on the generalizability of the results. The violation of the assumption of randomness is not unique to this study but, in fact, seems to be characteristic of studies carried out on married couples (for example, Levinger and Breedlove, 1966). Unfortunately, there is no simple solution to this sampling problem when the information desired from respondents is personal and highly salient. In sum, the small sample size and its non-randomness requires that the data be treated primarily as exploratory and of limited generalizability.

Administrative procedures

Once subjects had been contacted and had volunteered their time, individual and group administration times were arranged at the convenience of the respondents. Sixteen of the pairs were administered the questionnaire individually and sixteen of the pairs in groups of two or more couples. In all cases husbands and wives filled out the questionnaires simultaneously and great care was taken to separate the spouses during this time. An administrator was always present to insure that the questions were answered separately.

The typical individual session took place in the home of the respondents. The administrator talked through the general instructions, a copy of which is presented as a cover sheet in Appendix C. The pair then opened their individual envelope, took one questionnaire each, separated, and began working. Upon completion, the subjects returned their questionnaires to their envelope, sealed it, and returned the envelope to the

administrator. At this point the pair was debriefed. Throughout the administration care was taken to give the subjects confidence that their anonymity was being guarded.

Instrumentation and Indices

In testing the deduced hypotheses, it is necessary to obtain or develop measures of the husband's and wife's communication activity, procedural rules to serve as objects of coorientation (ultimately to be used as indices of perceived individual consensus and actual system consensus), and measures of marital satisfaction and predictions of marital longevity. In this section, we shall indicate the choices made in each of the above areas, the validity and reliability of the measures when available, certain of the problems which arise with each measure, and the specific indices developed.

Measuring system consensus (X_1) and perceived consensus (X_3 and X_5)

Attempting to develop procedural rules applicable to a broad range of married couples and yet fit the criteria laid out by Cushman and Whiting (1972) proved to be no simple task. The literature employing a coorientational or person perception scheme tends to use rather simple scales for first and higher order perceptions (for example, Laing, Philipson, and Lee, 1966). Theory requires our operationalizations to be more complex.

The best sources of items for procedural rules was found to be observational rating scales used in the evaluation of family interaction (Behrens, et. al., 1969), in the evaluation of counselors' empathy (Kurtz, 1968) and in the evaluation of family

quarrels (Bach and Wyden, 1970). Observational scales from these sources attempted to tap a single dimension for each item, to provide a detailed verbal description for each level of the scale, and, presumably, to tap an important interpersonal skill. This combination made the adaptation of the scales to self-report questions relatively straightforward. The final set of items used in this study is to be found in Appendix C, Section I of the questionnaire, questions 1a, 2a, 3a, 4a, 5, 6a, and 7a. It should be noted that each question does give an indication of circumstances in which the rule is operative, as the Cushman and Whiting formulation requires, and a set of alternatives descriptive of the couple's behavior in the situation. The questions fall into four categories: (1) rules on how to quarrel (1a, 2a, 3a), (2) rules on discussing sensitive topics (4a), (3) rules on making decisions (5, 6a), and (4) rules on what topics can be brought up for discussion (7a). It is hoped that these four categories are simply dimensions of a more general construct described as procedural rules for transferring symbolic information. This set is obviously unique to interpersonal communication situations.

In order to obtain measures for P_2 and P_3, it was necessary to repeat the same questions two more times. Questions 1a, 2a, 3a, 4a, 5a, 6a, and 7a of Section IV (see Appendix C) ask the subject to answer the same set of questions in terms of what his spouse thinks. Questions 1b, 2b, 3b, 4b, 5b, 6b, and 7b of the same section ask him to predict what his spouse thinks that he thinks. In order to minimize the tendency to project one's own orientation to the other, Section IV did not follow Section I but was separated from it by other questions. Questions 1-6 in both sections were coded 1 to 7 by superimposing a clear plastic sheet which had premarked units equal in length to the vertical scale lines.

In order to obtain a measure of the importance of agreement and accuracy on each rule (constants we denoted as G_1 and G_2 in the previous chapter), the "b" questions of Section I and the "c" questions of Section IV were developed. Both attempt to measure a general intensity of feeling regarding disagreement or misunderstanding in terms of a propensity to communicate either persuasively (the "b" questions) or informatively (the "c" questions). These important measures, G_1 and G_2, will be used to weight the agreement and perceived agreement, accuracy, and perceived accuracy scores respectively, as indicated in the previous chapter.

Developing an index of a pair's actual system consensus and perceived individual consensus based on the P_1, P_2, P_3, G_1 and G_2 measures is, unfortunately, not a trivial matter. According to Wackman (1969), the general approach used to obtain indices of relational variables, such as agreement and accuracy, has been to use the so-called D^2 score. If X_i is $(P_1A)_i$ for the i^{th} item and Y_i is $(P_2B)_i$ for the i^{th} item, then

$$D^2 = \frac{\sum_{i=1}^{N} (Y_i - X_i)^2}{N}$$

is a measure of B's accuracy, where N equals the number of items. But, as both Wackman and Cronbach (1955) have shown, D^2 is not a pure measure but is confounded by individual response set factors. In fact, Wackman (1966, Appendix A) shows that

$$D^2 = (\overline{X} - \overline{Y})^2 + (s_x - s_y)^2 + 2s_x s_y (1-r_{xy}) \qquad (13)$$

where s_x is the standard deviation for the (P_1A) distribution, and s_y is the standard deviation of the (P_2B) distribution. The response set

differences give rise to the first two terms on the right in equation (13) and only the final term represents a "pure" measure of accuracy. One way to obtain such a measure is to use r_{xy} as an index of similarity rather than D^2. In this way, we are assured that $\overline{X} = \overline{Y}$ and $s_x = s_y$, and response set effects are controlled.

On the other hand, the standard error of estimate of the z-value corresponding to r_{xy} is $\sigma_z = 1/(N-3)^{1/2}$, where N equals the number of items (McNemar, p. 157). In the present case with thirteen items, σ_z equals .316 and, hence, r_{xy} as a measure of the degree of similarity is highly unstable. Furthermore, the measure of accuracy that is needed according to Chapter I is one in which the accuracy on each item is weighted by the importance of that item, in particular by G_2. This destroys the possibility of interpreting r_{xy} in any of the usual ways. Lastly, Wackman (1969, p. 17) presents some data to support his contentions as to the effects of response set on the D^2 index. The data are by no means unequivocal. The greatest correlations are between D and $(1-r_{xy})$ and they are significant at $\alpha = .05$. The correlations between D and $(\overline{X} - \overline{Y})^2$ and D and $2s_x s_y$ are low and not significant. The correlation between D and $(S_x - s_y)^2$ is significant, but only for person 1 and not for person 2. In sum, the data only confirm that the rejected D score in fact correlates highly with the proposed index, r_{xy}. For present purposes, were it not for the problem of instability and the necessity of weighting each X_i, Y_i pair, Wachman's approach would be the safest. But there is some condolence in the fact that, according to Wackman's own data, the greatest percentage of the variance in D^2 is explained by $(1 - r_{xy})$.

Thus, using the D^2 approach, the following indices were developed. As a measure of the amount of disagreement,

$$D^2_{agr} = \sum_{i=1}^{13} \left(\frac{G_1A + G_1B}{2}\right) i \left((P_1A)_i - (P_1B)_i\right)^2.$$

As a measure of the amount of inaccuracy,

$$D^2_{acc} = \sum_{i=1}^{13} \left((G_2A)_i \left((P_2A)_i - (P_1B)_i\right)^2 + (G_2B)_i \left((P_2B) - (P_1A)\right)^2\right).$$

As a measure of the degree of failure to realize,

$$D^2_{rel} = \sum_{i=1}^{13} \left(((P_3A)_i - (P_2B)_i)^2 + ((P_3B)_i - (P_2A)_i)^2\right)$$

And, the <u>inverse</u> of actual system consensus, D, depends on these indices as follows:

$$D = (D^2_{agr} + D^2_{acc} + D^2_{rel})^{1/2}.$$

It should be remembered throughout that D is a measure of <u>lack</u> of consensus and not of the amount of consensus. As a measure of <u>perceived</u> disagreement for A,

$$D^2_{pagrA} = \sum_{i=1}^{13} \left((G_1A)_i \left((P_1A)_i - (P_2A)_i\right)^2\right).$$

The amount of perceived inaccuracy for A is given by

$$D^2_{paccA} = \sum_{i=1}^{13} (G_2A)_i \left((P_3A)_i - (P_1A)_i\right)^2.$$

And, as before, the inverse of the perceived consensus for person A is

$$DPA = (D^2_{PAGRA} + D^2_{PACCA})^{1/2}.$$

There are similar indices for B's perceived consensus.

Measuring A's and B's communication (X_4 and X_6)

The instrument used to measure the amount of communication generated by A and B is an adaptation of the Primary Communication Inventory (PCI) (Navran, 1967) used widely in family and marital research (Petersen, 1969; Locke and Sabagh, 1956). The instrument is a self-report measure of verbal and non-verbal activity filled out by both spouses. The reliability of the instrument has not been reported at this time. No tests of its validity are reported either.

In order to obtain a measure of the amount of communication generated by A and B separately, three sub-indices from each questionnaire were formed. The first sub-index I_1A is a measure of A's report of his own communication activity (questions 6, 10, 12, 17, 18, 21, and 23 of Section V; see Appendix C). The second, I_2A, is A's report of his spouse's communication activity (questions 5, 7, 9, 11, 16, 19, 20, 22, and 24). The third, I_3A, is A's estimate of the couple's communication activity (questions 1, 3, 4, 8, 13, 14, 15, and 25). A similar set of sub-indices are calculated for B. To obtain an index of A's communication, the sub-indices were added as follows:

$$COMA = I_1A + I_2B + \left(\frac{I_3A + I_3B}{2}\right).$$

That is, A's communication is derived from an estimate by A of his own activity, an estimate by B of A's activity, and an average estimate by A and B of their communication together. A similar index is calculated for B.

Measuring satisfaction and prediction

The derived hypothesis of Chapter I is actually two hypotheses. The first concerns the satisfaction or adjustment of the marriage at a point in time. The second concerns the longevity of the marriage over time, that is, its long run successfulness. Instruments to measure these exact variables have been available since the early 1950's (Burgess and Wallin, 1953). These instruments, widely tested and validated, had been developed for use primarily in family therapy and counseling and did not find their way into research literature because of their length and complexity (up to 246 questions). However, Locke and Wallace (1959) have developed a short form of the tests which conforms to the constraints of research situations. Several studies have used this measure successfully in both experimental and field settings.

Locke and Wallace (1959, p. 254) report that the short-form adjustment test shows a split-half reliability corrected by Spearman-Brown formula of .90. Furthermore, of the sample of 236 married couples tested by Locke and Wallace, 48 were known to be maladjusted from psychiatric case study data. Only 17% of the maladjusted received scores of 100 or greater, while 96% of the adjusted group received scores of 100 or greater. Thus, the satisfaction test seems to be both reliable and valid. The test is reproduced in Section II of the questionnaire (see Appendix C).

The prediction test shows a reliability corrected by Spearman-Brown formula of .84. There was no longitudinal study carried out to validate the short-form prediction test. However, it showed a correlation of .47 with the adjustment test which is essentially the same as that between their longer counterparts. Hence, the prediction test has some degree of validity as well. The test is reproduced in Section III of the questionnaire.

The indices formed from each test are straightforward sums of the scores on each question, where the special scoring system developed by Locke and Wallace was used but is not indicated in Appendix C. On the prediction test, scores can range from 0 to 532 for men and from 5 to 502 for women. On the adjustment test, scores can range from 3 to 149.

Testing the Data

Since marital satisfaction and longevity are at least conceptually distinct if not operationally distinct variables, then the derived hypothesis ought to be tested separately for each. The reasoning developed in Chapter I suggested no difference between satisfaction at a point in time (the time of administration) and longevity over time, and, hence, none should be expected.

Now, a clear-cut test of the derived hypotheses for satisfaction would pit a low satisfaction group against a high satisfaction group on each of the estimates of a_{24}, a_{54}, a_{36}, and a_{26} (see Table 4). If in

Table 4. Primary Format for the Data Display and Testing.

Hi Satisfaction	Lo Satisfaction
est a_{24}	est a_{24}
est a_{54}	est a_{54}
est a_{36}	est a_{36}
est a_{26}	est a_{26}

each of the four cases the estimate of the a_{ij} coefficient is significantly greater in the high satisfaction than in the low satisfaction group, then

the derived hypothesis for satisfaction will have unequivocal support. A similar argument holds for the high longevity and low longevity groups.

It may not be clear that this constitutes a test of the derived hypothesis for satisfaction. The hypothesis in essence states that when the correlations between measures of communication and certain measures of consensus are all positive, than flexibility-stability is optimally balanced, while a system with all negative or with two negative (a_{24} and a_{54}) and two positive (a_{26} and a_{36}) correlations favors growth in the former case and stability in the latter case. Assuming that both satisfaction and longevity vary directly with an optimal balance of flexibility-stability, then the greater the satisfaction, the greater the observed correlations. The derived hypothesis does not expect that the correlations of the high satisfaction group will be positive and the low group all negative but that the correlations in the high satisfaction group will be greater than those of the low satisfaction group.

In studies involving marital adjustment and longevity, groups are usually not divided into high and low on the basis of the median. In order to insure a successful "manipulation," extreme groupings are usually used with middle range scores left out. This will be our primary mode of data display. Unfortunately, the measures of a_{ij} will be correlational and, hence, dependent on $1/(N-3)^{1/2}$ for their stability. Thus, using extreme groupings will increase the instability of our estimates by decreasing N while also increasing their purity.

The estimates of a_{24}, a_{54}, a_{36}, and a_{26} will of necessity be first-order partial correlations rather than product moment correlations. For example, an estimate of a_{36} is the degree of variability in X_3 attributable to the variability in X_6. According to Figure 6, this variability

can arise through the direct causal relationship between X_6 and X_3 and through the direct causal relationship between X_6 and X_3 and through the indirect causal relationship from X_6 to X_2 to X_1 and, finally, to X_3. Since only a measure of the direct influence between X_6 and X_3 is desired, the effects of the indirect path need to be controlled. Since no measure of X_1 is available, $r_{63.2}$ is the best estimate of a_{36}. Similarly, the best estimate of a_{54} is $r_{54.2}$. In an analogous way, the correlation between X_2 and X_4 in Figure 6 can arise through the path $X_4 \longrightarrow X_5 \longrightarrow X_6 \longrightarrow X_2$ as well as directly. Hence, the best estimate of a_{24} controls for the indirect path and is $r_{24.5}$. The best estimate of a_{26} is $r_{26.3}$.

The data display of Table 5 will then consist of partial correlation coefficients which are independent between the high and low groups but correlated across levels since they are based on the same sample. Unfortunately, no significance test exists for testing the overall differences between treatments and across correlated levels. But our primary interest is in the overall pattern and direction of the relationships, not in their mere differences. However, the significance of difference between partial correlation coefficients can be tested (Hays, p. 576; Blalock, p. 406) within one level. The test involves transforming the partial r's to z's by Fisher's Z-transformation and taking their difference relative to the standard error of estimate for difference between two z-scores. That is,

$$Z = \frac{z - z'}{\left(\frac{1}{N_1-3-k} + \frac{1}{N_2-3-k}\right)^{1/2}}$$

where N_i = the number of observations in group i, and k = the number of variables controlled in the partial correlation coefficient (one in this case). Obviously, the value of Z is directly dependent on the square root of the sample size. In fact, to obtain a Z = 1.96 (minimum value for α = .05, two-tailed) for the maximum group size in this study (N_1 = N_2 = 16) with k=1, z - z' must be at least .800. Obviously, with the small sample size of this study, significant differences will be difficult to obtain.

CHAPTER III

RESULTS

In this chapter data will be presented which is pertinent to testing the model of Chapter I, describing the overall characteristics of the sample, and evaluating the strength of the data itself. The chapter proceeds by presenting statistics descriptive of the individual measures, correlations among variables for the entire sample, and, finally, data for testing the satisfaction and the longevity hypotheses.

Descriptive Statistics for the Individual Measures

The means and standard deviations for average satisfaction, and husband and wife satisfaction are presented in Table 5. The difference between

Table 5. Means and Standard Deviations for Satisfaction.

	Mean	Std. Dev.
Average satisfaction	101.39	26.89
Husband satisfaction	100.94	30.03
Wife satisfaction	101.84	28.57

husband's and wife's mean satisfaction is not significant ($t = -.12$, $df = 62$). In addition, the correlation between husband's and wife's satisfaction is 0.741 and, hence, the mean is probably a valid measure of the couple's satisfaction.

Table 6 presents means and standard deviations for husband's, wife's, and average prediction of longevity scores.

Table 6. Means and Standard Deviations for Prediction of Longevity.

	Mean	Std. Dev.
Average prediction	328.02	59.94
Husband prediction	318.56	71.56
Wife prediction	337.47	74.90

The means on husband's and wife's prediction scores are not significantly different ($t = -1.02$, $df = 62$). Although the correlation between husbands' and wives' prediction scores was only 0.339, this is to be expected from the individual nature of the personality and demographic items which constitute this index.

Table 7 provides data similar to that of the previous tables but for communication. Husbands' and wives' communication is not significantly

Table 7. Means and Standard Deviations for Communication.

	Mean	Std. Dev.
Average communication	94.70	11.81
Husbands' communication	94.84	12.86
Wives' communication	94.56	11.82

different ($t = .09$, $df = 62$) and, in fact, these items correlate 0.900. This very high correlation casts some doubt on the independence of the measures of the amount of communication generated by the husband and by the wife.

Table 8 summarizes the means and standard deviations for the various con sensus measures. It should be remembered that the D measures are

Table 8. Means and Standard Deviations for Consensus Measures.

	Mean	Std. Dev.
D	18.59	4.83
DPA (Husband	10.01	3.41
DPB (Wife)	9.22	4.34

measures of dissimilarity and of the lack of system and perceived individual consensus. Husbands' and wives' are not significantly different on perceived dissensus (DPA, DPB) measures (t = .80, df = 62).

Correlations Descriptive of the Entire Sample

In order to obtain some indication of the strength of relationship among variables crucial to our model over the entire sample, various correlations among communication and dissensus variables were calculated and are presented in Table 9. Using the test presented in McNemar (1969, p. 156) for the significance of a correlation coefficient we find that any r greater than 0.348 will be significant at an α = .05 confidence level for df = 32 (two-tailed test). It is clear that all the r's in Table 9 are at least significant at α = .10.

Table 9. Correlations Among Communication and Dissensus Measures for the Entire Sample.

	COMH	COMW	D	DPH	DPW
COMH (4)	—				
COMW (6)	.900	—			
D (2)	-.403	-.377	—		
DPH (5)	-.377	-.387	.659	—	
DPW (3)	-.264	-.304	.266	.204	—

Now the correlations of Table 9 can be used to obtain estimates for the a_{ij} of the model as indicated earlier but here based on the entire sample. These estimates are presented in Table 10. It should be carefully noted that it is the absolute value of these partial correlations which represent the estimates of the a_{ij} since D, DPW, and DPH are dissensus measures. Of the first four correlations in Table 10, all indicate a slight positive relationship between communication and the consensus

Table 10. Estimates of a_{ij} from Total Sample Correlations.

a_{ij} Estimated	Estimate	Value
a_{24}	$r_{COMHxD \cdot DPW}$	-.183
a_{26}	$r_{COMWxD \cdot DPH}$	-.361
a_{45}	$r_{COMHxDPW \cdot D}$	-.178
a_{36}	$r_{COMWxDPH \cdot D}$	-.199
a_{56}	$r_{DPWxCOMW}$	-.304
a_{34}	$r_{DPHxCOMH}$	-.377

measures. Of these, only the estimate of a_{26} is significant ($\alpha = .05$, two-tailed). This should not be construed as a sex difference since essentially identical results obtain when husbands and wives are randomly assigned to the A and B role. The estimate of a_{34} is significant ($\alpha = .05$, df = 30, two-tailed) and that of a_{56} near significance (less than $\alpha = .10$, df = 30, two-tailed) but are opposite in sign to that suggested in propositions 2' and 3' of Chapter I. This fact will be of some significance later. In sum, the estimates of the a_{ij} in Table 10 represent the best estimates of the a_{ij} for the entire population.

Before turning to the data of primary interest, Table 11 presents several correlates of marital prediction and adjustment which are of

Table 11. Communication and Consensus Correlates of Marital Prediction and Adjustment.

	Average Satisfaction	Average Prediction
Average Satisfaction	-----	.640
Average Prediction	.640	-----
Communication Average	.710	.334
D	-.400	-.445
DPH	-.616	-.440
DPW	-.412	-.222

general interest in the family and marital research literature. Once again all correlations greater than 0.348 are significant (α = .05, df = 30, two-tailed).

Data Display for Satisfaction Groupings

In this section, the data pertinent to testing the derived hypothesis for satisfaction is presented and the appropriate statistical tests performed. The same statistics will be presented in two major divisions, each with two sub-divisions. The first division presents the total sample (N=32), first with husband and wife measures controlled, and second with husband and wife randomly assigned to the person A or person B role. The second division presents only the extreme scores in high and low groups, first with sex controlled and second with male and female randomly assigned to the A or B role. It was necessary to display the data in both forms since preliminary analyses indicated the possibility of strong sex difference. Since the possibility of sex differences is of interest in itself but cannot be accounted for by the model, it is valuable to retain that control, but it is only fair to evaluate the model on the randomized data.

The following four tables, Tables 12, 13, 14, and 15 present the satisfaction groupings and the appropriate Z value for significance of difference. A negative value for Z indicates that the direction is opposite of that predicted. In addition, Table 16 presents the mean satisfaction scores for each of the groupings of the previous four tables as a manipulation check. All the groups differ significantly on satisfaction by a t-test for the difference between independent sample means (α = .001, two-tailed). In fact, the means of the low group in this study compare

Table 12. Satisfaction Groups for Total Sample with H and W Controlled.

Partial r	Lo	Hi	Z
$r_{COMHxD \cdot DPW}$	-.553	.227	-2.09*
$r_{COMWxD \cdot DPH}$	-.327	.298	-1.58
$r_{COMHxDPW \cdot D}$	-.140	-.102	-0.09
$r_{COMWxDPH \cdot D}$	.401	-.377	2.01*

*Indicates significance at α = .05, two-tailed test.

Table 13. Satisfaction Groups for Total Sample with H and W Randomized.

Partial r	Lo	Hi	Z
$r_{COMAxD \cdot DPB}$	-.623	.211	-2.31*
$r_{COMBxD \cdot DPA}$	-.420	.230	-1.67**
$r_{COMAxDPB \cdot D}$	.350	-.340	1.76**
$r_{COMBxDPA \cdot D}$	.153	-.234	0.96

*Indicates significance at α = .05, two-tailed test.

**Indicates significance at α =.10, two-tailed test.

Table 14. Satisfaction Groups for Extreme Scores with H and W Controlled.

Partial r	Lo (N=11)	Hi (N=12)	Z
$r_{COMHxD \cdot DPW}$	-.499	.340	-1.74**
$r_{COMWxD \cdot DPH}$	-.323	-.023	-0.60
$r_{COMHxDPW \cdot D}$	-.205	-.260	0.11
$r_{COMWxDPH \cdot D}$	.278	-.357	1.27

**Indicates significance at = .10, two-tailed test.

Table 15. Satisfaction Groups for Extreme Scores with H and W Randomized.

Partial r	Lo (N=11)	Hi (N=12)	Z
$r_{COMAxD \cdot DPB}$	-.381	-.021	-0.76
$r_{COMBxD \cdot DPA}$	-.309	.210	-1.06
$r_{COMAxDPB \cdot D}$	.218	-.208	0.87
$r_{COMBxDPA \cdot D}$	-.203	-.425	0.50

Table 16. Mean Satisfaction Scores for High and Low Groups of Tables 12, 13, 14, and 15.

	Mean			
	Hi	Lo	t	df
Table 12	123.37	79.41	-7.52	30
Table 13	123.37	79.41	-7.52	30
Table 14	126.25	69.54	-9.85	21
Table 15	126.25	71.50	-9.36	22

favorably with the mean adjustment score for the maladjusted sample of couples reported by Hobert and Klausner (1959, p. 260) as 71.17). Similarly, the mean adjustment score for the well-adjusted couples was reported at 135.9, only slightly higher than the mean adjustment score in the high groups in this sample.

Data Display for Prediction Groupings

In this section, the data relevant to testing the second derived hypothesis (i.e., concerning marital longevity) is presented. The order of presentation, division among the groupings, and statistics presented and tested are identical to that of the previous section.

The following four tables, Tables 17, 18, 19, and 20 present the prediction groupings and the Z statistic for the significance of difference

Table 17. Prediction Groups for the Total Sample with H and W Controlled.

Partial r	Lo	Hi	Z
$r_{COMHxD \cdot DPW}$	-.264	-.162	-0.26
$r_{COMWxD \cdot DPH}$	-.590	-.221	-1.11
$r_{COMHxDPW \cdot D}$	.040	.275	0.79
$r_{COMWxDPH \cdot D}$	-.151	-.256	0.27

Table 18. Prediction Groups for the Total Sample with H and W Randomized.

Partial r	Lo	Hi	Z
$r_{COMAxD \cdot DPB}$	-.047	-.252	+0.51
$r_{COMBxD \cdot DPA}$	-.279	-.245	-0.09
$r_{COMAxDPB \cdot D}$	-.139	-.343	0.55
$r_{COMBxDPA \cdot D}$	-.176	-.226	0.13

Table 19. Prediction Groups for Extreme Scores with H and W Controlled.

Partial r	Lo (N=11)	Hi (N=12)	Z
$r_{COMHxD \cdot DPW}$	-.201	-.119	-0.16
$r_{COMWxD \cdot DPH}$	-.147	-.196	0.09
$r_{COMWxDPH \cdot D}$	-.197	-.638	1.04
$r_{COMHxDPW \cdot D}$	.027	-.280	0.59

Table 20. Prediction Groups for Extreme Scores with H and W Randomized.

Partial r	Lo (N=12)	Hi (N=12)	Z
$r_{COMAxD \cdot DPB}$	-.213	-.237	0.50
$r_{COMBxD \cdot DPA}$	-.180	-.011	-0.34
$r_{COMAxDPB \cdot D}$	.001	-.541	1.22
$r_{COMBxDPA \cdot D}$	.031	-.548	1.30

between high and low groups. None of the differences are significant and only $r_{COMAxDPB \cdot D}$ and $r_{COMBxDPA \cdot D}$ in Table 20 begin to approach significance.

As with the satisfaction groups in the previous section, the prediction groups are significantly different on the prediction measures. The data on the appropriate means will be found in Table 21. All are significant (α = .001) by t-test for difference between independent sample means.

Table 21. Mean Prediction Scores for High and Low Groups of Tables 17, 18, 19, and 20.

	Mean			
	Hi	Lo	t	df
Table 17	376.78	279.16	-7.82	30
Table 18	376.78	279.16	-7.82	30
Table 19	392.14	266.68	-8.70	20
Table 20	388.87	269.42	-8.63	22

CHAPTER IV

INTERPRETATION OF RESULTS, CONCLUSIONS, AND IMPLICATIONS

The primary purpose of this chapter is to interpret and evaluate the model of Chapter I in light of the empirical results of the previous chapter. The interpretations and evaluations offered will aim to modify the model when empirical results so dictate, to draw out from both the data and model the implications for interpersonal communication, and to provide direction for future research on modification, and extension of the model.

Validity of the Sample and Instruments

Although we have no direct evidence for the representativeness of the sample or validity of the instruments, several data reported in the previous chapter offer indirect evidence supporting the representativeness of the sample and the validity of the test instruments. The correlation between satisfaction and prediction measures (.64) is only slighly higher than that reported by Locke and Burgess (1959, p. 261) (.47) between the same two measures on a much larger sample (N=236). Furthermore, the means for the low and high satisfaction groups (see Table 16, page 76) are very similar to the means for the maladjusted and adjusted groups in the Locke and Burgess study. Together, these results indicate that the sample used in this study is not severely biased relative to the much larger Locke and Burgess sample on satisfaction and prediction measures. Also, the

high correlation between the husbands' and wives' estimates of their satisfaction (.74) suggests that dividing couples into high and low groups by their mean score on this measure is a sound estimate of the couple's satisfaction. The same is not true of the prediction measure since the correlation between husbands' and wives' prediction scores is low enough to be non-significant (.34, α = .05). Also on the negative side, the extremely high correlation between husband's and wife's communication (.90) must be suspected, since such a correlation may be the result of an artifact of measurement or of the index construction procedure. Conceptually, the amount of communication generated by A and that generated by B are distinct. But one interpretation of the high observed correlation is that the communication measure is tapping the couple's communication together and not the individual's communication to the other. Unfortunately, there appears to be no means of distinguishing this interpretation from the one advocating that the correlation is a "true" measure of the conceptually distinct variables. In the absence of such distinguishing data, the correlation must be treated as valid.

Several of the correlations of Table 9 (page 72) can also be compared to correlations between conceptually similar (but by no means identical) pairs of variables often measured in marital studies on communication and empathy. For example, average satisfaction and average communication correlate at .71 as compared to a correlation of .91 between verbal communication and satisfaction and a correlation of .66 between non-verbal communication and satisfaction, as reported by Navran (1966, p. 178) using the same instrument to measure communication as in this study. The positive correlations between average satisfaction and husband's and wife's perceived consensus are also to be expected from the literature (for

example, Levinger and Breedlove, p. 370). In addition, we should expect that the husband's perceived consensus explains more of the variance in satisfaction than the wife's (Levinger and Breedlove, 1966, p. 369), and this is the case here as well (38% versus 17%). Finally, this sample shows a somewhat stronger relationship between satisfaction and system consensus (approximately .40) than is usually reported. In fact, Hobart and Klausner (1959, p. 259) report an essentially negligible correlation between empathy and adjustment. However, this is an exceptional result. Although empathy and system consensus are not strictly comparable, they are conceptually similar and should exhibit similar direction and roughly similar magnitudes.

Together the above results provide additional indirect evidence that the sample self-selected for this study is at least comparable to samples used in studies employing conceptually similar variables. Although we have no direct validity check on our operationalizations (other than satisfaction), the above comparisons do indicate results comparable to studies employing conceptually similar variables and, hence, a certain minimum convergent validity.

Testing the Underlying Propositions: Estimates of a_{ij}

The estimates of the a_{ij} coefficients presented in Table 10 (page 73) have been shown to be the best estimates of the path coefficients between variables i and j in the model of Figure 6. In Chapter I, it was argued that the amount of communication should exhibit no significant positive or negative relationship to system consensus or to the perceived individual consensus variables across the entire sample. This reasoning produced Propositions 4', 5', and 6'. Now while three of the four correlations

which can test this reasoning are not significant (a_{24}, a_{45}, and a_{36} of Table 10) and only a_{26} is, all indicate a slight positive relationship between communication and the various consensus measures. Taking the small sample size into account, the safest conclusion to be drawn from these data is that the reasoning which led to Propositions 4', 5', and 6' should be modified slightly to allow for small, positive correlations between communication and the various consensus measures across the entire sample. However, it is clear from the results of Tables 13 and 15 that the correlations between communication and consensus measures can take on a range of values from positive to negative depending on the level of satisfaction. We can safely conclude that propositions 4', 5', and 6' are sound in their implication that the effects of communication should differ from level to level. Part of the reason that this small, positive relationship has been consistently observed in the data could be a result of the measure of communication itself. Many of the questions do not isolate the sheer amount of verbal or nonverbal interaction, but actually measure the quality of that interaction. Questions 5, 9, and 13 of Section V of the questionnaire (see Appendix C) are flagrant examples. When the transfer of symbolic information is accurate, a strong, positive relationship between communication and the various consensus measures should be expected. It is only the sheer amount, undifferentiated as to quality, which should exhibit no relationship to the consensus measures over the range of the entire sample.

The estimates of a_{56} and a_{34} displayed in Table 10 (page 73) are opposite in direction to those hypothesized in Propositions 2' and 3'. Also, the correlations are not insignificant and, so cannot be explained

away by appealing to sampling error. Propositions 2' and 3' were derived from Newcomb's A-B-X model and the extension to higher order perceptions which was developed here. In addition, there is some empirical support for these propositions reported by Schachter (1951, p. 202) and Festinger and Thibaut (1951, p. 96). They indicate that more communication was directed to another when the speaker felt that there existed a discrepancy or disagreement between himself and the other. While on the face of it these results seem to be directly opposite to the results of this study, let us look deeper.

One of the crucial characteristics separating successful fron unsuccessful attempts at theory construction is casting the variables of the theory at the same level of abstraction. This is especially true of causal theories, such as the one developed here. Although the "level of abstraction" principle is a sound one, simple rules for satisfying it are difficult to develop.[13] I believe that this is the kind of problem which has occurred here. The predictions of Propositions 2' and 3' are probably valid when there exists perceived dissensus on a topic of immediate relevance to the completion of the task at hand (as is the case in the Festinger and Thibaut, and Schachter studies cited). Thus, at a micro level of abstraction the propositions probably do characterize interaction. However, in this study, general patterns of communication activity and overall perceived consensus on rules were the measures. These represent a higher level of abstraction. Thus, these findings are probably valid at a macro

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[13] For a general discussion of the abstraction problem and an attempt to develop guidelines, see H. M. Blalock's Theory Construction (Prentice-Hall: Englewood Cliffs, N. J., 1969).

level of abstraction. Intuitively, the results are plausible, since we would expect spouses who perceive themselves to be more in agreement with their mate and who perceive the other to be more accurate on the rules governing their interaction, to engage in more communicative interchange than those perceiving disagreement and inaccuracy. Furthermore, it is fairly well-established that high disagreement and low communication are characteristic of maladjusted marriages and that low disagreement and high communication characterize adjusted marriages. These propositions imply that we should not expect the overall patterns of interaction for long-term relationships to be as hypothesized in Propositions 2' and 3'. However, this does not mean that Propositions 2' and 3' are false in other contexts, such as those described in the Festinger and Thibaut, and Schachter studies. In sum, Propositions 2' and 3', while valid in certain contexts, are reversed in this one because of the error involved in measuring the propositions at a high level of abstraction but casting them at a low level of abstraction.

Changing the sign in Propositions 2' and 3' and combining them, they now read

Proposition 2'': The greater the degree of perceived individual consensus on rules for interaction, the greater the amount of communication.

But this single alteration has profound effects on the predictions from the model. In order to obtain the derived hypotheses, it was necessary to assume the validity of the direction (or sign) of the underlying propositions since the sign in turn determined whether each t_i (see page 37) was greater or less than zero. Now that analysis must be altered to take into account the fact that a_{34} and a_{56} are positive rather than

negative coefficients. Before presenting re-analysis of the conditions for flexibility-stability, it would be wise to evaluate certain other assumptions which underpinned the analysis of Chapter I.

Evaluating the Derived Hypotheses

As we have indicated, the data for the satisfaction and prediction groupings was presented both with sex controlled and sex randomized, because sex differences had been anticipated. If sex differences were present, they would show up as patterns of difference between a_{24} and a_{26} (that is, $r_{COMHxD \cdot DPW}$ and $r_{COMWxD \cdot DPH}$), and a_{54} and a_{36} (that is, $r_{COMHxDPW \cdot D}$ and $r_{COMWxDPH \cdot D}$). For the prediction groups (Tables 17 and 19, page 77), no such patterns are present and, hence, sex differences are negligible. However, for the satisfaction groups (Tables 12 and 14, page 75), a slight but consistent pattern exhibits itself in the low groups. These differences are summarized in Table 22. For the low satisfaction

Table 22. Patterns of Sex Differences for Low Satisfaction Groups on a_{24} and a_{26}, and a_{54} and a_{36}.

	Coefficient	Direction	Coefficient
Table 12	$r_{COMHxD \cdot DPW}$ (-.55)	<	$r_{COMWxD \cdot DPH}$ (-.33)
Table 14	$r_{COMHxD \cdot DPW}$ (-.50)	<	$r_{COMWxD \cdot DPH}$ (-.32)
Table 12	$r_{COMHxDPW \cdot D}$ (-.14)	<	$r_{COMWxDPH \cdot D}$ (.40)
Table 14	$r_{COMHxDPW \cdot D}$ (-.21)	<	$r_{COMWxDPH \cdot D}$ (.29)

groups, it appears that the husband's communication activity is more positively related to system consensus than is the wife's.[14] More surprisingly,

[14] Remember that D, DPW, and DPH are dissensus measures.

the wife's communication activity is positively related to the husband's perceptions of dissensus while the husband's communication shows a slight positive relationship to the wife's perceptions of consensus. If the language of causality can be temporarily assumed, husband's communication produces slightly more system consensus than the wife's. Furthermore, (for the low satisfaction groups only) the wife's communication tends to cause more perceived disagreement and inaccuracy for the husband than his does for her. Although these observations cannot be explained within the context of the model, it might be that the effectiveness of communication is correlated with marital satisfaction. That is, we observe differences between the effects of husband's communication and wife's communication in the low satisfied group and not in the high satisfaction groups. It might be that a relationship is perceived as more satisfying when the efforts at persuasion, understanding, and discussion are equally efficacious rather than imbalanced in favor of the husband or wife. However, this can only be a tentative hypothesis since the differences on which it is based are not strong.

Once husbands and wives are randomly assigned to the A and B roles (Tables 13, 15, 18, and 20), even slight patterns of difference disappear, as should be expected. That is, with random assignment to the A and B roles, a_{24} should equal a_{26}, and a_{54} should equal a_{36}. This is the operational equivalent of rejecting situations 6 through 10 of Table 3 (page 39). It had been argued in Chapter I that situations 6 through 10 represented empirically implausible styles of interaction. However, the more compelling argument is that any style is possible for a particular couple but random assignment across the sample will insure that $a_{54} = a_{36}$ and $a_{24}=$

a_{26}. To take situations 6 through 10 into account, the model would need to include some exogeneous correlates of sex whose effects would produce differences between a_{54} and a_{36}, and between a_{24} and a_{26}.

It had also been argued that situation 3 (see Table 3, page 39) represented an empirically plausible style of interaction despite the fact that $a_{54} \neq a_{36}$ and $a_{24} \neq a_{26}$. But by the argument presented above, the control of sex differences through randomization allows the plausibility of situation 3 as a style of interaction for a particular couple, but negates the possibility of situation 3 arising across a sample or a subgroup of a sample. Thus, it should not have been included as a possible style of interaction.

It was also argued in Chapter I that styles 4 and 5 of Table 3 would not be expected to arise because it would be implausible to assume that the effect of communication on perceived consensus (a_{54}, a_{36}) would differ markedly from its effects on system consensus (a_{24}, a_{26}). It now appears that this assumption is also erroneous. A quick glance at the Z values in Tables 13 and 15 (pages 75 and 76) show that the differences between low and high groups on the estimators of a_{24} and a_{26} are <u>opposite</u> in direction to the differences for a_{54} and a_{36}. If situations 4 and 5 were truly impossible styles across the sample, then such stark reversals as found in Tables 13 and 15 could not be present. Although the results for the randomized prediction groupings (Tables 18 and 20) are not as striking, there is a similar effect here, especially with the extreme score group (Table 20). What is implied by the differential results between the effects of communication on actual consensus (a_{24}, a_{26}) and the effects of communication on perceived consensus (a_{54}, a_{36}) is that styles 4 and 5

cannot be rejected out of hand as implausible nor controlled as sex differences were. In other words, the rejection of these styles cannot be upheld in the face of the results obtained.

In light of the failure of Propositions 2' and 3', and in light of the problems encountered in accepting style 3 which should have been rejected, and rejecting styles 4 and 5 which should have been included, we would expect our derived hypotheses to fail. And indeed they do. Although a_{54} and a_{36} are in the predicted direction in all cases, a_{24} and a_{26} are not. Now this would be an acceptable result if there was essentially no difference between the low and high groups on a_{24} and a_{26}, for it could be argued that the system would still exhibit stable-positive characteristics under those conditions. However, although this is almost the case for the total-sample, randomized-prediction groups (Table 18), it is clearly not the case for the randomized satisfaction groupings (Tables 13 and 15). In fact, as pointed out above, there is a fairly strong opposite effect in the satisfaction groups for a_{26}, a_{24} than had been predicted. In the extreme score prediction groups, the differences from low to high on a_{24} and a_{26} are essentially negligible.

Because of these clearly unexpected results and failure of the model at a few key junctures, it is imperative that those failures be repaired and we attempt to explain the observed data with a reformulated theory. We turn to this task in the following section.

Explanation and Reformulation

With the failure of Propositions 2' and 3', the conditions for stability and growth must be recalculated. We begin with a new table of possible communication styles akin to Table 3 of Chapter I. Table 23 takes into

Table 23. A Reformulated Set of Communication Styles.

	1	2	3	4
a_{24}	+	-	-	+
a_{26}	+	-	-	+
a_{54}	+	-	+	-
a_{36}	+	-	+	-

account the discussion and reasoning of the previous section to limit the number of different styles. It should be noted that style 3 of Table 22 corresponds to style 4 of Table 3 and 4 above corresponds to 5 in Table 3. Styles 1 and 2 are the same in both.

Now, as in Chapter I, if we assume that the relationships specified in the propositions hold as modified, then

1. if $a_{24}, a_{26}, a_{54}, a_{36} > 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1| > |t_2 + t_3 + t_4 + t_5 + t_6|$

2. if $a_{24}, a_{26}, a_{54}, a_{54} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_3 + t_4| > |t_2 + t_5 + t_6|$

3. if $a_{24}, a_{26} < 0$, and $a_{54}, a_{36} > 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_3 + t_4 + t_5 + t_6| > |t_2|$

4. if $a_{24}, a_{26} > 0$, and $a_{54}, a_{36} < 0$, then $\|a_{ij}\| > 0$ if and only if $|t_1 + t_5 + t_6| > |t_2 + t_3 + t_4|$.

Applying the same reasoning as in Chapter I, we interpret situation 1 as the maximally unstable, growth-oriented case, situation 3 is the maximally stable case, and situations 2 and 4 represent the cases optimal between flexibility and stability.

In the present analysis, if we were to develop new derived hypotheses, then, using the flexibility-stability criterion (Proposition 9') as before,

we would expect the data to basically conform to either situation 2 or situation 4. That is, we would expect our results to be of the form of Table 24a or Table 24b for both satisfaction and prediction groupings. However, neither set of new predictions reproduces the results of Tables 13 and 15. In fact, situation 4 is exactly opposite in direction to that reported in the results. The situation which does best reproduce the obtained results is the maximum stability condition, situation 3.

Table 24. Expected Results for the Reformulated Flexibility-Stability Cases.

a. Situation 2

Low		High
est a_{24}	>	est a_{24}
est a_{26}	>	est a_{26}
est a_{25}	>	est a_{54}
est a_{36}	>	est a_{36}

b. Situation 4

Low		High
est a_{24}	<	est a_{24}
est a_{26}	<	est a_{26}
est a_{54}	>	est a_{54}
est a_{36}	>	est a_{36}

Here, the greater correlations between communication and system consensus should be obtained in the low groups and the greater correlations between communication and perceived individual consensus should be observed in the high groups. This does seem to be the pattern of results, more significantly so in the satisfaction than in the prediction groupings.

Of course, such a result offers damaging evidence to a central argument of this thesis, namely that stability alone is insufficient to insure system satisfaction and longevity. What we seem to have found in our post hoc analyses is that stability alone is the better predictor of marital behavior. Although it represents a distasteful set of results to this author, it seems that the more satisfied and adjusted couples seek to maintain the status quo. They react to situations which might perturb the current relationship with a communication style which is stability oriented. It should be carefully noted that the more satisfied group has higher mean values on communication, system consensus, A's perceived consensus, and B's perceived consensus than the low satisfaction group. These facts are meant to indicate that the stability-oriented styles of the more satisfied couples is not associated with less overall communication or consensus but with differential effects of that communication on consensus across levels of satisfaction. Those stability-oriented styles can be summarized as follows: The symbolic interaction of less satisfied couples tends to produce actual consensus on rules but perceptions of the lack of consensus. The symbolic interaction of more satisfied couples results in the perception of consensus but actually produces dissensus. The implication of the above statements is that the style of interaction which is stability oriented and, hence, associated with satisfaction is one which seeks to produce the guise of similarity, agreement, and understanding. It need not necessarily result in actual similarity, agreement, and understanding.

Of course, the implications of the above results for counseling married couples on their techniques of communication are profound. To

achieve satisfaction and happiness, styles increasing the perception of agreement and understanding would be advocated and taught. Because such a guideline for counseling is contrary to some current approaches (Miller, Nunnally, and Wackman, 1971), contrary to strong intuitive views, and based on one study's post hoc analyses, it cannot be strongly trusted. But also because it is counter-intuitive, it deserves further attention.

In sum, we can be relatively satisfied with the quality of the data generated by the instruments used in this study, and while the results are contrary to our initial hypotheses, we were able to reformulate the model of Figure 6 and the possible styles of interaction which could accompany that model. In this sense, the results have corrected our errors rather than fundamentally invalidated our propositions. On the other hand, the applicability of Proposition 9' of Chapter I, which argued the necessity of flexibility as well as stability, to marital communication systems must be called into question. While no one set of empirical results can invalidate such a postulate, that interpretation of the results cannot be lightly brushed aside.

Conclusions, Directions

Aside from the particular model and the results pertaining to it, several other positive results have accrued from the work in this thesis in the areas of explanation and cybernetics (we have already spoken of the developments for theory construction).

From the point of view of explanation, the techniques of theory construction advocated above result in what might be called a system's explanation (Meehan, 1968; Monge, 1972). That which permits one to understand the relationships derived are the propositions and the

connection among propositions which undergird the derived relationships. Without the underlying propositions and their interconnection, the derived hypotheses cannot be explained. Indeed, the derived hypotheses would represent nothing but isolated relationships whose significance or insignificance was indeterminant and whose basis was inscrutable.

On a less abstract level, we have showed that it is possible under certain conditions to employ a cybernetic logic with its purposive characteristics in a causal framework. Although in retrospect the simple transformation of variables, which permitted this, seems almost trivial, the effects are significant. Rather than speaking of growth in terms of mere change (as Maruyama does), we are now capable of speaking of growth relative to some goal state. The emphasis changes from mere alteration to directed development or decay.

Although the model that was formulated from the above developments was found to be erroneous at several points, its reformulated version still merits the attention of students of interpersonal communication. Any attempts to replicate this study based on predictions from the reformulated model ought to include the following modifications: First, the communication index ought to consist of items tapping both qualitative and sheer quantitive dimensions of communication activity. In this way, Propositions 4', 5', and 6' can be more adequately tested. Second, the prediction measure ought to be dropped or replaced by a similar measure, whose validity is well-established or whose validity is established independently of the satisfaction measure. Third, the number of items used as objects of coorientation ought to be increased to permit the use of Wackman's (1969) proposed measure of accuracy without a concomitant

large standard error of estimate. Fourth, measures of coordination ought to be obtained so that estimates of a_{12}, a_{13}, and a_{15} can be obtained. With these modifications and a slightly larger sample size (about N=50), more precise estimates for stability and growth conditions can be obtained and, hence, a more complete understanding of the roles of stability, on the one hand, and flexibility, on the other, can be obtained.

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APPENDICES

APPENDIX A

Vector notation, because of its unfamiliarity within the social sciences, can make interpretation difficult. However, a simple transformation should clear up this difficulty. A vector is nothing more than a directed line segment with magnitude (the length of the line) and orientation (the angle between the line and some arbitrary axis). Let us take the artificial vector defined as (ACCA, ACCB) = ($P_2A - P_1B$, $P_2B - P_1A$) or system accuracy, and apply these criteria and interpret them. Since this vector is two dimensional, the coordinate system is also two dimensional with the horizontal axis the $P_2A - P_1B$ value (or A's accuracy) and the vertical axis the $P_2B - P_1A$ value (or B's accuracy). The origin of this coordinate system is at the point (0,0) or perfect system accuracy. The distance between the point representing system accuracy, (P_2A-P_1B, P_2B-P_1A), and the origin is given by

$$((P_2A-P_1B)^2 + (P_2B-P_1A)^2)^{1/2}$$

which is nothing more than the amount of inaccuracy in the system (about a particular X). Furthermore, the point represented by (P_2A-P_1B, P_2B-P_1A) can lie in any of the four quadrants labeled in Figure A1. The angle between the line segment and the horizontal axis determines in which quadrant the vector lies. The angle provides information concerning the <u>distribution</u> of inaccuracy within the interpersonal system. If the angle is 0° or 180°, then all the inaccuracy is due to A.

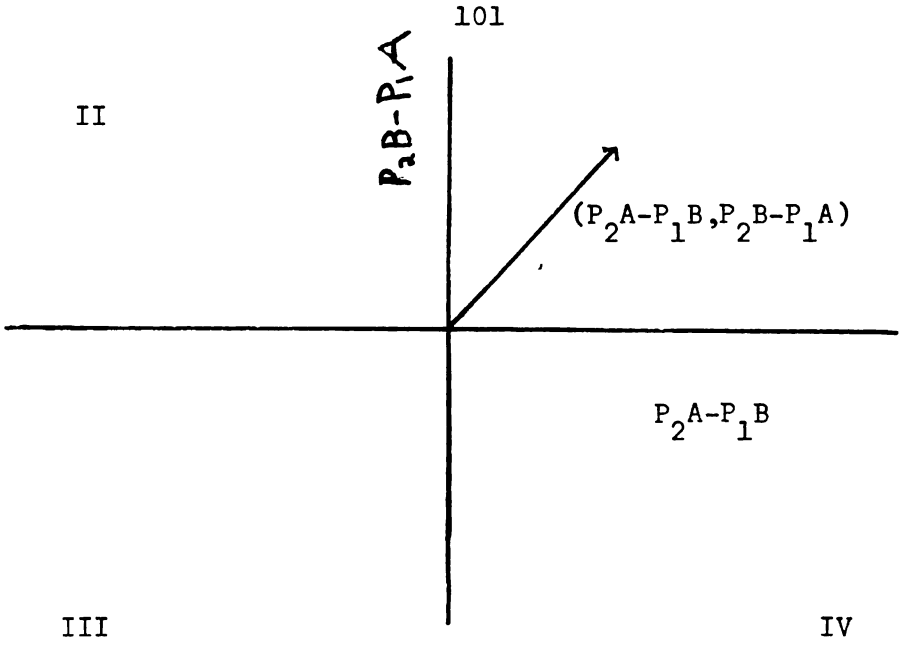

Figure A1. The Vector Describing System Accuracy.

If the angle is 90° or 270°, then all the inaccuracy is due to B. If the angle is in the first quadrant, then both A and B tend to overestimate the other's orientation; if the angle is in the third quadrant, then both A and B tend to underestimate the other's actual orientation; in quadrant two, A is underestimating and B is overestimating and in quadrant four, A is overestimating and B is underestimating. Similar interpretations can be made for other state vectors.

APPENDIX B

The theory and details of the methods for evaluating determinants need not be presented here since several mathematical and social scientific texts (Blalock, 1969; Marcus and Minc, 1965) provide lucid discussions. The method used here is that of expanding the determinant by minors as follows:

$$a_{ij} = \begin{vmatrix} a_{11} & a_{12} & 0 & 0 & 0 & 0 \\ 0 & a_{22} & 0 & a_{24} & 0 & a_{26} \\ a_{31} & 0 & a_{33} & 0 & 0 & a_{36} \\ 0 & 0 & a_{43} & a_{44} & 0 & 0 \\ a_{51} & 0 & 0 & a_{54} & a_{55} & 0 \\ 0 & 0 & 0 & 0 & a_{65} & a_{66} \end{vmatrix}$$

$$= a_{11} \begin{vmatrix} a_{22} & 0 & a_{24} & 0 & a_{26} \\ 0 & a_{33} & 0 & 0 & a_{36} \\ 0 & a_{43} & a_{44} & 0 & 0 \\ 0 & 0 & a_{54} & a_{55} & 0 \\ 0 & 0 & 0 & a_{65} & a_{66} \end{vmatrix}$$

$$+ a_{12} \begin{vmatrix} 0 & 0 & a_{24} & 0 & a_{26} \\ a_{31} & a_{33} & 0 & 0 & a_{36} \\ 0 & a_{43} & a_{44} & 0 & 0 \\ a_{51} & 0 & a_{54} & a_{55} & 0 \\ 0 & 0 & 0 & a_{65} & a_{66} \end{vmatrix}$$

$$= a_{11}a_{33}\begin{vmatrix} a_{22} & a_{24} & 0 & a_{26} \\ 0 & a_{44} & 0 & 0 \\ 0 & a_{54} & a_{55} & 0 \\ 0 & 0 & a_{65} & a_{66} \end{vmatrix} - a_{11}a_{36}\begin{vmatrix} a_{22} & 0 & a_{24} & 0 \\ 0 & a_{43} & a_{44} & 0 \\ 0 & 0 & a_{54} & a_{55} \\ 0 & 0 & 0 & a_{65} \end{vmatrix}$$

$$-a_{12}a_{24}\begin{vmatrix} a_{31} & a_{33} & 0 & a_{36} \\ 0 & a_{43} & 0 & 0 \\ a_{51} & 0 & a_{55} & 0 \\ 0 & 0 & a_{65} & a_{66} \end{vmatrix} - a_{12}a_{26}\begin{vmatrix} a_{31} & a_{33} & 0 & 0 \\ 0 & a_{43} & a_{44} & 0 \\ a_{51} & 0 & a_{54} & a_{55} \\ 0 & 0 & 0 & a_{65} \end{vmatrix}$$

$$= a_{11}a_{33}a_{44}\begin{vmatrix} a_{22} & 0 & a_{26} \\ 0 & a_{55} & 0 \\ 0 & a_{65} & a_{66} \end{vmatrix} - a_{11}a_{36}a_{65}\begin{vmatrix} a_{22} & 0 & a_{24} \\ 0 & a_{43} & a_{44} \\ 0 & 0 & a_{54} \end{vmatrix}$$

$$-a_{12}a_{24}a_{43}\begin{vmatrix} a_{31} & 0 & a_{36} \\ a_{51} & a_{55} & 0 \\ 0 & a_{65} & a_{66} \end{vmatrix} - a_{12}a_{26}a_{65}\begin{vmatrix} a_{31} & a_{33} & 0 \\ 0 & a_{43} & a_{44} \\ a_{51} & 0 & a_{54} \end{vmatrix}$$

$$= a_{11}a_{22}a_{33}a_{44}a_{55}a_{66} - a_{11}a_{22}(a_{36}a_{65}a_{54}a_{43})$$
$$-a_{33}a_{44}(a_{12}a_{26}a_{65}a_{51}) - a_{55}a_{66}(a_{31}a_{12}a_{24}a_{43})$$
$$-a_{12}a_{24}a_{43}a_{36}a_{65}a_{51} - a_{12}a_{26}a_{65}a_{54}a_{43}a_{31}.$$

APPENDIX C

General Instructions

In the following pages are a series of questions about your relationship with your spouse. Most of the questions can be answered very quickly. Others will require more thought -- about yourself and your spouse together. The purpose of these questions is to find out how typical couples, like yourselves, interact in marriage. The whole study is contained in this questionnaire. There will be no further interviews or questions.

The questions which follow are divided into five sections. You should begin answering the first question in Section I and answer all questions in the order presented. Once you have completed a page, go on to the next page but do not go back. Work as rapidly as is comfortable for you. Remember, some questions will require more thought than others.

Your spouse's questionnaire is identical to yours, but it is very important to ANSWER THE QUESTIONS INDEPENDENTLY OF YOUR SPOUSE.

One last point must be strongly emphasized: Because of the confidential nature of some of the questions, careful steps have been taken to guard your anonymity. No names, addresses, birthdates, respondent numbers, or identification of any sort will be found on the questionnaires or the envelope. In this way, both the respondents and the researcher are protected. There is no way of knowing which questionnaires belong to which respondents.

When you are ready, open the envelope, make sure that each of you takes one copy of the questionnaire, and begin to answer the questions, independently of each other.

Section I

In this section you will be asked about certain aspects of your relationship with your spouse. Each question will have a series of statements describing your relationship. Next to these statements will be a vertical line. Make a slash on the vertical line nearest to the statement which most accurately describes your relationship. Questions 0a and 0b are examples of the kind of questions which follow.

0a. I think that ...

We almost always have meals together.

We usually have meals together.

We have meals together about as often as not.

We seldom have meals together.

We almost never have meals together.

0b. Suppose your spouse disagreed with you about the necessity of having meals together. How would you feel?

I'd feel strongly, enough to try to change his (her) mind.

I'd be bothered enough to tell him (her) so.

It would bother me some, but not enough to tell him (her).

It wouldn't bother me at all.

All of the questions which follow will have this same format, so if you have any questions or difficulties now, please ask the administrator to help you before you go on. Be sure to answer the questions in terms of how you actually behave, not how you would like to behave nor what you think is acceptable behavior.

It is a well-known fact that couples fight, argue, disagree, squabble, and quarrel. It is also well-known that this need not be a bad thing. Questions 1 through 3 are about how you and your spouse fight, quarrel and argue.

1a. In our bigger quarrels, I think that ...

- We usually stop before the emotional hurts become intolerable to either of us.
- We usually stop when the emotional hurts become intolerable to one of us.
- We sometimes stop when the emotional hurts become intolerable to one of us.
- We seldom stop before the emotional hurts become intolerable to one of us.
- We almost never stop until one or both of us can no longer tolerate the emotional hurts.

1b. Suppose your spouse disagreed with you about when to stop quarrels. How would you feel?

- I'd feel very strongly, enough to try to change his (her) mind.
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

2a. I think that ...

- Our big quarrels almost always end with one or both of us trying to undo or repair damage done during the quarrel.
- Our big quarrels usually end with one or both of us trying to undo or repair damages done.
- Our big quarrels end with attempts at reconciliation and forgiveness as often as not.
- Our big quarrels usually end without any attempts to undo or repair damages done.
- Our big quarrels never end with attempts at repair and reconciliation.

2b. Suppose your spouse disagreed with you about how to end quarrels. How would you feel?

- I'd feel very strongly, enough to try to change his (her) mind.
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

3a. I think that ...

- Our big quarrels are almost always directed at current actions and here and now situations.
- Our big quarrels are usually directed at here and now situations, but sometimes bring in sore points from past quarrels not relevant to the current situation.
- Our big quarrels usually bring sore points from past quarrels into the current situation.
- Our big quarrels almost always bring in sore points from past quarrels although they begin with here and now disagreements.

3b. Suppose your spouse disagreed with you about bringing up past quarrels in here and now situations. How would you feel?

- I'd feel very strongly, enough to try to change his (her) mind.
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

Questions 4, 5, and 6 are about other aspects of your relationship with your spouse.

4a. When we are alone and a particularly sensitive topic comes up, I think that ...

- We usually avoid directly discussing the problem.
- We usually discuss the problem, but avoid exploring our deeper feelings about it.
- We usually discuss the problem, stating how we feel but being careful not to get emotionally involved.
- We usually discuss the problem, stating how we feel and not worrying if we get emotionally involved or not.

4b. Suppose your spouse disagreed with you about how to talk over sensitive topics. How would you feel?

- I'd feel very strongly, enough to try to change his (her) mind.
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

5. When we make important decisions affecting both of us, I think that ...

- We almost always compete with each other for the dominant position in a hostile atmosphere.
- We usually compete with each other for the dominant position.
- We usually balance the dominant positions between us with only occasional competitiveness.
- We almost always balance the dominant positions between us, and have little desire to compete with or dominate one another.

6a. When we make important decisions affecting both of us, I think that ...

- We cooperate very little, seldom helping one another or working together.
- We cooperate about some decisions some of the time.
- We cooperate on most decisions most of the time.
- We cooperate almost always, helping each other verbally and in activities.

6b. Suppose your spouse disagreed with you about the way to reach decisions on important matters. How would you feel?

I'd feel very strongly, enough to try to change his (her) mind.

I'd be bothered enough to tell him (her) so.

It would bother me some, but not enough to tell him (her).

It wouldn't bother me at all.

The next question is a little different from the others. Below is a list of topics that most partners talk about at one time or another. Some topics are easier to talk about with your spouse than others because they are less sensitive. For each of the topics listed below, put a check in the column at the right which indicated how easy or difficult it is to bring the topic up in conversation with **your** spouse.

7a. I think that the topic ...

	Very Easy	Easy	"So-So"	Diffi-cult	Very Diffi-cult
"How to deal with inlaws" is					
"Right and proper conduct at parties" is					
"Who decides when to have sex relations" is					
"When and how to show affection" is					
"Deciding about matters of recreation" is					
"Handling family finances" is					
"Which friends to visit or invite over" is					

7b. Suppose your spouse disagreed with you about what can and cannot be talked over. How would you feel?

I'd feel very strongly, enough to try to change his (her) mind.

I'd be bothered enough to tell him (her) so.

It would bother me some, but not enough to tell him (her).

It wouldn't bother me at all.

Please go on to the Next Section

Section II

1. On the line below, circle the dot which best describes the degree of happiness, everything considered, of your present marriage. The middle point, "happy," represents the degree of happiness which most people get from marriage, and the scale gradually ranges on one side to those few who are very unhappy in marriage and on the other, to those few who experience extreme happiness and joy in marriage.

. . . . . .

Very Unhappy | Happy | Perfectly Happy

Estimate the approximate extent of agreement or disagreement between you and your spouse on the following items 2 through 9. Please make one check for each item.

	Always Agree	Usually Agree	Occasionally Disagree	Often Disagree	Always Disagree
2. Handling family finances					
3. Matters of recreation					
4. Demonstrations of affection					
5. Friends					
6. Sex relations					
7. Right, good or proper conduct					
8. Philosophy of life					
9. Ways of dealing with inlaws					

For questions 10 through 15 please check the one response which best answers the question.

10. When disagreements arise, they usually result in:

_____ Husband giving in
_____ Wife giving in
_____ Agreement by mutual give and take

11. Of your outside interests, how many do you engage in with your spouse?

_____ All of them
_____ Some of them
_____ Very few of them
_____ None of them

12. In leisure time do you generally prefer:

_____ To be on the go
_____ To stay at home

Does your spouse generally prefer:

_____ To be on the go
_____ To stay at home

13. If you had your life to live over, do you think you would:

_____ Marry the same person
_____ Marry a different person
_____ Not marry at all

14. Do you ever wish that you had not married?

_____ Frequently
_____ Occasionally
_____ Rarely
_____ Never

15. How frequently do you confide in your spouse?

_____ Almost never
_____ Rarely
_____ Often
_____ Almost always

Section III

1. Circle the number which represents the highest grade of schooling which you had completed at the time of your present marriage.

1 2 3 4 5 6 7 8	1 2 3 4	1 2 3 4	1 2 3 4
Grade School	High School	College	Postgraduate

For the remaining questions in this section, please check the <u>one</u> response which best answers the question.

2. Check the number which represents your age at the time of your present marriage.

_____ 19 and under
_____ 20 - 24
_____ 25 - 30
_____ 31 and over

3. How long did you "keep company" with your spouse before marriage?

_____ 1 to 3 months
_____ 3 to 6 months
_____ 6 months to 1 year
_____ 1 to 2 years
_____ 2 to 3 years
_____ 3 years or longer

4. How long did you know your spouse at the time of marriage?

_____ 1 to 3 months
_____ 3 to 6 months
_____ 6 months to 1 year
_____ 1 to 2 years
_____ 2 to 3 years
_____ 3 to 5 years
_____ 5 years or longer
_____ since childhood

5. My father and mother ...

_____ Both approved my present marriage
_____ Both disapproved
_____ Father disapproved
_____ Mother disapproved

6. My childhood and adolescence, for the most part, were spent in:

_____ Open country
_____ A town of population 2,500 or under
_____ A city of 2,500 to 10,000
_____ 10,000 to 50,000
_____ 50,000 and over

7. Did you every attend Sunday school or other religious school for children and young people?

_____ No
_____ Yes, if YES, at what age did you stop attending such a school?

_____ Before 10 years old
_____ 11 to 18 years old
_____ 19 and over
_____ Still attending

8. Religious activity at the time of your present marriage:

_____ Never attended church
_____ Attended less than once per month
_____ Once per month
_____ Twice per month
_____ Three times per month
_____ Four times
_____ More than four times

9. Indicate the number of your friends of the same sex before your present marriage:

_____ Almost none
_____ A few
_____ Several
_____ Many

10. Before marriage how much conflict was there between you and your father?

_____ None
_____ Very little
_____ Moderate
_____ A good deal
_____ Almost continuous

11. Before marriage how much attachment was there between you and your father?

_____ None
_____ Very little
_____ Moderate
_____ A good deal
_____ Very close

12. Before marriage how much conflict was there between you and your mother?

_____ None
_____ Very little
_____ Moderate
_____ A good deal
_____ Almost continuous

13. Before marriage how much attachment was there between you and your mother?

_____ None
_____ Very little
_____ Moderate
_____ A good deal
_____ Very close

14. Give your appraisal of the happiness of your parents' marriage:

_____ Very happy
_____ Happy
_____ About averagely happy
_____ Unhappy
_____ Very unhappy

15. My childhood on the whole was:

_____ Very happy
_____ Happy
_____ About averagely happy
_____ Unhappy
_____ Very unhappy

16. In my childhood I was ...

_____ Punished severely for every little thing
_____ Punished frequently
_____ Occasionally punished
_____ Rarely punished
_____ Never punished

17. In my childhood, the type of training in my home was ...

_____ Exceedingly strict
_____ Firm but not harsh
_____ Usually lax
_____ Always lax
_____ Irregular (sometimes strict, sometimes lax)

18. What was your parents' attitude toward your early curiosities about birth and sex?

_____ Frank and encouraging
_____ Answered briefly
_____ Evaded my questions or lied to me
_____ Scolded or punished me
_____ I did not disclose my curiosity to them.

19. My general mental ability compared to my spouse's is ...

_____ Very superior to his (hers)
_____ Somewhat greater
_____ About equal
_____ Somewhat less
_____ Considerably less

20. What is your general attitude toward sex in your marriage?

_____ One of disgust and aversion
_____ Indifference
_____ Interest and pleasant anticipation
_____ Eager and passionate longing

21. Do you often feel lonesome even when you are with other people?

_____ Yes
_____ No
_____ Unsure

22. Are you usually even-tempered and happy in your outlook on life?

_____ Yes
_____ No
_____ Unsure

23. Do you often feel just miserable?

_____ Yes
_____ No
_____ Unsure

24. Does some particular useless thought keep coming into your mind to bother you?

_____ Yes
_____ No
_____ Unsure

25. Do you often experience periods of loneliness?

_____ Yes
_____ No
_____ Unsure

26. Are you in general self-confident about your abilities?

_____ Yes
_____ No
_____ Unsure

27. Are you touchy on various subjects?

_____ Yes
_____ No
_____ Unsure

28. Do you frequently feel grouchy?

_____ Yes
_____ No
_____ Unsure

29. Do you usually avoid asking for advice?

_____ Yes
_____ No
_____ Unsure

30. Do you prefer to be alone at times of emotional stress?

_____ Yes
_____ No
_____ Unsure

31. Do you feelings alternate between happiness and sadness for no apparent reason?

_____ Yes
_____ No
_____ Unsure

32. Are you often in a state of excitement?

_____ Yes
_____ No
_____ Unsure

33. Are you considered critical of other people?

_____ Yes
_____ No
_____ Unsure

34. Does being disciplined make you unhappy?

_____ Yes
_____ No
_____ Unsure

35. Do you always try carefully to avoid saying anything that may hurt anyone's feelings?

_____ Yes
_____ No
_____ Unsure

Please go on to the Next Section

Section IV

In this section you will be asked about the same aspects of your relationship with your spouse as in Section I. However, this time we want you to answer the way you think your spouse will. Otherwise, the format is exactly as in Section I. Make a slash on the vertical line nearest to the statement which answers the question. Questions 0a, 0b, and 0c are examples of the types of questions which follow.

0a. My spouse will say that ...

- We almost always have meals together.
- We usually have meals together.
- We have meals together about as often as not.
- We seldom have meals together.
- We almost never have meals together.

0b. What will your spouse say that you think?

My spouse will say that I think ...

- We almost always have meals together.
- We usually have meals together.
- We have meals together about as often as not.
- We seldom have meals together.
- We almost never have meals together.

0c. Suppose your spouse misunderstood what you thought about the necessity of having meals together. How would you feel?

- I'd feel very strongly, enough to try to correct him (her).
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

The questions which follow will have this format, so if you have any questions or difficulties please ask your administrator to help you now before you go on. A few of the questions which follow are complicated, so take your time. Do not return to the previous sections once you have started this one.

1a. My spouse will say that in our bigger quarrels ...

- We usually stop before the emotional hurts become intolerable to either of us.
- We usually stop when the emotional hurts become intolerable to one of us.
- We sometimes stop when the emotional hurts become intolerable to one of us.
- We seldom stop before the emotional hurts become intolerable to one of us.
- We almost never stop until one or both of us can no longer tolerate the emotional hurts.

1b. What will your spouse say that you think?

My spouse will say that I think ...

- We usually stop before the emotional hurts become intolerable to either of us.
- We usually stop when the emotional hurts become intolerable to one of us.
- We sometimes stop when the emotional hurts become intolerable to one of us.
- We seldom stop before the emotional hurts become intolerable to one of us.
- We almost never stop until one or both of us can no longer tolerate the emotional hurts.

1c. Suppose your spouse misunderstood what you thought about when to stop quarrels. How would you feel?

- I'd feel very strongly, enough to try to correct him (her).
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

2a. My spouse will say that ...

- Our big quarrels almost always end with one or both of us trying to undo or repair damage done during the quarrel.
- Our big quarrels usually end with one or both of us trying to undo or repair damages done.
- Our big quarrels end with attempts at reconciliation and forgiveness as often as not.
- Our big quarrels usually end without any attempts to undo or repair damages done.
- Our big quarrels never end with attempts at repair and reconciliation.

2b. What will your spouse say that <u>you</u> think?

My spouse will say that I think ...

- Our big quarrels almost always end with one or both of us trying to undo or repair damage done during the quarrel.
- Our big quarrels usually end with one or both of us trying to undo or repair damages done.
- Our big quarrels end with attempts at reconciliation and forgiveness as often as not.
- Our big quarrels usually end without any attempts to undo or repair damages done.
- Our big quarrels never end with attempts at repair and reconciliation.

2c. Suppose your spouse <u>misunderstood</u> what you thought about <u>how</u> to end quarrels. How would you feel?

- I'd feel very strongly, enough to try to correct him (her).
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

3a. My spouse will say that ...

- Our big quarrels are almost always directed at current actions and here and now situations.
- Our big quarrels are usually directed at here and now situations, but sometimes bring in sore points from past quarrels not relevant to the current situation.
- Our big quarrels usually bring in sore points from past quarrels into the current situation.
- Our big quarrels almost always bring in sore points from past quarrels, although they being with here and now disagreements.

3b. What will your spouse say that <u>you</u> think?

My spouse will say that I think ...

- Our big quarrels are almost always directed at current actions and here and now situations.
- Our big quarrels are usually directed at here and now situations, but sometimes bring in sore points from past quarrels not relevant to the current situation.
- Our big quarrels usually bring in sore points from past quarrels into the current situation.
- Our big quarrels almost always bring in sore points from past quarrels, although they begin with here and now disagreements.

3c. Suppose your spouse <u>misunderstood</u> what you thought about bringing up past disagreements in here and now quarrels. How would you feel?

- I'd feel very strongly, enough to try to correct him (her).
- I'd be bother enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

4a. My spouse will say that when we are alone and a particularly sensitive topic comes up ...

- We usually avoid directly discussing the problem.
- We usually discuss the problem, but avoid exploring our deeper feelings about it.
- We usually discuss the problem, stating how we feel but being careful not to get emotionally involved.
- We usually discuss the problem, stating how we feel and not worrying if we get emotionally involved or not.

4b. What will your spouse say that <u>you</u> think?

My spouse will say that I think ...

- We usually avoid discussing the problem.
- We usually discuss the problem, but avoid exploring our deeper feelings about it.
- We usually discuss the problem, stating how we feel but being careful not to get emotionally involved.
- We usually discuss the problem, stating how we feel and not worrying if we get emotionally involved or not.

4c. Suppose your spouse <u>misunderstood</u> what you thought about how to discussion sensitive topics. How would you feel?

- I'd feel very strongly, enough to try to correct him (her).
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

5a. My spouse will say that when we make important decisions affecting both of us ...

- We almost always compete with each other for the dominant position in a hostile atmosphere.
- We usually compete with each other for the dominant position.
- We usually balance the dominant positions between us with only occasional competitiveness.
- We almost always balance the dominant positions between us, and have little desire to compete with or dominate one another.

5b. What will your spouse say that you think?

My spouse will say that I think ...

- We almost always compete with each other for the dominant position in a hostile atmosphere.
- We usually compete with each other for the dominant position.
- We usually balance the dominant positions between us, with only occasional competitiveness.
- We almost always balance the dominant positions between us and have little desire to compete with or dominate one another.

6a. My spouse will say that when we make important decisions affecting both of us ...

- We cooperate very little, seldom helping one another or working together.
- We cooperate about some decisions some of the time.
- We cooperate on most decisions most of the time.
- We cooperate almost always, helping each other verbally and in activities.

6b. What will your spouse say that you think?

My spouse will say that I think ...

- We cooperate very little, seldom helping one another or working together.
- We cooperate about some decisions some of the time.
- We cooperate on most decisions most of the time.
- We cooperate almost always, helping each other verbally and in activities.

6c. Suppose your spouse misunderstood what you thought about the way to make important decisions. How would you feel?

- I'd feel very strongly, enough to try to correct him (her).
- I'd be bothered enough to tell him (her) so.
- It would bother me some, but not enough to tell him (her).
- It wouldn't bother me at all.

For each of the topics listed in Question 7a, put a check in the column at the right which indicates what your spouse will say on how easy or difficult it is to bring the topic up in conversation with you.

7a. My spouse will say that the topic ...

	Very Easy	Easy	"So-so"	Difficult	Very Difficult
"How to deal with inlaws" is					
"Right and proper conduct at parties" is					
"Who decides when to have sex relations" is					
"When and how to show affection" is					
"Deciding about matters of recreation" is					
"Handling family finances" is					
"Which friends to visit or invite over" is					

For each of the topics listed in Question 7b, put a check in the column which indicates what your spouse will say that you think about how easy or difficult it is to bring the topic up in conversation with him (her).

7b. What will your spouse say that you think?

My spouse will say that I think ...	Very Easy	Easy	"So-so"	Difficult	Very Difficult
"How to deal with in-laws" is					
"Right and proper conduct at parties" is					
"Who decides when to have sex relations" is					
"When and how to show affection" is					
"Deciding about matters of recreation" is					
"Handling family finances" is					
"Which friends to visit or invite over" is					

7c. Suppose your spouse misunderstood what you thought about which topics can and cannot be talked over. How would you feel?

I'd feel very strongly, enough to try to correct him (her).

I'd be bothered enough to tell him (her) so.

It would bother me some, but not enough to tell him (her).

It wouldn't bother me at all.

Please go on to the Next Section

Section V

Below is a list of items on the communication between you and your spouse. In the columns on the right are five possible responses. Opposite each item place a check in the column which best represents the extent to which you and your spouse actually behave in the specified way.

	Item	Very Frequently	Frequently	Occasionally	Seldom	Never
1.	My spouse and I talk over the pleasant things that happen during the day.					
2.	My spouse and I talk over the unpleasant things that happen during the day.					
3.	My spouse and I talk over the things that we disagree about and have difficulties over.					
4.	My spouse and I talk about things in which we are both interested.					
5.	My spouse adjusts what he (she) says and how he (she) says it to the way I feel at the moment.					
6.	When I start to ask a question, my spouse knows what it is before I ask it.					
7.	My spouse expresses himself (herself) to me through gestures and glances.					
8.	Before making important decisions, my spouse and I discuss the decision.					

Item	Very Frequently	Frequently	Occasionally	Seldom	Never
9. I can tell what kind of day my spouse had without asking.					
10. If my spouse wanted to visit friends or relatives whose company I didn't enjoy, I would tell him (her).					
11. My spouse discusses matters of sex with me.					
12. I avoid telling my spouse things which put me in a bad light.					
13. My spouse and I discuss my most sacred beliefs without feelings of restraint or embarrassment.					
14. My spouse and I use words which have a special meaning not understood by others.					
15. If my spouse and I were visiting friends and something were said which caused us to glance at one another, we would understand one another.					
16. I can tell as much from the tone of voice my spouse uses as from what he (she) actually says.					
17. I would rather talk about intimate matters with my spouse than with someone else.					

Item	Very Frequently	Frequently	Occasionally	Seldom	Never
18. I avoid talking about certain subjects with my spouse because it may be unpleasant for us.					
19. My spouse encourages me to express my concerns.					
20. My spouse lets me know how he (she) feels about what I'm saying.					
21. It's easy to talk to my spouse about any problem or complaint.					
22. It's hard to tell my spouse's feeling and emotions from his (her) gestures and facial expressions.					
23. When I intend to do things which affect my spouse, I tell him (her) outright.					
24. When my spouse intends to do something which affects me, he (she) tells me outright so that I don't have to guess.					

For Questions 25 and 26, please check the one response which best answers the question.

25. When you and your spouse were together yesterday, how much time did you spend in conversation? Count the time actually spent talking and listening to your husband (wife).

_____ Didn't spend any time
_____ Less than 30 minutes
_____ 30 minutes to 1 hour
_____ 1 to 2 hours
_____ 2 to 4 hours
_____ 4 to 6 hours
_____ 6 to 8 hours
_____ More than 8 hours

26. Is the amount of time you spent talking with your spouse yesterday typical of most weekdays?

_____ Yes.
_____ No.

If NO, please estimate the amount of time you spend talking, with your spouse on a typical weekday.

_____ Don't spend any time
_____ Less than 30 minutes
_____ 30 minutes to 1 hour
_____ 1 to 2 hours
_____ 2 to 4 hours
_____ 4 to 6 hours
_____ 6 to 8 hours
_____ More than 8 hours

Thank you for your time and cooperation. Please return the questionnaire to your administrator.

APPENDIX D

MARITAL COMMUNICATION

The divorce rate in the United States has climbed to an incredible 33% as one in three marriages end in divorce. What are the causes of this ever-increasing dissatisfaction within marriage? More importantly, what marital styles can counter this trend?

As a part of ongoing research and education concerning communication and interaction in the "normal" marriage, a member of the Department of Communication of Michigan State University will offer a program on "Communication in the Normal Marriage" on Sunday evening, December 3 at 7:30 p.m. in the Community Center.

The program will be open to all E.H. married couples. It will begin with a questionnaire on communication patterns in marriage. The questionnaires will be used for research purposes and as a focus for the evening's discussion. An informal discussion will follow with emphasis on audience-involving exercises aimed at increasing both awareness and skills in the solution of marital communication problems.

For additional information, call Joe Cappella at 238-3349.