77-25,277

PAULLIN, Robert John, 1941-
CONSTRUCTION MANAGEMENT: IMPLICATIONS FOR INTERMEDIATE SCHOOL DISTRICT BOARDS OF EDUCATION AND ADMINISTRATORS IN MICHIGAN.

Michigan State University, Ph.D., 1977
Education, industrial

Xerox University Microfilms, Ann Arbor, Michigan 48106

CONSTRUCTION MANAGEMENT: IMPLICATIONS FOR INTERMEDIATE SCHOOL DISTRICT BOARDS OF EDUCATION AND ADMINISTRATORS IN MICHIGAN

By

Robert John Paullin

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Secondary Education and Curriculum

1977

ABSTRACT

CONSTRUCTION MANAGEMENT: IMPLICATIONS
FOR INTERMEDIATE SCHOOL DISTRICT
BOARDS OF EDUCATION AND ADMINISTRATORS IN MICHIGAN

By

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The purpose of this study was to examine in depth the role of the owner and the owner's representative during the design phase of a construction management project to determine if there was a change in the responsibility which they assumed when compared to similar roles in a traditional construction project. Further, if appropriate, to identify decision making areas for which inservice and preservice education of programs should be developed.

The study was conducted as an expanded case study. It included three projects in which the construction management technique was employed and three projects in which the traditional construction technique was employed. All six projects were located in Michigan and were intermediate school district owned area vocational centers.

The major conclusions of the study were:

1. The level of involvement of board representatives participating in construction management projects reflected a decrease when compared to the level of involvement of board representatives participating in traditional construction projects.
2. The level of involvement of board members participating in construction management projects reflected an increase when compared to the level of involvement of board members participating in traditional construction projects.

3. There is a positive relationship between the importance of the decision and the level of involvement of board representatives participating in construction management projects.
4. There is no relationship between the importance of the design decision and the level of involvement of board members participating in construction management project.
5. Board representatives involved in construction management projects had a higher level of involvement than board representatives participating in traditional construction projects in eighty percent of the design decisions which impacted mechanical and electrical design.
6. Board representatives involved in construction management projects had a higher level of involvement than board members participating in traditional construction projects in 83.3 percent of the design decisions which impacted mechanical and electrical design.
7. The study tended to support the implications which existed in the literature relative to the increased level of involvement of owner participating in a design phase of the construction management project.
8. Board representatives participating in traditional construction projects were perceived as having a higher level of competence in decision making than were board representatives involved in construction management projects.
9. Board members involved in traditional construction projects were perceived to have a higher level of competence in decision making than were board representatives involved in construction management projects.

10. The need to provide both preservice and inservice education programs for board representatives involved in construction management projects was identified.
11. The need to provide inservice education programs for board members involved in construction management projects was identified.
12. The need to provide both preservice and inservice education programs for board representatives involved in traditional construction projects was identified.
13. The need to provide inservice education programs for board members involved in traditional construction projects was identified.

Dedicated to my wife Jean and my daughters Lisa and Laura without whose love and understanding I could not have completed this study; and to those board members and administrators who had the courage to pioneer the Construction Management Technique.

ACKNOWLEDGEMENTS

The completion of the requirements for an advanced degree is only possible because of the professional dedication and personal consideration of many people, only a few of which I am recognizing.

My most sincere appreciation goes to Dr. Floyd Parker for his constructive guidance, particularly during the research portion of my program. I am also grateful to Dr. George Ferns for his assistance as Chairman of my Doctoral Committee and to Dr. Richard Featherstone and Dr. Blair MacLean for serving as members of my committee.

For their technical assistance I wish to express my gratitude to my sister Nancy Paullin for the many hours she spent on the graphics in this document, to Sandy Bates for typing the manuscript and to Carroll Walenberg for her assistance in copy editing the study.

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CHAPTER 1

INTRODUCTION

For years, builders in the private sector have been using management techniques to improve the cost/quality ratio of construction. Many times these management techniques eliminated competitive bidding through negotiated contracts and, therefore, were not applicable to construction in the public realm.[1] In order to bring some of these benefits to public construction projects, a methodology, hereinafter referred to as 'Construction Management' was devised. This process consisted of placing the owner in a position of the general contractor. It is accomplished with the assistance of a consultant identified as a construction manager.[2]

There are many benefits accrued to the owner through the replacement of the general contractor. One of the most significant benefits comes from the elimination of the profit pyramid. This is a situation which exists when a general contractor is responsible for submitting a lump sum bid for a particular project. In preparing this bid, the general contractor receives bids from prime subcontractors, normally the mechanical contractor and the electrical contractor, who in turn

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[1]J. Carl Justin, "An Architect's Notes on Construction Management: Construction Manager's Role in Bidding and Contract Preparation," Architectural Record 155 (January, 1974):75.

[2]George T. Heery, "Let's Define Construction Management: Excerpts From Time and Cost in Architecture", Architectural Record 156 (March, 1974): 69.

may further subcontract some of the work. The complexities of this particular relationship vary from project to project. In principle, however, the subcontractor prepares an estimate which is composed of material and labor costs upon which he bases his overhead and profit. He then passes his estimate on to the prime subcontractor. The prime subcontractor in turn incorporates this bid plus the materials and labor of his particular proposal and estimates his overhead and profit. By this action and because of the incorporation of the previous bid presented by a subcontractor, the prime subcontractor is, in fact, applying an overhead and profit factor not only to the materials and labor submitted to him by the subcontractor but also to the overhead and profit which was submitted by the particular subcontractor. The prime subcontractor then submits his bid to the general contractor and the cycle is repeated. At this point, the general contractor is figuring his overhead and profit on the assembled bid which constitutes a profit on a profit on a profit.

On projects employing a construction management technique, all contractors are prime contractors and bid directly to the owner, thus flattening out the structure and eliminating the profit pyramid.[3] Placing all contractors in the position of prime contractors bidding directly to the owner not only eliminates the middle man and thus reduces cost but also has some other very beneficial side effects. One of these beneficial effects rests in the fact that the owner has a direct line of communication with each contractor, and thus, all bids are exposed.

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[3]E. W. Davis, "How To Avoid Construction Headaches," Harvard Business Review 51 (March, 1973):90.

In the general contracting situation, the contract is awarded to the low lump sum bidder. Many times hidden within this lump sum package are sub-bids which do not represent the low bids for that division. By having a direct line of communication with all trade contractors bidding on the project, the owner has the opportunity through post-bid negotiations to take advantage of the cost savings recommended by the trade contractors. This is a typical process even in general contracting. However, the savings accrued through this process under a general contractor go into the general contractor's pocket, while savings accrued through this process under a construction management package, benefit the owner.

Another advantage to having a direct line of communication between the owner and all trade contractors is that a system for responsive payment can be established (e.g., billings submitted by the twentieth of the month will be paid by the tenth of the following month). With this kind of an assurance, the trade contractor can be more competitive in his bidding. This situation exists because he does not have to include carrying charges. It is not uncommon for a general contractor to be four to six months in arrears in payments to his subcontractors. Thus, the subcontractors must increase their bids to cover the finance or carrying charges of this type of an operation.[4]

By contracting separately with as many as 45 to 50 different contractors (thus establishing 45-50 different bid divisions), the owner with the assistance of the construction manager realizes a control over the project heretofore never experienced in the public sector. Because each one of these bid divisions may generate five to ten bids,

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[4]Bradford Perkins, "Cost Knowledge: Tool for Budget, Program and Design," Architectural Record 147 (June, 1970):84.

the owner, the construction manager and the architect have the opportunity to review 150 to 300 bids. This compares to the seven or eight bids normally reviewed with a general contracting package. The design team is thereby allowed to assemble a package by evaluating all of its components and picking those which best meet the demands of the project. This process is known as 'Value Engineering'.[5]

The construction manager normally assists the architect in preparing the bid documents. It is at this point that the construction manager establishes the timing of the events which must take place during the construction of a particular project. The schedule which has been determined becomes part of the bid documents. It informs the contractors who are bidding on the project of the time frame within which they are expected to function. Upon receipt of the bids, this time frame is again reviewed and additional adjustments are made.

Once construction is underway, the construction manager assumes responsibility for coordinating all trades on the site and for expediting materials which are necessary to keep the construction process moving. This is a very important aspect of the construction management approach since the manager, in fact, replaces the general contractor's superintendent. Because the construction manager's relationship with the owner is one of agency, he is concerned with getting the best quality workmanship for the owner. This compares to the relationship the superintendent has with the general contractor. His allegiance is oriented towards the general contractor; therefore, his efforts are in the

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[5]R. Y. Finley, "The Value Analysis: Total Project Cost Perspective," Architectural Record 157 (March, 1975):69.

direction of gaining as much profit from the project as possible. This may have a tendency to reduce the quality of workmanship on the project.[6]

In the case of an unresponsive contractor, the construction manager consults directly with the owner and the architect. Based on the owner's decision, appropriate action is taken. This is possible only because the owner has contracted directly with each trade contractor on the job.

In summary, the construction manager assists the owner during the design phase in making decisions relative to the cost/quality factors throughout the building. In addition, he assists the owner and the architect in the bidding phase by breaking up the bids into various bid divisions (normally 45 to 50) and then bidding each separately. This puts the owner in the same position as the general contractor, that of assembling services to put together a total construction package.[7] The entire process is reflected in the program schedule which is prepared by the construction manager.

Background Statement

Construction management started becoming visible in school construction in the early seventies. Since that point in time, many articles have been published espousing the merits or pointing out the shortcomings of construction management. To compound the problem

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[6]William B. Foxhall, "New GSA System for Construction Management," Architectural Record 157 (June, 1975):69-70

[7]Perkins, "Some Common Errors in Cost Control Programs," Architectural Record 147 (January, 1970):61-62.

three different professions have been vying for the role of construction manager. The architectural community feels that it should carry the prime responsibility as construction manager because of its role in the design process.[8] The engineering community feels that it should play the role of the construction manager because of its particular expertise. There is also a third emerging profession which represents elements of general contracting.[9]

For the most part, existing articles point out the savings in time and dollars and/or improved quality of the projects which are constructed under this management system. The growing popularity of construction management on school projects seems to reinforce the positive attributes of the approach. In 1972, the American Institute of Architects and the Architectural Record published a book by William B. Foxhall entitled Professional Construction Management and Project Administration. This book restates many of the positions which have been previously set forth. Such issues as who's responsible for quality, when do interests conflict, phased construction fees, etc. are discussed. A major portion of the book is devoted to case studies which are somewhat ambiguous but add to the growing body of testimony praising the merits of construction management.

Need for the Study

The need for this study was generated as a result of the increasing application of the construction management technique to intermediate

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[8] Walter F. Wagner, "High Cost of Construction: What Hope in the Seventies?" Architectural Record 148 (October, 1970):9-10.

[9] Foxhall, "New GSA System for Construction Management," 157, pp. 69-70.

school district projects.

In a position paper approved by the State Board of Education on June 3, 1975, the recommendation was made to establish fifty intermediate school district based area vocational centers during the six years between 1974-75 and 1979-80. This would place the rate of development at approximately nine projects per year. The estimated cost for delivering the above mentioned is $319,018,384.[10]

The literature on construction management implies that the owner and the owner's representative play an expanded role in the design process. If this is the case, because of its direct and potentially traumatic impact on administrators and boards of intermediate school districts and based on the scope of project intermediate shcool district activity in the State of Michigan, there may be an increasing need for both inservice and preservice programs which prepare the owner and the owner's representative to assume their rightful role in the design team. This study serves as a base from which the content of inservice and preservice programs can be determined.

The Problem

As indicated in previous paragraphs, much attention has been given to the improvement of the cost/quality ratio and the time savings which can be accrued through the use of construction management. Little or no mention has been made, however, of the basic change in the approach which facilitates the above mentioned, that of the owner assuming the role of the general contractor. If as implied, the owner is central to

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[10] A Position Paper on Capital Outlay for Area Vocational Education Center Development, Michigan Department of Education (June 3, 1975) pp. 16-19.

this process, the varying degrees of sophistication which the owner may bring to the team could have a significant impact on the success or failure of the process.[11]

On the other hand, the construction manager may bear the burden of the general contractor and involve the owner only as a figurehead and not as a decision maker in the total process. In such a case, the owner's role would not differ appreciably on a project employing construction management from a project which is handled in the traditional manner.

Statement of the Problem

The problem which existed was to examine in depth the role of the owner and the owner's representative during the design phase of a construction management project to determine if there was a change in the responsibility which they assume when compared to similar roles in a traditional construction project. Further, if inservice and preservice were appropriate, the areas of need must be identified.

The problem as it has been stated has five major components. They are as follows:

1. The examination of the role of the owner and the owner's representative during the design phase of a project in which the construction management (CM) technique was employed, then comparing it to the role of the owner and the owner's representative during the design phase of a project in which

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[11]Foxhall, "Budget Control of the Phase Construction Project: Excerpts from Professional Construction and Administration," Architectural Record 150 (October, 1971):97-98.

the traditional approach was employed.

2. The examination of the level of competence perceived by the owner and the owner's representative during the design phase of a project in which the CM technique was employed.
3. The examination of the level of competence perceived by the owner and the owner's representative during the design phase of a project in which the traditional approach was employed.
4. The examination of the difference, if any, in the level of competence required of both the owner and the owner's representative during the design of a project in which the construction management technique was employed when compared to the competence level required of both the owner and the owner's representative during the design phase of a project in which the traditional approach was employed.
5. The determination of the areas of competence which need reinforcement and upgrading to allow the owner and the owner's representative to better assume their role as a member of the team during the design phase of a project in which the construction management technique is being employed. This activity will reflect itself in a list of needs for both inservice and preservice.

Nature and Scope of the Study

The study was conducted as an expanded case study. It included three projects in which the construction management technique was employed and three projects in which the traditional construction technique was employed. All six of the projects were located in

Michigan and were intermediate school district owned area vocational centers.

Delimitations

1. The study was confined to the experiences of the intermediate school district Boards of Education and their representatives on projects involving the construction of area vocational centers in the State of Michigan.
2. There are three primary phases involved in the delivery of an educational facility. The predesign phase consists of those activities by which the owner develops the educational specification and project parameters. The design phase consists of activities undertaken by the design team (architect, owner and CM, if appropriate) to convert the educational specifications into contract documents (working drawings and building specifications). The construction phase includes all of the activities necessary to convert the contract documents into the educational facility described by the owner in the educational specifications. This study examined the various roles of the owner and the owner's representative during the design phase.
3. Only those construction management projects in which the construction manager represented an organization separate from that represented by the project architect were examined.
4. Only those traditional construction projects established after FY 72-73 were examined.
5. The number of traditional projects examined did not exceed the number of construction management projects examined.

6. For purposes of this study, no additions or renovations were considered.

Theoretical Framework

In 1963, Patricia Smith and L. M. Kendall from Cornell University, published an article in the Journal of Applied Psychology entitled "Re-translation of Expectations: An Approach to the Construction of Unambiguous Anchors for Rating Scales". They identified experts (in this instance, head nurses) who were restricted to medical-surgical nursing. The procedures followed were:

1. Qualities or characteristics to be evaluated were listed by each group. The most frequent dimensions were selected for further analysis. The nurse's own terminology was retained. Coverage of important aspects was further assured by gathering classified, critical incidents in the customary way.
2. The groups formulated general statements representing definition of high and low acceptable performance for each quality.
3. The group submitted examples of behavior in each quality and these were edited in the form of expectations of specific behavior.
4. Judges indicated independently what quality was illustrated by each example. Examples were eliminated if there was not a clear moral agreement as to the quality to which each belonged. Qualities were eliminated if examples were not consistently reassigned to the quality for which they were originally designed.

5. Other judges used the examples to describe a specific nurse with an outstanding good nursing performance and another nurse with unsatisfactory performance. The difference between the outstanding and the unsatisfactory nurse was computed for each pair of ratings to determine the discrimination value for each example.
6. Each vertical scale, together with a general definition, was presented with a list of items previously judged by other raters as belonging to that quality. The judges rated each item zero to two according to the desirability of the behavior illustrated. Items were eliminated if the dispersion of judgements was large or if distribution of multi-modal was multi-model.

All of the items which met these criteria were assembled for each scale and the mean scale positions assigned to them for each group of judges were inter-correlated to give estimates of the scale reliabilities. Therefore, if one is interested in the consistency with which successive random samples of subjects or judges respond to an invariant set of stimulus items, one encounters a problem of scale reliability rather than test reliability. It was recognized that the mean values were distorted somewhat by skewness in the distribution of judgements at the extremes. But it was felt that since the effect of skewness would be to reduce the stability of the means as estimates of central tendency, correlations using means would give at least a minimal estimate of agreement among groups of judges as to the relative position of the items on the scale. In addition, a comparison among the samples of means and variances for all items in each scale indicates a similarity in the absolute location of items by the various groups of judges. The procedures seemed satisfactory with adequate agreement concerning the allocation of examples, excellent discrimination, and a high scale of reliability.

Overview of Procedure

The investigator applied procedures similar to those tested by Smith and Kendall to the problem identified in this study. The procedures were addressed in five phases:

Phase 1 - Two panels of judges were identified. Panel No. 1 was composed of five members, and Panel No. 2 was composed of ten members all of whom were architects registered in the State of Michigan.

A. Panel No. 1 was charged with the responsibility of identifying all the decisions that were typically made during the design phase of a building project.

B. Panel No. 2 was given the list developed by Panel No. 1 and charged with rating the decisions made during the design phase of a building project.

C. Based on the ratings of Panel No. 2, the decisions were placed in rank order from most important to least important and the twenty-nine decisions most important to the design phase of a building project were identified.

Phase 2 - Based on the outcome of the activities in Phase 1, separate questionnaires were developed for the owner, the owner's representative and the architect. These questionnaires were designed to gain from the respondents the following information:

A. The owner's perception of the importance of the role they play in the decision-making process during the design phase of the project in which they were involved.

B. The owner's representative's perception of the importance of the role the owner played in the decision-making process during the design phase of the project in which he was involved.

C. The architect's perception of the importance of the role of the owner in the decision-making process during the design phase of the project in which he was involved.

D. The owner's representative's perception of the importance of the role he played in the decision-making process during the design phase of the project in which he was involved.

E. The owner's perception of the importance of the role played by their representative in the decision-making process during the design phase of the project in which they were involved.

F. The architect's perception of the importance of the role played by the owner's representative in the decision-making process during the design phase of the project in which he was involved.

G. The owner's perception of their competence in making decisions which their role required based on the project in which they were involved.

H. The architect's perception of the owner's competence in making the decisions which their role required based on the project in which the architect was involved.

I. The owner's representative's perception of this competence in making decisions which his role required based on the project in which he was involved.

J. The architect's perception of the owner's representative's competence in making the decisions which his role required based on the project in which he was involved.

Phase 3 - The respondents identified in Phase 2 were asked to respond to the appropriate questionnaires.

Phase 4 - This phase consisted of comparing the perceptions of the architect, the owner and the owner's representative relative to the various points of concern identified in Phase 2 of this study. Based on the outcome of this phase, the existing relationships were examined.

Phase 5 - Recommendations for future preservice and inservice were made which are designed to improve the owner and the owner's representative's ability to participate on the design team.

Assumptions

1. The opinions of recognized experts in the field of architecture are valid in the absence of data that have been established experimentally.
2. Although differences exist among the individuals involved in the design phase of a construction management project, enough similarity exists that the common strengths and weaknesses which are present can be identified.
3. There are identifiable weaknesses in the individuals involved in construction management during the design phase which can be impacted by both preservice and inservice education.

Definitions

Literature in the field of school planning and construction contains terms which are general in use and understood by most readers of school plant planning literature. These terms are used frequently throughout the study and exist without need or benefit of special definition. Some of the terms used in the discussion of construction management as it applies to school plant planning and construction are unique to the topic and may, in fact, be interpreted to have several different meanings at this point in time. The term Construction Management, for example, depending upon its application, has a wide range of definitions starting with simple cost estimating and ending with total project management. Further, there is no recognized lexicon of construction management terms to which the reader may refer. Terms requiring clarification of meaning as used in this study are defined in the following paragraphs:

Agency - (1) Relationship between agent and principal.
(2) Organization acting as agent.
(3) Administrative subdivision of an organization, particularly in government.[12]

Architectural Community - Individuals, both professional and non-professional, who participate in the practice of architecture.

Area Vocational Center - A facility constructed for the purpose of housing area vocational education programs.

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[12] Glossary of Construction Industry Terms (Washington, D.C.: The American Institute of Architects, 1970) p. 3.

Bid Division - The subunit of a complete bid package which represents a specific trade (e.g., glazing, flatwork concrete, footings and foundations, etc.).

Bid Document - Building specifications and working drawings which are used to solicit bids from the various trade contractors interested in bidding the project.

Bidding Phase - The fourth phase of the architect's basic services during which competitive bids or negotiated proposals are sought as the basis for awarding a contract. (Ref: AIA Documents B131, B231 and B331 and Handbook Chapters 9 and 16.)[13]

Board/Owner - The governing body of an intermediate school district.

Constituent School District - A local school district whose territory is entirely within, and is, an integral part of an intermediate school district.[14]

Construction Management - That group of management activities over and above normal architectural and engineering services related to a construction program carried out during the predesign, design and construction phases that contribute to the control of time and cost in the construction of a new facility.[15]

Cost-Quality Ratio - The ratio between the cost and the quality of a construction project when the quantity is held constant.

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[13]Ibid., p. 5.

[14]The School Code of 1976, Act No. 451 Public Acts of 1976, State of Michigan 78th Legislature Regular Session of 1976.

[15]Heery, "Let's Define Construction Management," p. 69.

Design Phase - The second phase of the architect's basic services. In this phase, the architect prepares from the approved schematic design studies for approval by the owner the design development documents consisting of drawings and other documents to fix and describe the size and character of the entire project as to structural, mechanical and electrical systems, materials and such other essentials as may be required.[16]

Design Process - The act of converting educational specifications into building specifications and working drawings.

Design Team - The individuals involved in making design decisions during the design process.

Electrical Contractor - The person or organization responsible for performing the electrical work identified as such in the owner-contractor agreement.[17]

Engineering Community - Those individuals, both professional and non-professional, involved in the practice of engineering.

General Contractor - The person or organization responsible for performing the work identified as such in the owner-contractor agreement.[18]

Inservice Education - An educational process designed to improve the skills and knowledge of individuals who are charged with the responsibility of performing a particular function (e.g., board members, administrators, etc.).

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[16] Glossary of Construction Industry Terms, p. 8.

[17] Ibid., p. 7.

[18] Ibid., p. 7.

Intermediate School District - A corporate body established under Part 7 of the school code of 1976.[19]

Lump Sum Bid - A bid in which a specific amount is set forth as the total payment for performance of the contract.[20]

Mechanical Contractor - The person or organization responsible for performing the mechanical work identified as such in the owner-contractor agreement.[21]

Owner - The intermediate school district Board of Education.

Owner's Representative - The intermediate school district administrator who has been assigned the primary responsibility for working as a member of the design team by the intermediate school district Board of Education.

Perception - Any act or process of knowing objects, facts, or truths, whether by sense experience or by thought; awareness of objects and consciousness.[22]

Phased Construction - A process of overlapping certain steps in the building process to provide increased efficiency by reducing the amount of time normally required in the building process.

Preservice Education - An educational process designed to develop skills and knowledge in those individuals who are in the educational main stream preparing to assume the responsibility of performing a particular function (e.g., prospective teachers, administrators, etc.)

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[19]"The School Code of 1976," p. 2.

[20]*Glossary of Construction Terms*, p. 15.

[21]Ibid., p. 7.

[22]Howard S. Bartley, *Principles of Perception* (Chicago: Harper and Brothers, 1958), pp. 8-9.

Prime Contractor - Any contractor on a project having a contract directly with the owner.[23]

Profit Pyramid - The markup which occurs in the bidding process as the number of contractors handling a particular item increases.

Project Architect - The individual who is directly responsible for coordinating the design phase of a building project.

Subcontractor - A person or organization who has a direct contract with a prime contractor to perform a portion of the work at the site.[24]

Sub Bids - Bids submitted by subcontractors.

Trade - Occupation requiring manual or mechanical skill (e.g., sheetmetal worker, flat concrete worker, masonry worker, etc.)[25]

Traditional Approach - The approach to designing and constructing a building in which the architect completes all bid documents, advertising for bids and receiving bids from general contractors, finally awarding to one general contractor the responsibility for construction of the project.

Traditional Construction Project - A project that employs a traditional approach.

Value Engineering - The process of reviewing available material, hardware and equipment to determine the combination which will insure the greatest inherent value in the facility upon completion of the construction.

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[23] Glossary of Construction Terms, p. 16.

[24] Ibid.

[25] Ibid.

Summary

In order to bring some of the benefits to public construction projects which have been available in the private sector for years, methodology referred to as "Construction Management" was devised. Its application to school construction started becoming visible in the early seventies. For the most part, its benefits included savings in time and dollars and/or an improved cost quality of the projects which were constructed under this system. Some of the earliest applications of this process in the State of Michigan were undertaken by intermediate school districts who were in the process of building facilities to house area vocational education.

Future projections indicated that the State of Michigan was planning the establishment of 50 intermediate school district based area vocational centers during the six years between 1974-75 and 1979-80. The problem which existed then was to examine in depth the role of the owner and the owner's representative during the design phase of the construction management project. This was necessary to determine if there was a change in the responsibility which these participants assumed when compared to similar roles in traditional construction projects. The study included six projects located in the State of Michigan and was conducted as an expanded case study. Three intermediate school district owned area vocational centers which were constructed using the construction management technique and three intermediate school district owned area vocational centers which were constructed using a traditional construction technique were identified.

Procedures for gathering the data were then identified and the parameters of the study, delimitation, assumptions and definitions were established.

CHAPTER 2

REVIEW OF LITERATURE

An extensive review of the literature which relates to the application of the construction management technique to public owned construction projects was conducted. A search of dissertation abstracts was initiated using the Comprehensive Dissertation Query Services's Datrix II program. This search generated 52 references none of which could be related to this study. A search was conducted on ERIC using S.D.A.'s International Search Service's Orbit III program. This effort generated 82 citations, 58 of which had a direct relationship to the study. The resources available at Michigan State University Library and through State Library Services were also used extensively in conducting the review of literature.

As a result of this effort, it became obvious that with respect to its development the construction management process was evolutionary not revolutionary. The emergence of such management tools as Program Evaluation and Review Technique (PERT), Critical Path Method (CPM), Bar Charts, Modified Bar Charts and Systems Building resulted because of a desire to smooth the flow of activities and speed delivery of construction projects in the public realm.

Fast Track Method

Starting in the mid fifties through the early sixties, the successful Critical Path Method (CPM) experiences in engineering and construction and the Program Evaluation and Review Techniques (PERT) of the Navy's Polaris Missle development in 1958 to 1960, precipitated the application of such management tools to schoolhouse construction.[1]

As these applications gained sophistication, it became apparent that by phasing the various aspects of design and construction, the delivery time for a building could be further shortened. Whitcomb and Kliment in their article entitled "On Track With Fast Track", speak to what the fast track process of phase design and construction process means to the architect. They point out that there are 12 categories of considerations which must be kept in mind if fast track is to work sucessfully. These considerations are:

1. Irrevocable Decisions - Fundamental to the fast track process is early commitment to decision, not only by the designer but also by the owner. Decisions become irrevocable, even bad ones.
2. Deferred Decisions - Under the conventional method, the design team is under constant pressure. One thousand cubic yards of foundation construction cannot start until the hand rails have been detailed. This unnecessary constraint to construction is removed by awarding foundation contracts as soon as a particular set of decisions has been made. Detailing of the hand rails can wait until later.
3. Planning and Scheduling - It is the construction schedule that sets the pace for the architectural and engineering schedule. All architectural and engineering decisions, owner/agency reviews and approvals and preparation of contract documents must allow the construction itself to proceed in a continuous and logical sequence.

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[1]Baret Thompson, "A Project Scheduling System That Really Works," Architectural Record 152 (April, 1975):57.

4. Contracts and Bid Packages - One of the first decisions to be made is division of the work. How many separate contracts should be awarded and what work items should be included must be determined.
5. Bidding - The lowest cost is still the primary objective. The architect with his responsibility for bidding the project has a tougher job with multiple bidding. With multiple bidding, each trade contractor becomes a prime contractor. This is often a new role for subcontractors and the lack of understanding often leads to high bids.
6. General and Supplementary Conditions - Multiple bidding eliminates the umbrella of the general contractor who normally provides many general condition construction items necessary to support the trade contractors. The architect in preparing the bid documents needs to inform the bidders that they must supply their own temporary toilets, utilities, etc. or that they will be provided by someone else.
7. Multi-Estimates - The day of reckoning for the architect arrives when the bids come in. Does the construction proceed or is it back to the boards? With multi-bidding, this worry is often repeated because of multiple bid openings.
8. Financial Risk - The owner is asked to spend money and thus commit himself before he knows what the total price tag will be. Therefore, a significant factor to consider in fast track is risk. When construction is started before working drawings and specifications are complete, the owner does not have a closed contract. What will be built has not yet been clearly defined. Its final cost cannot, therefore, be pinned down.

9. Critical Procurement Items - Ordering elevators and switch gear is usually furthest from the architects mind in grappling with the initial design problems of siting and circulation flow. Starting construction three months after the architectural and engineering contract is signed instead of having the usual 12 to 16-month cushion requires that all construction items which have long fabrication and delivery time be identified and purchasing scheduled.
10. Owner Commitment - Whether a proposed fast track operation works out well or not is largely a function of the way in which the architect initially promotes the project. Prospective owner and client need to be aware of the extra responsibility they must commit themselves to if fast track is to work as promised.
11. Maximum Benefit - The fast track process is the most applicable on large projects and on building systems projects. On a 15-25 million dollar project, excavation alone can take as much as three to four months. The sooner this is started the better, especially if it can be done during the dry season when the ground is free of frost.
12. Project Management - It takes a good project manager to run a fast track project. Careful planning, coordination and constant communication with all team members is essential more than ever. The design and construction are simultaneous.[2]

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[2]Francis G. Whitcomb and Stephen A. Clement, "On Track with Fast Track," American Institute of Architect Journal 59 (February, 1973): 45-48.

Clement and Smith, in their article "Fast Track - How It Slices Cost and Speeds Up Construction", point out that fast track offers essentially three major advantages over the conventional method of managing a school building delivery process. They are as follows:

1. "It saves time from start to finish, usually about 25 percent. When the process is paired with systems building and pre-engineered components, a 50 percent savings in construction time isn't unheard of.
2. It eases the effects of inflation by completing the structure sooner.
3. It gives planners more time to change their minds about design approaches. Minor and even major design decisions do not have to be made at the outset. They can be formulated during the construction process instead."[3]

By tightening up on the time schedule of a school construction project thus completing it sooner, significant cost savings can be accrued. With construction costs climbing at an annual rate of approximately 12 percent, any economies short of poor quality construction is difficult to achieve. With time reductions of up to 50 percent, depending upon the financial scope of the project, it is not difficult to see how one to one and one half percent per month of inflationary increase can be converted into significant cost savings.[4]

The Federal Government General Services Administration (GSA), in an item released May 10, 1970, stated that "Streamlined procedures for

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[3]Steven A. Clement and Jack W. Smith, "Fast Track: How It Slices Cost and Speeds Up Construction," American School Board Journal 159 (August, 1971):15.

[4]Ibid., p. 17.

constructing federal building were implemented today by the General Services Administration . . . Thirty-two specific recommendations for change were contained in a recent study of the construction contracting systems used by the GSA . . . The report found the present system too time consuming. Obviously, observed GSA adminstrator Robert L. Kunzig, in the present climate of steadily rising construction costs, a savings of time means a savings of money. The emphasis of the new GSA procedures apparently to be implemented immediately is on centralizing project responsibility, reducing design and construction time, utilizing phased construction and expeditious processing of paper. Let's hope that new leaf stays turned."[5]

Value Engineering

A development which grew out of the concept of fast tracking was the idea of multiple contracting, that is, breaking down the traditional contract package into sub-components to allow phased bidding and to facilitate a procedure called "Value Engineering". Very simply, this procedure entails evaluating all multiple bids and then picking and choosing between the options which are available.

Robert Finlay of CM Associates states, "The standard method for defining the value alternative is to rate it according to parameters of effect on the building use, cost, esthetics, environmental impact and market value."[6] He further indicates that there will undoubtedly be trade-offs and that while esthetics are of the utmost importance, they

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[5]Walter F. Wagner, "Isn't the Best Way to Cut Cost to Cut Time (to recoin a phrase)?" Architectural Record 147 (June, 1970):9.

[6]Finley, "The Value Analysis: Total Project Cost Perspective," pp. 69-70.

tend to create the most emotion. They are usually the first to get tampered with when the budget is threatened. One of the major goals of value engineering should be to permit cost effectiveness that does not generate a quality trade-off.

Value engineering should be applied early in the design stage and then at every subsequent stage of the building process right on through the procurement and construction stage. This procedure represents itself in four phases.

> "Phase 1 is the information phase. It has two separate stages. The predesigned concepts must first be documented and reviewed. Then, once drawings and specifications for the program are established, they must be reviewed and the owner's values must be established.
>
> Phase 2 is the analysis phase. These phase cost estimates are made for each of the major building disciplines (e.g., architectural, structural, mechanical, electrical, etc.). Cost models which are based on historical data are then prepared and the estimates are compared to each of the models. The value engineer then analyzes building disciplines, systems and components as to their function and cost. The cost of substitutes are then reviewed and a determination made as to the effect it would have on the owner's value scale.
>
> Phase 3 is the speculation phase. The scope and parameters are defined and the functions are analyzed. Ideas are presented, recorded and evaluated and then numerically rated against a list of value objectives. This process results in reaching a consensus on the best solution.

Phase 4 is the documentation phase. Based on the outcome of Phase 3, a recommendation is written. If this recommendation is approved by the client, it becomes a document with drawings and specifications. This process is repeated many times during the design development stage of the project."[7]

Value engineering has been applied to the cost management process in order to overcome the negative effects which exist in more simplistic cost pairing operations. "The goal of value engineering is not just to cut cost. It is aimed at achieving unimpaired program results for a minimum cost."[8] Therefore, a program which has been successfully value engineered will achieve the same performance criteria as the more costly alternatives. In its most basic application, this technique has been employed to check for overdesign. In more sophisticated applications, it involves refinement in product specifications to eliminate costly contradictions and restrictions. Detailed evaluation of mechanical systems and careful refinement of the internal composition is of major importance.[9]

Randell N. Yearwood indicates, "Value engineering is the process of getting the most value for your dollar."[10] The value engineer is aware of the cost/schedule relationship. He knows that the initial cost, maintenance cost and operating cost all have their effect on the building.

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[7]Ibid.

[8]Perkins, "Cost Knowledge" Tool for Budget Program and Design," p. 84.

[9]Ibid.

[10]Ibid.

Systems Building

A parallel development to the aforementioned was the emergence of the concept of systems building. The building industry had been characterized by its slowness to respond to modern techniques. While examples of industrialized or systems building can be traced as far back as 1851 with construction of the Crystal Palace, it was not until the end of World War II when a number of countries began utilizing systems building in the housing industry that the technique began to gain the attention of the United States.

"The School Constructions Systems Development (SCSD) program in California, the Study of Educational Facilities (SEF) in Florida and the Construction Systems Project (CSPI) of Detroit, Michigan provided a basis from which the educational community could pursue the adoption of systems building to schoolhouse construction across the nation. Because systems buildings employ off the shelf items which are prefabricated, the capital intensive aspects of their employment in school building projects yield both time and cost benefits. It is reported that over 900 schools across the country have incorporated building components that have been developed specifically for the SCSD schools in California."[11]

Construction Management

"The construction management concept has been touted by some of its more evangelical proponents as a major breakthrough in the history

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[11]Earl Gordon, "The Systmes Approach to School Construction - The Potential Benefits and Necessary Conditions and the Implications for Michigan Schools" (Doctoral thesis, Michigan State University, 1971, pp. 22, 23, 24, 41, 43.

of building, but it is really not a single discovery; instead, it is a mixed bag of techniques and procedures dating back to antiquity which have been fused together under the pressure of the present building crisis. The catalyst for this fusion has been the owner's determination to force the construction industry to regard a highly fragmented series of discrete decisions and events as a single process. In other words, the owners have argued that the building process can be effectively managed."[12]

Techniques, multiple contracting, fast tracking, value engineering and systems building began to be applied in various combinations until early in the 1970's the concept of construction management began to take form. The construction manager evolved as the result of an attempt to orchestrate the above mentioned techniques. George T. Heery, President of Heery and Heery, defines construction management as "... that group of management activities over and above normal architectural and engineering services related to a construction program carried out during the predesign, design and construction phases that contribute to the control of time and cost in the construction of a new facility."[13]

Hiring the Construction Manager

The construction manager should be engaged at the same time as the architect if not earlier and should work closely with the school officials from the conception of the project through to its completion. In order to perform his many tasks effectively, the construction

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[12]Edward W. Davis and Lindsey White, "How to Avoid Construction Headaches," Harvard Business Review 51 (March, 1973):93.

[13]Heery, "Let's Define Construction Management," p. 69.

manager should employ the fast track process and utilize either the PERT or CPM systems. If this is not the case, he will be merely functioning as another clerk of the works.[14]

Bradford Perkins states, "To date, a CM has rarely been called on for advice in selection of the architect and engineer because the CM is often selected at the same time as or after the architect and engineer."[15] This is subject to change, however, as owners are more often engaging architects and construction managers and other consultants for feasibility studies, programming and other predesign work in more and more areas of owner concern. One has to remember that the rapid rise in the use of separate services called "Construction Management" can be viewed as a symptom of consumer revolution. GSA and other owners rather than construction industry producers have taken the lead in the development of the definition of construction management because they needed more effective means of delivery of large complex projects than had been available through the public bidding of single contracts for each project. "Ideally, the construction manager should be engaged at the same time as the architect and design built team if not earlier and should work closely with either one and with the school officials from the conception of the project through to its end."[16]

Hiring the construction manager prior to hiring the architect allows the owner to establish cost parameters, square footage parameters, the

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[14]John H. Fredrickson, "The New Planning and Building Terms," <u>School Management</u> 18 (January, 1974):53.

[15]Perkins, "A/C-CM Relations: Approaching a Modis Vivendi," <u>Architectural Record</u> 154 (October, 1973):68.

[16]Fredrickson, "The New Planning and Building Terms," p. 53.

design production schedule and the identification of site conditions prior to the selection of an architect. By providing the interviewing architects with a complete package of data relative to the project, the firm can more realistically make a decision about its abilities to perform at the level required by a particular project. As a result of having a construction manager who represents the construction industry on board at the time of design, there is more realistic cost accounting through schematic, design development and working drawing stages.

The Team

School boards and administrators should concern themselves with four core concepts of construction management as they approach new construction responsibilities.

1. The owner must recognize that he is the key member of the project development team. Only the owner can select and organize the proper team of designers, educational consultants and construction consultants, etc., provide the final definition of his needs, set proper priorities, monitor the project development and serve as the final decision maker for the project. Since he cannot really delegate any of these roles, he must be prepared to deal effectively with each.
2. A corallary of this first concept is that the project team should have the capability to deal effectively with all project problems. Because of the rapidly growing complexity of design and construction, many owners and design teams have not been able to provide all of the required capabilities. Project cost, time management skills and construction experience are currently the most common areas where the typical team needs assistance.

3. All of the team's capabilities should be brought to bear at the earliest possible time. As the project is developed, the team has fewer and fewer alternatives available. This is particularly true of the construction knowledge, for cost and time related factors can best be reduced and controlled by decisions made during the programming and conceptual design. Realistic budgets can be compared and realistic schedules developed at the very earliest stage of the project and indeed should be considered as part of the program in the parameters of design.
4. By providing the team with all the capabilities required and by bringing them all to bear at the earliest point of the project, it is possible to integrate programming, design and construction into a single project delivery process.[17]

This integration is a major improvement over the fragmented process which has led to so many of the current construction problems. It has its greatest impact when construction starts before design is complete.

GSA views the role of the owner, architectural engineer and construction manager as a team with no prime participants, only indispensable members working side by side. The architect is in his normal role but with estimates and advise of the construction manager. He is required by his contract to design so that the project bidding is within the established cost limitations. In addition, the architectural engineering firm in this system must package the output of working drawings and specifications to fit the most advantageous packaging and

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[17]Perkins, "A New Building Program Can Run Smoothly," School Management 15 (September, 1971):36.

grouping of separate contracts selected while working within the strict schedule and discipline. The thrust of the GSA policy is to encourage if not enforce the multiple contract phase of the construction approach to delivery."[18]

Barry Sibson states "A key element to the eventual success of the construction management method is a high degree of interaction between the owner, the architect and the construction manager. Certainly a higher degree of the interaction prevails on a phased construction project with construction management than is normal under the usual sequential design built procedure."[19]

The Design Phase

There is a common school of thought in which the construction management services are limited to the process in which the general contractor is eliminated while the construction manager assumes the administrative responsibility for a series of separate contracts under a professional fee arrangement with the owner. While this can have an important impact on the elimination of the profit pyramid, which is a condition that exists under the traditional construction approach, the fundamental fact that the greatest cost savings in time and money in a construction program can be achieved during the design phase must not be ignored. It is during the design phase that the quantity and the quality of the building are established. The systems which will affect construction procedures are selected and the start time for construction is determined.

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[18]Barry Sibson, "CM: The Only Way To Go Fast Track - Part 2," Architectural Record 155 (January, 1975):69.

[19]Foxhall, "New GSA Systems for Construction Management," p. 69.

Although construction management has several different variations, the essence of the concept centers around the introduction of the construction manager as the owner's agent and the manager of the entire building process. This creates a situation which is similar to that of the master builder of ancient times whose responsibilities span both the design and the construction phases of the building process.[20]

Since the construction manager has overall management responsibility, there is not a prime or general contractor on the job. Further, each segment of construction is contracted separately with the owner, not the construction manager, with the advisement of the construction manager, thus placing the owner in the same position as the general contractor, that of brokering services for the purpose of constructing a particular facility.

Johnathan King supports this position by stating "Building systems are hardware and fast track scheduling is an organizational technique. Construction management is as the name implies, a way to manage the process of construction in a new potentially more efficient way. The contractor in traditional public construction gets the job because he is the low bidder whether he does a good job or a bad job. The construction manager is a professional who works for the owner on a professional fee basis. He is hired because of his management skill to represent the owner in organizing the construction job skillfully and efficiently. His management tools include expert cost control and schedule control techniques such as computerized critical path method schedules."[21] Construction management allows bids to be taken from

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[20]Davis and White, "How to Avoid Construction Headaches," p. 89.

[21]Jonathan King, "New Ways to Build - Or, How to Get Your School Built Before You Retire," National Elementary School Principal, (September, 1972):22.

subcontractors on various subsystems of the building at the most advantageous time and not necessarily at the same time, thus facilitating fast track scheduling. Foundations and site work can be bid early while design is still in process. Structures can be bid and then fabricated in the factory before subsystems are needed. In short, the management role of contracting is taken from the entrepreneurial realm of the professional.

John L. Tishman points out that while the general contractor is assembling his bid, he adds all of the component subcontracts, adds his own estimate for coping with general conditions on the site and further adds his own expectations of profit. If the general contractors in a given area must assemble their bids from the same universe of subcontractors, the only area in which there can be a difference is in the general site conditions and the profit allocations. Tishman further indicates that if a true application of expertise in management discipline can make a savings of 20 percent on a job, its a matter of history that at least half of this savings occurs in the disciplines applied to the planning stage, the other half in buying the project.[22]

Cost Accounting

The cost accounting reflects itself in a conceptual estimate prepared by the construction manager during the schematic phase of design.

The estimate is then sophisticated, based on design development drawings, the result being line item estimates based on each of the major divisions which are inherent in the construction project. Once

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[22]John L. Tishman, "The Guaranteed Maximum Price: A Sampling of Views," Architectural Record 155 (April, 1974):65-66.

working drawings are complete and the project is ready to go out for bids, a refinement of the line item estimates which is made of the design development stage, is generated. With this information, the owner can determine the necessity to modify the materials or scope of the project based on predicted costs of the building. Oftentimes these modifications will reflect themselves as additive alternates.

This is supported by Phillip Meath as he states, "There are two important qualities of construction management where phased construction is involved. First is the early and continuous refined accuracy of what has been called 'the conceptual estimating process' as opposed to the 'take-off estimating'. Second, the isolation of those costs system by system makes it possible to spread design flexibility throughout the components of the entire project rather than forcing a massive paring job on quality after all bidding documents are completed and bids have come in over budget. While this method inevitably increases the role of the owner (project administrator), the whole process will not work well at all unless the owner does maintain continuous participation in what has been called the United Team Action Program."[23]

Bid Divisions

The bidding of a project is usually accomplished by subdividing the total package into bid divisions. It is not uncommon to have 35 to 50 separate bid divisions on a typical construction management project.

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[23]Phillip Meath, Jr. and Harry A. Coleman, "Budget Control of Phased Construction Project," Architectural Record 59 (October, 1975):76.

Carl Justin states that fast track projects can result in 30 or more, sometimes less, separate prime contracts. These are then coordinated and administered in the field as a further part of the construction management function. He also points out that some construction managers desire to reduce the number of prime contracts to reduce the number of problems with interface by combining various trade combinations. He presents a methodology in which the overall project schedule is just as short as normal fast tracking. The total number of separate prime contractors is limited to approximately 17 rather than the 30 or more, the field coordination, therefore, being correspondingly simplified.[24]

Geroge T. Herry states that with construction management there are separate prime contracts that remain separate through the project for salutory or phasing reasons. Under this format, the separate prime contracts might include major parts of project such as mechanical electrical work, structural work, systems components, special equipment, site work and general construction.

Bidding Phase

The construction manager prepares bidder lists for the various packages. He should have intimate knowledge of the available contracting firms that may have the ability as well as the interest in bidding on the work. Prequalification of perspective bidders may be appropriate where highly specialized skills are critical to production schedules. The construction manager should arrange prebid conferences to inform

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[24]Justin, "An Architect's Notes on Construction Management," pp. 75, 77.

perspective bidders of the special conditions in the proposed work and to clear any ambiguities in the documents. The owner and the architect should be present at these conferences.

At least half of the savings that can be expected as a result of the construction manager's professional services are made in the bidding phase as a result of the CM's fulfilling the role of the general contractor in handling the bids at separate trades. The CM takes bids, but he is also able to talk to the contractors directly as the owner's agent clarifying documents and scope so that the subcontractor can submit his bid with confidence that the scope and detail are truly stated in the document.[25]

Once bidding has taken place, there is virtually no opportunity for further savings no matter what disciplines are applied except in matters of scheduling and management which are, in effect, methods of avoiding disaster rather than ways of effective savings. Under the terms of construction management as it is now being defined, the owner begins to have more direct association and responsibility among the trades involved in his project. The owner, through the construction manager, is able to talk to the trades and evaluate the options that arise in many basic alternatives which are not available in the process that must arrive at a construction document before bidding in the open market place. "The owner does participate more directly with the project. This, of course, means that he accepts more risk, but at the same time, he is not required to pay the price of that risk to an entrepreneur whose profit is adversary to his own interests."[26]

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[25]Tishman, p. 67.

[26]Ibid, p. 6.

Davis and White indicate, relative to this area, that in the bidding phase the local construction knowledge of the construction manager is valuable in prequalifying bidders for the various contract packages. He can rate specialty contractors on their financial strengths, on previous commitments and on their performance records. If the contract package is larger than local contractors can handle efficiently, it may be broken into smaller packages since the price is usually closely related to the number of bidders. Tailoring the contracts to the needs and capacities of local bidders is crucial. In some circumstances, the owner may wish to break a contract down so small that minority contractors have a change to bid, and the construction manager is useful there as well. He can also set up information meetings for bidders to insure that each is familiar with project demands and constraints. Finally, after bids are in,he leads their analysis and comparison against a final estimate before contracts are awarded.[27]

Construction Phase

John H. Fredrickson indicates that the construction manager must be conversant with modern construction methods, building materials and offer expertise in budget analysis, cost estimating, bid evaluation work scheduling and supervision. The need for an independent construction manager coordinator has grown out of the recognition that some architects under the traditional approach to school design and construction are either unable or unwilling to devote the time and expertise to overseeing the building project.

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[27]Davis and White, "How to Avoid Construction Headaches," pp. 92-93.

During the construction phase, the construction manager performs services which include detailed observation of appropriate liason/ coordination of architects, engineers, contract administration, payment control and reporting to the owner. When there are two or more contractors on the site, the construction manager must coordinate the efforts of these separate contractors, but these services are only basic CM services during construction. Other CM activities may include scheduling of CPM program maintenance, administration of owner or tenant move-in, coordination of off-site work, recommendations regarding recovery plans if contractors are behind schedule, preparation of maintenance manuals and other services depending upon the needs and desired authorizations of the owner.[28]

The construction management approach then provides direct management of separate trade contracts and field crews. A separate trade contract is a contract for a portion as large as the mechanical system and as small as the tile work, glazing, painting, cabinet work, cleaning or the like. Within this format it is not unusual to find 30 to 40 separate trades on the project. The field crews (i.e., not sepatate contracts, the labor crews directly employed by the owner under the construction manager's provision) might be used for such miscellaneous tasks as cleaning and unskilled labor work. In this case there is no actual general contractor. This approach might frequently be employed in situations when the traditional owner contractor relationship may not be in the owner's interest.

The federal engineering construction agency of the Department of

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[28]Heery, "Lets Define Construction Managment," pp. 69, 71.

Health, Education and Welfare issued a handbook entitled "Technical Handbook for Facilities, Engineering and Construction Manual." In this manual, the agency defines the role of the construction manager during construction. In doing so they state that the construction manager must have a strong capability in engineering budgeting, cost estimating, scheduling, purchasing, inspection, management and labor relations. In addition, the firm should have a record of successful performance during the project design phase and the management phase of construction projects. The construction manager's responsibilities during construction may include items listed under the general conditions normally performed by a general contractor on a lump sum fixed price contract. These functions may require the furnishing of labor on the site, however, such labor should be restricted to performing support types of operation such as the establishment, maintenance and operation of temporary field construction facilities.[29]

To preclude any conflict of interest, the construction manager should avoid bidding work in competition with bidding contractors. Therefore, the construction manager and any principle stockholder or member of a construction management firm who has financial interest, should not during the term of the contract, make or cause to be made any bids for construction work on the project referred to in the construction manager's contract.

By comparison, under the general contracting approach, there is no incentive for the contractor to reduce the cost of the building, but often, large incentive to increase it. For example, it is common

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[29]Foxhall, "Federal Handbook Includes Guide for Construction Management Applicants," Architectural Record 153 (March, 1973):57.

practice in some sections of the industry to bid jobs low and make money on changes and extras. Then, in negotiations for changes and extras, the general contractor tends to side with the subcontractor and against the owner. After all, he will probably work with the same subcontractor on another job while commitments to the owner beyond this contract may be negligible. This set of conditions is frequently detrimental to the owner's interest. Conversely, the construction manager has overall management responsibility since there is no prime or general contractor on the job. Each segment of construction is contracted separately with the owner, not the construction manager, with the advisement of the construction manager. One incidental benefit to the construction manager approach therefore, is that any single contractor can be replaced without radically affecting the whole job. Since the construction manager is the owner's agent, his loyalties are to the owner, and, as a result, his motivations are in the direction of expediting the project and assuring a high level of quality while maintaining the original cost parameters.[30]

Cash Flow

The responsive payment of each contractor is possible under the construction management approach becuase each contractor is a prime contractor. This fact works in the owner's favor to reduce cost. These cost reductions occur because the trade contractors who are normally subcontractors have an improved cash flow, and, as a result, they do not have to include carrying costs in their bid. This is not the

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[30]Davis and White, "How to Avoid Construction Headaches," pp. 89-90.

case under the general contracting process. Oftentimes, because the general contractor may have as many as eight to ten jobs running simultaneously, he takes advantage of the cash flow and applies it across many projects in a manner which will benefit him the greatest. Under this arrangement, it is not uncommon for a subcontractor to carry his billing for as long as four to six months. Obviously the lethargic cash flow which results requires a subcontractor to borrow for an extended period of time, thus he must increase his bids to cover his interest costs.

Shop Drawings

Under the traditional construction approach, the architect is responsible for checking and approving all shop drawings. These drawings are designed by the vendor to communicate the quality of the product and the critical measurements required for installation of a particular piece of equipment. Under construction management, both the architect and the construction manager checks shop drawings. Since the construction manager has the field superintendent on the job, the management firm normally takes responsibility for field dimensions leaving the architect with the responsibility of assuring the quality of a particular piece of equipment or material. Having both the architect and the construction manager responsible for checking shop drawings and construction improves the quality of the overall facility.

Summary

A review of the literature tends to indicate that construction management evolved as a result of owner dissatisfaction with the conventional design/construct approach. In its initial stages, the dissatisfaction surfaced with the application of specific management tools such as Critical Path Method, Program Evaluation and Review Technique, Multiple Contracting and Phased Construction. These techniques were applied independently and were usually targeted to impact projects of significant financial magnitude.

With successful application, these techniques began to be applied in various combinations until a recognized need for a professional service designed to assist the owner emerged.

The growing volume of literature tends to indicate a trend toward the increased application of the construction management technique to schoolhouse construction. This increase has its roots in the many owner benefits which are accrued through its application when compared to the traditional construction approach. The quality control during the design phase is based on owner established criteria. By involving a construction manager during this phase of the project, expertise from the construction community can be brought to bear in combination with the expertise from the architectural community. This assures that the qualitative aspects of the program which have been determined by the owner are given appropriate consideration.

Another benefit of construction management falls in the area of cost control. By employing techniques of value engineering, multiple bidding and fast tracking (phase construction) during the design phase of the project, it is possible to control the cost in a manner which will keep them within the parameters which have been established by the owner. While the total cost of the project may not be known at the time the initial contracts are awarded, it is possible to make mid-course adjustments which do not compromise the original intent but do insure the financial scope of the project.

Another owner benefit is achieved with faster project delivery through phased construction or fast tracking. This is achieved by allowing the design process to overlap the construction process, thus collapsing the schedule rather than having a linear progression of events. Because the relationship of the construction manager to the owner is one of agency, the owner benefits from improved workmanship during construction. This situation exists because the construction manager provides a field CM (superintendent) on the job who is responsible for coordinating all construction activities. Since the construction manager's fee is based on the service which he can provide, he is encouraged to maintain the highest level of workmanship while at the same time expediting the project. Conversely, under the traditional construction approach, the superintendent is provided by the general contractor and is charged with the responsibility of making a profit for the general contractor. It is easy to see how this can work against the owner's interest.

In order to provide the above mentioned benefits, the construction management technique employs a team approach to both the design phase and the construction phase project. A design team consists of the owner, the architect, the engineer and the construction manager all of whom share an equal burden in the decision making process. This differs from the traditional approach in which the architect usually emerges as the dominant decision maker. The field team consists of the construction manager's field CM (superintendent), the owner, the architect and the engineer. The decisions a team must make are directly related to the construction progress of the project. Field changes, payments and provisions of services all become this team's responsibility.

The common theme which emerges throughout the available literature is that with increased owner benefits comes increased owner responsibility. During the design phase, it is necessary for the owner to make early irrevocable commitments while the total cost of the project is still unknown. In addition, the owner assumes the role of general contractor in assembling the services of the trade contractors necessary for the construction of the project. This is accomplished with the assistance of the construction manager with all contracts being made directly with the owner.

The change in format is necessary if the owner is to accrue all of the aforementioned benefits. It does increase considerably the amount of responsibility which is assumed when compared to that involved in the traditional construction approach. The information contained in the literature does not consider the impact that this level of responsibility can have on the owner if he is not professionally prepared or competent to assume this role.

At the present time, there is a lack of research existing in the area of owner involvement in construction management. As a result, it is difficult to prescribe preservice or inservice education programs which can assist the owner in preparing to assume his role on the design team. All of this tends to support the need for this study.

CHAPTER 3

PROCEDURE

A review of literature in the field of construction management indicates that the approach has many benefits which are perceived as being desirable by the owner. Some of these are cost benefits through value engineering during the design phase and through multiple contracting during the construction phase. Both of these techniques produce improved cost quality ratios. Fast tracking or phased construction speeds the delivery of the facility and provides for greater owner control through direct contracting. A higher quality workmanship is also achieved because of the owner-oriented supervision.

With the increase in these benefits comes an increase in the owner's level of responsibility. As indicated in Chapter 1, because of the direct and potentially traumatic impact subscribing to the construction management approach may have on the administrators and board members of intermediate school districts, there may be an increasing need for both inservice and preservice programs. These programs should be designed to prepare the owner and the owner's respresentative to assume their roles in the design team.

The problem as stated then was to examine in depth the role of the board members and the board representatives during the design phase of a construction management project to determine if there was a change in the responsibility which they assumed when compared to similar roles in traditional construction projects.

Data are not available from a vigorously controlled study which compares the level of involvement of board members and board representatives in making decisions during the design phase of a construction management project to the level of involvement of board members and board representatives in making decisions during the design phase of a traditional construction project. However, individual examples of construction management projects can be found scattered across the nation. In Michigan, some public schools and more specifically, intermediate school district owned area vocational centers have been constructed using both approaches. Because of this situation, special value can be ascribed to the perceptions of the board members, the board representatives and the project architects who have been involved in both types of projects.

It was necessary in addressing this problem to (1) identify the decisions which must be made during the design phase of a school construction project; (2) rank those decisions in the order of their importance; (3) identify the level of involvement of intermediate school districts' Boards of Education and their administrators who employed the construction management process for the design and construction of their building using the most important of these decisions as the basis. Then, using the intermediate school district Boards of Education and their administrators who employed the traditional approach to the design and construction of an area vocational center as a control, compare the levels of involvement; (3) examine the perceived level of competence of both sets of intermediate school district Boards of Education and their administrators to participate in the decisions which are made during the design phase of an area vocational center; and (5) identify the extent of inservice need for those intermediate school district boards and administrators who elect to employ the construction management techniques in the design and construction of an area vocational center. This chapter describes the procedural approach which was used in gathering, ordering and analyzing the information necessary to address the problem.

Design Decisions

There were no data available related to the decisions which impact the design phase of a construction management project. Therefore, in order to address the problem, the initial area of concern was the establishment of a list of decisions which had the greatest impact during the design phase.

To accomplish this, a three-step approach was used. The first step was designed to identify all of the decisions which are normally made in the design phase of a school contstruction project. A jury of five architects registered in the State of Michigan was established. This was accomplished by obtaining the names and addresses of registered architects who were experienced in the design of public schools from the Michigan Society of Architects Directory. Five of these individuals were contacted by telephone and the scope and intent of the study was explained in detail. They were then invited to participate in this phase of the project. The first five architects who were contacted accepted the invitation.

A data collection format consisting of the categories site, architectural, mechanical, electrical and others was then developed. The instructions which accompanied this format requested that all of the decisions which were normally made during the design phase be listed by the categories in the format. A cover letter restating the intent of this study was generated and forwarded along with the instructions and the format to each architect (see Appendix A). Within approximately 30 days after the mailing, the data was received from 100 percent of the respondents. They experienced no difficulty in addressing the format.

The second step of this effort involved combining all of the decisions which had been identified by each of the five architects in a manner which generated a non-duplicated list of design decisions. It was then necessary to determine which of these decisions had the greatest impact on the design phase of the school construction project. This was accomplished by first reordering the list which had been generated by the jury of five architects. The primary reason for doing this was to overcome those biases which may exist within a particular category (i.e., site, architectural, mechanical, electrical). A five-point lickert scale was then established using the categories "Critical", "Extremely Important", "Very Important", "Important" and "Somewhat Important". The category "Critical" was assigned five points with the category "Somewhat Important" being worth one point (see Appendix B).

A jury of ten architects registered in the State of Michigan and who were experienced in the design of public schools was then identified. Again the Michigan Society of Architects Directory was used. Each architect was contacted by telephone and the scope and intent of the study was explained to them in detail. Each architect was then invited to participate in rating the unduplicated list of design decisions which had been generated. The first ten architects who were contacted indicated that they were willing to assist in this step of the study.

Instructions were developed describing in detail how each architect should respond to the questionnaire. The instructions and the questionnaire, accompanied by a cover letter restating the scope and intent of the study, were forwarded to each architect (see Appendix B). Eighty percent of the instruments were completed and returned within 30 days after the mailing. Telephone calls were then placed to the non-respondents relative to the problems they were having filling out the questionnaire. The respondents indicated that the problem was not with the questionnaire but one of finding the time to respond to it. They assured the researcher that they were still interested in participating in the project, and, as a result of this follow-up, the two additional data collection instruments were received. A 100 percent response to this part of the study was, therefore, generated

In order to convert the data received into a rank order of design decisions, the ratings which were submitted by the architects were tabulated and a total point score was established for each question. These were then rank ordered most important to least important. It had been the researcher's initial intent to use the 25 most important decisions as a basis for developing the questionnaires which would be used in this study. However, because of the points assigned to each decision by the architectural jury, it was necessary to include the top 29 decisions, thus expanding the scope of the study by four decisions.

It should be mentioned here that arriving at this point of development would not have been possible without the full cooperation of those individuals representing the architectural community in the State of Michigan. The quality of their responses speak highly of their profession.

Potential Differences in Involvement

To gain the necessary information for the populations identified previously, the 29 design decisions which were the result of the architectural ratings were used as the basis for the development of questionnaires which were designed to collect the necessary data. A standard format was developed in such a manner that by modifying the questions in the heading "Design Decision", the appropriate information could be gathered (see Appendix C). The board representatives' perceptions of their level of involvement and competence in making each design decision was gained by inserting the questions:

(1) What was your level of involvement in the following decisions?

(2) How qualififed were you to make the decisions?

The board representatives' perceptions of their respective board members' level of involvement and competence in making each design decision was obtained by inserting the questions:

(1) What was the level of involvement of the board members in the following decisions?

(2) How qualified were they to make those decisions?

The board members' perceptions of their level of invovlement and competence in making each design decision was gained by inserting the questions:

(1) What was your level of involvement in the following decisions?

(2) How qualified were you to make the decisions?

The board members' perceptions of their respective board representatives' level of involvement and competence in making each of the design decisions was obtained by inserting the questions:

(1) What was the level of involvement of the board's representative in the following decisions?

(2) How qualified was he to make those decisions?

The project architects' perceptions of the board representatives' level of involvement and competence in making each design decision was gained by inserting the questions:

(1) What was the level of involvement of the board's representative in the following decisions?

(2) How qualified was he to make those decisions?

The project architect's perceptions of the board members' level of involvement and competence in making each design decision was obtained by inserting the questions:

(1) What was the level of involvement of the members on the board in the following decisions?

(2) How qualified were they to make those decisions?

Area vocational center projects dating back to 1973 were then identified, three of which were constructed under the traditional construction approach and three of which were constructed using the construction management technique. The intermediate school district superintendent for each project was then contacted. The scope and intent of this study was discussed in detail and permission was requested to access both the board representatives and the board members involved in each project. All six superintendents gave their permission.

The board representatives involved in the six projects were then contacted by telephone. The scope and intent of the study was explained in detail and they were invited to participate in the project. All six board representatives agreed to respond to the questionnaires.

Questionnaires designed to obtain the board representatives' perceptions of their own involvement and competence in making the decision as well as a questionnaire designed to gain their perceptions of their respective board members involvement and competence in making each decision were prepared. These two questionnaires were packaged along with instructions indicating the manner in which the questionnaires should be utilized. A cover letter was then generated restating the scope and intent of the project, and, along with the instructions, the questionnaires were forwarded to each of the board representatives (see Appendix D). Within 15 days of the mailing, 100 percent of the board representatives had returned the questionnaire. An effort was conducted at that point to determine the usability of the instrument. Since no difficulties were identified, similar instruments were packaged along with instructions and a cover letter and were forwarded to the intermediate school district superintendents to be administered to their respective board members at their monthly board meeting.

Concurrently, the project architects for each of the projects were contacted and the scope and intent of the study was discussed in detail with them. They were then invited to participate by responding to the questionnaires, and all six project architects accepted. Two different questionnaires, one designed to gain the architect's perception of the board representative's involvement and competence in making each design decision, and another one designed to obtain the architect's perceptions of the board members level of involvement and competence in making each decision, were prepared. These two questionnaires were then packaged along with a set of instructions and a cover letter restating the scope and intent of the project (see Appendix D). A package was then forwarded to each project architect. Within 30 days, 100 percent of the project architects had returned the questionnaires.

In an attempt to gain uninhibited responses from each of the participants, it was necessary to insure confidentiality in the administering of each instrument. Color coding was used to differentiate between the architects, administrators and board members of construction management projects. However, no coding was done which would tend to bias the response. Because of the timing of the various board meetings, it took approximately two months to receive the first wave of returns which represented the over-all response of 67 percent. At this point, two of the agencies had responded at the 100 percent level. The superintendents of the other four intermediate school districts which had incomplete responses from their respective board members were then contacted by telephone and informed of the status of the board members' response. With their concurrence, additional cover letters and questionnaires were forwarded to them to be administered to those individuals who had not yet responded to the questionnaire. This increased the overall response of the board members from 67 percent to 72.7 percent with those board members involved in traditional construction projects having a response rate of 71.4 percent while those board members involved in construction management projects had a response rate of 73.7 percent.

The combined responses of board representatives, board members and project architects generated 72 data bits per question. Since this study was an expanded case study involving six construction projects, three of which were construction management and three of which were traditional construction projects, the populations identified were too small to apply any design which would yield inferential statistics. Therefore, descriptive statistics were used in reporting the responses. The responses were tabulated by question and converted to percentages. Once this process was complete for all 29 questions, graphic representations of each of the following situations were generated:

(1) Perceptions of the board representatives' level of involvement in making the decision in a construction management project; (2) Perceptions of the board members' level of involvement in making the decision in a traditional construction project; (3) Perceptions of board representatives' competence to make the decision in a construction management project; and (4) Perceptions of the board members' competence to make the decision in a traditional construction project. A narrative was then generated describing the impact of the responses of the various participants. An analysis was then generated to identify the need for inservice on a question by question basis.

In order to accomplish the second part of this effort, it was necessary to (1) generate graphic representations of the comparative perceptions of the board representatives' level of involvement and competence in making the decisions in a construction management project versus traditional projects and (2) generate graphic representations of the comparative perceptions of the board members' level of involvement and competence in making the decisions in construction management projects versus traditional construction projects. The graphs were then described in narrative form and an analysis was made to determine question by question which board representative had the greatest involvement in the decision; those involved with construction management projects or those involved with traditional construction projects. The same determination was made for those board members involved in the construction management projects and those board members involved in traditional construction projects.

In summary, the research was conducted as an expanded case study. Perceptions of the level of involvement of the board members and board representatives obtained were from board members, board representatives and project architects. Indications of the competence which board members and board representatives demonstrated in making the decisions were obtained from the same populations. In order to identify the decisions upon which the above mentioned respondents acted, it was necessary to gain from the architectural community an indication of those decisions which were of the greatest importance during the design phase of the construction project.

Once all the data had been collected, question by question analysis was conducted to determine those areas in which the board members and the board representatives were in need of inservice and to determine if, in fact, there was an increased level of involvement on the part of those board members and board representatives who were involved in the construction management projects. The analysis was then summarized in Chapter 5 and conclusions were drawn. Recommendations were made relative to the preservice and inservice needs on a category by category basis.

CHAPTER 4

ANALYSIS OF DATA

Chapter 3 describes the methods by which the data for this study were gathered. These data are presented and analyzed in this chapter. Comparisons are made within sets of data and across sets of data for those projects employing the construction management technqiue and those projects employing the traditional construction management technique. The information is presented on a question by question basis for each of the 29 questions which are contained within this study.

It is indicated in Chapter 3 that the questionnaires when administered generate 72 data bits for each of four sets of data. These four sets related to: (1) the perceptions of the board representatives' level of involvement and competence in making the decisions in a construction management project; (2) the board members' level of involvement and competence in making the decision in a construction management project; (3) the board representatives' level of involvement and competence in making the decision in a traditional construction management project; (4) the board members' level of involvement and competence in making the decision in a traditional construction project.

Because of the complexity which the approach generated, it was necessary to divide the analysis into two parts. Part I was a question by question analysis of:

1. Perceptions of the board representatives' level of making the decision in a construction management project;

2. Perceptions of the board representatives' level of competence in making the decision in a construction management project;
3. Perceptions of the board members' level of involvement in making the decision in the construction management project;
4. Perceptions of the board members' level of competence in making the decision in a construction management project.
5. Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project;
6. Perceptions of the board representatives' level of competence in making the decision in a traditional construction project;
7. Perceptions of the board members' level of involvement in making the decision in a traditional construction project;
8. Perceptions of the board members' level of competence in making the decision in a traditional construction project.

Part II of the analysis was designed to gain:

1. Comparative perceptions of the board representatives' level of involvement and competence in making the decision in a construction management project versus a traditional construction project.
2. Comparative perceptions of the board members' level of involvement and competence in making the decision in a construction management project versus a traditional construction project.

In order to further clarify the analysis of both Part I and Part II, graphic representations of each portion of the questions were generated. The following legend is provided for purposes of interpreting Part I:

Legend

Board Representative ______________

Board Member - - - - - - - - - - -

Project Architect ____ _ ____ _ ____

Part I

Decision # 1 - Determining the Space Relationships in Flow Diagrams

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

Both the board representatives and the board members perceived the board representatives as having a high level of involvement in this decision. This is supported by their responses of 33.3% and 23.1%, respectively for the category "Made Decision" and 66.7% and 61.5% for the category "Input Decision." Their responses for the category "No Involvement in Decision" were minimal with board representatives responding at a 0% level and board members indicating only a 15.4% response. The project architects split their responses evenly indicating 33.3% in each of the categories "Made Decision", "Input Decision" and "No Involvement in Decision" (see Figure 1A).

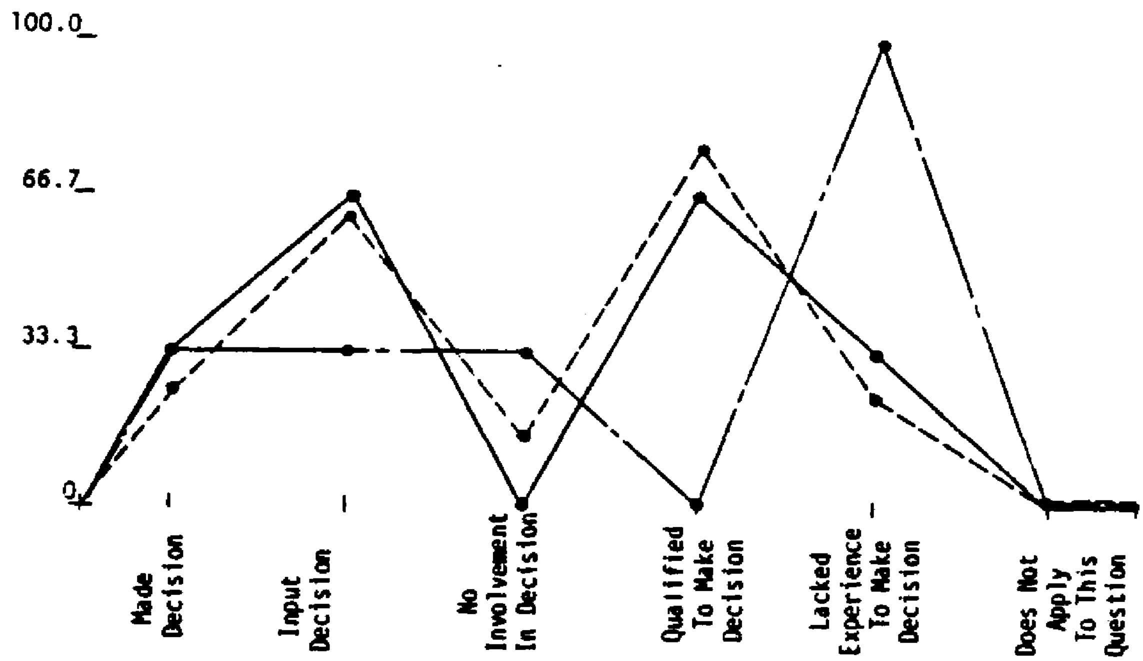

Figure 1A. Determining the space relationships in flow diagrams.
--Perceptions of the board representatives' level of competence in making the decision in a construction management project.

While the responses were mixed, both the board representatives and the board members tended to perceive the board representatives as competent to participate in the decision. This is supported by their responses of 66.7% and 76.9%, respectively for the categories "Qualified to Make Decision" with only 33.3% of the board representatives and 23.1% of the board members perceiving the board representative as lacking the experience necessary to make the decision. The project architects agreed unanimously that the board representatives lacked the competence to make the decision by responding 100% in the category "Lacked Experience to Make Decision" (see Figure 1A).

As a result of the analysis of this part of the question, it would appear that the level of involvement of the board representatives as perceived by themselves and the board members when compared with the perceptions of the project architects of their competence in participating in the decision would indicate a moderate need for inservice in this area.

--Perceptions of the board members' involvement in making the decision in a construction management project

The responses for this part of the question were mixed with 15.4% of the board members perceiving they made decisions and 33.3% of the board representatives, 38.5% of the board members and 66.7% of the project architects perceiving the board members' input in the decision, and 66.7% of the board representatives, 46.1% of the board members and 33.3% of the project architects indicating that the board members had no involvement in the decision (see Figure 1B).

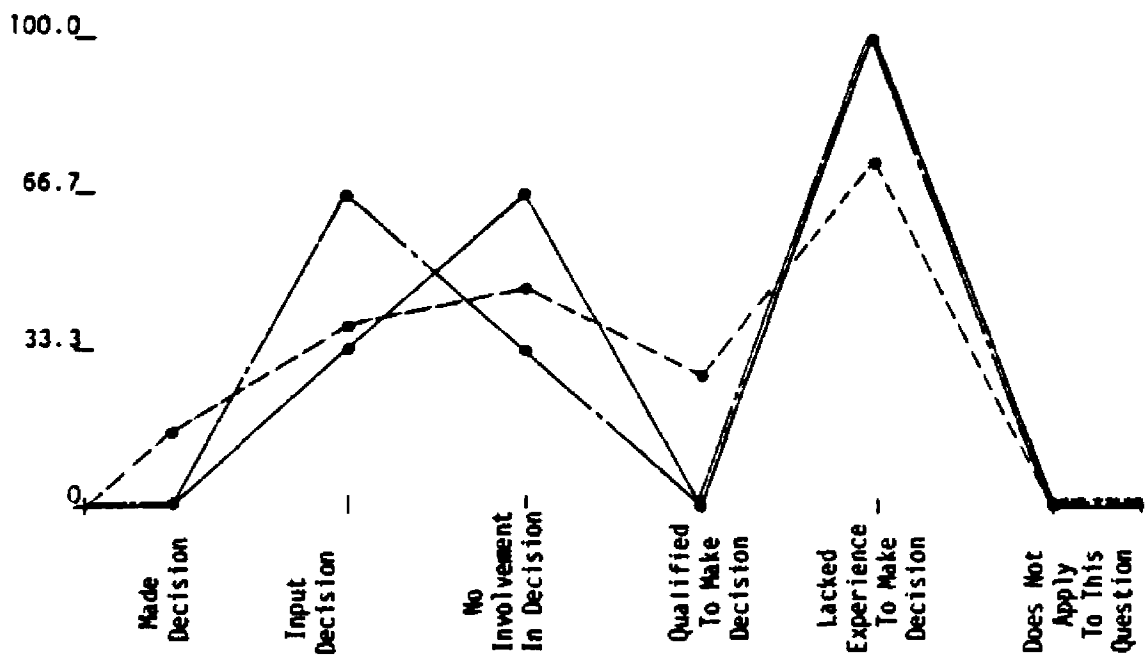

Figure 1B. Determining the space relationships in flow diagrams.

There is a strong indication that the board members lack the competence to participate in decision making in this area. This is supported by a response of 100% in the category "Lacked Experience to Make Decision" by both the project architects and the board representatives. The board members responded at the 72.7% level in this area with only 27.3% of the board members responding in the category "Qualified to Make Decision" (see Figure 1B).

While the analysis indicated a mixed response, board members obviously are involved to a degree in the decision making in this area. When this fact is paired with a strong indication that there is a lack of experience to make the decision, it becomes apparent that inservice for board members would be appropriate in this area. Possibly with increased competence would come increased invovlement.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A high level of involvement is indicated in this area with the board representatives and the project architects agreeing at the 33% level in the category "Made Decision" and agreeing at the 66.7% level for the category "Input Decision." This is reinforced by the board members' response of 77.8% in the category "Input Decision" with the only response in the category of "No Involvement in Decision" being the board members at a 22.2% level (see Figure 1C).

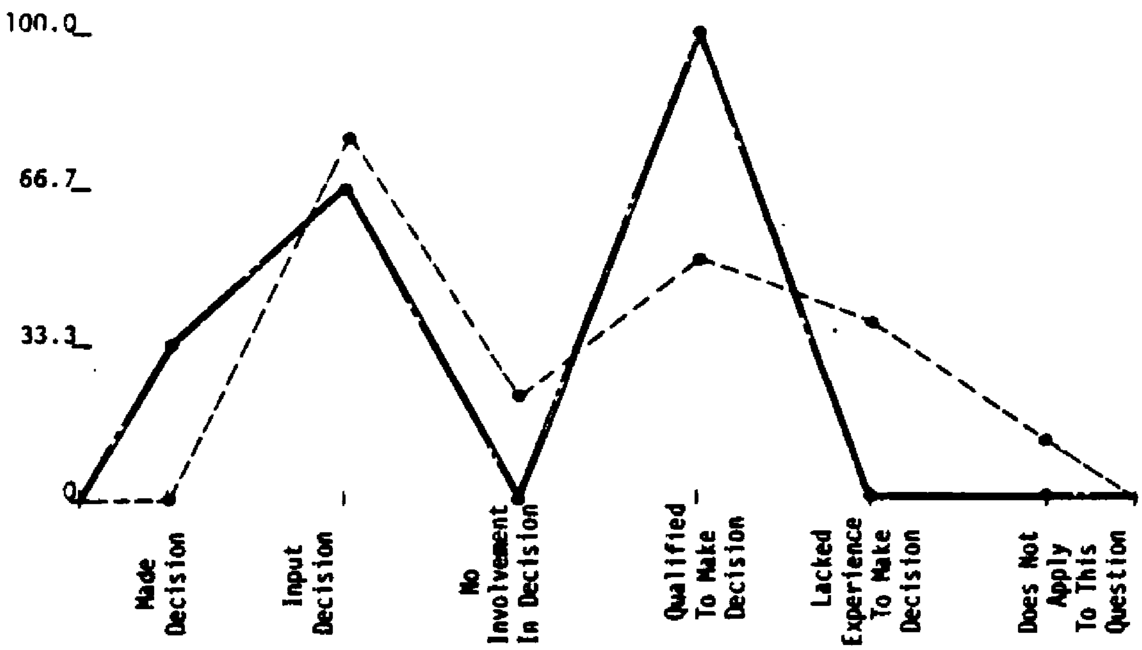

Figure 1C. Determining the space relationships in flow diagrams.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

The responses in this area strongly indicate that the owner's representatives are qualified to make the decision with the response of 100% on the part of both the board representatives and the project architects in that category with the board members responding at a 50% level. 37.5% of the board members felt that their representatives lacked the experience to make decisions in this area while 12.5% felt that the categories "Qualified to Make Decison" and "Lacked Experience to Make Decision" did not apply to this question (see Figure 1C).

As a result of this part of the question, it would appear that there is little rationale to provide inservice for this area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Both the board representatives and the project architects perceived the board members involvement in decision making as relatively minor. This is supported by the responses of 33% in the category "Input Decision" by both the board representatives and the project architects and a response of 66.7% in the category "No Involvement in Decision." The board members themselves perceived a slightly higher level of involvement with 15.4% of their responses in the category "Made decision," 38.5% of their responses in the category "Input Decision" and the majority of their responses (46.1%) in the category "No Involvement in Decision" (see Figure 1D).

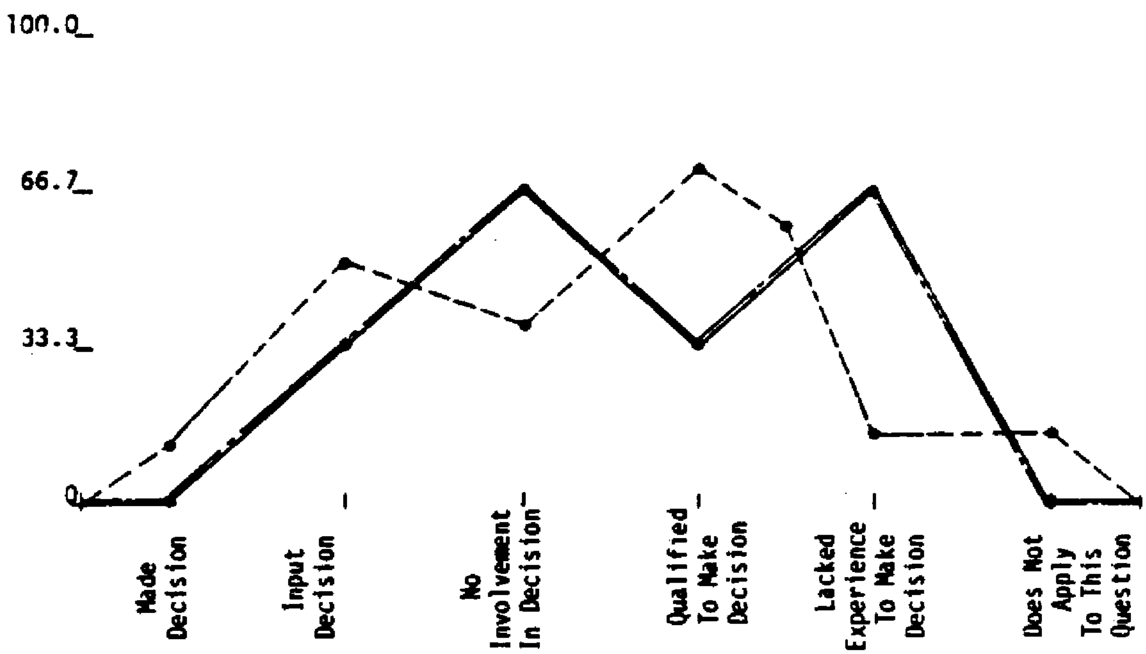

Figure 10. Determining the space relationships in flow diagrams.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Both the board representatives and the project archtiects responded at the 33.3% level in the category "Qualified to Make Decision" while the board members themselves responded at the 71.4% level in this area. Although this is a considerable indication of the qualification of the board members, it is offset by a 66.7% level of response in the category "Lacked Experience to Make Decision" on the part of both the board representatives and the project architects. The board members themselves responded at the 14.3% level in this category while 14.3% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience to Make Decision" did not apply to this question.

Decision # 2 - Selecting the Site

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

The board members and the project architects both felt that the board representatives had a high level of involvement in this decision. This is supported by their responses of 23.1% and 33.3%, respectively in the category "Made Decision" and 76.9% and 66.7% for the category "Input Decision." They both responded at the 0% level in the category "No Involvement in Decision." The board representatives perceived their level of involvement as considerably lower with an indication of 0% in the category "Made Decision," 66.7% in the category "Input Decision" and 33% of the board representatives felt they had no involvement in the decision (see Figure 2A).

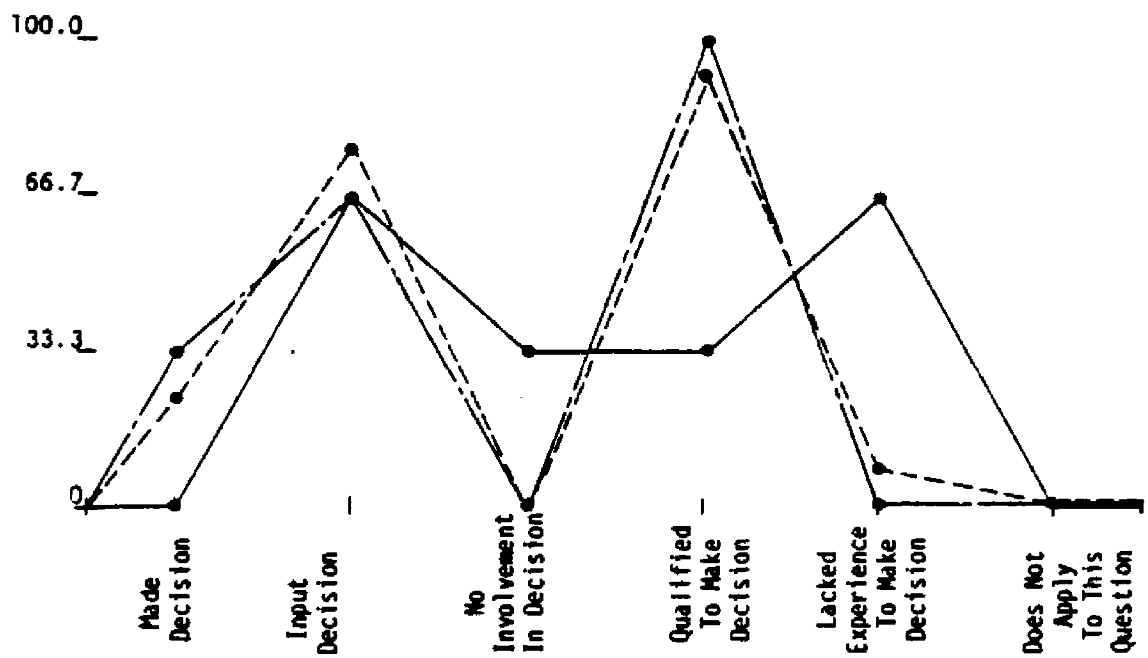

Figure 2A. Selecting the site.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

Both the board members and the project architects felt that the board representatives were highly qualified to make the decision. This is supported by the responses of 92.3% and 100%, respectively in the category "Qualified to Make Decision" with only 7.7% of the board members indicating the board representatives lacked the experience to make the decision. However, only 33.3% of the board representatives indicated they felt qualified to make the decision, while 66.7% responded in the category "Lacked Experience to Make Decision." All parties felt the categories "Qualified to Make Decision" and "Lacked Experience to Make Decision" were appropriate as applied to this question (see Figure 2A).

The analysis of this portion of the question indicates a moderately high level of involvement in making the decision and a very high level of competence in this decision area. The results of this analysis tend to indicate that there is no need to inservice board representatives.

--Perceptions of the board members' involvement in making the decision in a construction management project

The responses to this part of the question were mixed, with 33.3% of the board representatives, 42.9% of the board members and 66.7% of the project architects responding in the category "Made Decision." While board representatives and project architects agreed at the 33.3% level in the category "Input Decision," board members responded at the 50% level in this category. Board representatives responded at the 33.3% level while board members responded at the 7.1% level in the category "No Involvement in Decision." Project architects responded at the 0% level in this category (see Figure 2B).

--Perceptions of the board members' level of competence in making the decision in a construction management project

All three populations agreed at the 100% level in the category "Qualified to Make Decision," indicating that they felt that the board members were highly qualified to particpate in this area with corresponding responses of 0% in the categories "Lacked Experience to Make Decision" and "Does Not Apply to This Question"(see Figure 2B).

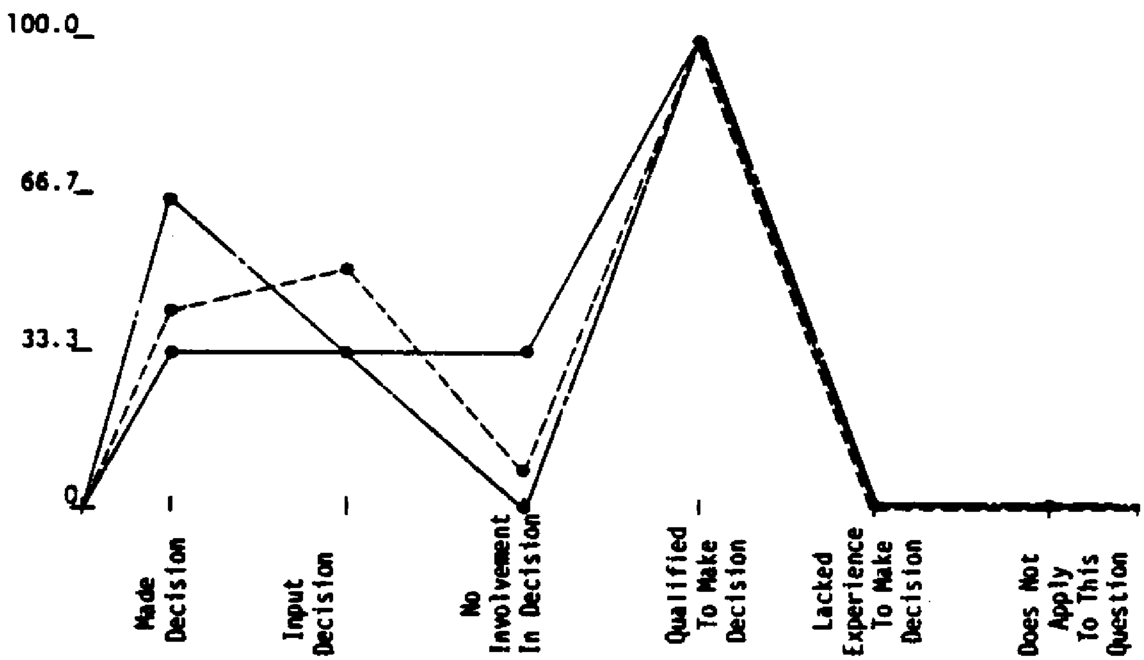

Figure 2B. Selecting the site.

As a result of the analysis of this part of the question, it would appear that both board members and board representatives are perceived to be quite active in participating in this decision, with board members perceived to have a higher level of involvement than board representatives. Board members are perceived to be highly qualified in making this decision. While board representatives are perceived by board members and project architects to be qualified, they perceive themselves as lacking the experience necessary to participate in making this decision, thus indicating a need for inservice in this area for board representatives.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A high level of involvement is indicated in this area with board representatives responding at the 33.3% level, board members responding at the 44.4 level and project architects responding at the 66.7% level in the category "Made Decision" and board representatives, responding at the 66.7% level, board members responding at the 55.6% level and project architects responding at the 33.3% level in the category "Input Decision." All parties responded at the 0% level for the category "No Involvement in Decision" (see Figure 2C).

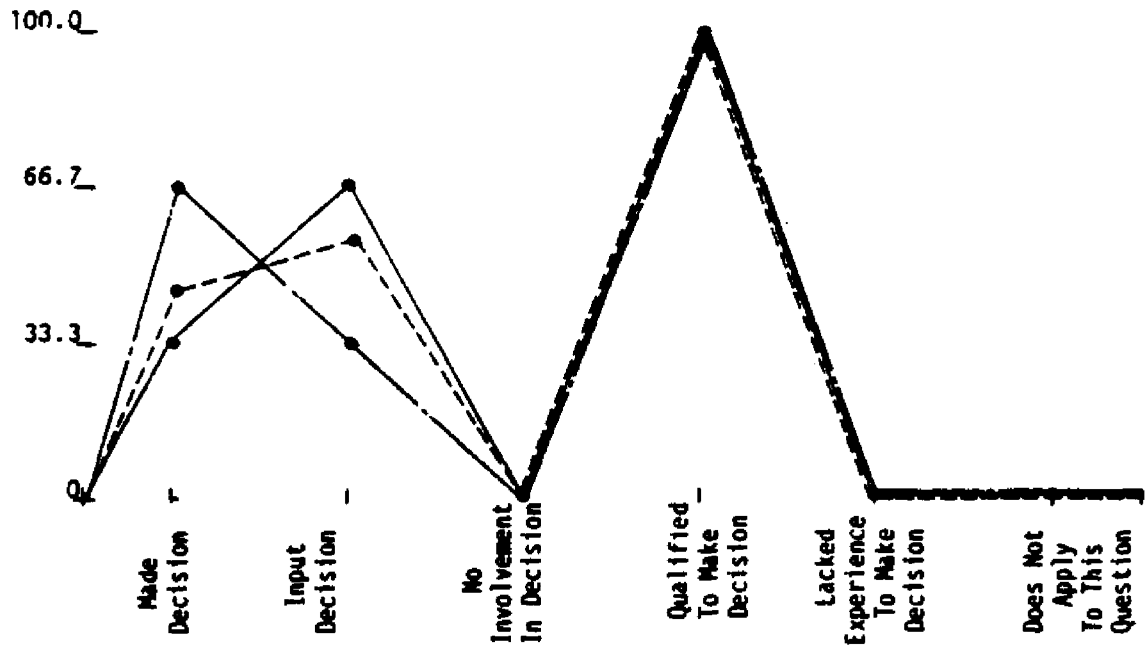

Figure 2C. Selecting the site.

--Perception of the board representatives' level of competence in making the decision in a traditional construction project

The responses in this area strongly indicate that the owner's representatives are qualified to make the decision with the response at the 100% level on the part of the board representatives, board members and project architects (see Figure 2C). As a result of the analysis of this part of the question, it would appear that there is no need to provide inservice in this area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members are perceived to have a high level of involvement in making this decision with board representatives responding at the 66.7% level, board members responding at the 62.5% level and project architects responding at the 33.3% level in the category "Made Decision," while their responses were 33.3%, 37.5% and 66.7%, respectively in the category "Input Decision." All parties responded at the 0% level in the category "No Involvement in Decision (see Figure 2D).

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Both board members and project architects agreed at the 100% level in the category "Qualified to Make Decision" while board representatives responded at the 66.7% level in the category "Qualified to Make Decision" and at the 33.3% level in the category "Lacked Experience to Make Decision" thus indicating a somewhat lower level of confidence in the ability of the board members to participate in this decision (see Figure 2D). An analysis of this portion of the question would indicate a very low level of need for inservice on this particular decision.

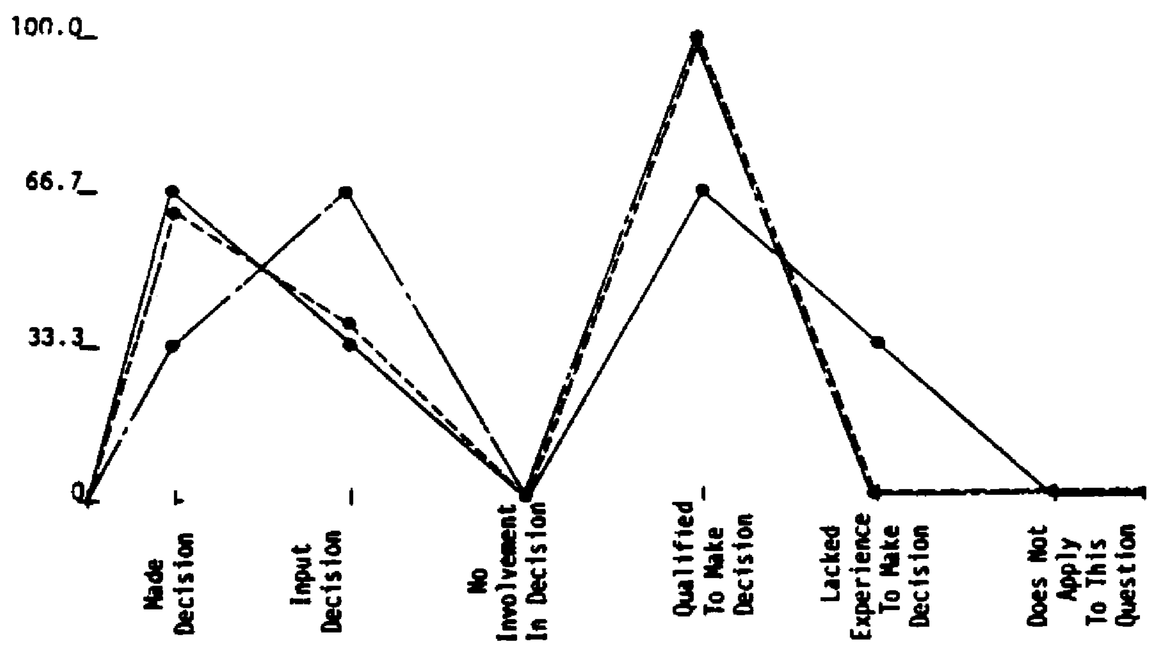

Figure 2D. Selecting a site.

Decision # 3 - Determining Major Entrances

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project.

The board representatives are perceived as having a moderate level of involvement in this decision with 0% of the board representatives, 23.1% of the board members and 33.3% of the project architects responding in the category "Made Decison," while 66.7% of the board representatives, 61.5% of the board members and 33.3% of the project archtiects responded in the category "Input Decision." There was a considerable indication of no perceived involvement on the part of the board representatives as indicated by the board representatives' response of 33.3%, the board members' response of 15.4% and the project architects' response of 33.3% in the category "No Involvement in Decision" (see Figure 3A).

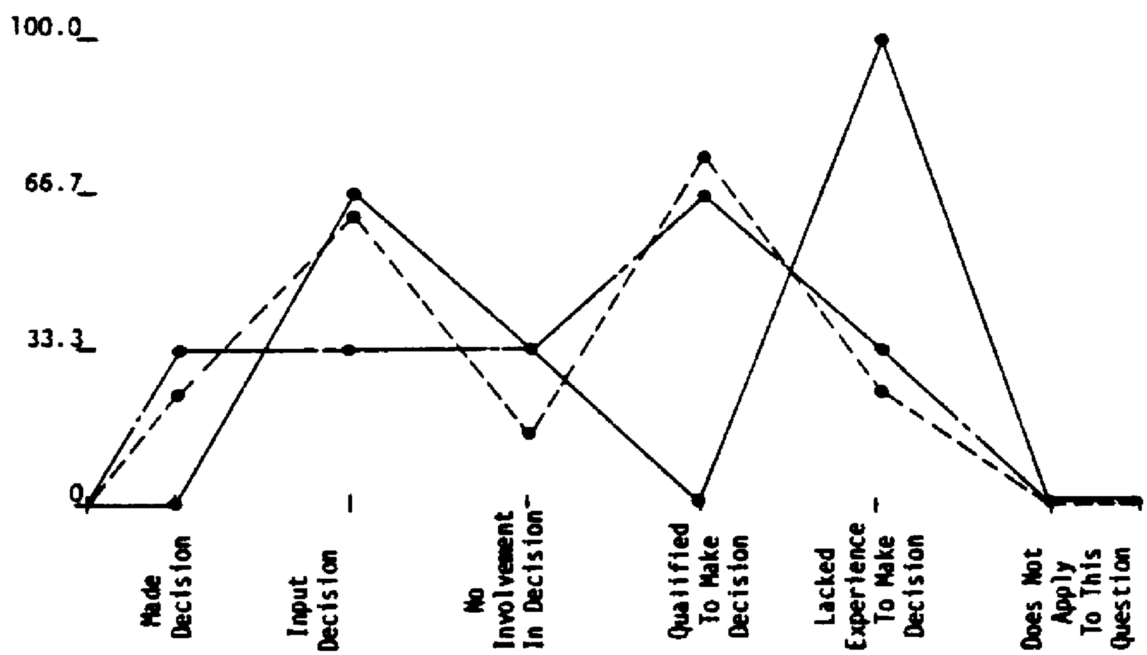

Figure 3A. Determining major entrances.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

The perceptions in this area were somewhat mixed, with board members and project architects responding at the 75.0% level and a 66.7% level, respectively in the category "Qualified to Make Decision." The board representatives, on the other hand, responded at the 100% level in the category "Lacked Experience Necessary to Make Decision," while board members responded at the 25% level and project architects responded at the 33% level. All respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 3A).

The result of the analysis of this part of the question would appear that the perceived level of involvement, while moderately high when compared to the perceived level of competence, would indicate a need for inservice in this area.

--Perceptions of the board members' involvement in making the decision in a construction management project

Both the board representatives and the project architects responded at the 0% level, while board members responded at the 7.7% level in the category "Made Decision." Board representatives and project architects agreed at the 66.7% level, while board members responded at the 46.2% level in the category "Input Decision." Board representatives and project architects also agreed at the 33.3% level in the category "No Involvement in Decision," while board members responded at the 46.2% level in this category (see Figure 3B).

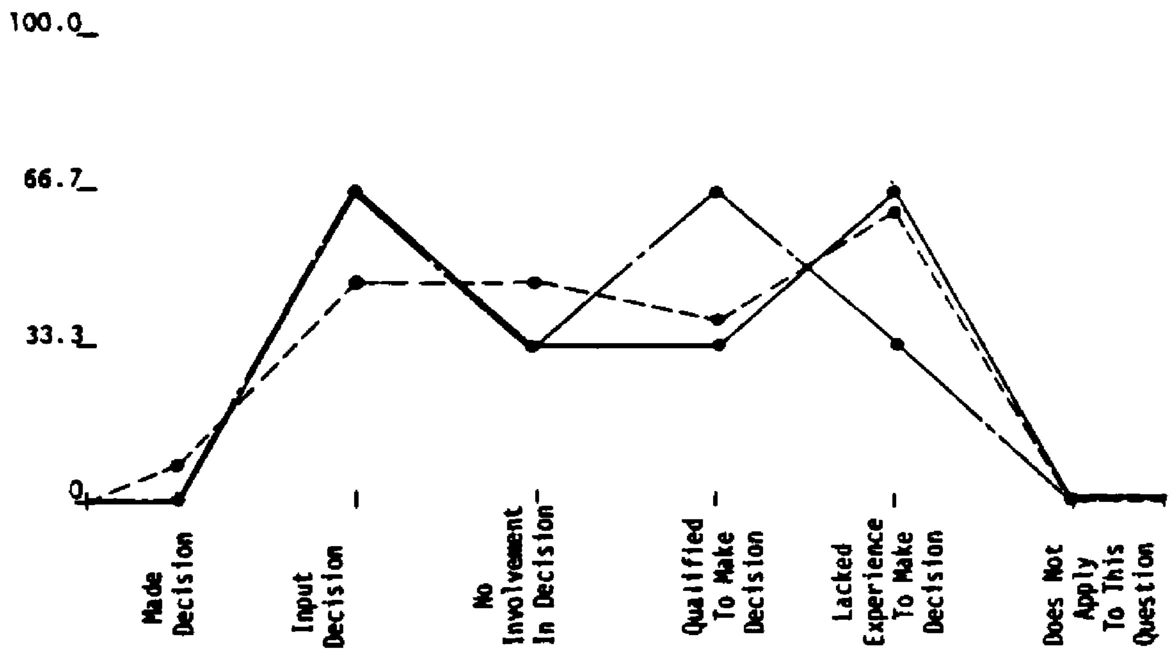

Figure 3B. Determining major entrances.

--Perceptions of the board members' level of competence in making the decision in a construction management project

The responses in this area were mixed, with board representatives responding at the 33.3% level, board members responding at the 38.5% level and the project architects responding at the 66.7% level for the category "Qualified to Make Decision." The board representatives and members indicated a considerable lack of experience necessary to make this decision by responding at the 66.7% and the 61.5% level, respectively, while the project architects responded at the 33.3% level in that category. All respondents felt the category "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 3B).

While the analysis indicated a mixed response, board members obviously are involved to a degree in the decision making in this area. Because of the relatively high indication in the category "Lacked Experience Necessary to Make Decision," it is apparent that inservice in this area would be appropriate for board members.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

Perceptions of the level of involvement of board members in this decision is relatively low, with the board representatives and the project architects agreeing at the 33.3% level in the category "Made Decision," while board members responded at the 11.1% level for that category. 33.3% of the board representatives and 44.4% of the board members responded in the category "Input Decision," however, the project architects responded at the 0% level for this category. There was a relatively high level of response in the category "No Involvement in Decision," with 33.3% of the board representatives, 44.4% of the board members and 66.7% of the project architects responding in this category (see Figure 3C).

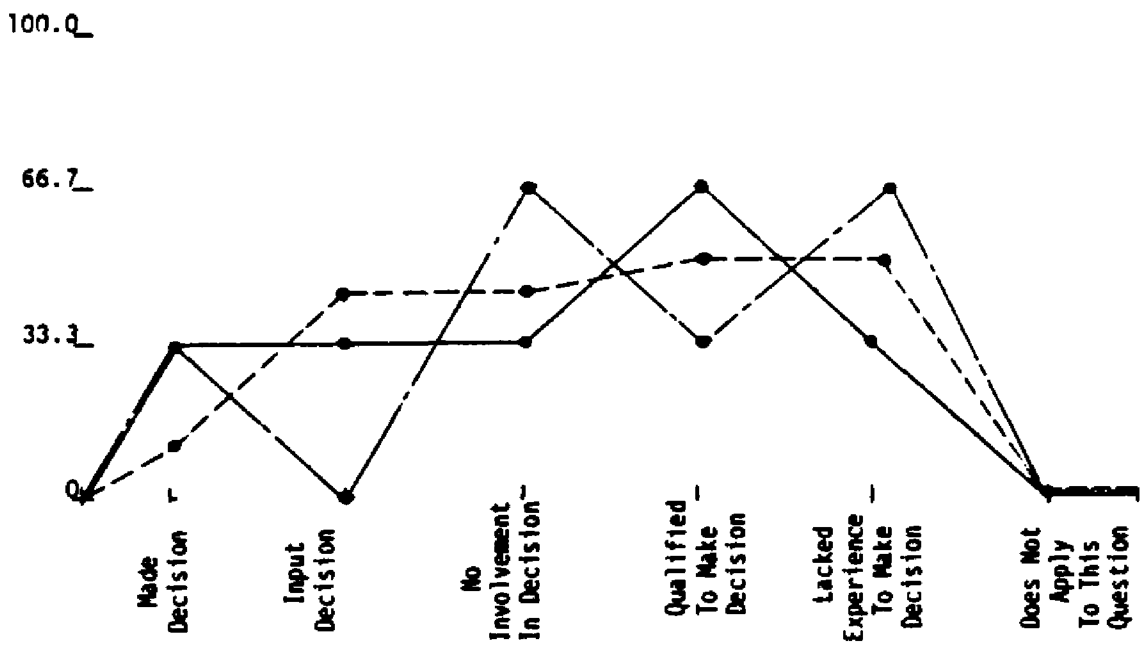

Figure 3C. Determining major entrances.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

The responses to this portion of the question were mixed, with board representatives responding at the 66.7% level, board members responding at the 50% level and project architects responding at the 33.3% level in the category "Qualified to Make Decision," while 33.3% of the board representatives, 50% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All respondents felt that categories "Qualified to Make Decision" and "Lacked Experience to Make Decision" were appropriate for this question (see Figure 3C).

The analysis of this part of the question indicates a relatively low level of involvement in making the decision with a moderate indication that the representatives were qualified to make the decision. Therefore, there is little rationale to provide inservice for this area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

The board members' level of involvement in this decision was quite low, with board representatives and project architects responding at the 0% level and board members responding at the 12.5% level in the category "Made Decision." Only 33.3% of the board representatives, 37.5% of the board members and 33.3% of the project archtiects responded in the category "Input Decision," with a majority of the respondents perceiving no involvement in the decision. This is supported by a 66.7% response on the part of both the board representatives and the project architects while the board members responded at the 50% level in this category (see Figure 3D).

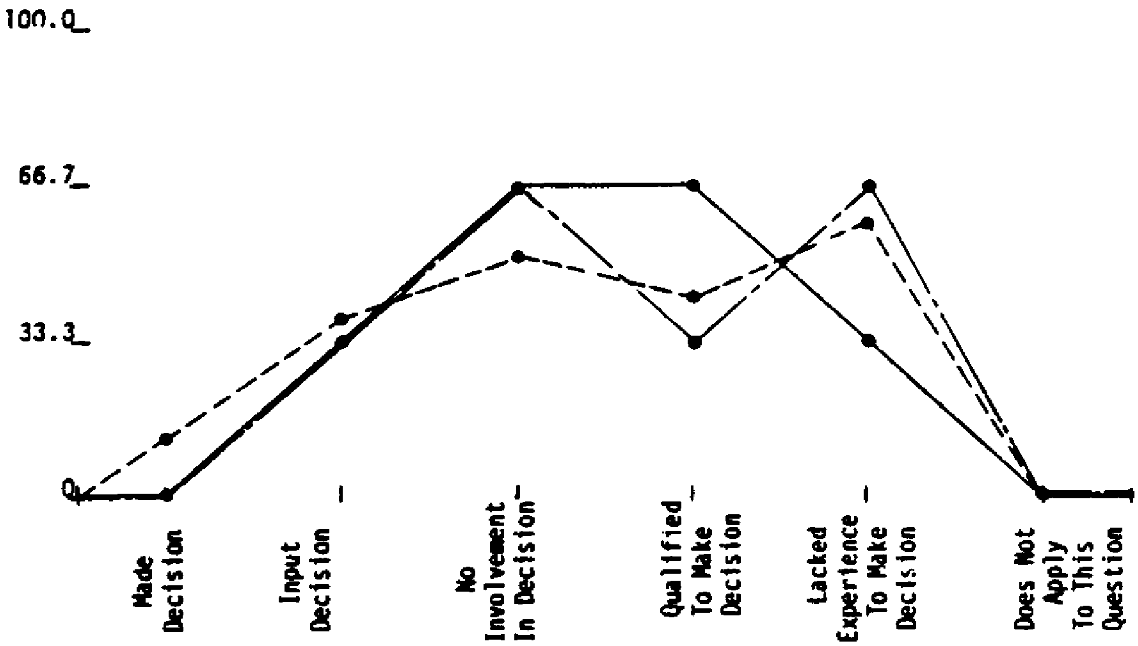

Figure 3D. Determing major entrances.

--Perception of the board members' level of competence in making the decision in a traditional construction project

The response to this portion of the question is somewhat mixed, with 66.7% of the board representatives, 42.9% of the board members and 22.2% of the project archtiects responding in the category "Qualified to Make Decision," while 33.3% of the board representatives, 57.1% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 3D).

Since the level of involvement of the board members in making this decision was quite low, even though the response in the category "Qualified to Make Decision" was slightly lower than the response in the category "Lacked Experience Necessary to Make Decision", inservice for board members in this decision area would probably be inappropriate.

Decision # 4 - Establishing Drives and Entrances Off Major Streets

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

The response for this portion of the question was somewhat mixed with board representatives responding at the 0% level, board members responding at the 30.8% level and project architects responding at the 33.3% level for the category "Made Decision." Both board representatives and project architects agreed at the 33.3% level and board members responded at the 53.8% level for the category "Input Decision." 66.7% of the board representatives felt that they had no involvement in the decision, while only 15.4% of the board members and 33.3% of the project architects responded in this category (see Figure 4A).

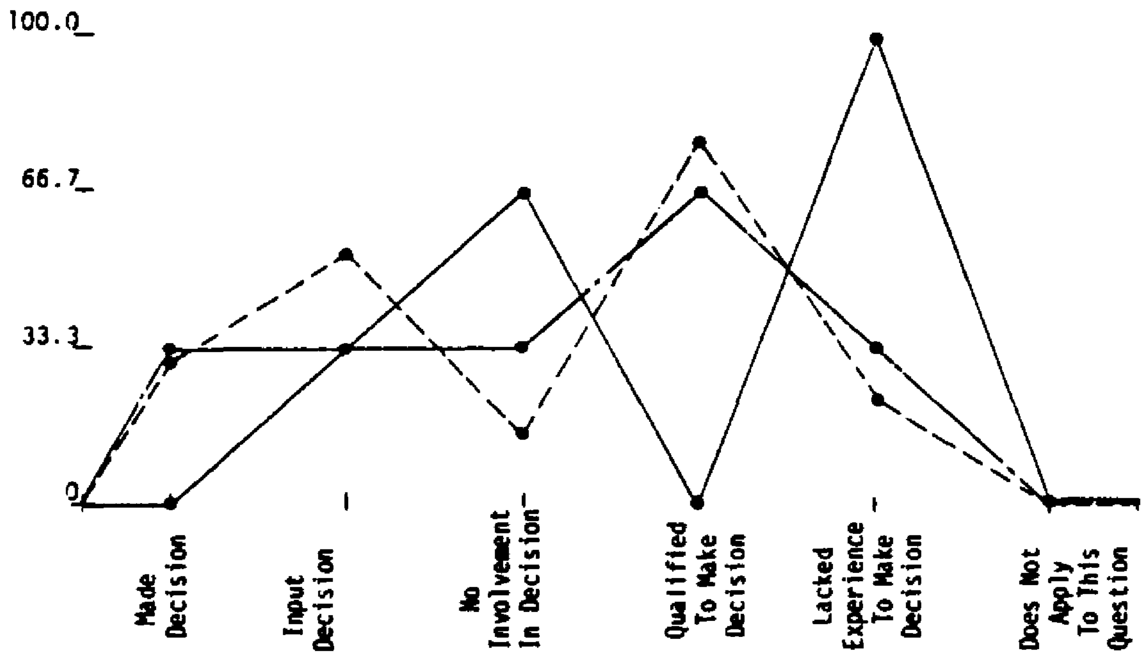

Figure 4A. Establishing drives and entrances off major streets.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

While the board members and the project architects indicated a relatively high level of qualification on the part of the board representatives with a 77.0% response on the part of the board members and a 66.7% response on the part of the project architects, board members felt that they lacked the necessary experience by responding at the 100% level in that category. Board members responded at the 23% level and project architects responded at the 33.3% level in the category "Lacked Experience Necessary to Make Decision." All respondents felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this part of the question (see Figure 4A).

The analysis of this portion of the question indicates that both the project architects and board members felt the owner was relatively active in the making of this decision and also felt that he was reasonably qualified to do so, while the board representatives themselves indicated a relatively low level of involvement and strong perceptions of lacking the experience for making the decision. This would tend to indicate a need for inservice for the owner's representative. Possibly with a greater understanding of the information necessary to make this decision, the level of participation would increase.

--Perception of the board member's involvement in making the decision in a construction management project

Both the project architects and the board representatives indicated a 0% response in the category "Made Decison," while the board members responded at the 30.8% level. The board representatives responded at the 0% level, board members responded at the 38.5% level and project architects responded at the 66.7% level in the category "Input Decision." While board representatives responded at the 100% level in the category "No Involvement in Decision", board members responded at the 30.8% level and project architects responded at the 33.3 level in that category (see Figure 4B).

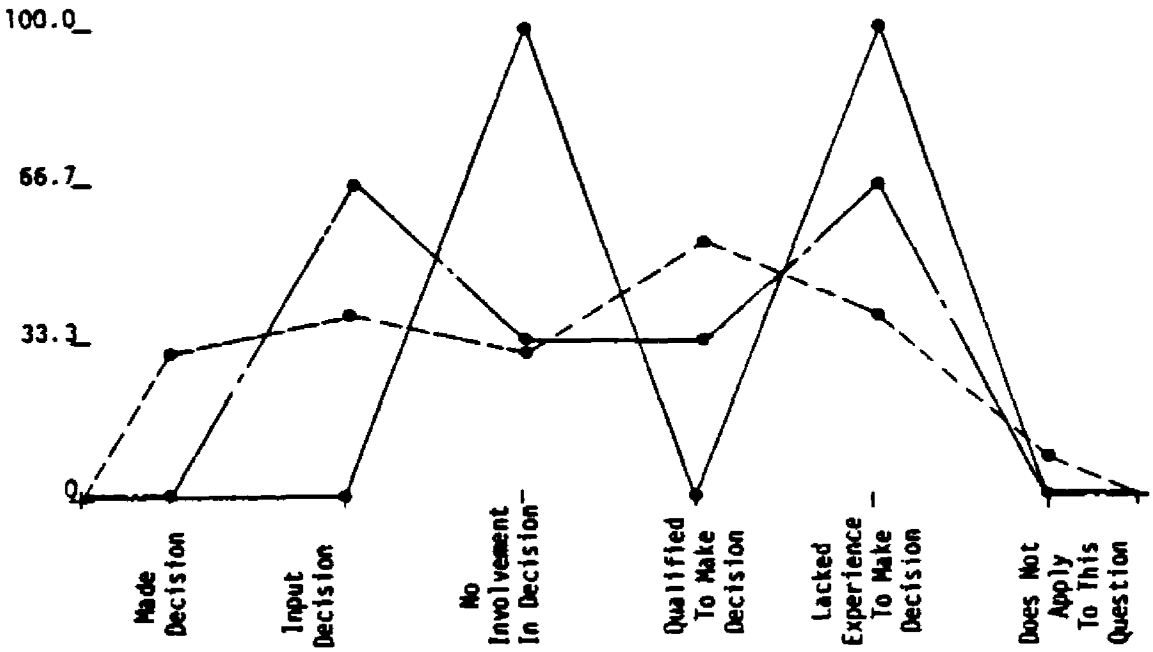

Figure 4B. Establishing drives and entrances off major streets.

--Perceptions of the board members' level of competence in making the decision in a construction management project

Both board members and project architects felt the board members were somewhat qualified to make the decision. This is supported by responses of 53.8% and 33.3% respectively for that category. Board representatives, on the other hand, felt strongly that the board members lacked the experience necessary to make the decision. This is supported with a response of 100% in that category, while 38.5% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 7.7% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this portion of the question (see Figure 4B).

Even though the analysis of this question indicates that the board representatives perceived no involvement in making this decision, both the board members and the project architects perceived a moderate level of participation in making this decision. When this is compared with the responses in the category "Qualified to Make Decision and "Lacked Experience Necessary to Make Decision," it becomes apparent that inservice for board members relative to the decision would be appropriate.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

The perceived level of involvement of the board representatives is quite high, with 37.5% of the board members and 33.3% of the project architects responding in the category "Made Decision" and the board representatives responding at the 100% level in the category "Input Decision." Board members responded at the 62.5% level and project architects responded at the 33.3% level for this category. Board members responded at only 12.5% level, while the project architects responded at the 33.3% level in the category "No Involvement in Decision" (see Figure 4C).

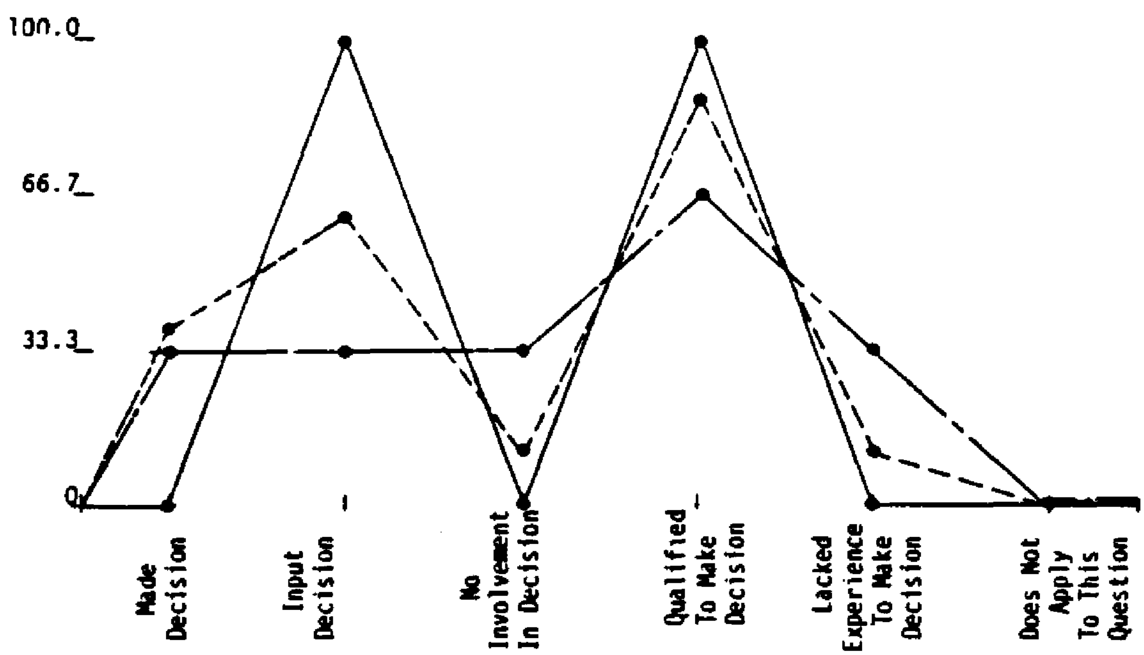

Figure 4C. Establishing drives and entrances off major streets.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

The perceptions are that the board representatives are highly qualified to make the decision. This is supported by the responses of board representatives at the 100% level, board members at the 87.5% level and project architects at the 66.7% level, while only 12.5% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All the respondents felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this portion of the question (see Figure 4C).

Analysis of this portion of the question indicates that while the perceived level of involvement of the board representatives is quite high, they are also perceived as being very qualified to make the decision; therefore, inservice for board representatives in this area appears to be unnecessary.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

The response to this portion of the question is mixed, with both the board representatives and the project architects responding at the 0% level and the board members responding at the 25% level in the category "Made Decision." 66.7% of the board representatives, 50% of the board members and 33.3% of the project architects responded in the category "Input Decision," while 33.3% of the board representatives, 25% of the board members and 66.7% of the project architects felt that the board members were not involved in the decision (see Figure 4D).

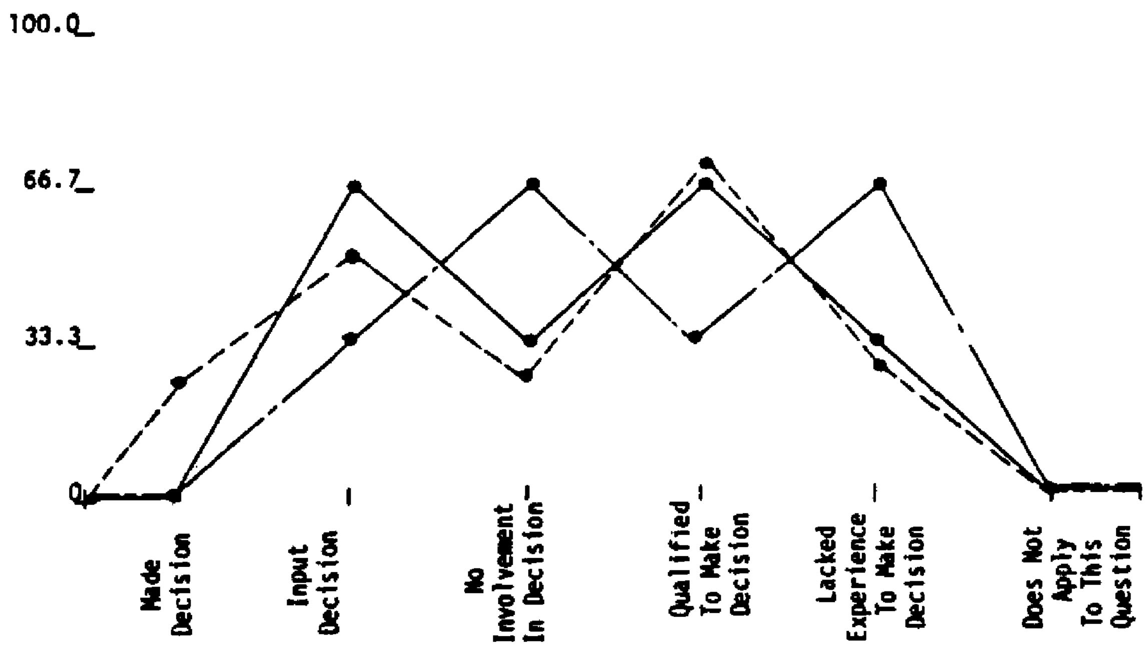

Figure 4D. Establishing drives and entrances off major streets.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Both the board representatives and the board members felt that the board members were highly qualified to make the decision. This is supported with responses of 66.7% and 71.4% respectively in the category "Qualified to Make Decision," while project architects responded at the 33.3% level for this category. The board representatives responded at the 33.3% level, board members at the 28.6% level and project architects at the 66.7% level in the category "Lacked Experience Necessary to Make Decision." All respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this portion of the question (see Figure 4D).

In analyzing this portion of the question, it is apparent that the perceived level of involvement in making the decision is moderate, while both board members and board representatives feel that the board members are qualified to make the decision with the project architects expressing reasonable doubts in this area. Taking all factors into consideration, there would appear to be a moderate need for inservice relative to this decision.

Decision # 5 - Determining Considerations for Future Expansion

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A very high level of involvement was indicated in this area with 33.3% of the board representatives, 16.7% of the board members and 33.3% of the project architects responding in the "Made Decision" category and 66.7% of the board representatives, 83.3% of the board members and 66.7% of the project architects responding in the category "Input Decision." These percentages constitute 100% response. There was no indication in the category "No Involvement in Decision" (see Figure 5A).

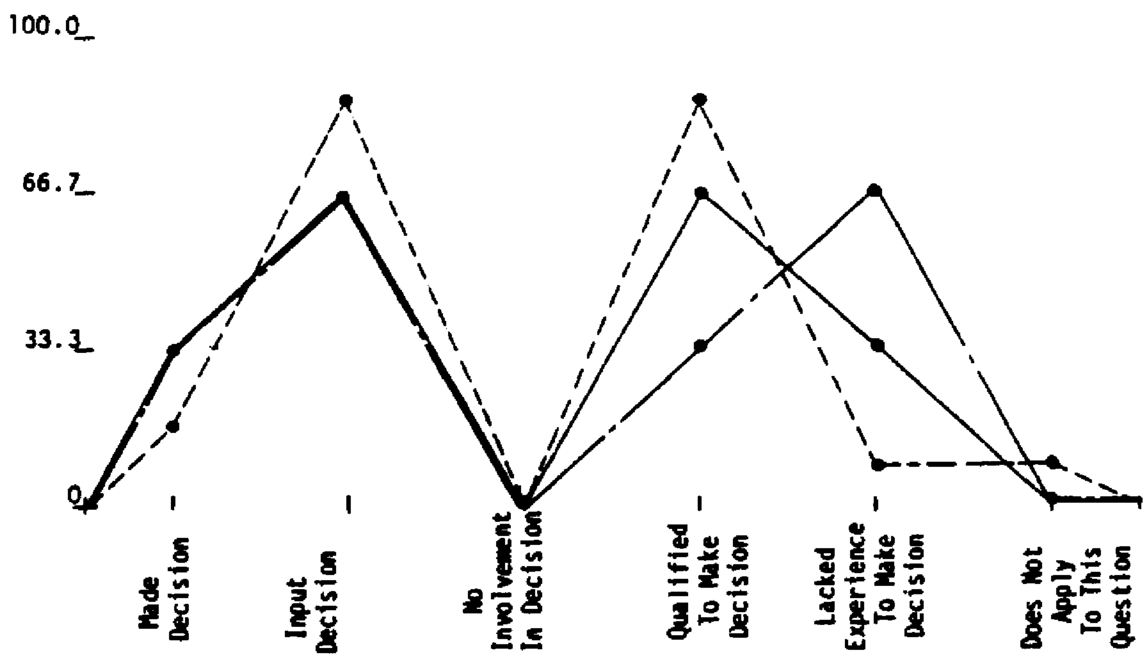

Figure 5A. Determining considerations for future expansion.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

While the perceptions in this area were somewhat mixed, there was a strong indication that the board representatives were qualified to make this decision with 66.7% of the board representatives, 84.6% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." 33.3% of the board representatives, only 7.7% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 7.7% of the board members felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 5A).

In analyzing this part of the question, it would appear that because of the high level of involvement which is perceived on the part of the board representatives and because there is some doubt created by the response of the project architects and the board representatives in the category "Lacked Experience Necessary to Make Decision," there is at least a moderate need identified for the inservice of board representatives relative to this decision.

--Perceptions of the board members' involvement in making the decision in a construction management project

The percentages for this part of the question indicate a very high level of involvement with board representatives responding at the 33.3% level and board members responding at the 30.8% level in the category "Made Decision" and 66.7% of the board representatives, 69.2% of the board members and 100% of the project architects responding in the category "Input Decision." As much as these percentages total 100% input on the part of the respondents, there were no indications in the category "No Involvement in Decision" (see Figure 5B).

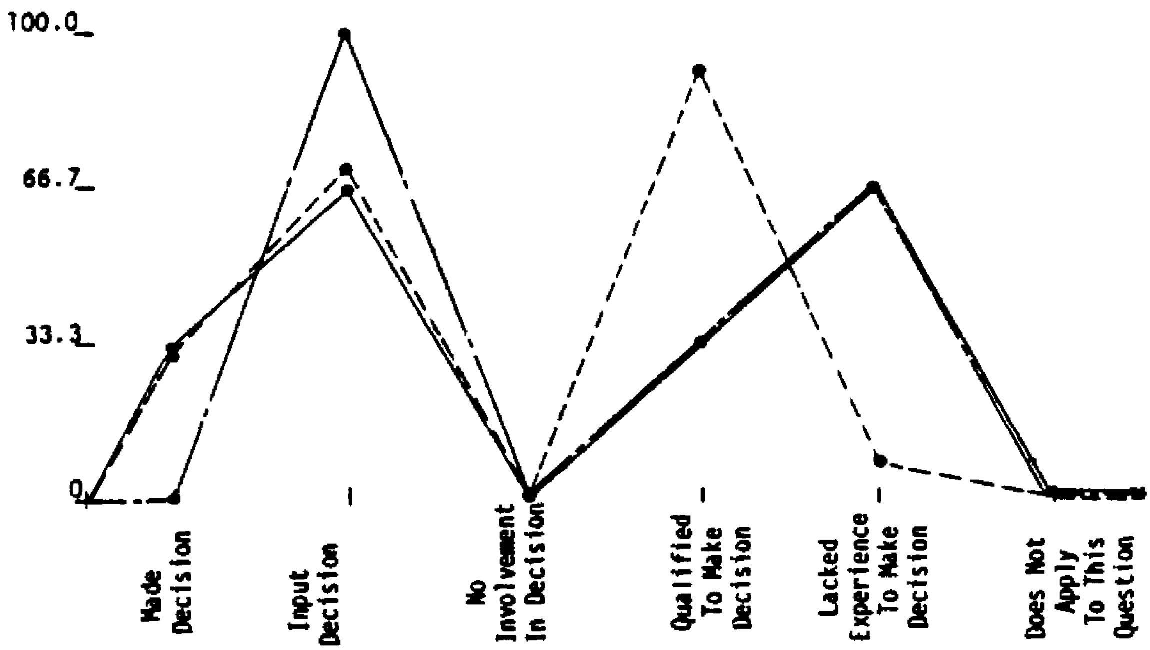

Figure 5B. Determining considerations for future expansion.

--Perceptions of the board members' level of competence in making the decision in a construction management project

The board members perceived themselves as very competent to make the decision and indicated so by responding at the 92.3% level in the category "Qualified to Make Decision" while the board representatives and project architects responded at the 33.3% level. Both the architects and board representatives indicated a relatively high level of doubt by responding at the 66.7% level in the category "Lacked Experience Necessary to Make Decision", while only 7.7% of the board members responded in this category. All respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate to this part of the question (see Figure 5B).

It appeared that the analysis of this part of the question would indicate considerable need to inservice board members relative to this decision. This is supported by the high level of involvement which was perceived by all the respondents paired with a strong indication that the board members lacked the experience to make the decision.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

The board representatives responded at the 0% level while the board members responded at 11.1% level and the project architects responded at the 66.7% level in the category "Made Decision." Board representatives responded at the 100% level while board members responded at the 33.3% level in the category "Input Decision." Responses in both of these categories indicate a high perceived level of involvement. Since these percentages total 100% response, there were no indications in the category "No Involvement in Decision" (see Figure 5C).

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

The board representatives were perceived as extremely competent to make this decision with 100% of the board representatives, 62.5% of the board members and 100% of the project architects responding in the category "Qualified to Make Decision." Only 37.5% of the board members responded in the category "Lacked Experience Necessary to Make Decision." All the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this part of the question (see Figure 5C).

The analysis of this part of the question indicates that even though there is a high level of perceived involvement in this decision because of the high level of competence perceived by the respondents, need for inservice for board representatives in this area is very minor.

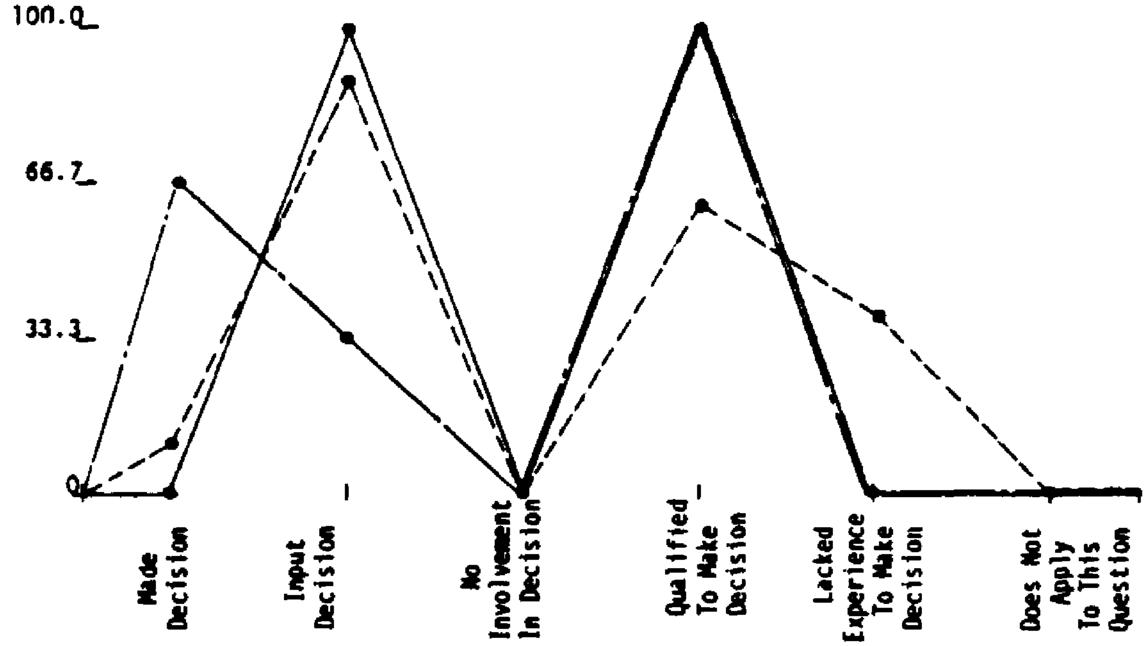

Figure 5C. Determining considerations for future expansion.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members were perceived as having a moderate level of involvement in this decision with 0% of the board representatives, 12.5% of the board members and 33.3% of the project architects responding in the category "Made Decision" and 66.7% of the board representatives, 62.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." However, 33.3% of the board representatives, 25.5% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision (see Figure 5D).

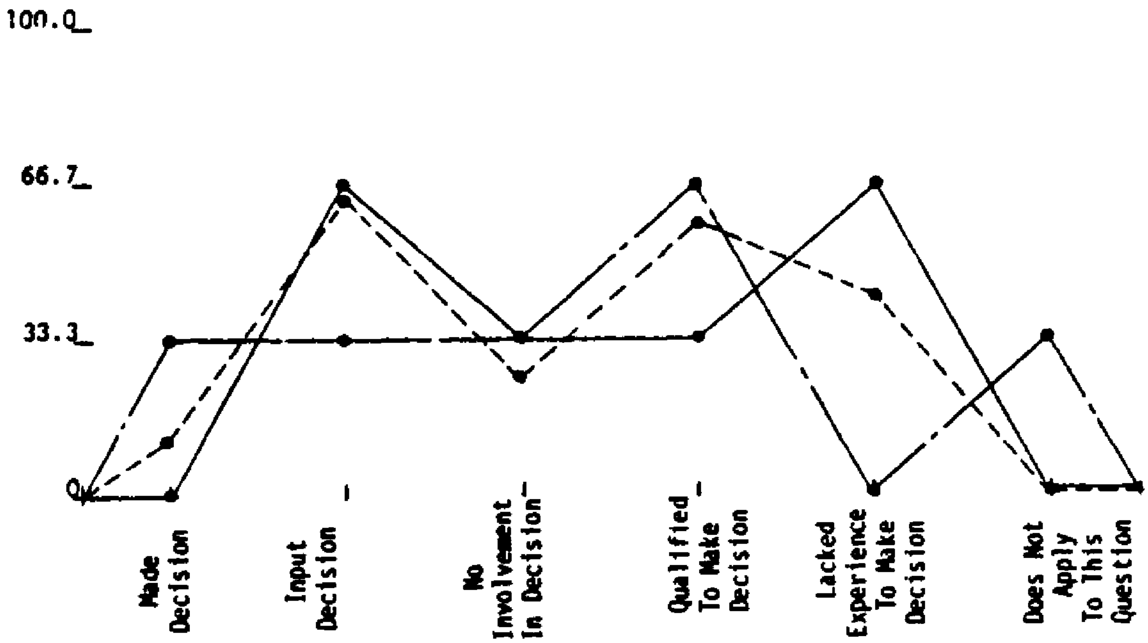

Figure 5D. Determining considerations for future expansion.

--Perceptions of the board members' level of competence in making decisions in a traditional construction project

The response to this portion of the question was mixed with 33.3% of the board representatives, 57.1% of the board members and 56.7% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 42.9% of the board members and 0% of the project architects responding in the category "Lacked Experience Necessary to Make Decision." 33.3% of theproject architects felt that the categories "Qualified to Make Decision" and "Lacked Experience to Make Decision" were inappropriate for this portion of the question (see Figure 5D).

Analysis of this portion of the question, though the responses are mixed, would indicate a sufficient amount of involvement and a sufficient lack of experience necessary to make the decisions to justify inservice for board members relative to the particular decision.

Decision # 6 - Determining the Integration of Architectural and Mechanical Systems

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

The perceived level of board representative involvement in this decision was moderately low with no responses in the category "Made Decision." Board representatives responded at the 33.3% level, board members at the 69.2% level and project architects at the 33.3% level in the category "Input Decision." However, in the category "No Involvement in Decision" the board representatives responded at the 66.7% level while board members responded at the 30.8% level and project architects responded at the 66.7% level (see Figure 6A).

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

Both the board representatives and project architects responded at the 0% level while board members responded at the 53.8% level in the category "Qualified to Make Decision." Board representatives and project architects agreed at the 100% level in the category "Lacked Experience Necessary to Make Decision" while board members responded at the 38.5% level in this category. 7.7% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 6A).

With the analysis of this part of the question showing a moderately low level of involvement and a very low level of competence, the conclusion could be drawn that this decision should be left in the architectural engineering profession. At the very most, it would indicate only a moderate need for inservice for board representatives relative to this decision area.

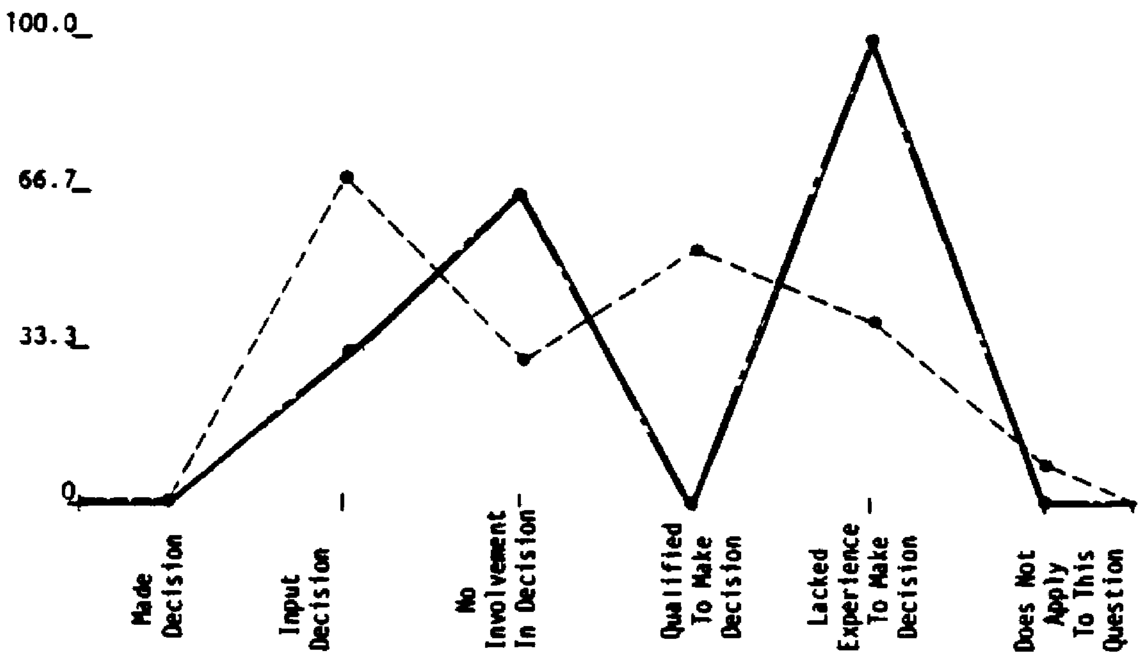

Figure 6A. Determining the integration of architectural and mechanical systems.

--Perception of the board members' involvement in making the decision in a construction management project

This part of the question indicates an extremely low level of involvement perceived relative to board members' participation with board representatives and project architects agreeing at the 0% level and board members responding at the 7.1% level in the category "Made Decision." The board representatives and project architects agreed at the 0% level in the category "Input Decision" and board members responded at the 35.7% level in that category (see Figure 6B).

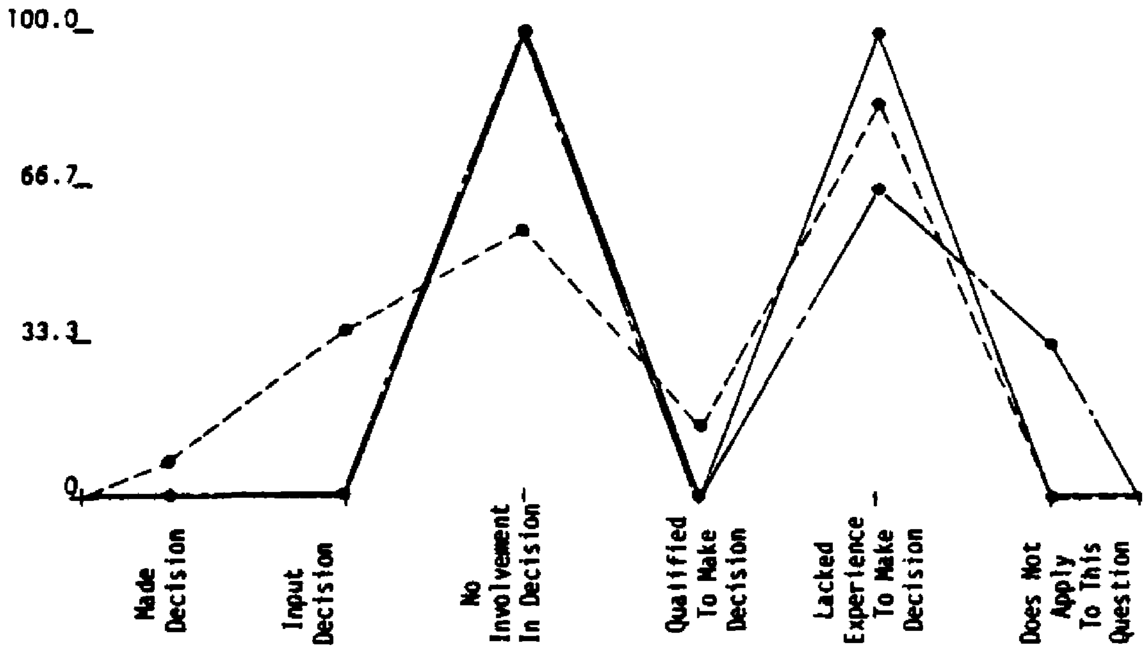

Figure 6B. Determining the integration of architectural and mechanical systems.

--Perceptions of the board members' level of competence in making the decision in a construction management project

The board members were perceived to have a very low level of competence in making this decision with only 15.4% of the board members responding in the category "Qualified to Make Decision", while 100% of the board representatives, 84% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the project architetects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 6B).

The analysis of the responses probably indicate that this is an area in which board members should not participate, and as a result, inservice relative to this decision for board members would not be inappropriate.

--Perception of the board representatives' level of involvement in making the decision in a traditional construction project

The responses in this area were mixed. The board representatives were perceived to have a moderate level of involvement in this decision with board representatives and project architects agreeing at the 0% level and board representatives responding at the 11.1% level in the category "Made Decision." The board representatives responded at the 66.7% level, board members at the 33.3% level and project architects at a 33.3% level for the category "Input Decision." Hosever, 33.3% of the board representatives, 55.6% of the board members and 66.7% of the project architects felt that the board representatives had no involvement and indicated so by responding in the category "No Involvement in Decision" (see Figure 6C).

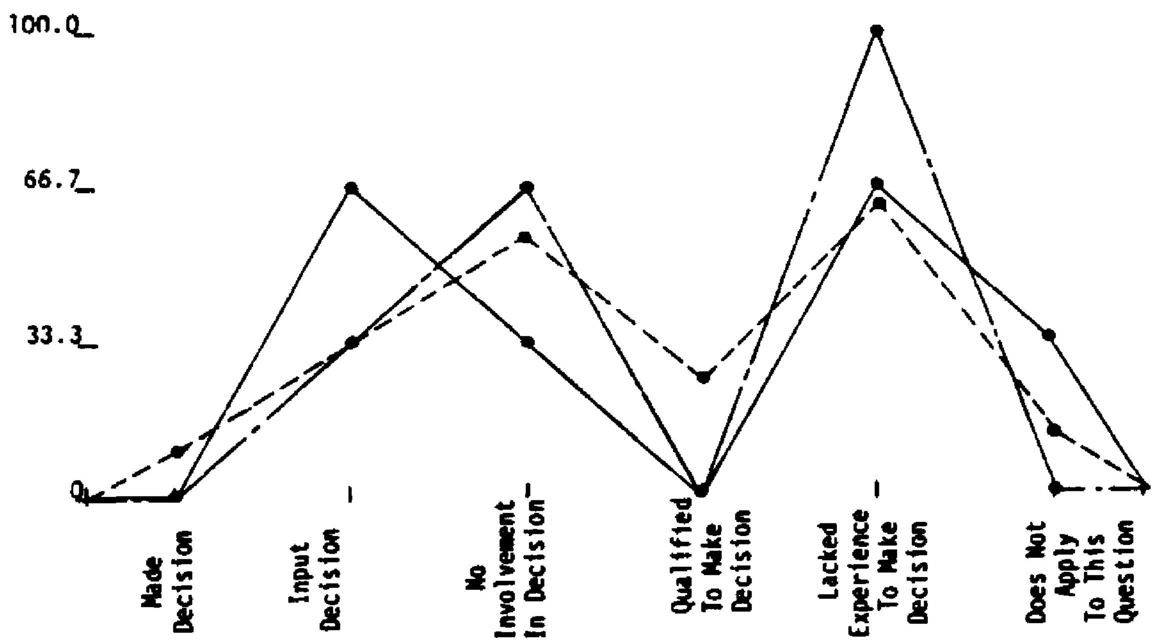

Figure 6C. Determining the integration of architectural and mechanical systems.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A relatively low level of competence was perceived by all respondents with board representatives and project architects agreeing at the 0% level and board members responding at the 25% level in the category "Qualified to Make Decision," while 66.7% of the board representatives, 62.5% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives and 12.5% of the board members felt that the categories "Qualified to Make Decision" and Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 6C).

The analysis indicates that because of the moderate level of perceived involvement in this decision and the extremely low level of perceived competence to make this decision, inservice in this area for board representatives would be appropriate.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

A very low level of involvement on the part of board members was indicated with no responses in the category "Made Decision" and only 33.3% of the board representatives and 25% of the board members responding in the category "Input Decision." However, 66.7% of the board representatives, 75% of the board members and 100% of the project architects indicated that board members were not involved in this decision (see Figure 6D).

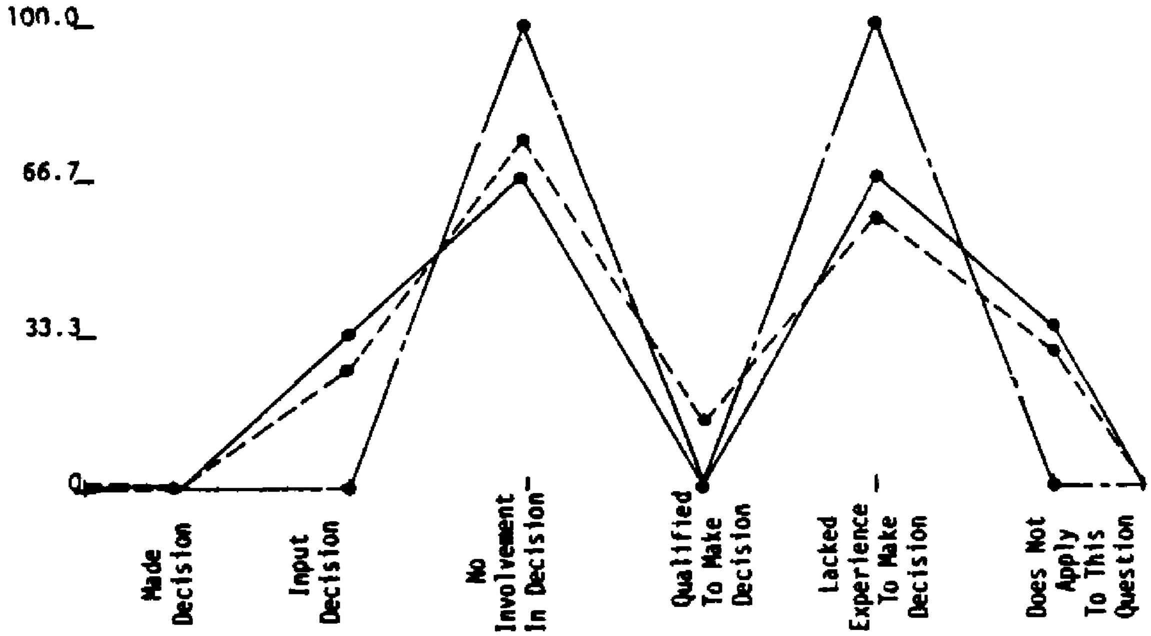

Figure 6D. Determining the integration of architectural and mechanical systems.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Board members were perceived to lack the competence necessary to make the decision. This was supported by 14.3% response of the board members in the category "Qualified to Make Decision", while 66.7% of the board representatives, 57.1% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives and 28.6% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 6D).

While there is small indication that board members are perceived as involved in this decision, the extreme lack of competence and even inappropriateness indicated probably signifies that this is an area which should be left to the architectural and engineering community. No inservice would be recommended for this area.

Decision # 7 - Determining the Interface Between Electrical and Mechanical Systems

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A relatively low level of involvement is indicated with no responses in the category "Made Decision" and board representatives responding at the 0% level, board members responding at the 58.3% level and project architects responding at the 33.3% level in the category "Input Decision." However, 100% of the board representatives, 41.7% of the board members and 66.7% of the project architects responded in the category "No Involvement in Decision" (see Figure 7A).

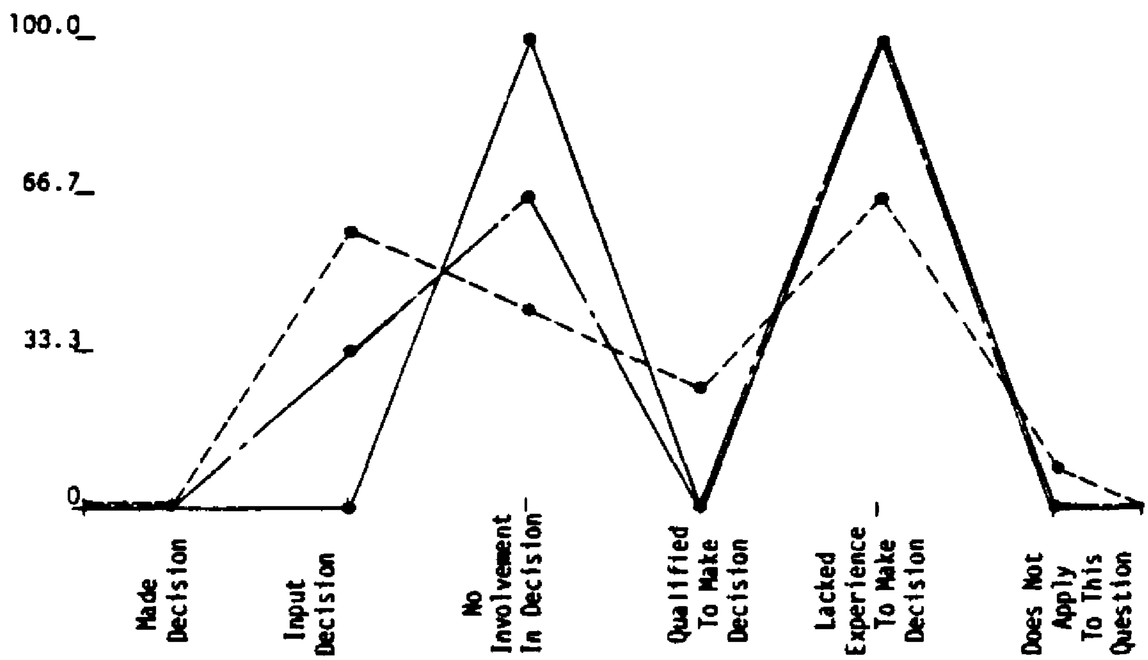

Figure 7A. Determining the interface between electrical and mechanical systems.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A very low level of competence was indicated with only 25% of the board members responding in the category "Qualified to Make Decision", while 100% of the board representatives, 66.7% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 8.3% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 7A).

In analyzing this portion of the question, it would appear that while the level of involvement is relatively low the extreme lack of competence perceived would indicate a potential need for inservice for board representatives in this area.

--Perceptions of the board members' involvement in making the decision in a construction management project

A very low level of involvement is indicated in this area with only 7.7% of the board members responding in the category "Made Decision" and 23.1% of the board members responding in the category "Input Decision." However, 100% of the board representatives, 69.2% of the board members and 100% of the project architects responded in the category "No Involvement" (see Figure 7B).

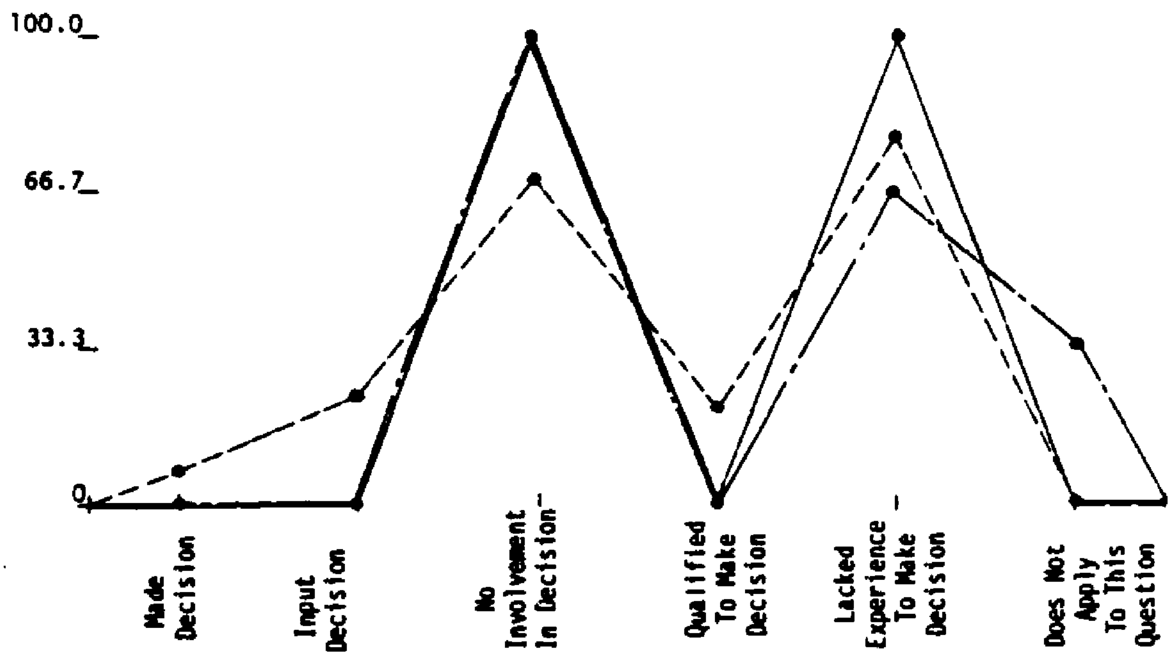

Figure 7B. Determining the interface between electrical and mechanical systems.

--Perceptions of the board members' level of competence in making the decision in a construction management project

There is a strong indication that the board members lacked the competence to participate in making the decision. This is supported by the response of 100% on the part of board representatives, 78.6% by board members and 66.7% by project architects for the category "Lacked Experience Experience Necessary to Make Decision," while only 21.4% of the board members responded in the category "Qualified to Make Decision." 33.3% of the project architects felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 7B).

Because of the extreme lack of involvement and the very low level of perceived competence, the analysis of this part of the question would indicate that this is an area which should be the primary responsibility of the architectural and engineering community. Therefore, no inservice need is indicated.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderately low level of involvement is indicated with no responses in the category "Made Decision" while 33.3% of the board representatives, 44.4% of the board members and 33.3% of the project architects responded in the category "Input Decision." There was a relatively high response in the category "No Involvement in Decision" with 66.7% of the board representatives, 55.6% of the board members and 66.7% of the project architects responding in this category (see Figure 7C).

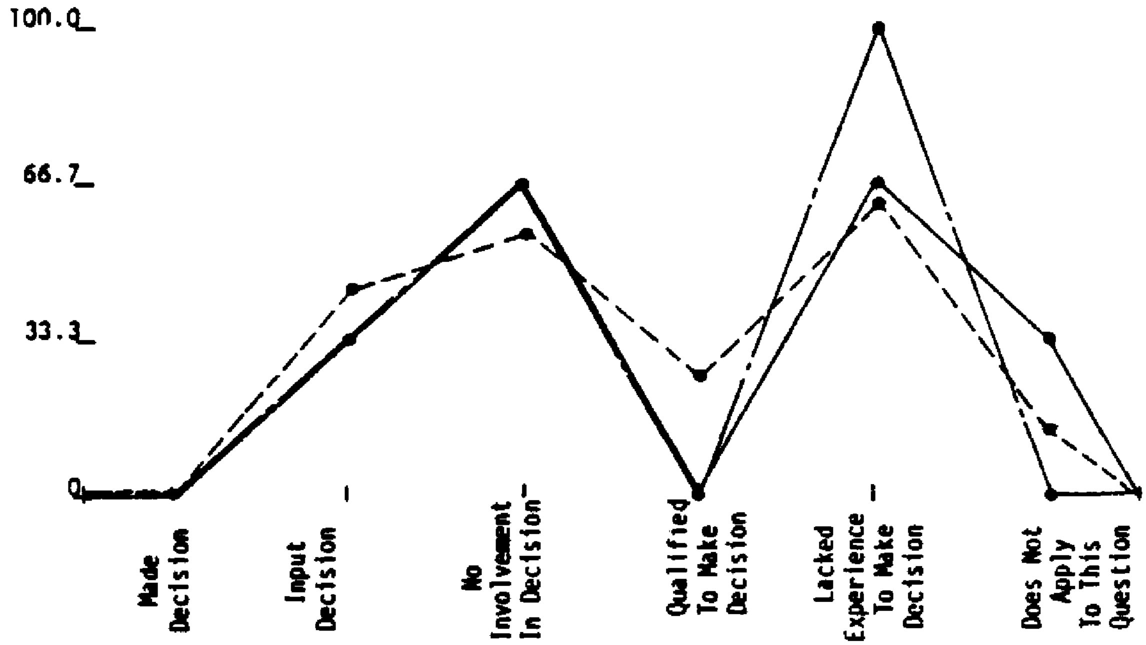

Figure 7C. Determining the interface between electrical and mechanical systems.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

An extremely low level of competence was indicated in this area with 25% of the board members responding in the category "Qualified to Make Decision." 66.7% of the board representatives, 62.5% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives and 12.5% of the board members felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 7C).

The analysis of this portion of the question would tend to indicate that this may be an area in which the engineering community should assume the prime responsibility. However, there is a moderate level of input indicated and a low level of competence indicating a moderate need for inservice of board representatives in this decision area.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

An extremely low level of involvement is indicated in this area with no responses in the category "Made Decision" and only 25% of the board members responding in the category "Input Decision." The board representatives responded at the 100% level while board members responded at the 75% level and project architects at the 100% level in the category "No Involvement in Decision" (see Figure 7D).

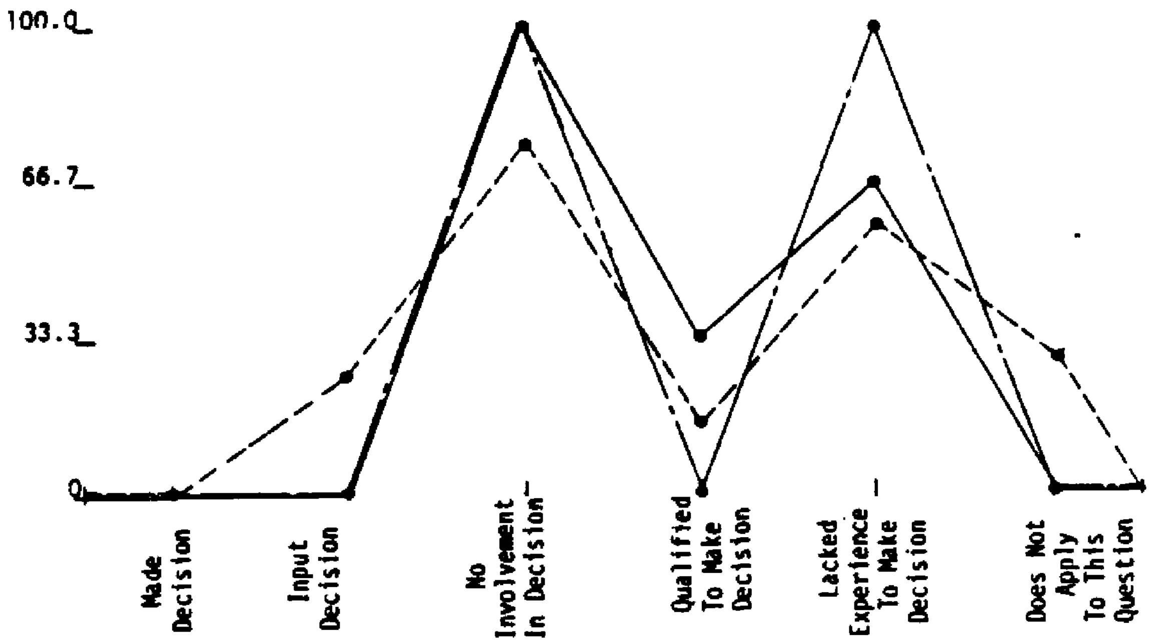

Figure 7D. Determining the interface between electrical and mechanical systems.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A moderately low level of competence is indicated with 33.3% of the board representatives, 14.3% of the board members and 0% of the project architects responding in the category "Qualified to Make Decision", while 66.7% of the board representatives, 57.1% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 28.6% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 7D).

Analysis of this part of the question would again indicate that this area probably should be the primary responsibility of the engineering community; therefore, no inservice is recommended for board members in this decision area.

Decision # 8 - Determining the Structural System

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderately high level of input is indicated in this area with 7.7% of the board members responding in the category "Made Decision" and 66.7% of the board representatives, 84.6% of the board members and 33.3% ofthe project architects responding in the category "Input Decision." 33.3% of the board representatives, 7.7% of the board members and 66.7% of the project architects responded in the category "No Involvement in Decision" (see Figure 8A).

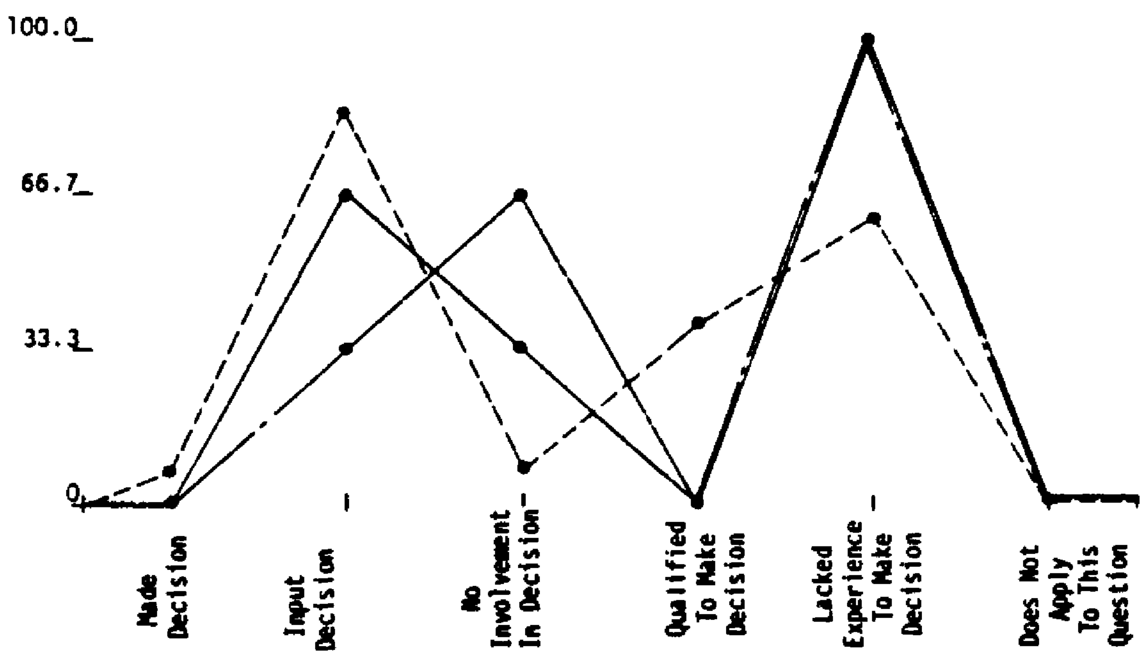

Figure 8A. Determining the structural system.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A very low level of competence is indicated in this area with only 35.8% of the board members responding in the category "Qualified to Make Decision", while 100% of the board representatives, 61.5% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 8A).

Analysis for this part of the question would indicate that because of the relatively high level of input and the very low level of competence which was perceived on the part of the respondents, there is a relatively high level of need for inservice in this decision area.

--Perceptions of the board members' involvement in making the decision in a construction management project

There is a moderately high level of involvement indicated with 21.4% of the board members responding in the category "Made Decision" and 66.7% of the board representatives, 71.4% of the board members and 66.7% of the project architects responding in the category "Input Decision." Only 33.3% of the board representatives, 7.2% of the board members and 33.3% of the project architects responded in the category "No Involvement in Deicison" (see Figure 8B).

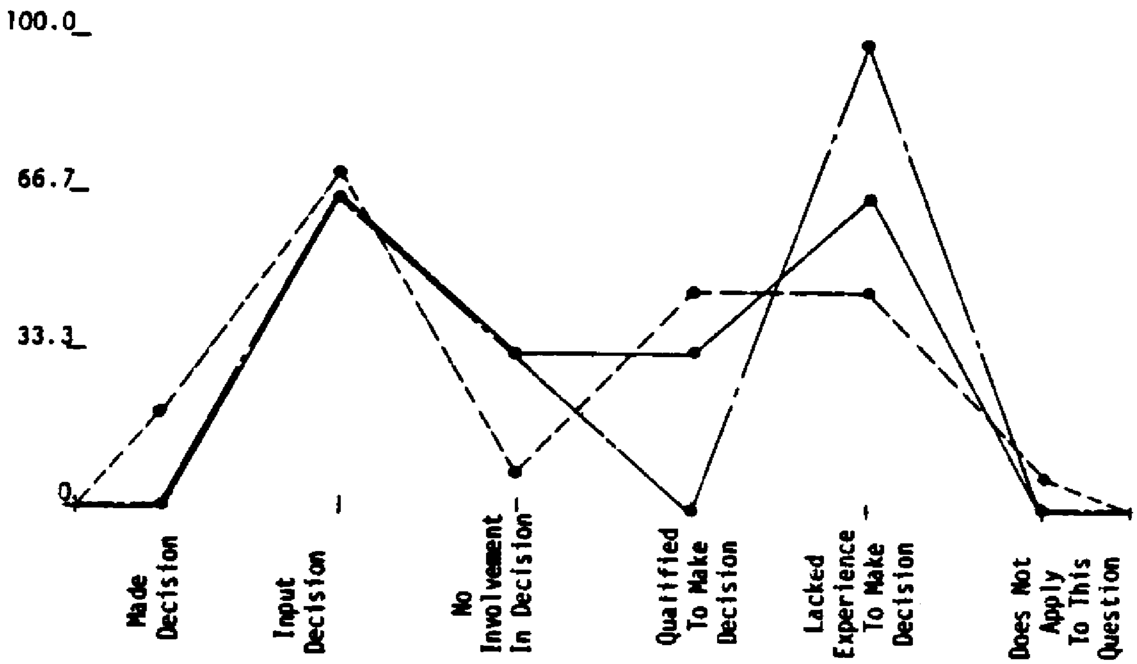

Figure 8B. Determining the structural system.

--Perceptions of the board members' level of competence in making the decision in a construction management project

The level of competence is relatively low with only 33.3% of the board representatives and 46% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 46% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 7.7% of the board members felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 8B).

Because of the relatively high level of involvement and the low level of competence which is perceived, it would appear that there is a definite need to inservice board members relative to this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional contruction project

A low level of involvement is indicated with only 11.1% of the board members responding in the category "Made Decision" and the board representatives and the board members agreeing at the 33% level in the category "Input Decision." The board representatives responded at a 66.7% level, board members at a 55.6% level and project architects at a 100% level in the category "No Involvement in Decision" (see Figure 8C).

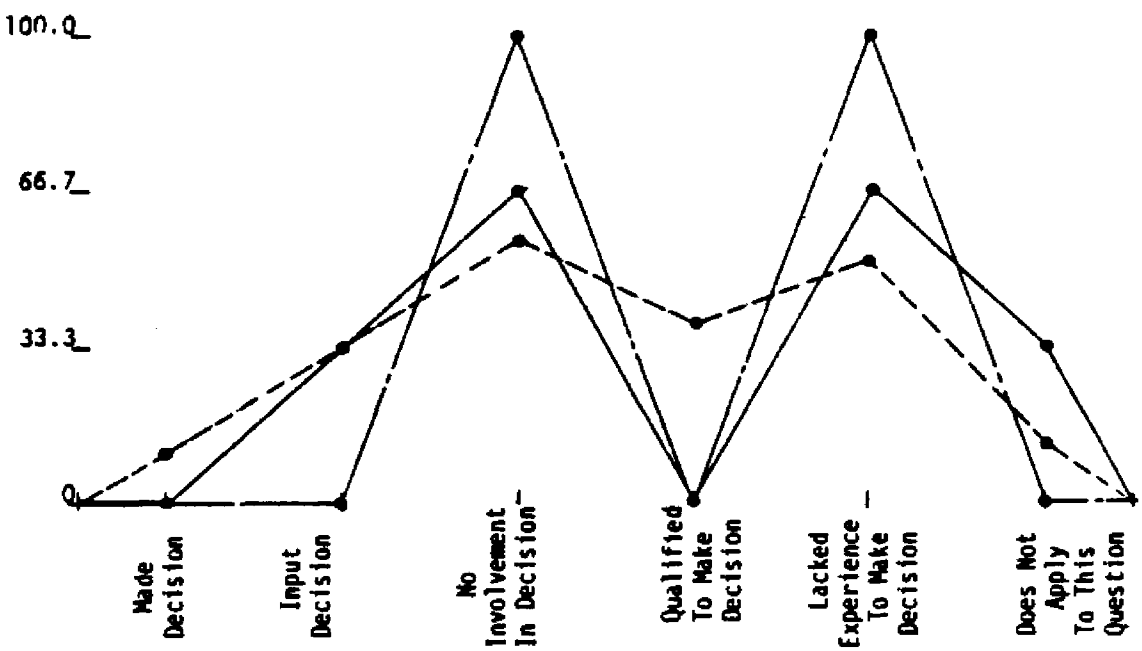

Figure 8C. Determining the structural system.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A very low level of competence was indicated in this area. This is supported by 37.5% response on the part of the board members for the category "Qualified to Make Decision", while board representatives responded at the 66.7% level, board members at the 50% level and project architects at the 100% level in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives and 12.5% of the board members felt that the categories "Qualified to Make

Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 8C).

Since the analysis of this question indicates a low level of involvement and a low perceived level of competence, inservice in this decision area is probably not necessary.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

There were no responses in the category "Made Decision" and only 33% of the board representatives and 37.5% of the board members responded to the category "Input Decision." 66.7% of the board representatives, 62.5% of the board members and 100% of the project architects responded in the category "No Involvement in Decision" thus indicating a relatively low level of participation in this decision (see Figure 8D).

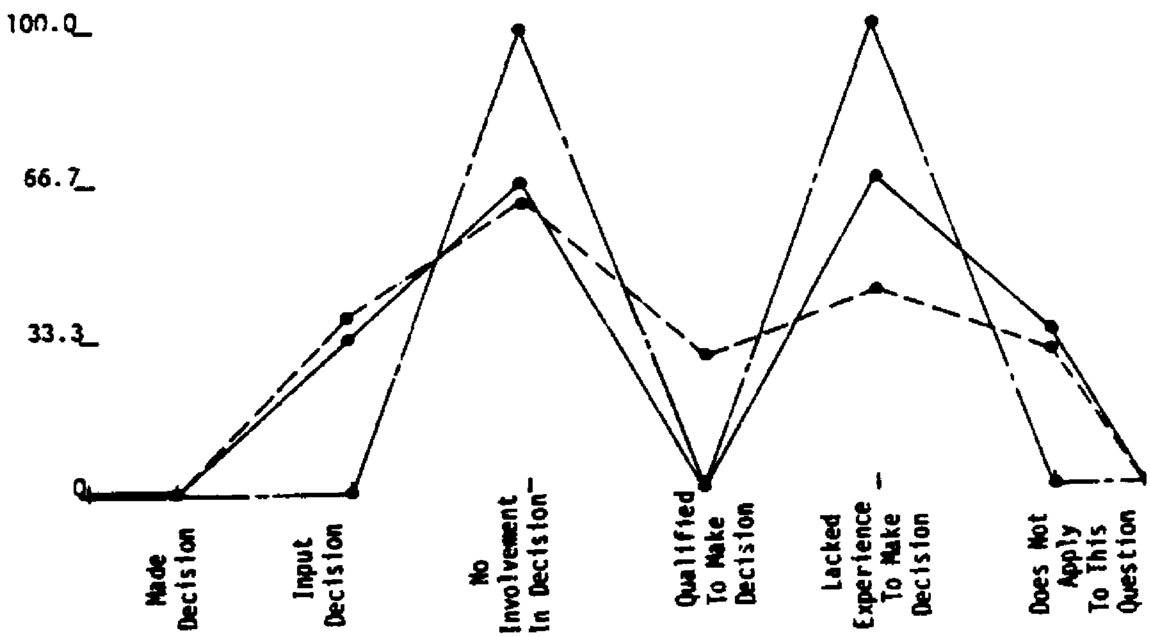

Figure 8D. Determining the structural system.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

The perceived level of competence of board members is very low. This is supported by a 28.6% response on the part of board members in the category "Qualified to Make Decision" while 66.7% of the board representatives, 42.9% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives and 28.6% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 8D).

The analysis of this part of the question indicates a low perceived level of involvement and a low level of competence. Therefore, inservice in this area is probably not necessary.

<u>Decision # 9</u> - <u>Establishing Access to the Building (Staff, Students and Public)</u>

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A high level of involvement was indicated with 46.2% of the board members and 33.3% of the project architects responding in the category "Made Decision" and 66.7% of the board representatives, 38.5% of the board members and 66.7% of the project architects responding in the category "Input Decision." Only 33.3% of the board representatives and 15.4% of the board members responded in the category "No Involvement in Decision" (see Figure 9A).

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

There is only a moderate level of competence indicated with 33.3% of the board representatives, 76.9% of the board members and

33.3% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 23.1% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 9A).

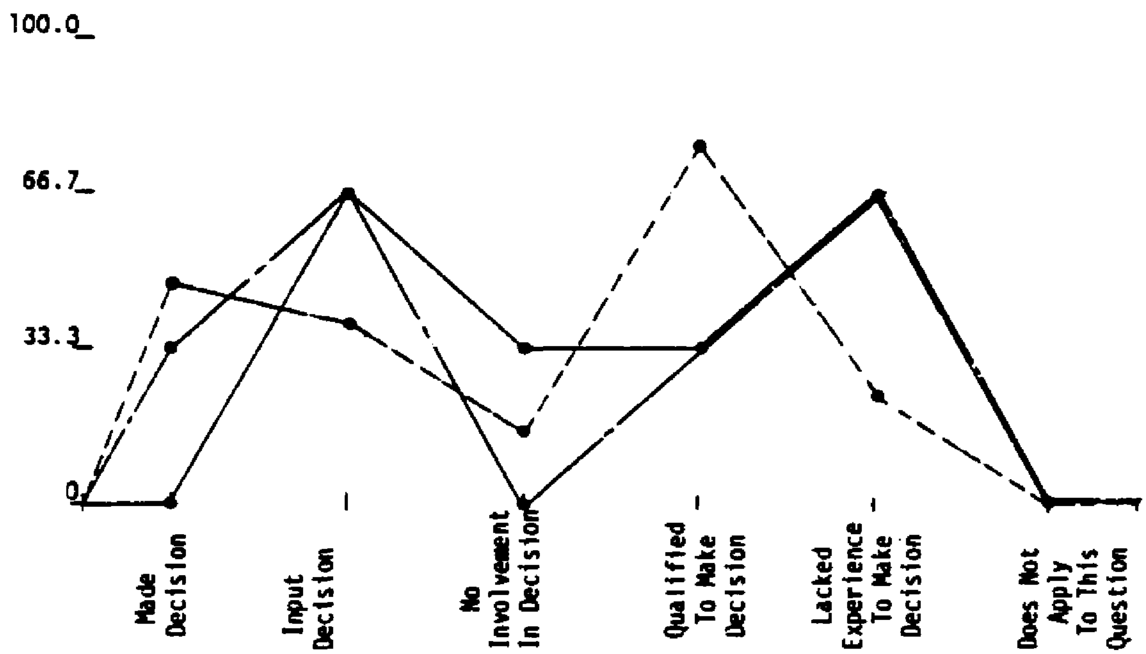

Figure 9A. Establishing access to the building (staff, students and public).

Since there is a very high level of involvement perceived and only a moderate level of competence indicated, the analysis of this part of the question would show a definite need for inservice for board representatives in this decision area.

--Perceptions of the board members' level of involvement in making the decision in a construction management project

A relatively high level of involvement is indicated with board representatives responding at the 33.3% level, board members responding at the 78.6% level and project architects responding at the 100% level in the category "Input Decision." There were no responses in the category "Made Decision." Board representatives responded at the 66.7% level and board members at the 21.4% level in the category "No Involvement in Decision" (see Figure 9B).

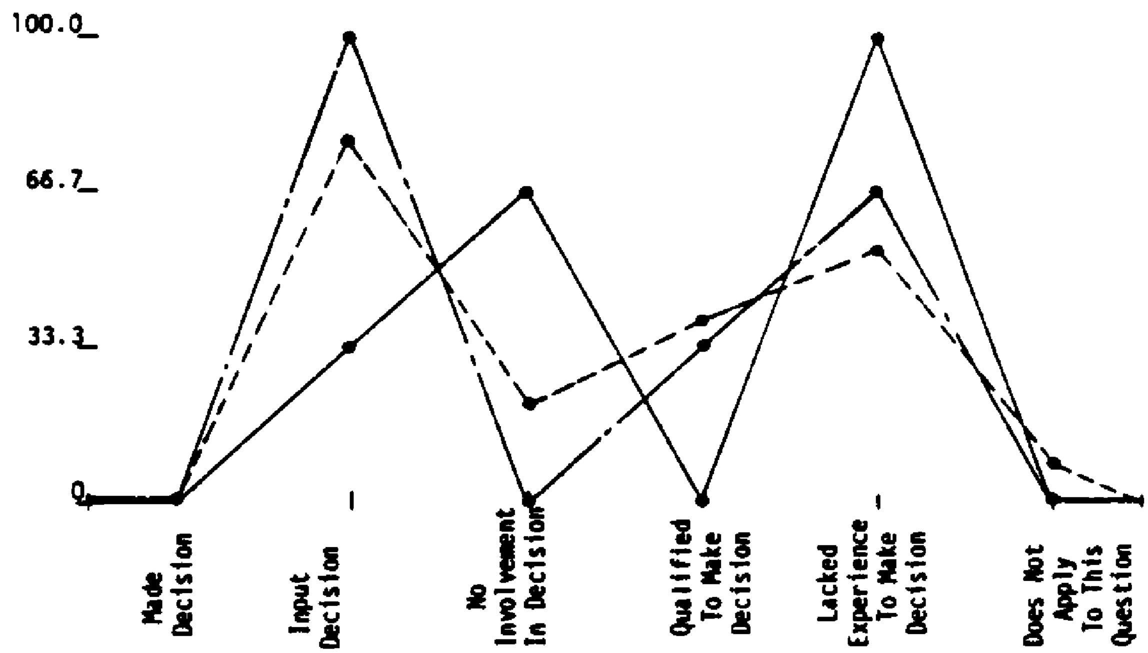

Figure 9B. Establishing access to the building (staff, students and public).

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence is indicated with only 38.5% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 100% of the board representatives, 53.8% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 7.7% of the board members felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 9B).

The analysis of this part of the question indicates a high perceived level of involvement and a low perceived level of competence thus identifying a definite need to inservice board members relative to this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A high level of involvement is indicated in this area with the board representatives and the project architects agreeing at the 33.3% level in the category "Made Decision" and the board members responding at the 11.1% level in that category. 66.7% of the board representatives, 77.8% of the board members and 33.3% of the project architects responded in the category "Input Decision." Only 11.1% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 9C).

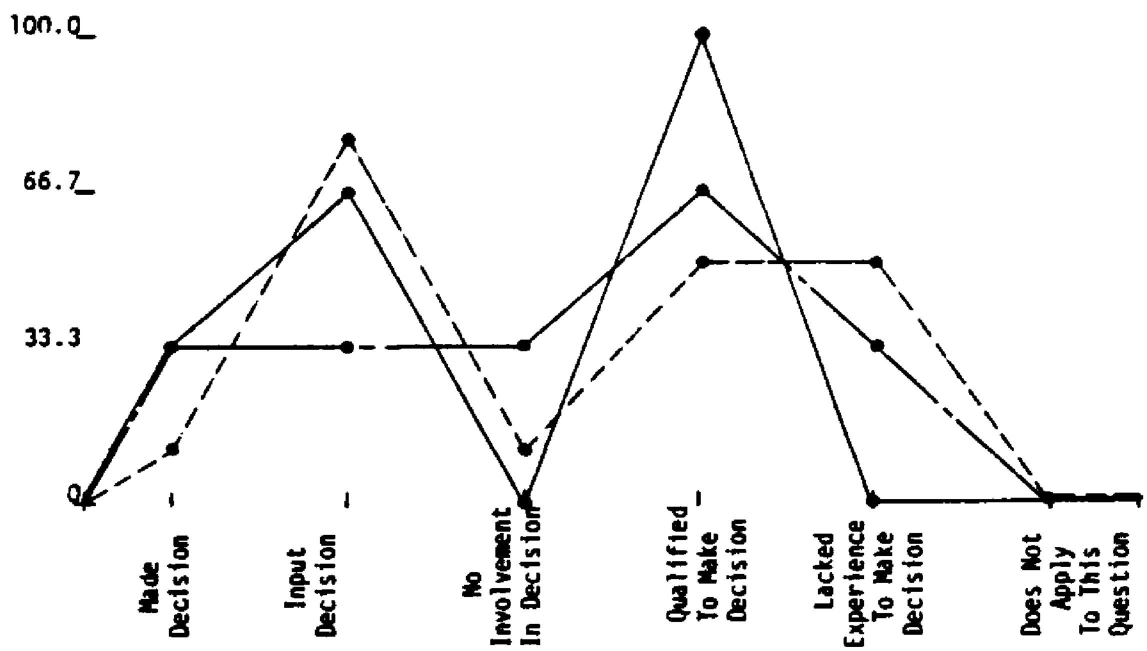

Figure 9C. Establishing access to the building (staff, students and public).

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

The responses in this area strongly indicate that the owner's representatives are "Qualified to Make Decision." The board representatives responded at the 100% level, board members at the 50% level and project architects at the 66.7% level in the category "Qualified to Make Decision," while 50% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 9C).

While the analysis of this question indicates a very high level of involvement in the decision, the perceived level of competence is also quite high. Therefore, the need for inservice for board representatives in this deicsion area is very low.

--Perception of the board members' level of involvement in making the decision in a traditional construction project

A relatively low level of involvement is indicated in this area with only 12.5% of the board members responding in the category "Made Decision," while 33.3% of the board representatives and 75% of the board members responded in the category "Input Decision." 66.7% of the board representatives, 12.5% of the board members and 100% of the project architects responded in the category "No Involvement in Decision" (see Figure 9D).

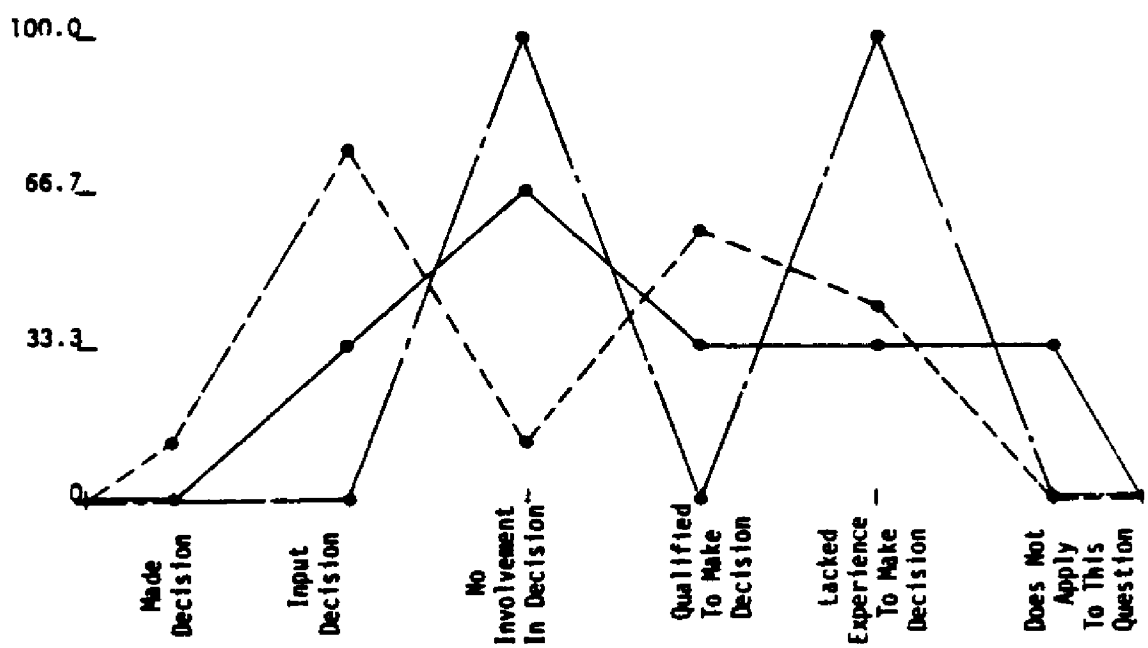

Figure 9D. Establishing access to the building (staff, students and public).

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A low level of competence is indicated. This is supported by a 33.3% response on the part of board representatives and 57.1% response by the board members in the category "Qualified to Make Decision," while 33.3% of the board representatives, 42.9% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 9D).

The analysis of this question would indicate that the perceived level of competence is moderately low, however, the perceived level of involvement is also moderately low. Therefore, a need for inservice in this decision area would be relatively low.

Decision # 10 - Determining Instructional Equipment Layouts, Both Moveable and Fixed

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A very high level of involvement is indicated with 33.3% of the board representatives, 46.2% of the board members and 66.7% of the project architects responding in the category "Made Decision" and 66.7% of the board representatives, 38.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." Only 15.4% of the board members responded in the category "No Involvement in Decision" (see Figure 10A).

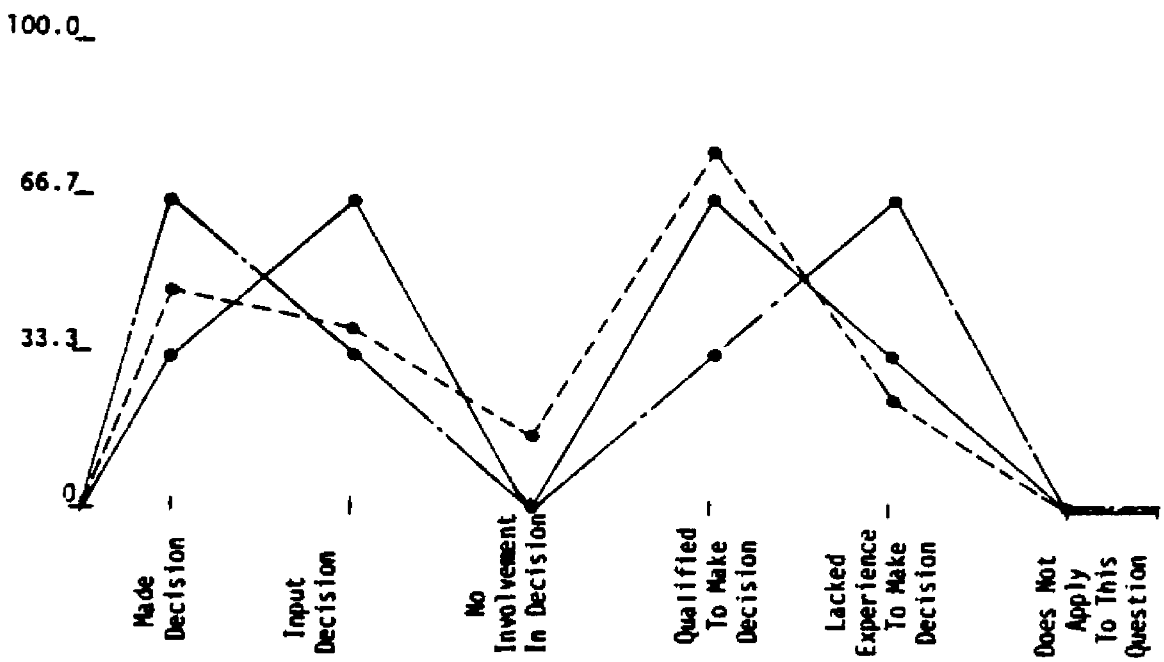

Figure 10A. Determining instructional equipment layouts, both moveable and fixed

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately high level of competence is indicated with 66.7% of the board representatives, 76.9% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 33.3% of the board representatives, 23.1% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate to this question (see Figure 10A).

The analysis of this part of the question indicates a moderately high level of competence and a very high level of involvement in making the decision. Therefore, there is probably only a moderate need to inservice board representatives in this decision area.

--Perceptions of the board members' involvement in making the decision in a construction management project

A moderate level of involvement is indicated in this area with no responses in the category "Made Decision" and 33.3% of the board representatives, 42.9% of the board members and 100% of the project architects responding in the category "Input Decision." 66.7% of the board representatives and 57.1% of the board members responded in the category "No Involvement in Decision" (see Figure 10B).

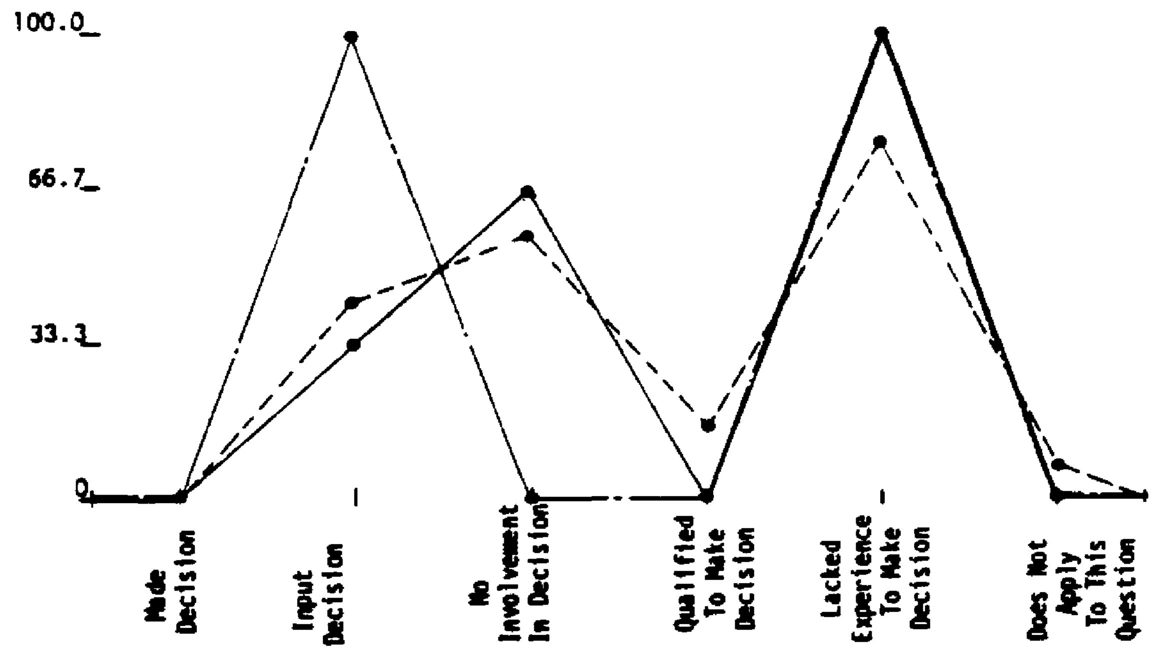

Figure 10B. Determining instructional equipment layouts, both moveable and fixed.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence is indicated in this area with only 15.4% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 76.9% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 7.7% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 10B).

The analysis of this part of the question would indicate a very low level of competence was perceived, while a moderate level of involvement was indicated. Therefore, a definite need for inservice of board members in this decision is identified.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A very high level of involvement is indicated in this area with 66.7% of the board representatives and 66.7% of the project architects responding in the category "Made Decision" and 33.3% of the board representatives, 77.8% of the board members and 33.3% of the project architects responding in the category "Input Decision." Only 22.2% of the board members responded in the category "No Involvement in Decision" (see Figure 10C).

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A very high level of competence was indicated with 100% of the board representatives, 50% of the board members and 100% of the project architects responding in the category "Qualified to Make Decision," while only 50% of the board members responded in the category "Lacked

Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 10C).

While the analysis of this question indicates a very high level of involvement in making decisions, it also indicates a very high perceived level of competence to make the decision. Therefore, inservice for board representatives in this area is probably not necessary. It is interesting to note that the board representatives and the project architects concur on all points in response to this portion of the question.

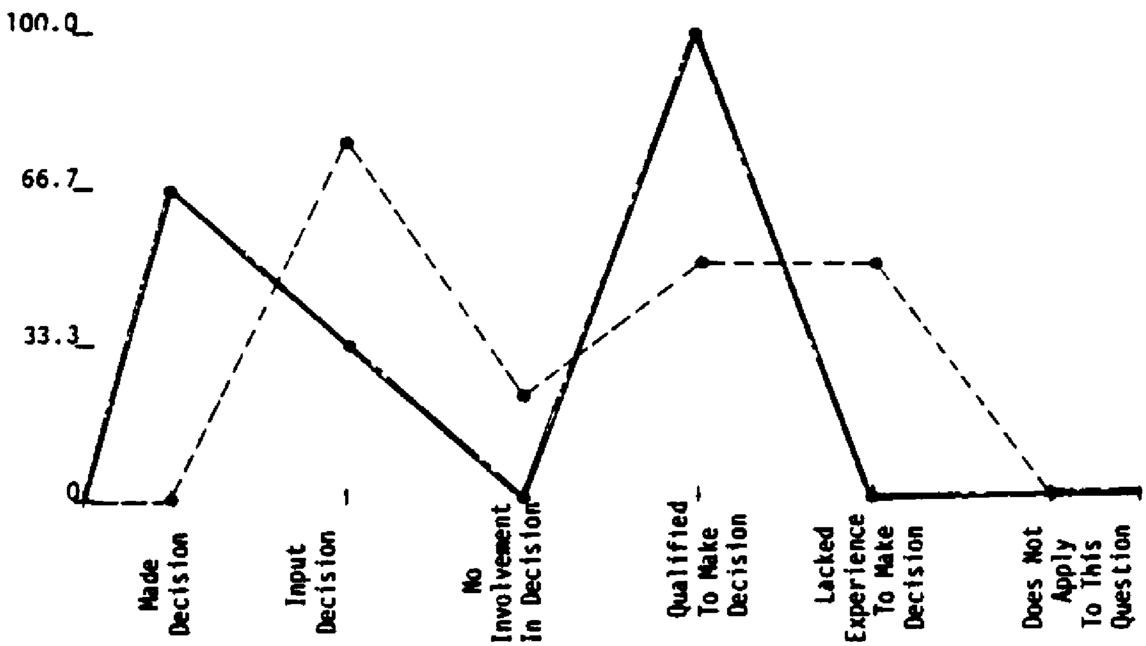

Figure 10C. Determining instructional equipment layouts, both moveable and fixed.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

There is a relatively low level of involvement indicated with only 33.3% of the project architects responding in the category

"Made Decision" and 62.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." 100% of the board representatives, 37.5% of the board members and 33.3% of th the project architects responded in the category "No Involvement in Decision" (see Figure 10D).

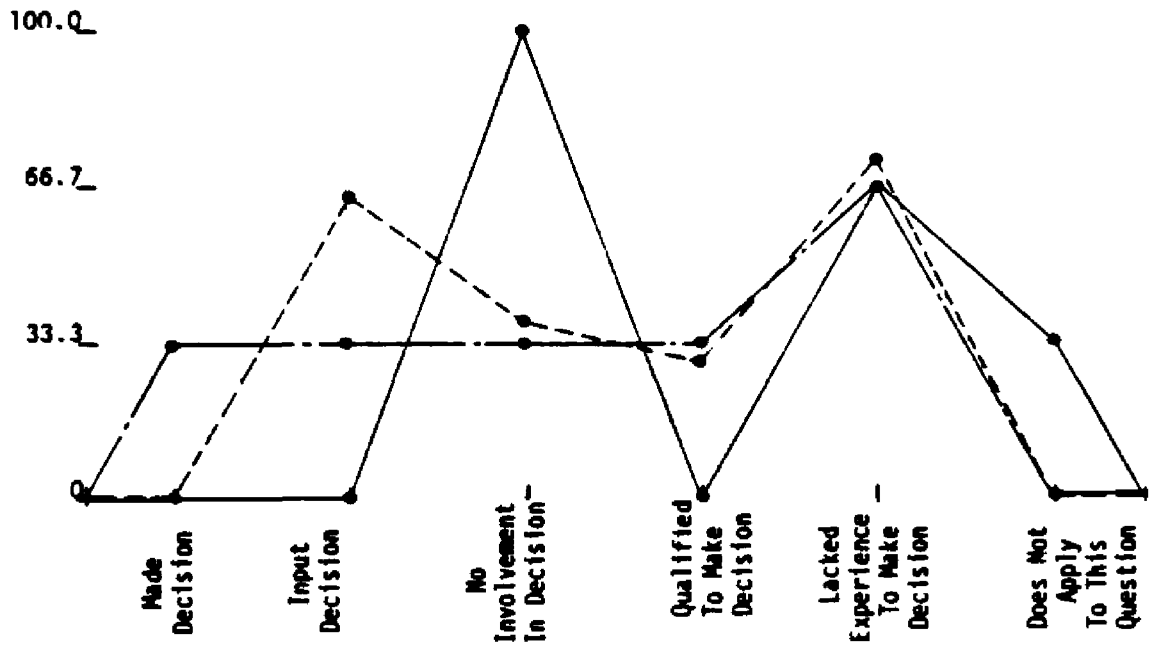

Figure 10D. Determining instructional equipment layouts, both moveable and fixed.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A relatively low level of competence was perceived in this area with only 28.6% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." However, 66.7% of the board representatives, 71.4% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives felt the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 10D).

The analysis of this part of the question would indicate a very low perceived level of competence to make the decisions while there was a moderately low level of involvement. Therefore, there is probably a moderate need to inservice board members relative to this decision area.

Decision # 11 - Establishing the Project Development Schedule

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderately high level of involvement is indicated with 7.7% of the board members and 33.3% of the project architects responding in the category "Made Decision" and 66.7% of the board representatives, 69.2% of the board members and 33.3% of the project architects responding in the category "Input Decision." 33.3% of the board representatives, 23.1% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 11A).

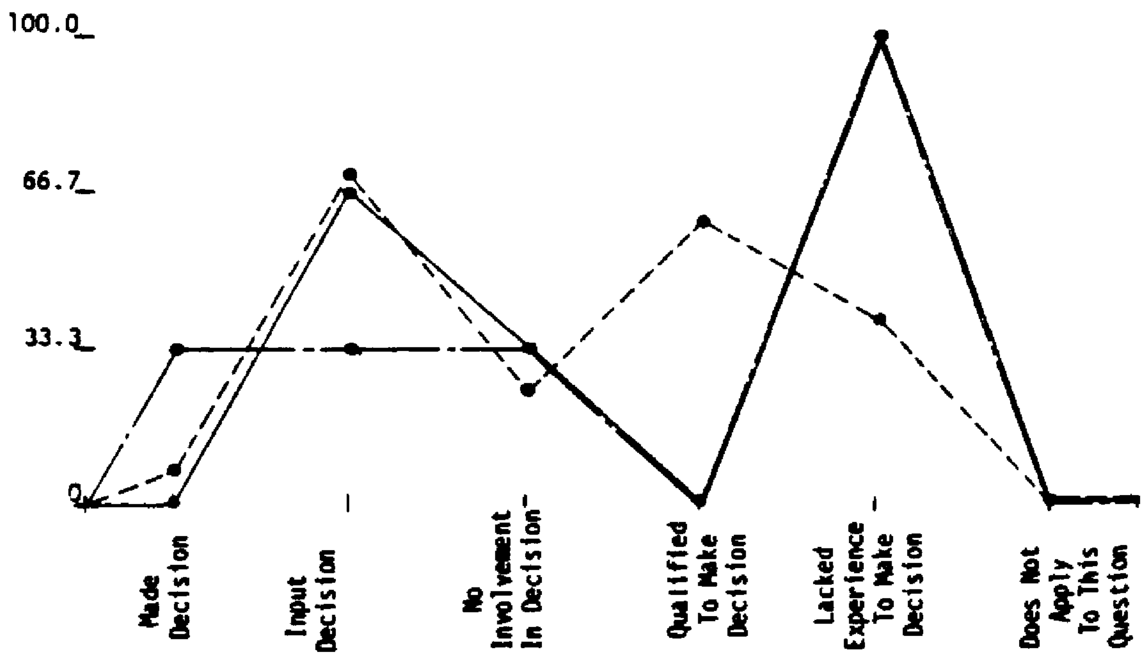

Figure 11A. Establishing the project development schedule.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A low level of competence was perceived with only 61% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 38.5% of the board members and 100% of the project architects resonded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate to this question (see Figure 11A).

The analysis of this question would indicate a very low level of competence with a relatively high level of involvement in making the decision. Therefore, definite need is identified to inservice board representatives relative to the decision in this area.

--Perceptions of the board members' involvement in making the decision in a construction management project

A fairly low level of involvement is indicated in this area with only 7.1% of the board members responding in the category "Made Decision," while 33.3% of the board representatives and 50% of the board members responded in the category "Input Decision." 66.7% of the board representatives, 42.9% of the board members and 100% of the project architects responded in the category "No Involvement in Decision" (see Figure 11B).

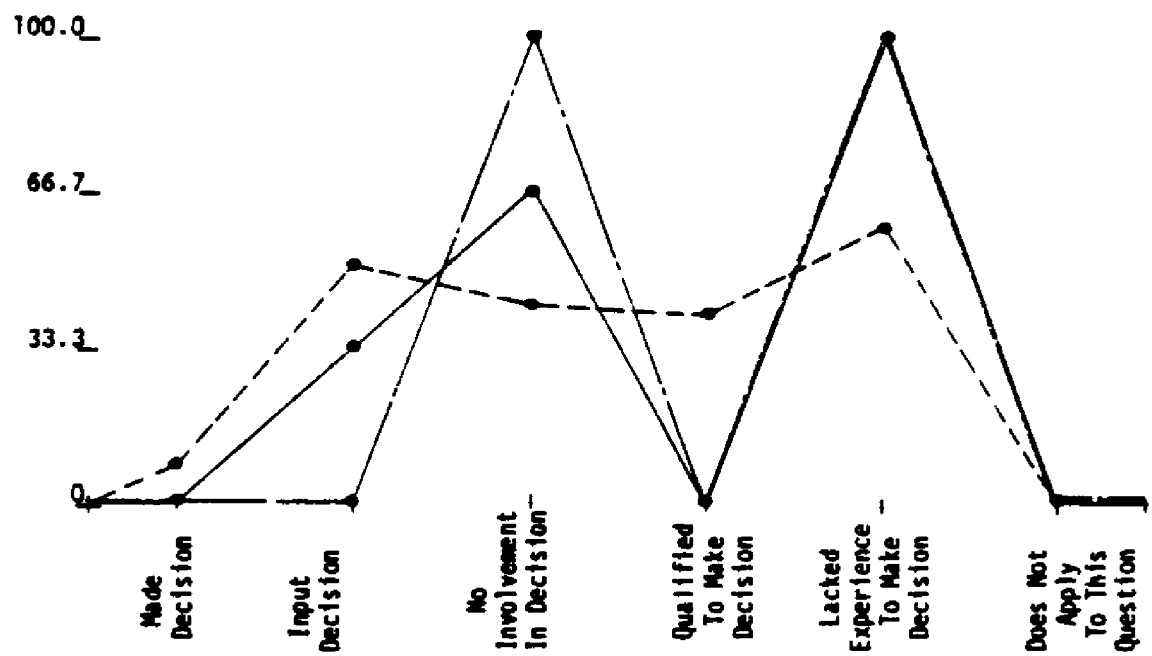

Figure 11B. Establishing the project development schedule.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence is indicated. This is supported with a 41.7% response on the part of the board members in the category "Qualified to Make Decision," while board representatives responded at the 100% level, board members at the 58.3% level and project architects at the 100% level in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 11B).

Analysis of this part of the question indicates a moderately low level of involvement in the decision and an extremely low level of competence to make the decision. Therefore, a moderate need for inservice may be indicated for board members in this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in the traditional construction project

A moderately high level of involvement is indicated with 11.1% of the board members responding in the category "Qualified to Make Decision" and 100% of the board representatives, 44.4% of the board members and 66.7% of the project architects responding in the category "Input Decision." 44.4% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 11C).

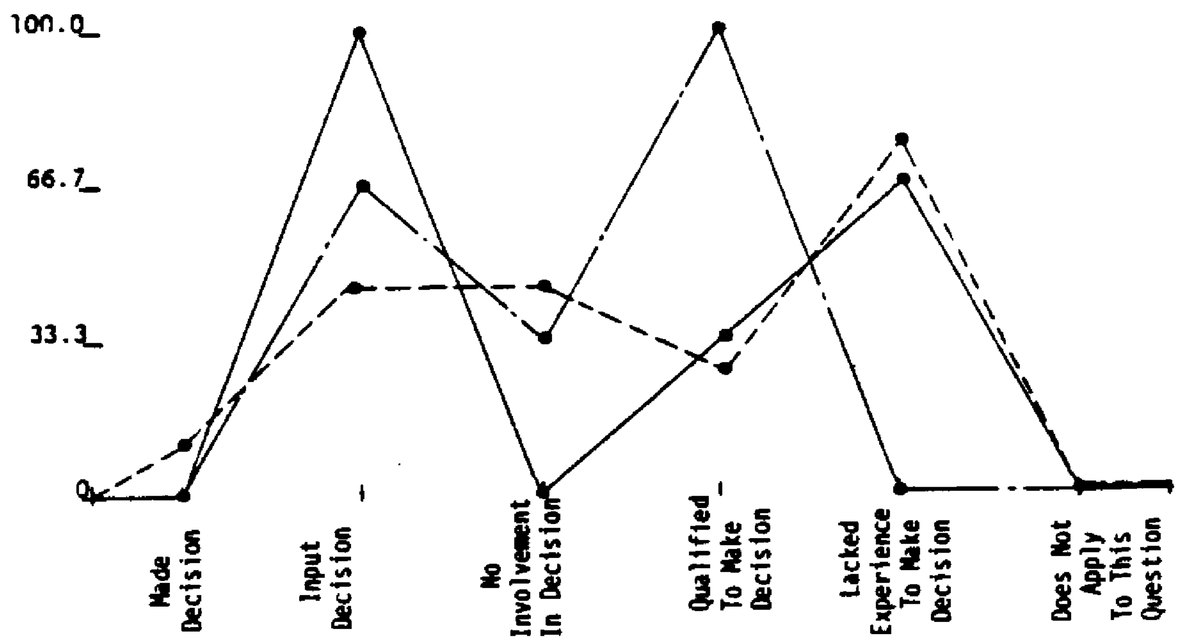

Figure 11C. Establishing the project development schedule.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A relatively high level of competence was indicated with 33.3% of the board representatives, 25% of the board members and 100% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives and 75% of the board members responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decison" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 11C).

The analysis of this question indicates a relatively high level of involvement in the decision making process with a relatively high level of competence to make the decision. However, while the project architects perceived the board representatives as being extremely competent to make the decision, the board representatives themselves and the board members strongly indicated that they lacked the experience necessary to make the decision. Therefore, there is a probable need for inservice for board representatives relative to this decision area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

A moderate level of involvement is indicated with 33.3% of the project architects responding in the category "Made Decision," while 66.7% of the board representatives, 62.5% of the board members and 33.3% of the project architects responded in the category "Input Decision." 33.3% of the board representatives, 37.5% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 11D).

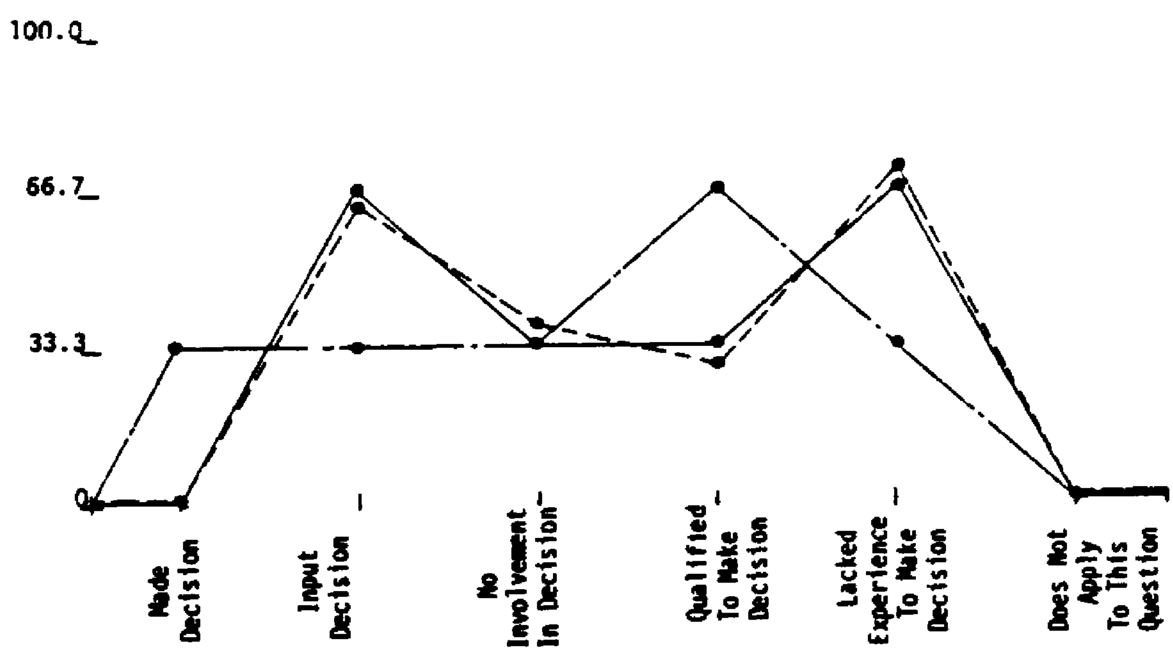

Figure 11D. Establishing the project development schedule.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A moderately low level of competence is indicated with 33.3% of the board representatives, 28.6% of the board members and 66.7% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71.4% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 11D).

The analysis of the question indicates a moderately low level of competence in this decision area with a moderately high level of involvement in the decision. Therefore, a need for inservice for board members is indicated.

Decision # 12 - Determining the Mechanical Trades Budget

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderately high level of involvement is indicated with 46.2% of the board members responding in the category "Made Decision," while 66.7% of the board representatives, 53.8% of the board members and 33.3% of the project architects responded in the category "Input Decision." 33.3% of the board representatives and 66.7% of the project architects responded in the category "No Involvement in Decision" (see Figure 12A).

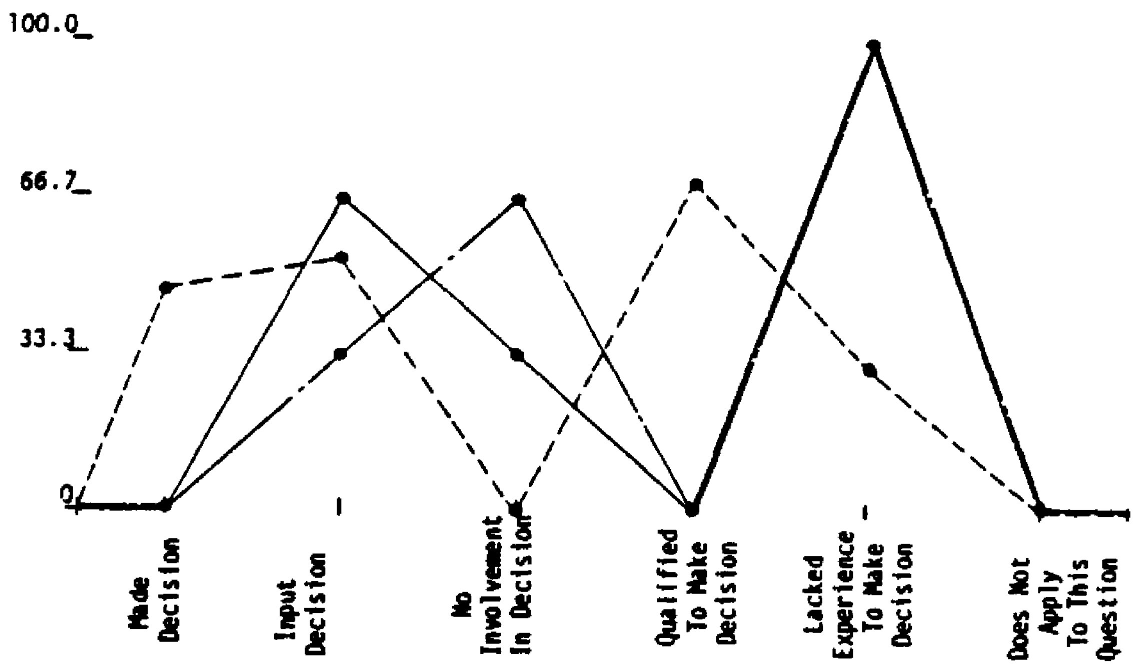

Figure 12A. Determining the mechanical trades budget.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A very low level of competence is indicated with 69.2% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 30.8% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 12A).

The analysis of this part of the question indicates a low level of competence with a moderately high level of involvement in making the decision. The need for inservice, therefore, is indicated for board representatives in this decision area.

--Perceptions of the board members' involvement in making the decision in a construction management project

The responses indicate a moderate level of involvement on the part of the board members. This is supported with the response of 7.1% by board members in the category "Made Decision" and 33.3% by the board representatives and 71.4% by the board members in the category "Input Decision." 66.7% of the board representatives, 214.% of the board members and 100% of the project architects indicated "No Involvement in Decision" (see Figure 12B).

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence is indicated with 41.7% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 58.3% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the project architects felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 12B).

With a moderately low level of involvement in the decision and an extremely low level of competence indicated, the analysis would indicate only a moderately low need for inservice for board members in this decision area.

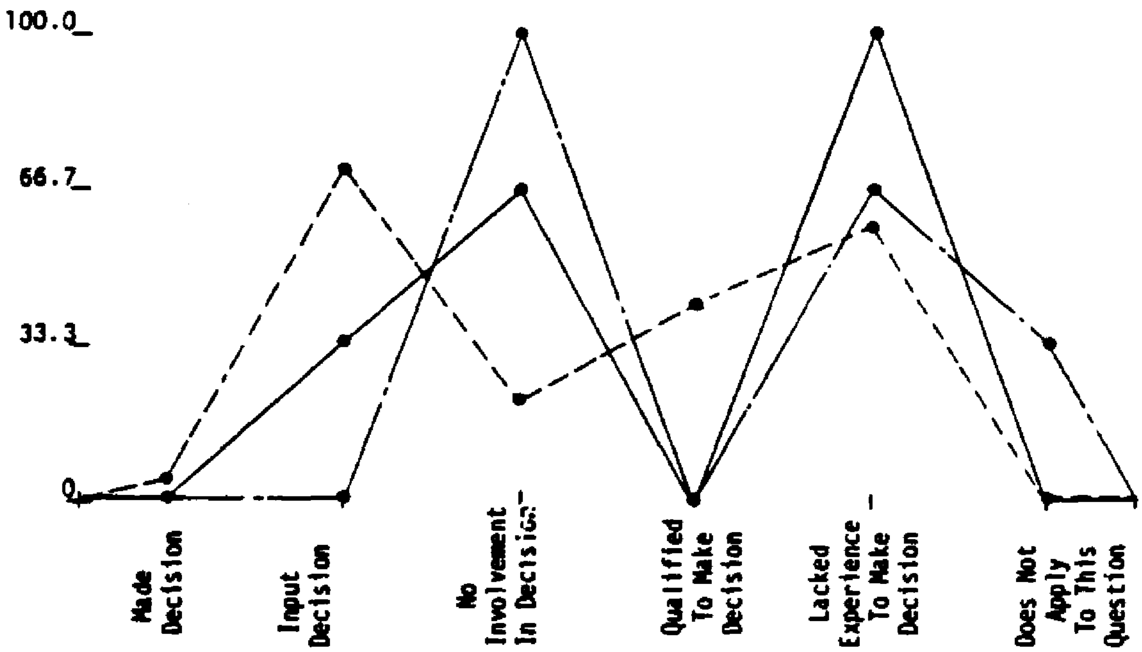

Figure 12B. Determining the mechanical trades budget.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A very low level of involvement is indicated with only 11.1% of the board members responding in the category "Made Decision" and 33.3% of the board members responding in the category "Input Decision." However, 100% of the board representatives, 55.6% of the board members and 100% of the project architects perceived the board members as having "No Involvement in Decision" (see Figure 12C).

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A low level of competence was indicated with only 33.3% of the board representatives and 25% of the project architects responding in the category "Qualified to Make Decision," while 33.3% of the board representatives, 75% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives indicated that the categories "Qualified to Make Decision" and "Lacked Experience

Necessary to Make Decision" were inappropriate for this question (see Figure 12C).

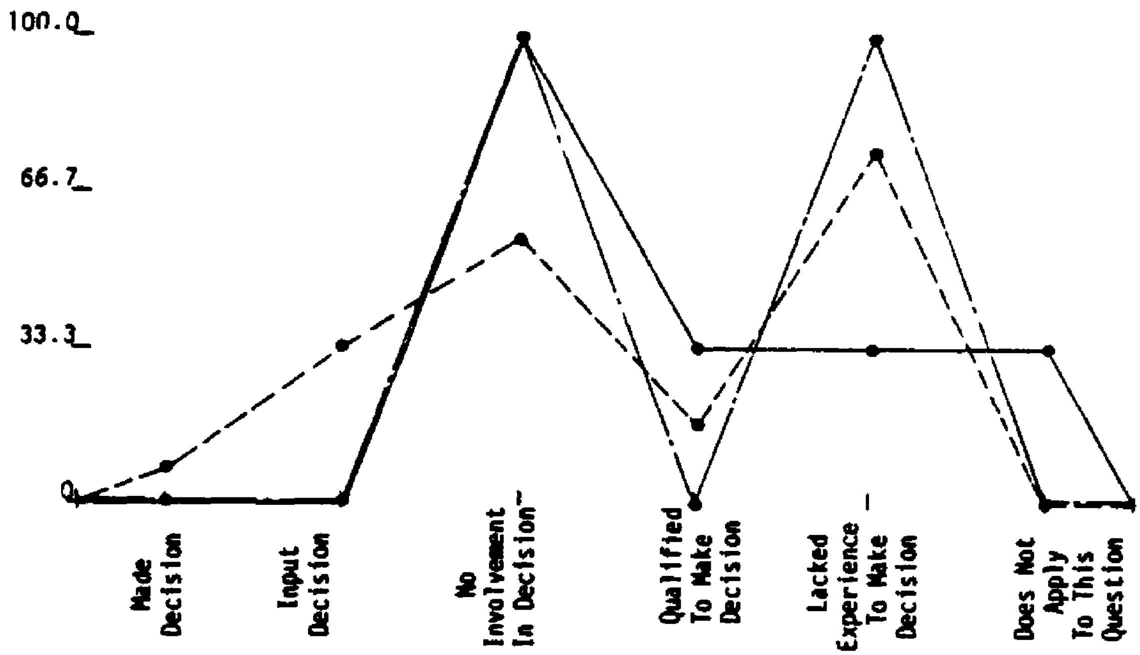

Figure 12C. Determining the mechanical trades budget.

Because of the very low level of involvement and the extremely low level of competence perceived in the decision area, the analysis would indicate that the primary responsibility for developing the mechanical trades budget should be assumed by the mechanical engineer. Therefore, no inservice is requied for board representatives in this decision area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

An extremely low level of involvement is indicated with no responses in the category "Made Decision" and only 12.5% of the board members responding in the category "Input Decison." 100% of the board representatives, 87.5% of the board members and 100% of the project architects responded in the category "No Involvement in Decision (see Figure 12D).

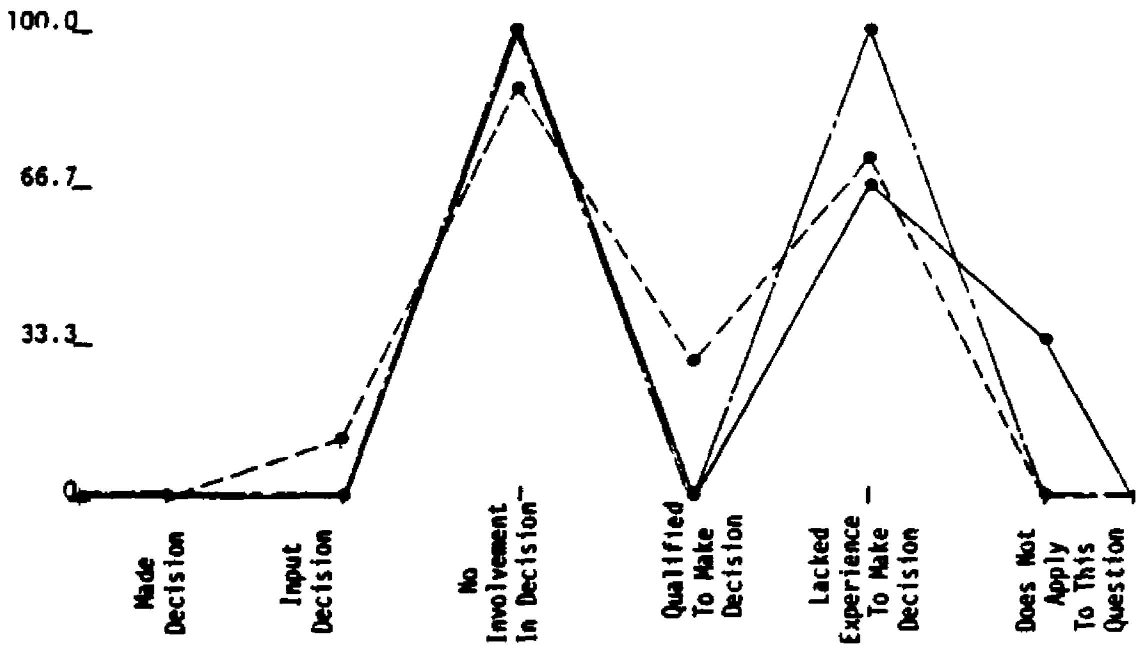

Figure 12D. Determining the mechanical trades budget.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

An extremely low level of competence is indicated in this area with only 28.6% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71.4% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 12D).

Based on the extremely low level of involvement and the extremely low level of competence, it would appear that the major responsibility for this area should be assumed by the mechanical engineer. Therefore, no inservice need is identified for board members in this decision area.

Decision # 13 - <u>Determining the Actual Building Location</u>

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A high level of involvement was indicated with 23.1% of the board members and 33.3% of the project architects responding in the category "Made Decision," while 66.7% of the board representatives, 76.9% of the board members and 66.7% of the project architects responded in the category "Input Decision." Only 33.3% of the board representatives responded in the category "No Involvement in Decision (see Figure 13A).

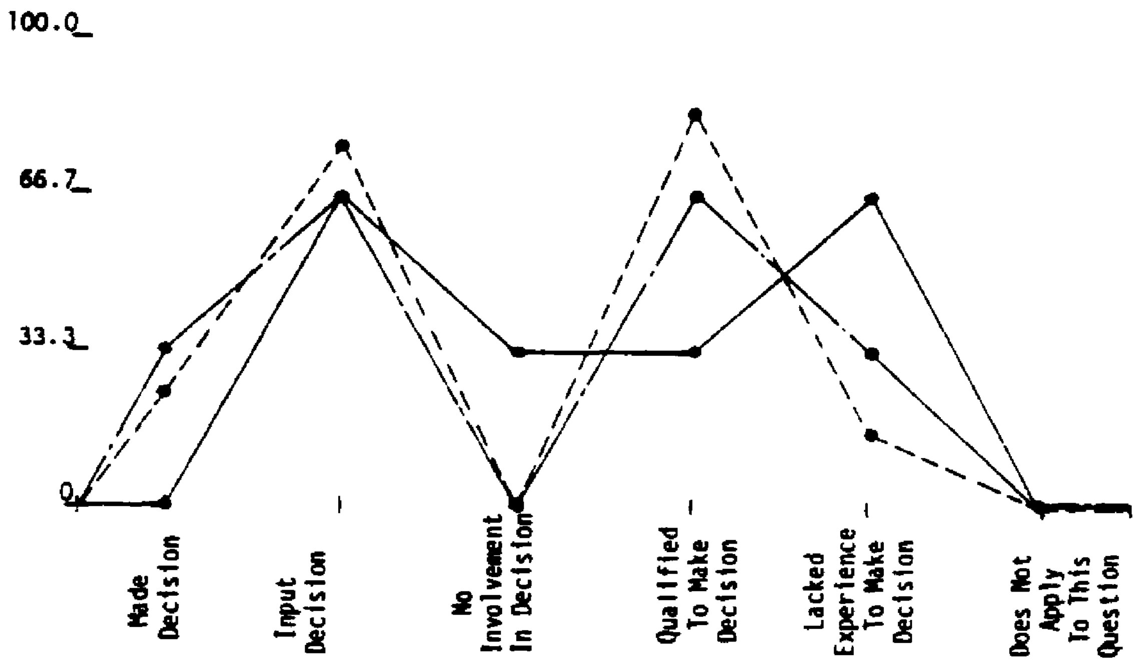

Figure 13A. Determining the actual building location.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately high level of competence was indicated with 33.3% of the board representatives, 84.6% of the board members and 66.7% of the project architects responding in the category "Qualified to Make Decision." However, 66.7% of the board representatives, 15.4% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 13A).

The analysis indicates that board representatives are perceived as having a high level of involvement in making the decision and a moderately high level of competence to do so. However, the board representatives themselves indicated, at the 66.7% level, that they lacked experience necessary to make the decision. Therefore, a definite need for inservice is indicated for board representatives in this decision area.

--Perceptions of the board members' involvement in making the decision in a construction management project

A very high level of involvement is indicated in this area with 33.3% of the board representatives, 42.9% of the board members and 33.3% of the project architects responding in the category "Made Decision." 33.3% of the board representatives, 42.9% of the board members and 66.7% of the project architects responded in the category "Input Decision." Only 33.3% of the board representatives and 14.3% of the board members responded in the category "No Involvement in Decision (see Figure 13B).

--Perceptions of the board members' level of competence in making the decision in a construction management project

A moderately high level of competence is indicated with 33.3% of the board representatives, 76.9% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." However, 56.7% of the board representatives, 15.4% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 7.7% of the board members felt that the categories "Qualified to Make Decision" and

"Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 13B).

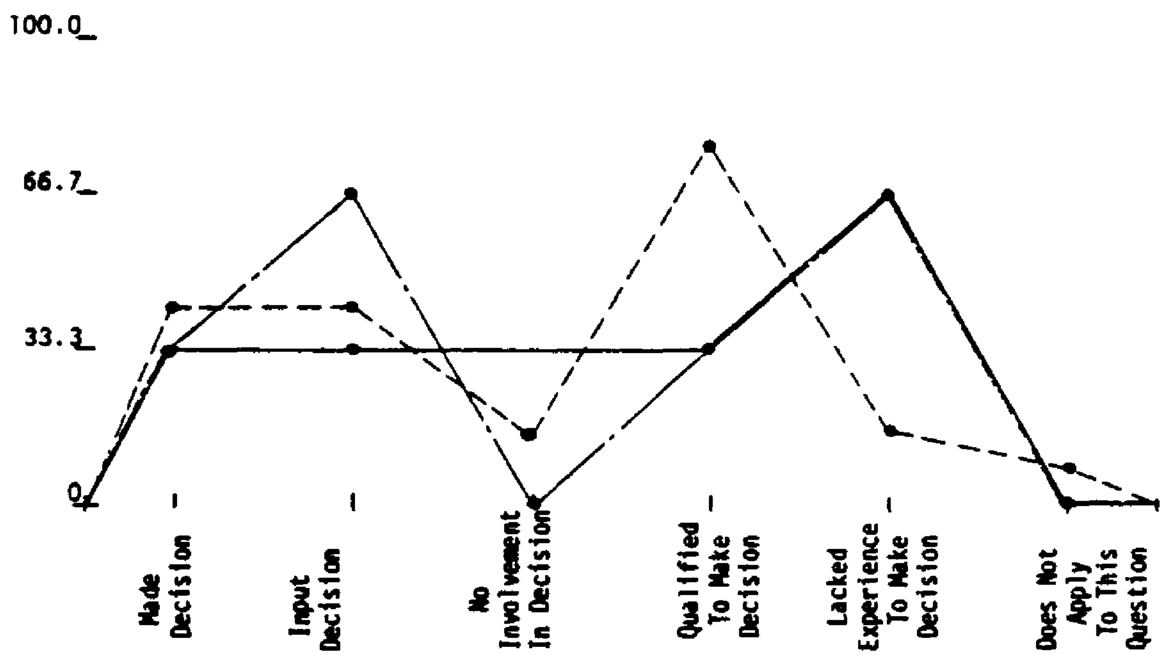

Figure 13B. Determining the actual building location.

Based on the perceived high level of involvement and the moderate level of competence, analysis of this part of the question would indicate that there is a possible need for inservice for board members in this decision area. It is interesting to note, however, that the board members feel quite comfortable making this decision, while the board representatives and the project architects have their doubts.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderately high level of involvement is indicated in this area with 22.2% of the board members and 33.3% of the board representatives responding in the category "Made Decision," while 100% of the board representatives and 66.7% of the board members responded in the category "Input Decision." 11.1% of the board members and 66.7% of the project architects responded in the category "No Involvement in Decision" (see Figure 13C).

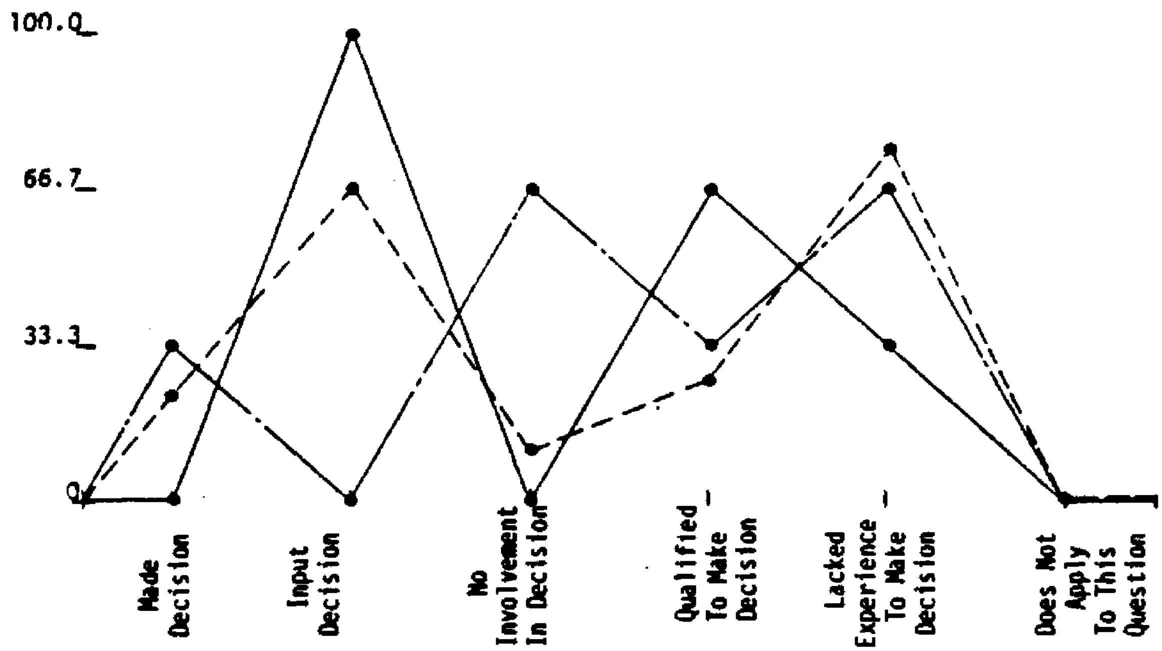

Figure 13C. Determining the actual building location.

--Perceptions of the board representatives' level of competence in making the decision in the traditional construction project

The level of competence indicated is, at best, moderate with 66.7% of the board representatives, 25% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 33.3% of the board representatives, 75% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 13C).

The analysis of this question indicates a relatively high level of involvement in making the decision with only a moderate level of competence to do so. Therefore, a need for inservice for board representatives in this decision area is indicated. It is interesting here to note that the board representatives feel competent to participate in the decision, however, board members and project architects view board representatives as having a moderately low level of competence to participate in the decision.

--Perceptions of the board members' level of imvolvement in making the decision in a traditional construction project

Board members are perceived as having a moderate level of involvement with 25% of the board members responding in the category "Made Decision." 66.7% of the board representatives, 37.5% of the board members and 33.3% of the project architects responded in the category "Input Decision." 33.3% of the board representatives, 37.5% of the board members and 66.7% of the project architects perceived the board members to have no involvement in this decision (see Figure 13D).

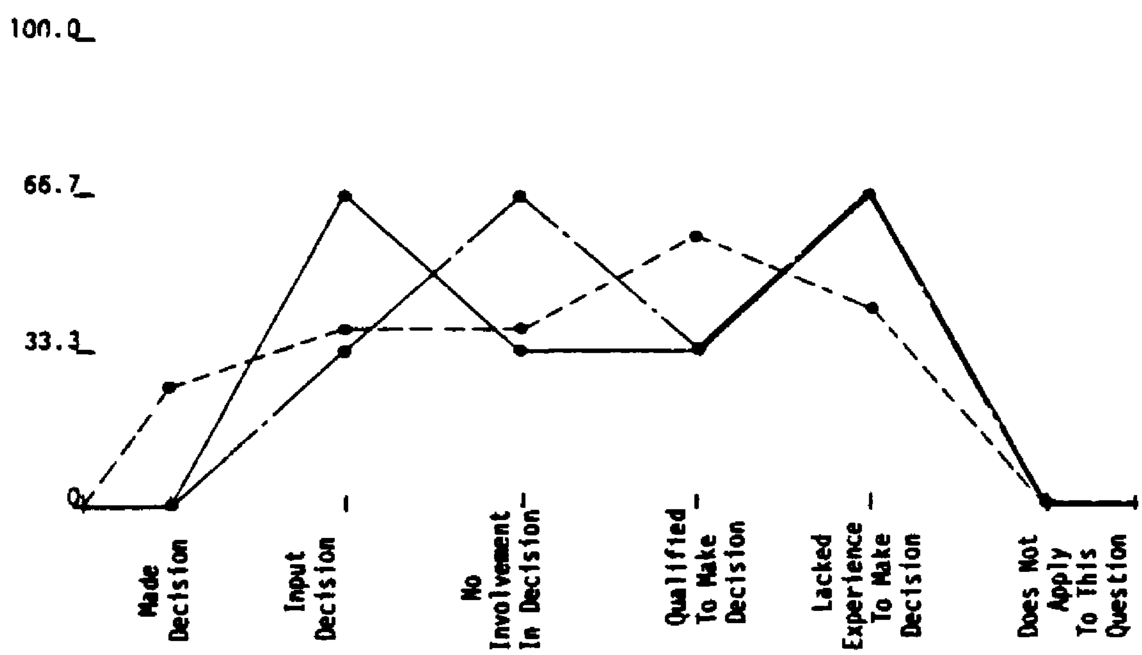

Figure 13D. Determining the actual building location.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A moderately low level of competence is indicated with only 33.3% of the board representatives, 57.1% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 42.9% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience to Make Decision" were appropriate for this question (see Figure 13D).

The analysis of this part of the question would indicate a moderately high level of involvement in the decision with a moderately low level of competence; therefore, inservice in this particular area would be appropriate.

Decision # 14 - Determining the Contouring for Purposes of Landscaping and Storm Drainage

--Perceptions of the board representatives' level of involvement in making the decision in a construction managment project

A moderate level of involvement is indicated with 7.7% of the board members responding in the category "Made Decision," while 33.3% of the board representatives, 92.3% of the board members and 33.3% of the project architects responded in the category "Input Decision." Both board representatives and project architects agreed at the 66.7% level in the category "No Involvement in Decision" (see Figure 14A).

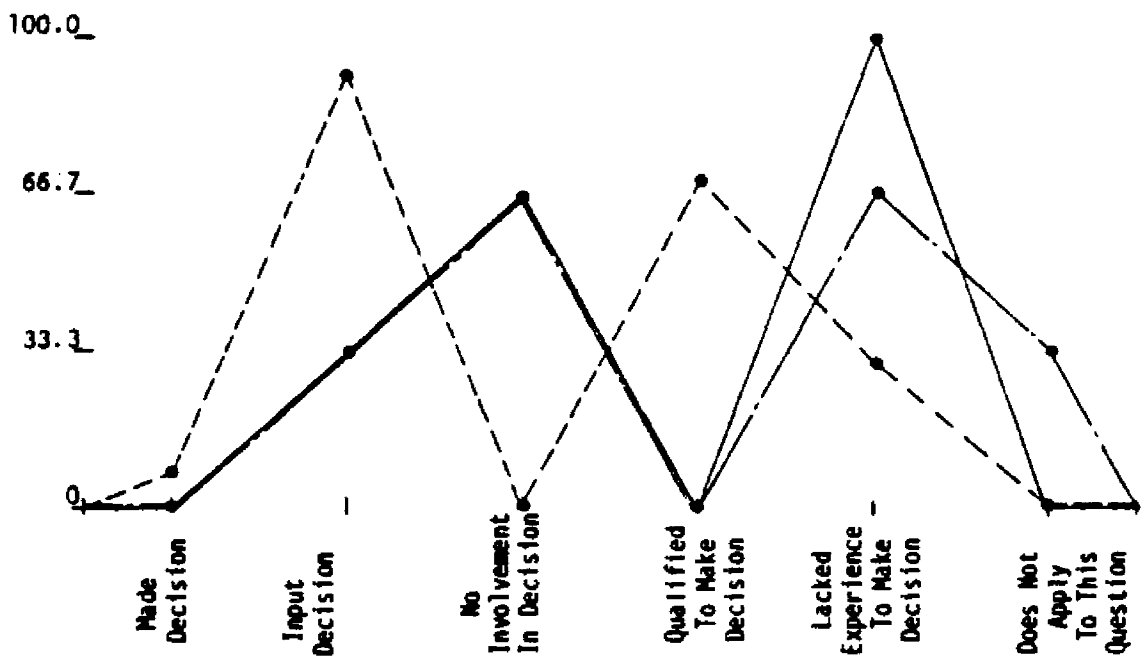

Figure 14A. Determining the contouring for purposes of landscaping and storm drainage.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A low level of competence is indicated with only 69.2% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 30.8% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the project architects felt that the category "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 14A).

An analysis of this part of the question would indicate a relatively strong need for inservice in the area based on the perceptions of a moderately high level of involvement in the decision and a perceived low level of competence in the decision area.

--Perceptions of the board members' involvement in making the decision in a construction management project

A moderately low level of involvement is indicated with 7.1% of the board members responding in the category "Made Decision" and 57.1% of the board members and 33.3% of the project architects responding in the category "Input Decision." However, 100% of the board representatives, 35.7% of the board members and 66.7% of the project architects indicated that the board members had no involvement in the decision (see Figure 14B).

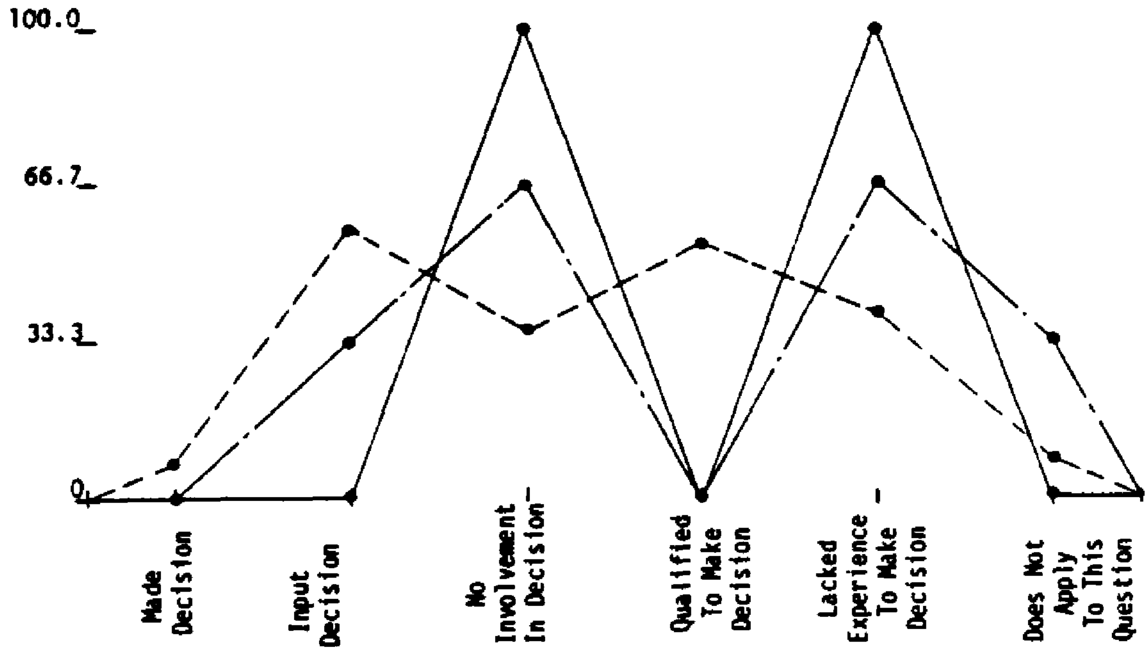

Figure 14B. Determining the contouring for purposes of landscaping and storm drainage.

--Perceptions of the board members' level of competence in making the decision in a construction management project

The board members responded at the 53.8% level in the category "Qualified to Make Decision' while the board representatives responded at the 100% level. The board mebmers responded at the 38.5% level and the project architects responded at the 66.7% level in the category "Lacked Experience Necessary to Make Decision" thus indicating a low level of perceived competence in the board members' ability to participate in this decision area. 7.7% of the board members and 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 14B).

The analysis of the question shows a relatively low level of perceived competence in the board members ability to participate in this decision. It also indicates that their level of participation is relatively low. Therefore, little if any inservice is indicated for this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderately low level of involvement is indicated with 11.1% of the board members responding in the category "Made Decision." 66.7% of the board representatives, 44.4% of the board members and 33.3% of the project architects responded in the category "Input Decision." 33.3% of the board representatives, 44.4% of the board members and 66.7% of the project architects indicated that the board representatives had no involvement in the decision (see Figure 14C).

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A moderately low level of competence is indicated with only 33% of the board representatives and 57% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 42.9% of the board members and 100% of the project architects indicated that the board representatives lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience

Necessary to Make Decision" were appropriate for this question (see Figure 14C).

The moderate level of involvement in decision making when paired with the moderately low level of competence perceived in this analysis would indicate a moderate need for inservice in the decision area.

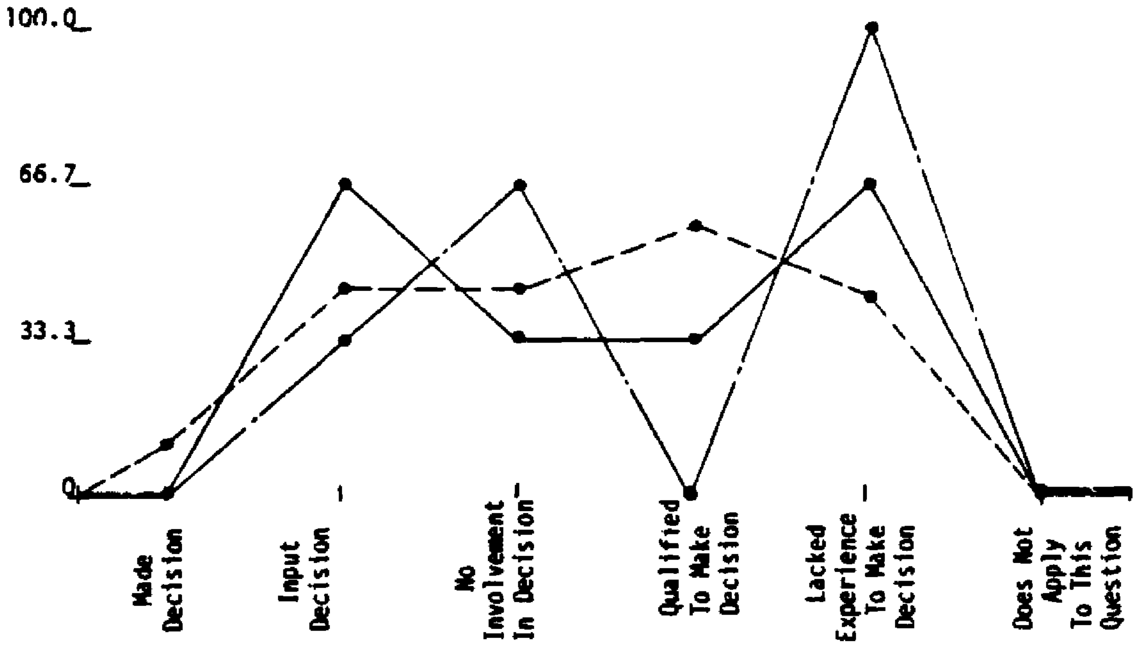

Figure 14C. Determining the contouring for purposes of landscaping and storm drainage.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

There were no respondents in the category "Made Decision" and only 33.3% of the board representatives, 37.5% of the board members and 33.3% of the project architects responded in the category "Input Decision." However, 66.7% of the board representatives, 62.5% of the board members and 66.7% of the project architects indicated that board members were not involved in making the decision (see Figure 14D).

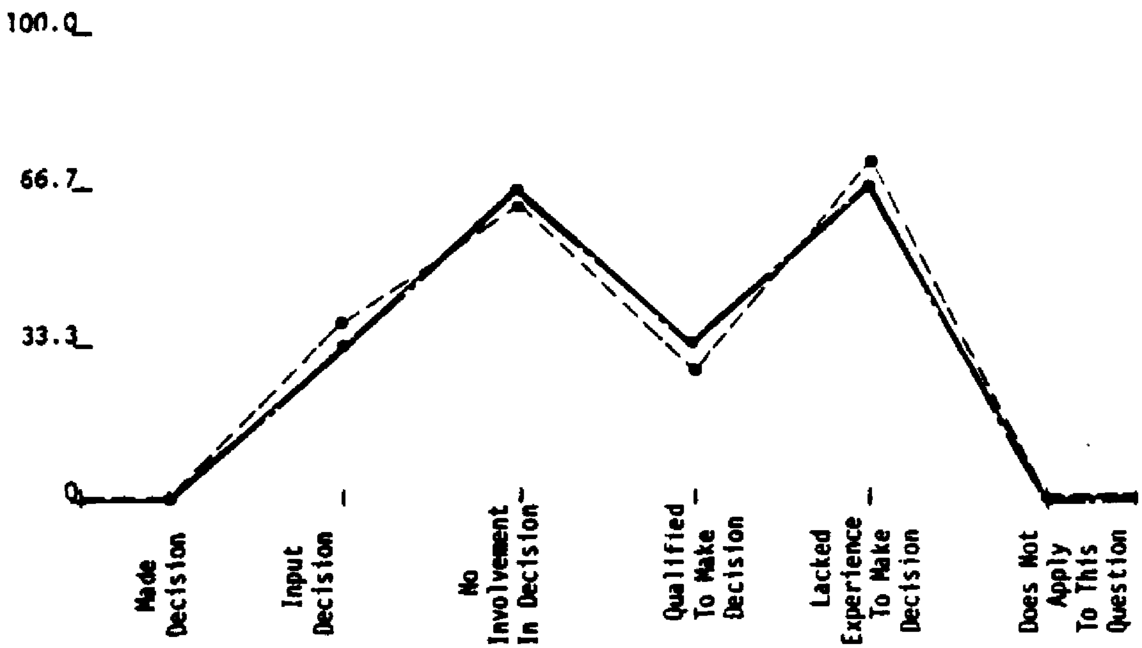

Figure 14D. Determining the contouring for purposes of landscaping and storm drainage.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A mdoerately low level of competence was perceived with only 33.3% of the board representatives, 28.6% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71.4% of the board members and 66.7 of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 14D).

Even though the analysis shows a relatively low level of perceived competence in this area, the moderately low level of involvement would indicate that there is probably no need to inservice board members in this area.

Decision # 15 - Determining the Final Building Cost Estimates Based on Value Engineering

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderately high level of involvement was indicated in this area with 15.4% of the board members responding in the category "Made Decision" and 100% of the board representatives, 84.6% of the board members and 66.7% of the project architects responding in the category "Input Decision." Only 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 15A).

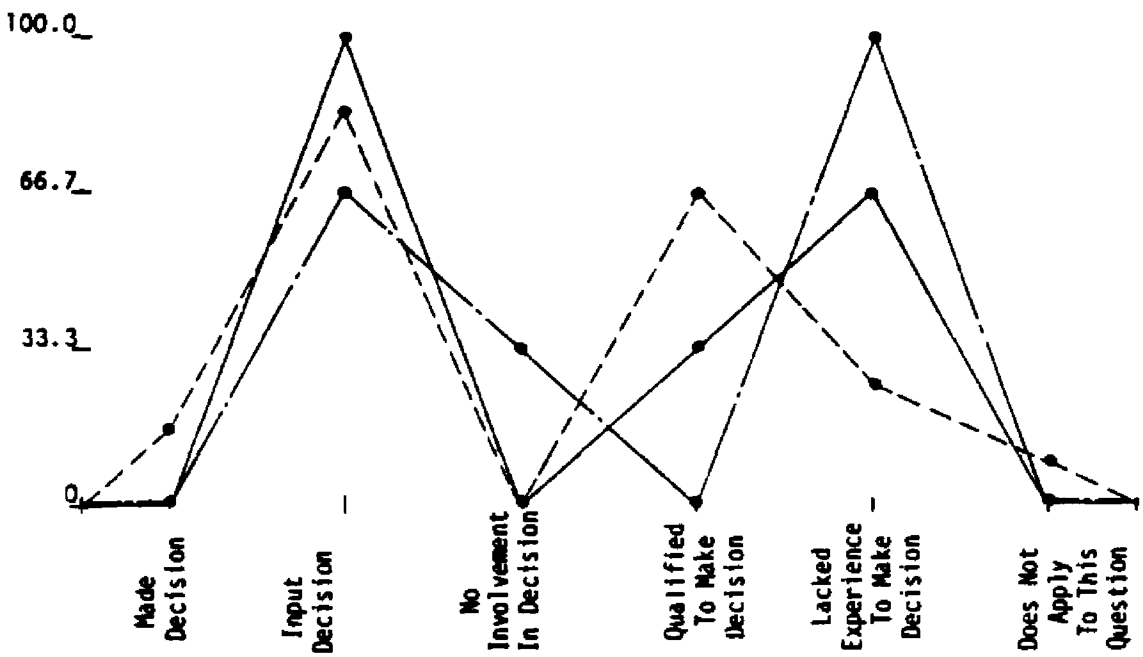

Figure 15A. Determining the final building cost estimates based on value engineering.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

Board representatives were perceived to have a mdoerately low level of competence in dealing with this decision area. This is supported by a response of 33.3% by board representatives and 66.7% by board members in the category "Qualified to Make Decision." Board representatives responded at the 66.7% level, board members at the 25% level and project architects at the 100% level in the category "Lacked Experience Necessary to Make Decision." 8.3% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 15A).

The analysis indicates that while the level of involvement is relatively high, the perceived level of competence is quite low. Therefore, inservice for board representatives in this decision area is definitely indicated.

--Perceptions of the board members' involvement in making the decision in a construction management project

A relatively high level of involvement is indicated with 35.7% of the board members and 66.7% of the project architects responding in the category "Made Decision," while 66.7% of the board representatives and 50% of the board members responded in the category "Input Decision." Both the board representatives and the project architects responded at the 33% level in the category "No Involvement in Decision," while only 14.3% of the board members responded in that category (see Figure 15B).

--Perceptions of the board members' level of competence in making the decision in a construction management project

Both board representatives and project architects agreed at the 33.3% level in the category "Qualified to Make Decision," while 64.3% of the board members responded in that category. However, 66.7% of the board representatives and project architects responded in the category "Lacked Experience Necessary to Make Decision" while 35.7% of the board members responded in this category, thus indicating a relatively low perceived level of competence in this decision area.

All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this category (see Figure 15B).

The analysis of this question would indicate a moderately high need for inservice in this decision area based on the high level of involvement indicated and the relatively low level of perceived competence of board members.

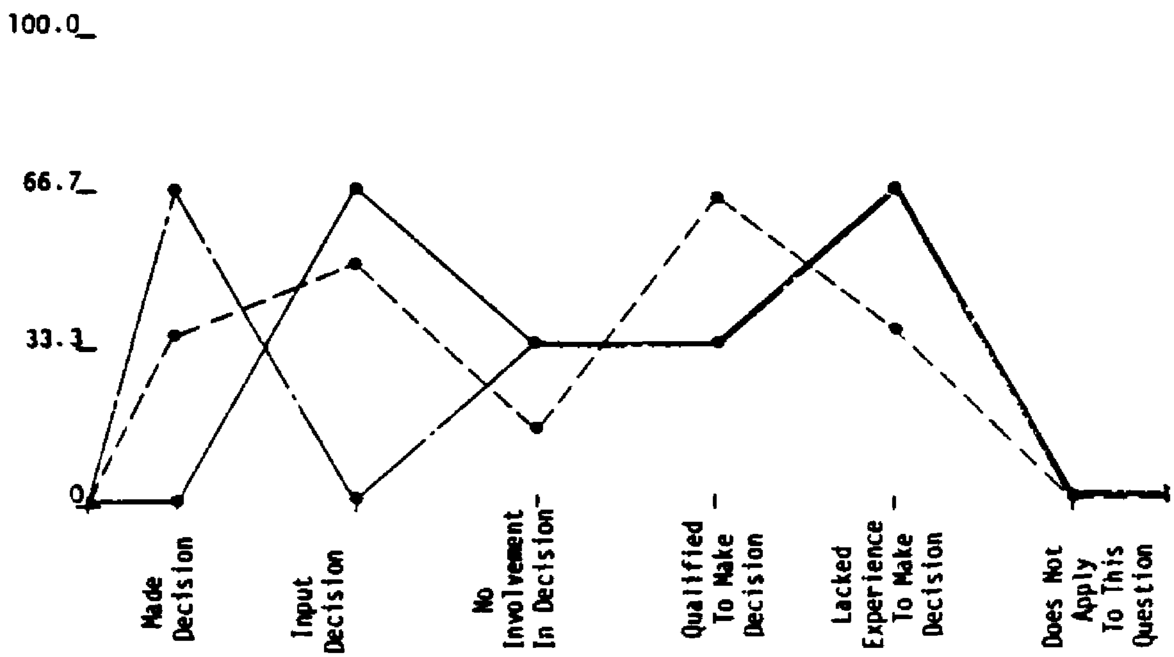

Figure 15B. Determining the final building cost estimates based on value engineering.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

The response in this area is mixed and somewhat confusing in that 22.2% of the board members responded in the category "Made Decision" while 66.7% of the board members and project architects responded in the category "Input Decision." It is interesting to note, however, that 100% of the board representatives perceived themselves as not being involved in the decision while 11.1% of the board members and 33.3% of the project architects responded in this category (see Figure 15C).

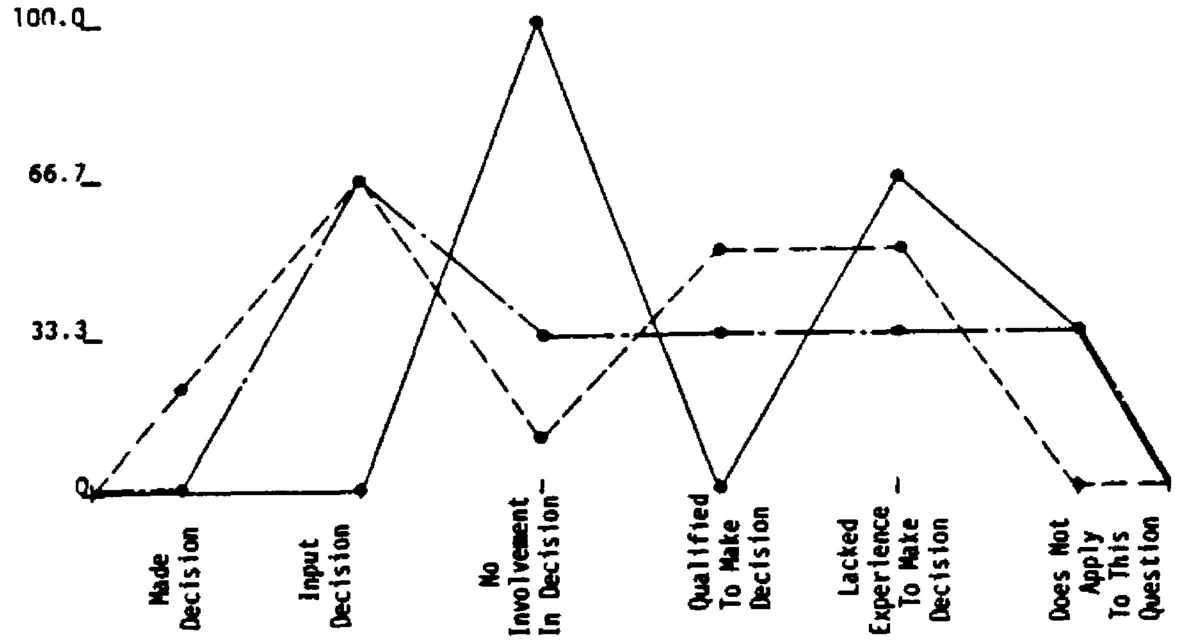

Figure 15C. Determining the final building cost estimates based on value engineering.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

The indicated level of competence in this area was relatively low with 50% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 50% of the board members and 33.3% of the project architects indicated that the board representatives "Lacked Experience Necessary to Make Decision." Both the board representatives and the project architects indicated at the 33.3% level that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 15C).

The analysis of this question indicates a moderate level of involvement in the decision as perceived by board members and project architects. However, the fact that 100% of the board representatives indicated that they were not involved in this decision tends to negate any need for inservice in this particular area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

A fairly high level of involvement is indicated in this decision with 33.3% of the board representatives and 12.5% of the board members responding in the category "Made Decision" and 33.3% of the board representatives, 75% of the board members and 66.7% of the project architects responding in the category "Input Decision." Both the board representatives and the project architects agreed at the 33.3% level in the category "No Involvement in Decision" while only 21.5% of the board members responded in this category (see Figure 15D).

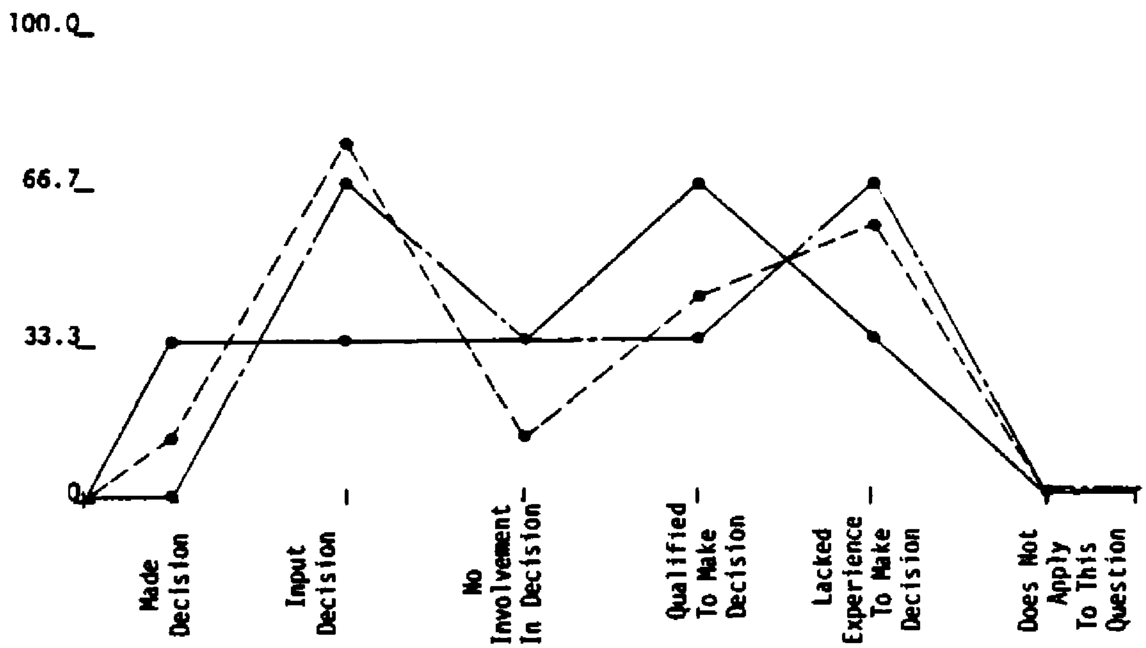

Figure 15D. Determining the final building cost estimates based on value engineering.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A moderate level of competence was perceived in this area with 66.7% of the board representatives, 42.9% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 33.3% of the board representatives, 57.1% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 15D).

The analysis of this question indicates a relatively high level of involvement in making the decision with a moderately low level of competence. This indicates a probable need for inservice for board members in this decision area.

<u>Decision # 16</u> - <u>Determining the Characteristics of the Exterior Envelope</u>

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

The level of involvement in this area is only moderately high. There were no responses in the category "Made Decision," while 100% of the board of representatives, 84.5% of the board members and 33.3% of the project architects responded in the category "Input Decision." 66.7% of the project architects responded in the category "No Involvement in Decision" while only 15.4% of the board members responded in that category (see Figure 16A).

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

The level of competence indicated is relatively low with only 33.3% of the board representatives and 50% of the board members responding in the category "Qualified to Make Decision," while 56.7% of the board representatives, 41.7% of the board members and 100% of the project architects felt that the board representatives "Lacked Experience Necessary to Make Decision. 8.3% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate (see Figure 16A).

The analysis of this question would indicate a need for inservicing board representatives based on the moderately high level of involvement in this decision area compared with a low level of perceived competence.

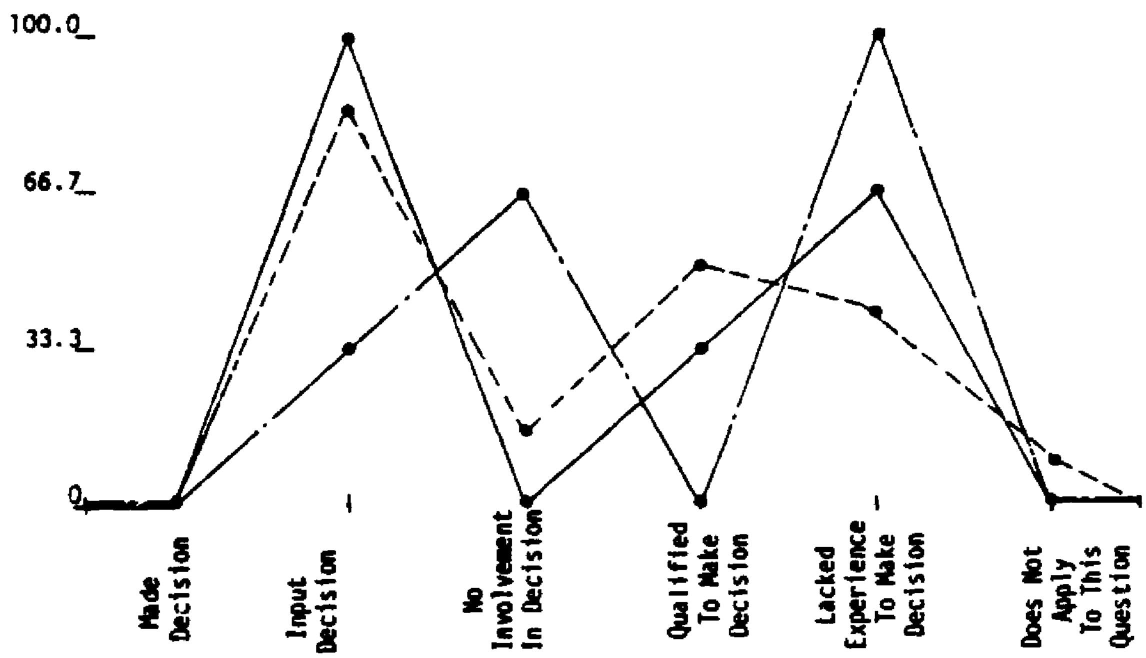

Figure 16A. Determining the characteristics of the exterior envelope. --Perceptions of the board members' involvement in making the decision in a construction management project

A high level of involvement is indicated in this area with 33.3% of the board representatives and 14.3% of the board members responding in the category "Made Decison" and 33.3% of the board representatives, 50% of the board members and 66.7% of the project architects responding in the category "Input Decision." The board members responded at the 35.7% level in the category "No Involvement in Decision," while both board representatives and project architects responded at the 33.3% level in that category (see Figure 16A).

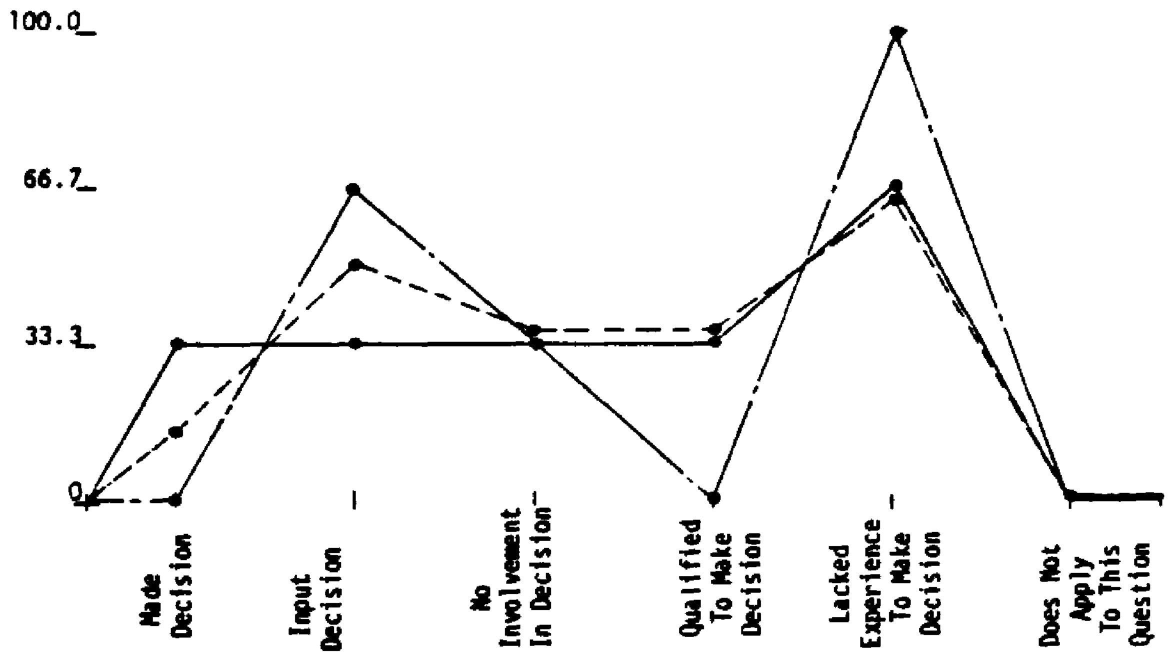

Figure 16B. Determining the characteristics of the exterior envelope.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A low level of competence is indicated with a board representative response of 33.3% and a board member response of 35.7% in the category "Qualified to Make Decision," while board representatives responded at the 66.7% level, board members at the 64.3% level and project architects at the 100% level in the category "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 16B).

An analysis of this part of the question indicates a definite need for inservice based on the moderately high level of involvement in the decision area and the very low level of competence board members were perceived to have in this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderately high level of involvement is indicated in this area with board members responding at the 11.1% level and project architects at the 33.3% level in the category "Made Decision." Both board representatives and board members responded at the 66.7% level in the category "Input Decision" while project architects responded at the 33.3% level in that category. Both the board representatives and the project architects responded at the 33.3% level in the category "No Involvement in Decision" while only 22.2% of the board members responded in that category (see Figure 16C).

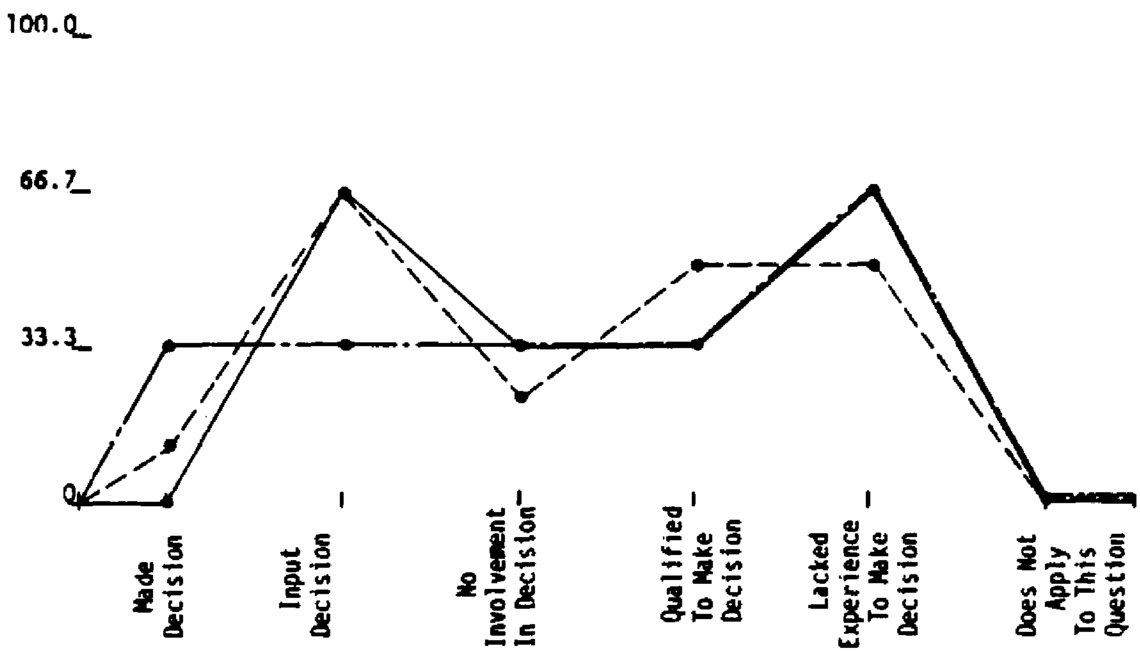

Figure 16C. Determining the characteristics of the exterior envelope.
--Perceptions of the board representatives' competence in making the decision in a traditional construction project

A moderately low level of competence is indicated in this area with both the board representatives and the project architects responding at the 33.3% level in the category "Qualified to Make Decision" while 50% of the board members responded in that category. Both the board representatives and the project architects responded at the 66.7% level in the category "Lacked Experience Necessary to Make Decision" while board members responded at the 50% level in that category. All respondents felt the categories "Qualified to Make Decision" and

"Lacked Experience Necessary to Make Decision" were appropriate for the question (see Figure 16C).

While the level of involvement is relatively high in this decision area, the level of competence indicated is moderately low. Thus, the analysis points to a need for inservice for board representatives relative to this particular decision.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Only a moderate level of involvement is indicated in this area with 12.5% of the board members responding in the category "Made Decision" while both the board representatives and the project architects responded at the 66.7% level in the category "Input Decision." Only 37.5% of the board members responded in this category. Both the board representatives and the project architects responded at the 33.3% level in the category "No Involvement in Decision" while 50% of the board members responded in the category (see Figure 16D).

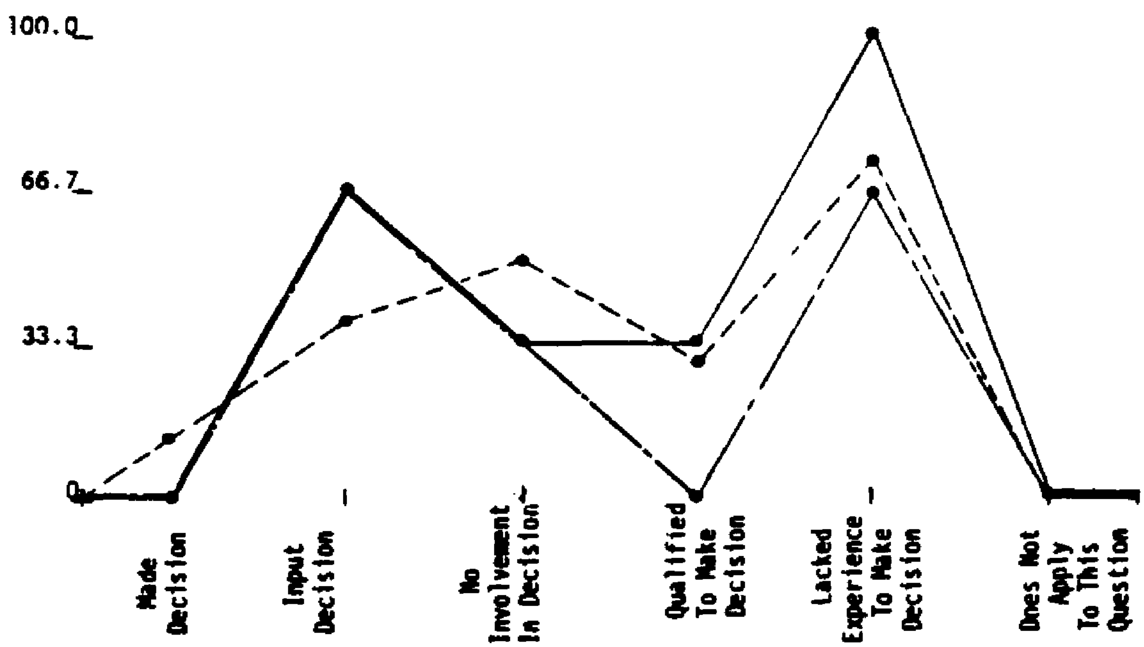

Figure 16D. Determining the characteristics of the exterior envelope.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A low level of competence is perceived in this area with 33.3% of the board representatives and 28.6% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71% of the board members and 100% of the project architects indicated that the board members lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualifited to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 16D).

The analysis of this question indicates only a moderate level of involvement in the decision because of the very low level of competence which is perceived relative to the ability of the board members to participate. Inservice is a definite need in this decision area. It is interesting to note that both the board representatives and the project architects concur on all points.

Decision # 17 - Determining the Exterior Treatment and Fenestration of the Building

The board representatives are perceived to have a moderately high level of involvement in this decision with 33.3% of the board representatives and 15.4% of the board members responding in the category "Made Decision" and 33.3% of the board representatives, 69.2% of the board members and 33.3% of the project architects responding in the category "Input Decision." 66.7% of the project architects responded in the category "No Involvement in Decision" while only 33.3% of the board representatives and 15.4% of the board members responded in that category (see Figure 17A).

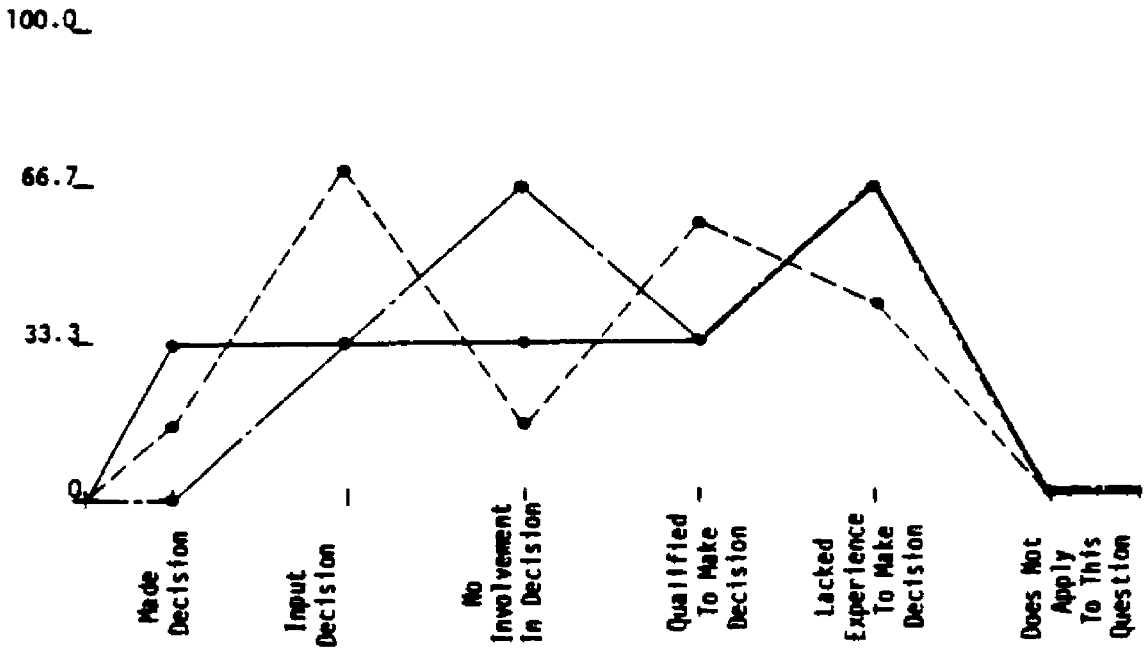

Figure 17A. Determining the exterior treatment and fenstration of the building.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately low level of competence is indicated with both the board representatives and the project architects agreeing at the 33.3% level in the category "Qualified to Make Decision" while 58.3% of the board members responded in this category. Both the project architects and the board representatives responded at the 66.7% level in the category "Lacked Experience Necessary to Make Decision" while 41% of the board members responded in that category. All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 17A).

The analysis of the question would indicate a moderate level of input and a moderately low level of competence in the decision area. This would indicate a definite need for inservice for board representatives.

--Perceptions of the board members' involvement in making the decision in a construction management project

A relatively high level of involvement is indicated with both board representatives and project architects responding at the 33.3% level in the category "Made Decision" while 7.1% of the board members responded in that category. 74.1% of the board members responded in the category "Input Decision" while both board representatives and project architects responded at the 33.3% level for that category. Both the board representatives and the project architects responded at the 33.3% level in the category "No Involvement in Decision" while only 21.4% of the board members responded in that category (see Figure 17B)

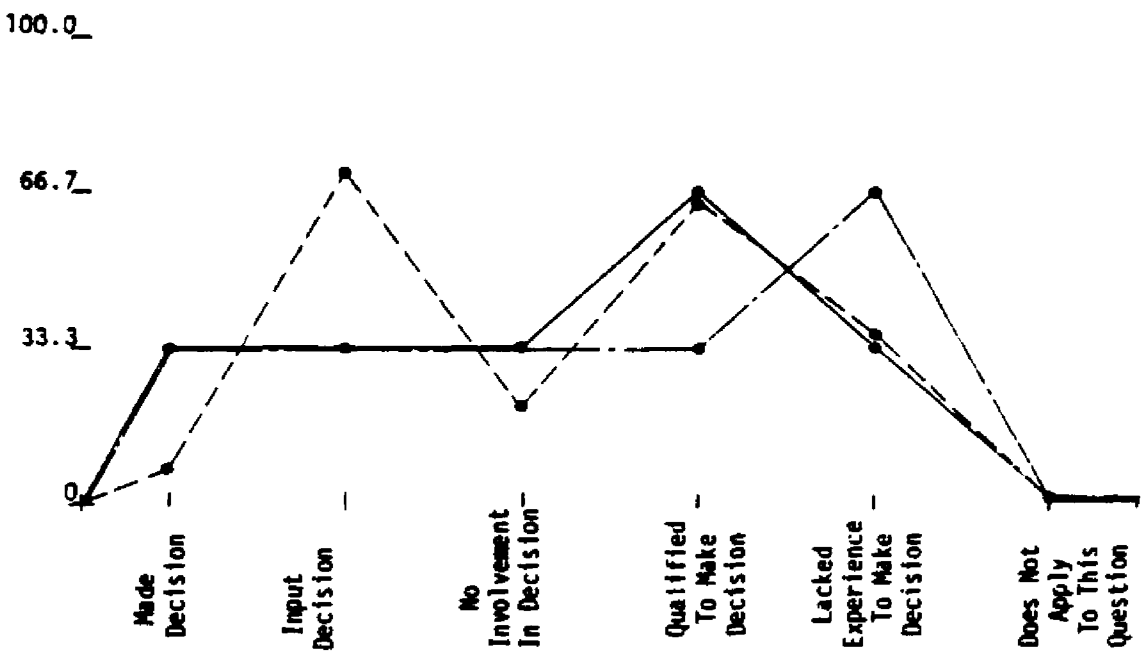

Figure 17B. Determining the exterior treatment and fenstration of the building.

--Perceptions of the board members' level of competence in making the decision in a construction management project

Board members are perceived to have a relatively high level of competence in this decision area. This is supported by responses of 66.7% on the part of board representatives, 64.3% by board members and 33.3% by project architects for the category "Qualified to Make Decision." 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision," while only 33.3% of the board representatives and 35.5% of the board members responded in that category. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 17B).

The analysis of this question would indicate that while there is a relatively high level of involvement in this decision area there is also a high perceived level of competence. Therefore, there is probably no need to inservice board members relative to this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

Only a moderate level of involvement is indicated with 33.3% of the project architects responding in the category "Made Decision." Both board representatives and the board members agreed at the 66.7% level in the category "Input Decision," while 33.3% of the project architects responded in that category. All respondents agreed at the 33.3% level in the category "No Involvement in Decision" (see Figure 17C).

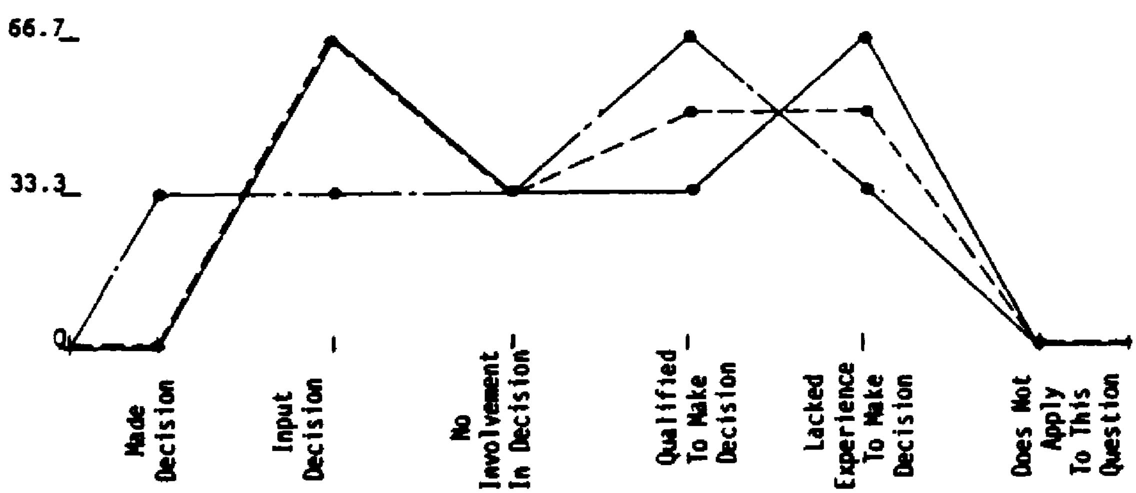

Figure 17C. Determining the exterior treatment and fenestration of the building.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

The respondents split the decision in this area with 33.3% of the board representatives, 50% of the board members and 66.7% of the project archtiects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 50% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Lacked Experience Necessary to Make Decision" and "Qualified to Make Decision" were appropriate for this question (see Figure 17C).

Because of the moderate level of involvement perceived relative to this decision area and due to the fact that the respondents split the decision equally between "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision," the analysis of this part of the question probably indicates a moderate need to inservice the board representatives.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

The board members are perceived as having a moderately low level of involvement in this decision area with 33.3% of the board representatives and 12.5% of the board members responding in the category "Qualified to Make Decision." 33.3% of the board representatives, 37.5% of the board members and 66.7% of the project architects responded in the category "Input Decision." Both the board representatives and the project architects agreed at the 33.3% level in the category "No Involvement in Decision," while 50% of the board members responded in that category (see Figure 17D).

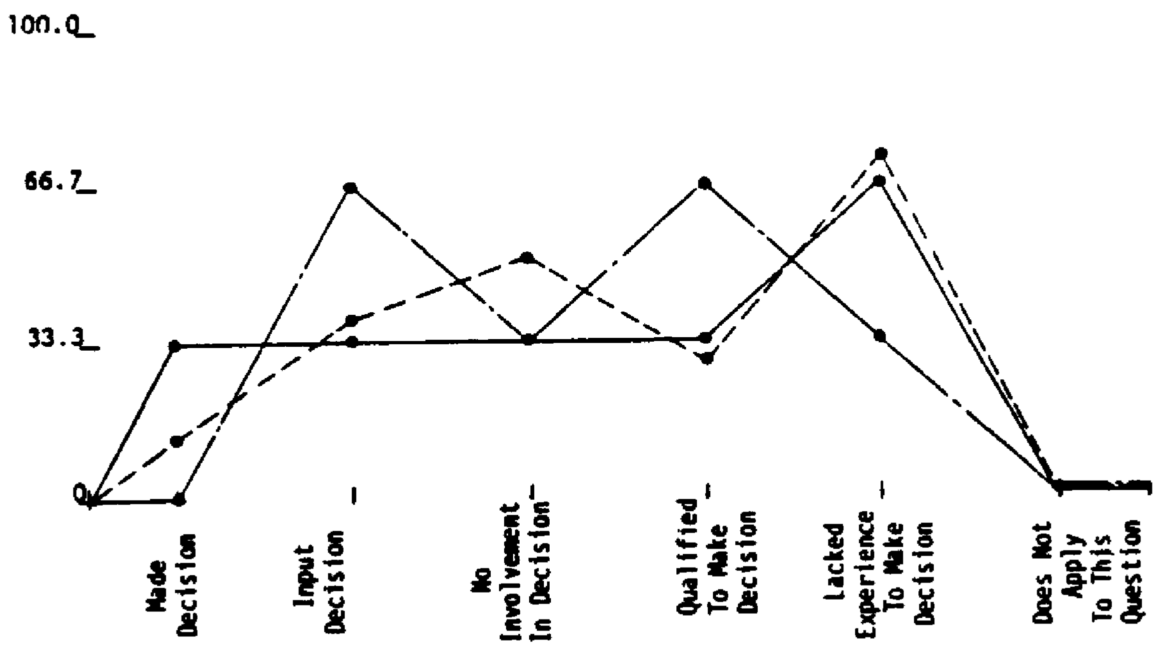

Figure 17D. Determining the exterior treatment and fenestration of the building.

--Perceptions of the board members' level of competence in making the decision in a traditional contruction project

A moderately low level of competence is indicated in this area with 33.3% of the board representatives, 29.6% of the board members and 66.7% of the project archtitects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71.4% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 17D).

The analysis of this question indicates only a moderate level of involvement in the decision with a moderately low level of competence to participate in the decision. Therefore, only a moderate need for inservice of board members is identified relative to this decision area.

Decision # 18 - Determining a Site Master Plan for the Purpose of Future Growth

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

While only 8.3% of the board members responded in the category "Made Decision," 100% of the board representatives, 83.3% of the board members and 33.3% of the project architects responded in the category "Input Decision" thus indicating a high level of involvement in this decision area. 66.7% of the project architects responded in the category "No Involvement in Decision," while 83.% of the board members responded in that category (see Figure 18A).

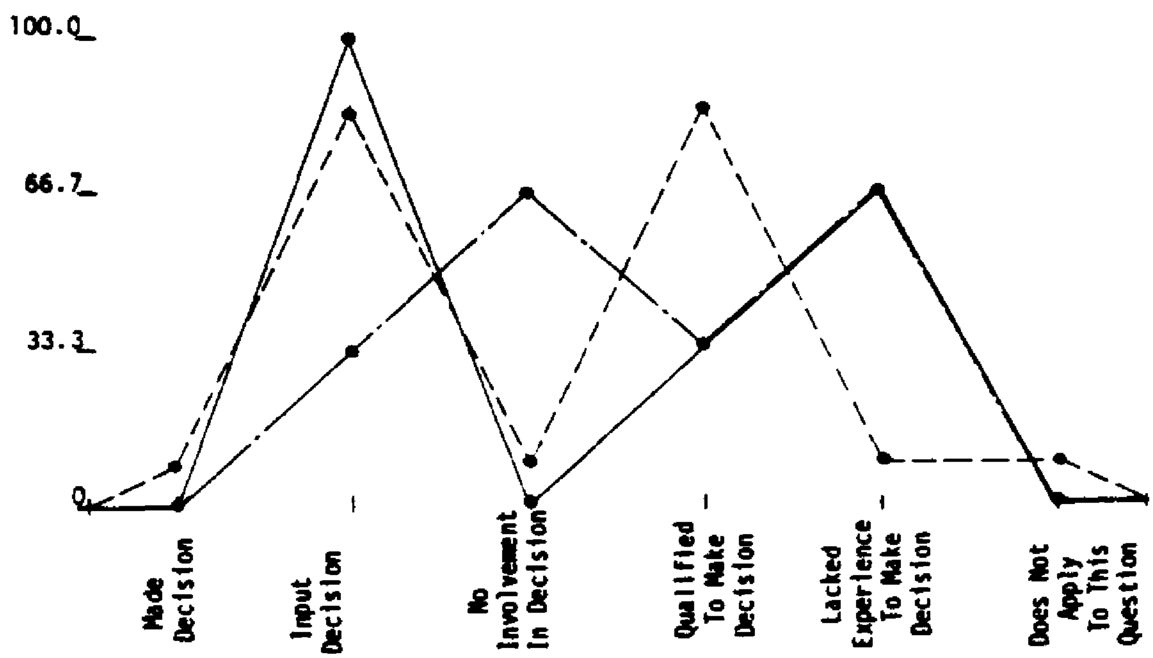

Figure 18A. Determining a site master plan for the purpose of future growth.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately low level of competence is indicated with board representatives and project architects responding at the 33.3% level in the category "Qualified to Make Decision" while 83.3% of the board members responded in that category. Both the board representatives and the project architects agreed at the 66.7% level in the category "Lacked Experience Necessary to Make Decision," while only 8.3% of the board members responded in that category. 8.3% of the board members felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for the question (see Figure 18A).

The analysis of this part of the question indicates a high level of involvement with a moderately low level of competence perceived relative to the board representatives abilities in this decision area. Thus, a need for inservice is established.

--Perceptions of the board members' involvement in making the decision in a construction management project

A very high level of involvement is indicated with both board representatives and the project architects responding at the 33.3% level and the board members responding at the 8.3% level in the category "Made Decision." The board representatives responded at the 66.7% level, board members at the 83.3% level and project architects at the 33.3% level in the category "Input Decision." 33.3% of the project architects responded in the category "No Involvement in Decision" while only 8.3% of the board members responded in that category (see Figure 18B).

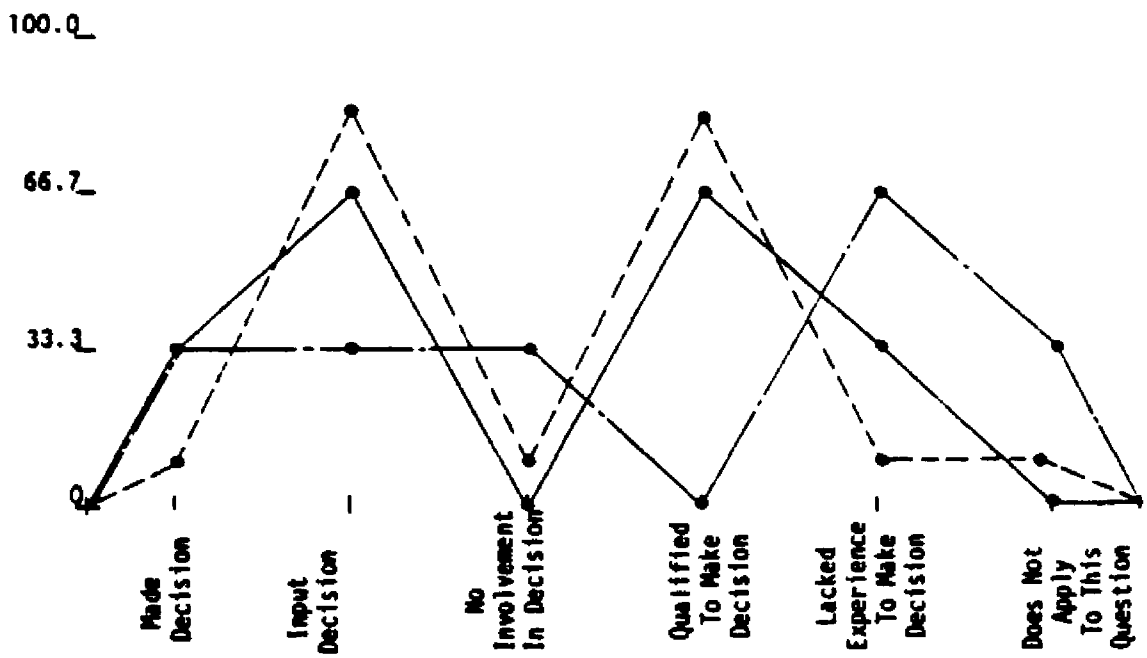

Figure 18B. Determining a site master plan for the purpose of future growth.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A moderately high level of competence is perceived in this area with 66.7% of the board representatives and 81.8% of the board members responding in the category "Qualified to Make Decision." 33.3% of the board representatives, 9.1% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 9.1% of the board members and 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 18B).

As much as the analysis of this question indicates a very high level of involvement in the decision and a moderately high level of competence to participate in the decision, only a moderate need for inservice would be justified in this area.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

Board representatives are perceived as having a very high level of involvement in this area with 33.3% of the project architects responding in the category "Made Decision." Both the board representatives and the board members responded at the 100% level in the category "Input Decision" and project architects responded at the 33.3% level in that category. Only 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 18C).

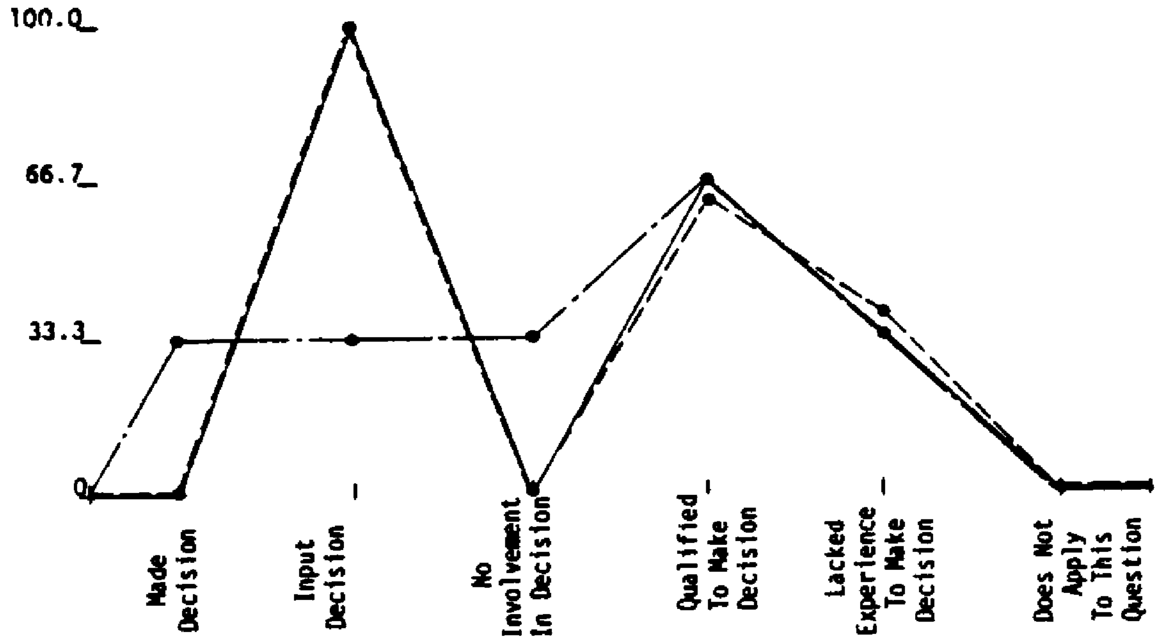

Figure 18C. Determining a site master plan for the purpose of future growth.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A high level of competence is indicated in this area with both the board representatives and the project architects responding at the 66.7% level in the category "Qualified to Make Decision," while 62.5% of the board members responded in that category. Only 33.3% of the board representatives, 37.5% of the board members and

33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 18C).

The analysis of this question indicates a very high level of involvement and a moderately high level of competence to participate in the decision area. Therefore, a very low level of need for inservice is indicated for board representatives making this decision.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members are perceived as having a very high level of involvement in this decision with board representatives and project architects agreeing at the 33.3% level and board members responding at the 12.5% level in the category "Made Decision." 66.7% of the board representatives, 87.5% of the board members and 33.3% of the project architects responded in the category "Input Decision." Only 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 18D).

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Board members are perceived as having a high level of competence. This is supported by a 66.7% response on the part of the board representatives, a 57.1% response by board members and a 66.7% response on the part of the project architects in the category "Qualified to Make Decision." Both the board representatives and the project architects responded at the 33.3% level while board members responded at the 42.9% level in the category "Lacked Experience Necessary to Make Decision." All of the respondents felt that the categories "Qualified to Make

Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for the question (see Figure 18D).

While the analysis of this part of the question indicates a very high level of involvement on the part of board members, it also indicates that they are perceived to have a high level of competence in making this decision thus indicating little need for inservice in this area.

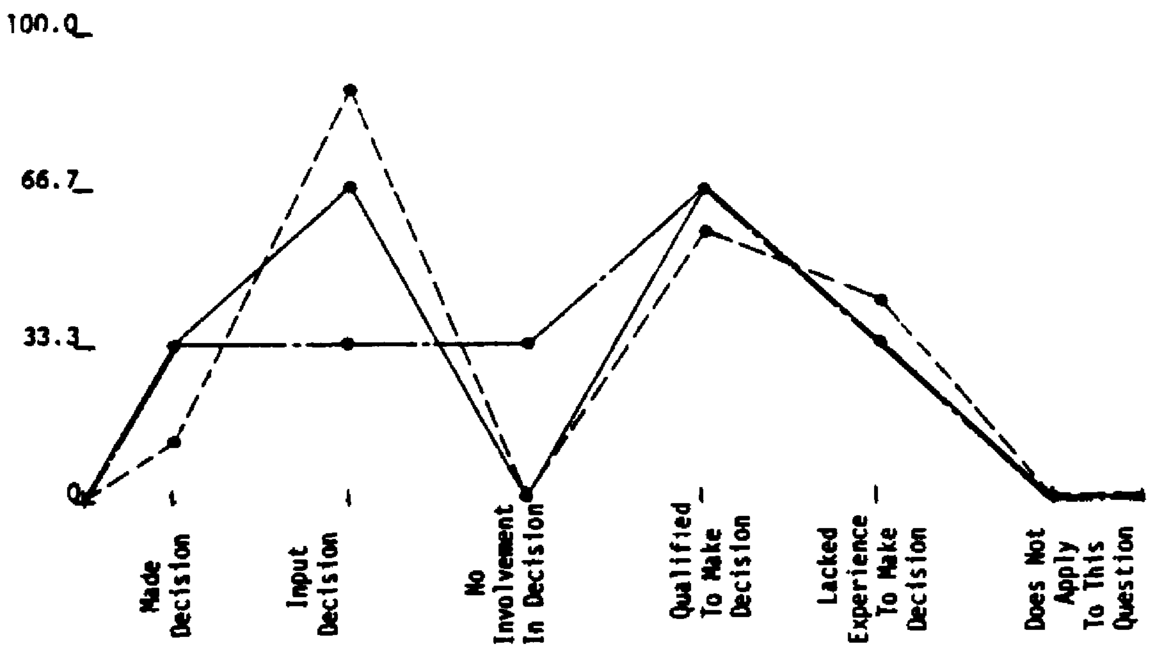

Figure 18D. Determining a site master plan for the purpose of future growth.

<u>Decision # 19</u> - <u>Establishing the "U" Factor of the Exterior Walls</u>

--Perceptions of the board representatives' level of involvement in making the decision in the construction management project

Board representatives are perceived as having a very low level of involvement in this decision area. There are no responses in the category "Made Decision." 60% of the board members and 33.3% of the project architects responded in the category "Input Decision," however, 100% of the board representatives, 40% of the board members and 66.7% of the project architects responded in the category "No Involvement in Decision" (see Figure 19A).

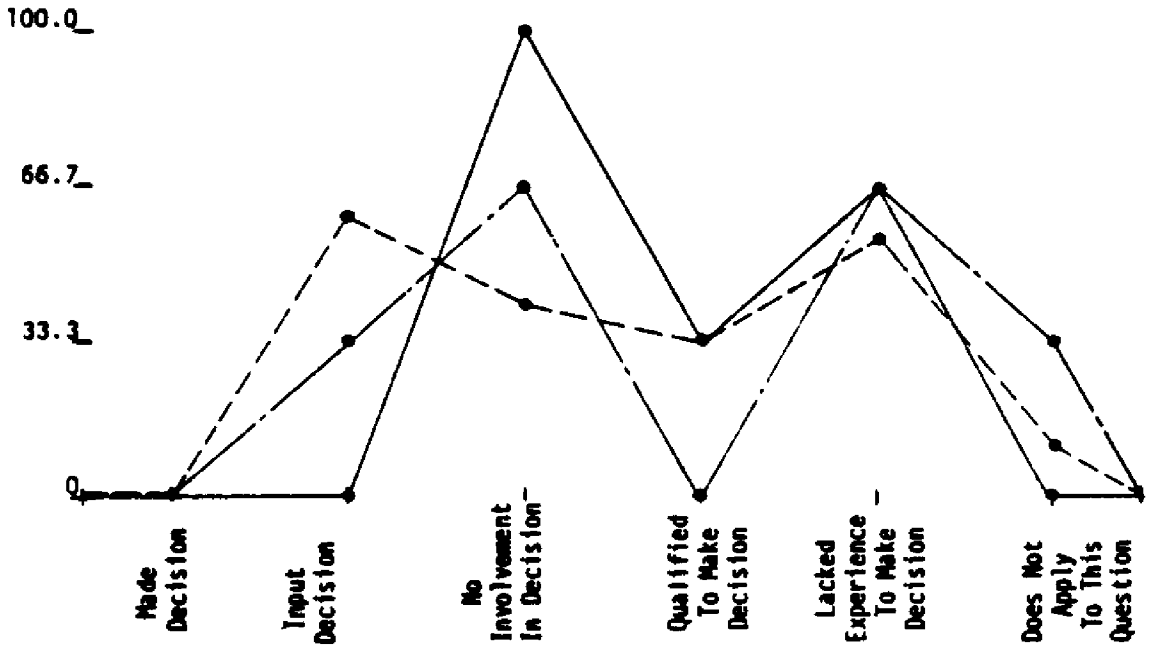

Figure 19A. Establishing the "U" factor of the exterior walls.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A very low level of competence was perceived in this area with both the board representatives and board members responding at the 33.3% level in the category "Qualified to Make Decision." Board representatives responded at the 66.7% level, board members at the 55.6% level and project architects at the 66.7% level in the category "Lacked Experience Necessary to Make Decision." 11.1% of the board members and 33.3% of the project architects felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 19A).

Because of the very low perceived level of involvement and the very low level of competence to make the decision, analysis of this question probably indicates that this decision area should be the primary responsibility of the architectural engineering community, therefore, identifying no need for inservice in this area.

--Perceptions of the board members' involvement in making the decision in a construction management project

An extremely low level of involvement is indicated with no responses in the category "Made Decision" and only 20% of the board members responding in the category "Input Decision." Both board representatives and project architects responded at the 100% level in the category "No Involvement in Decision" while 80% of the board members responded in that category (see Figure 19B).

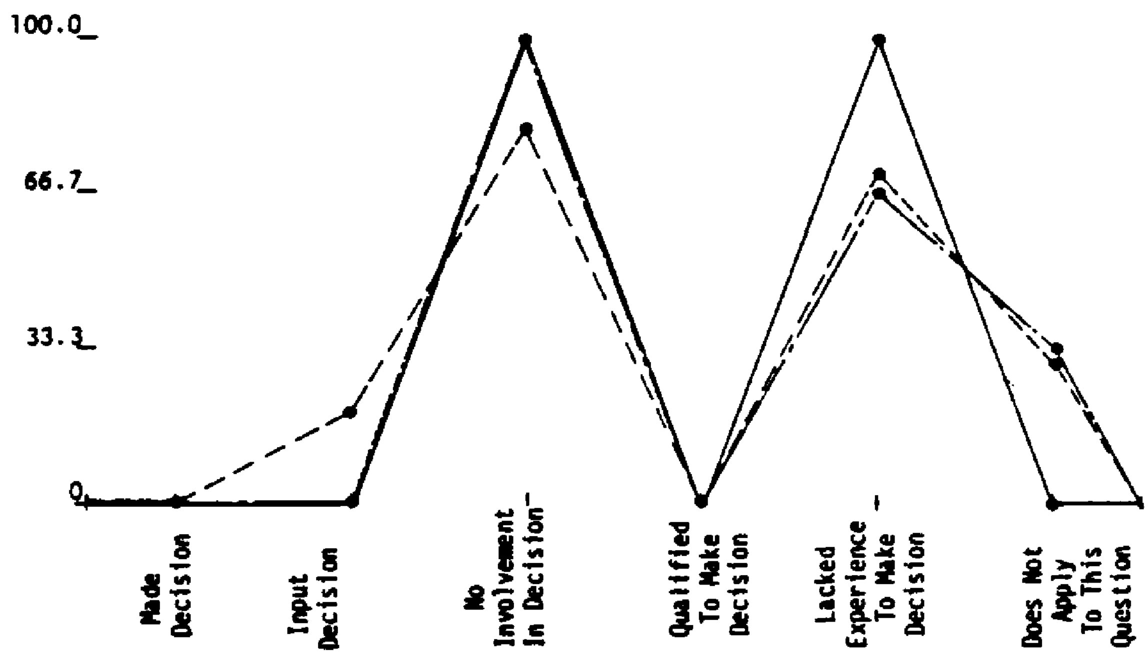

Figure 19B. Establishing the "U" factor of the exterior walls.

--Perceptions of the board members' level of competence in making the decision in a construction management project

The board members are perceived to have no competence in this area. This is supported by the fact that there were no responses in the category "Qualified to Make Decision," while board representatives responded at the 100% level, board members at the 70% level and project architects at the 66.7% level in the category "Lacked Experience Necessary to Make Decision." 30% of the board members and 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 19B).

Based on the extremely low level of involvement and the indication of no competence in this decision area, the analysis of this part of the question obviously indicates that this is a decision which should be the primary responsibility of the architectural and engineering community. Therefore, no inservice need is identified.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

Board representatives are perceived as having a moderately low level of involvement in this decision with 12.5% of the board members and 33.3% of the project architects responding in the category "Made Decision" while 37.5% of the board members responded in the category "Input Decision." 100% of the board representatives, 50% of the board members and 66.7% of the project architects responded in the category "No Involvement in Decision" (see Figure 19C).

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

Surprisingly, a moderate level of competence was indicated in this area with both the board representatives and the project architects responding at the 33.3% level and board members responding at the 50% level in the category "Qualified to Make Decision." 33% of the board representatives, 50% of the board members and 66.7% of the project arthictects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives indicated that the categories "Qualified to Make Decision" and "Lacked Experience

Necessary to Make Decision" were inappropriate for this question (see Figure 19C).

When the moderate level of competence is paired with the low level of involvement in this decision, the analysis of this question indicates that there is no need for inservice in this area.

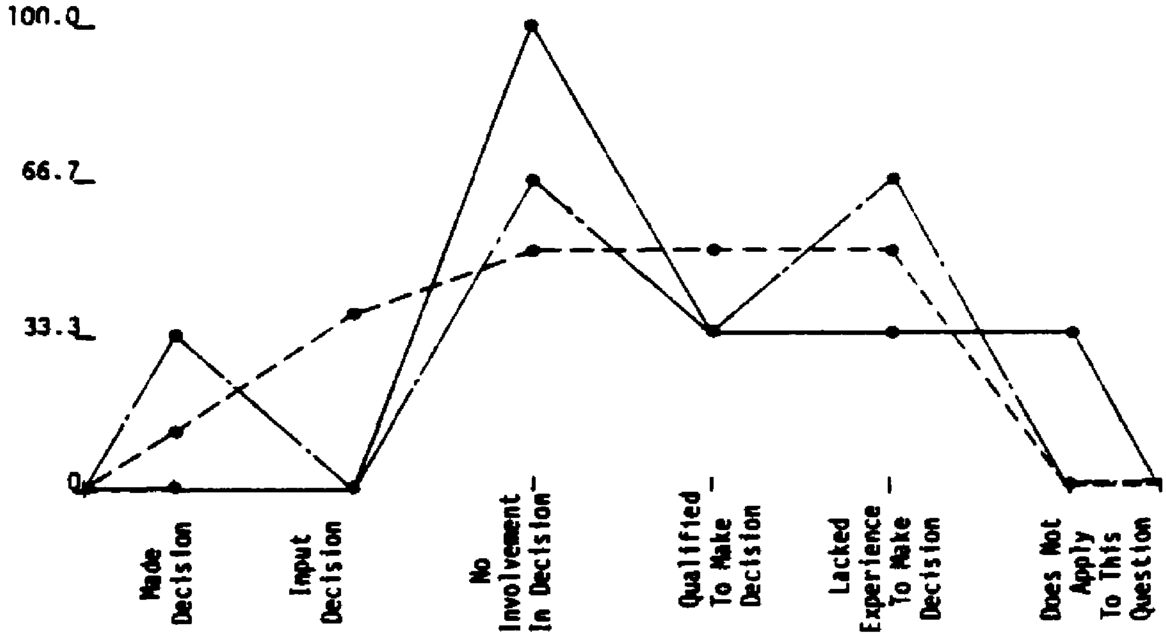

Figure 19C. Establishing the "U" factor of the exterior walls.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members are perceived as having a moderate level of involvement in this decision. 12% of the board members and 33.3% of the project architects responded in the category "Made Decision" while 66.7% of the board representatives and 12.5% of the board members responded in the category "Input Decision." 33.3% of the board representatives, 75% of the board members and 56.7% of the project architects responded in the category "No Involvement in Decision (see Figure 19D).

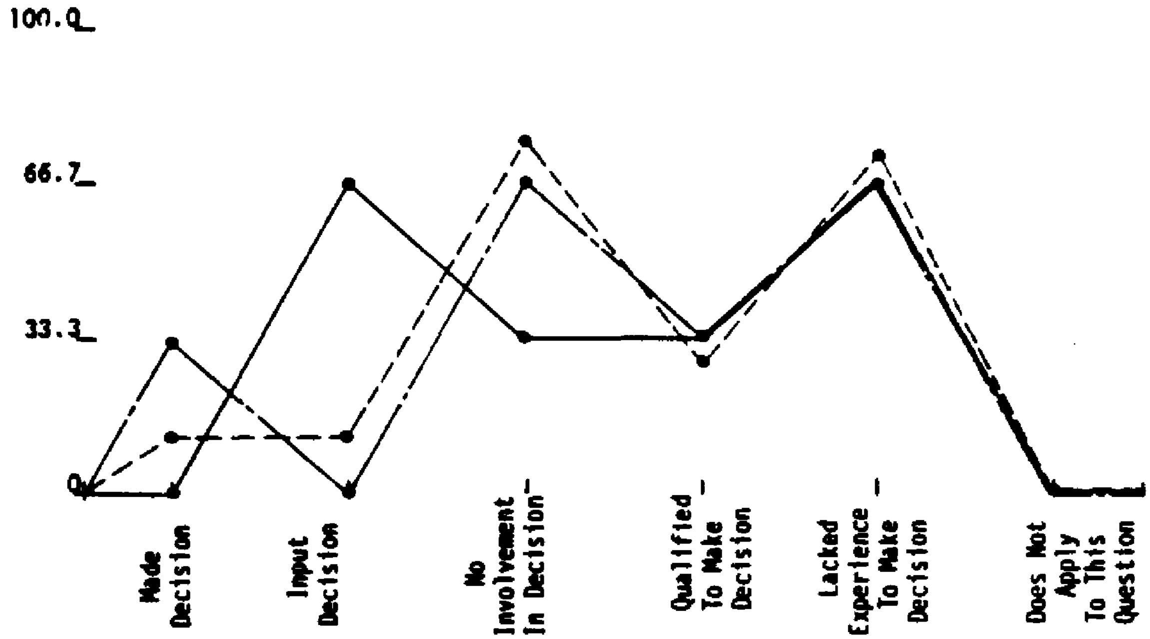

Figure 19D. Establishing the "U" factor of the exterior walls.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Only a moderately low level of competence was indicated with board representatives and project architects responding at the 33.3% level and board members responding at the 28.6% level in the category "Qualified to Make Decision." However, 66.7% of the board representatives, 71.4% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 19D).

The analysis of the question indicates a moderate level of involvement on the part of the board members with a moderately low level of competence to make this decision. Therefore, a moderate need for inservice is identified in this particular area.

Decision # 20 - Establishing the Preliminary Building Costs Through Value Engineering

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

Board representatives were perceived as having a moderately high level of involvement in this decision with 7.7% of the board members responding in the category "Made Decision," and 33.3% of the board representatives, 92.3% of the board members and 66.7% of the project architects responding in the category "Input Decision." 66.7% of the board representatives and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 20A).

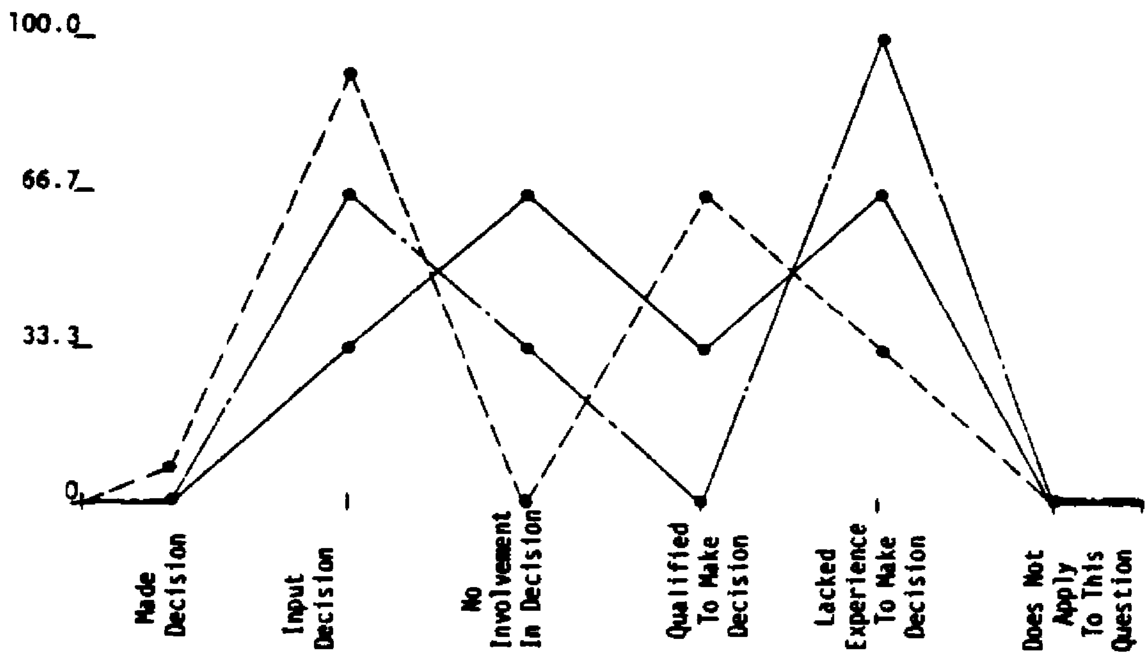

Figure 20A. Establishing the preliminary building costs through value engineering.

--Perceptions of the board representatives 'level of competence in making the decision in a construction management project

A low level of competence is indicated with only 33.3% of the board representatives and 66.7% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 33.3% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decison" were appropriate for this question (see Figure 20A).

The analysis of this part of the question indicates a somewhat unique situation in which the board representatives perceived themselves as being involved less in the making of this decision than do the board members and the project architects. However, because such a low level of competence in perceived in this area and there is an expected level of involvement in the decision, a need for inservice is probably indicated.

--Perceptions of the board members' involvement in making the decision in a construction management project

A moderately high level of involvement is indicated with 14.3% of the board members responding in the category "Qualified to Make Decision." 33.3% of the board representatives, 50% of the board members and 66.7% of the project architects responded in the category "Input Decision," while 66.7% of the board representatives, 35.7% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 20B).

--Perceptions of the board members' level of competence in making the decision in a construction management project

Board members were perceived to be moderately competent to make this decision with 33.3% of the board representatives, 53.8% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." Both the board representatives and the project architects responded at the 66.7% level in the category

"Lacked Experience Necessary to Make Decision" while 38.5% of the board members responded in that category. 7.7% of the board members indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 20B).

Because of the moderately high level of involvement in this decision and the moderately low level of perceived competence, the need for inservice is probably indicated in this decision area.

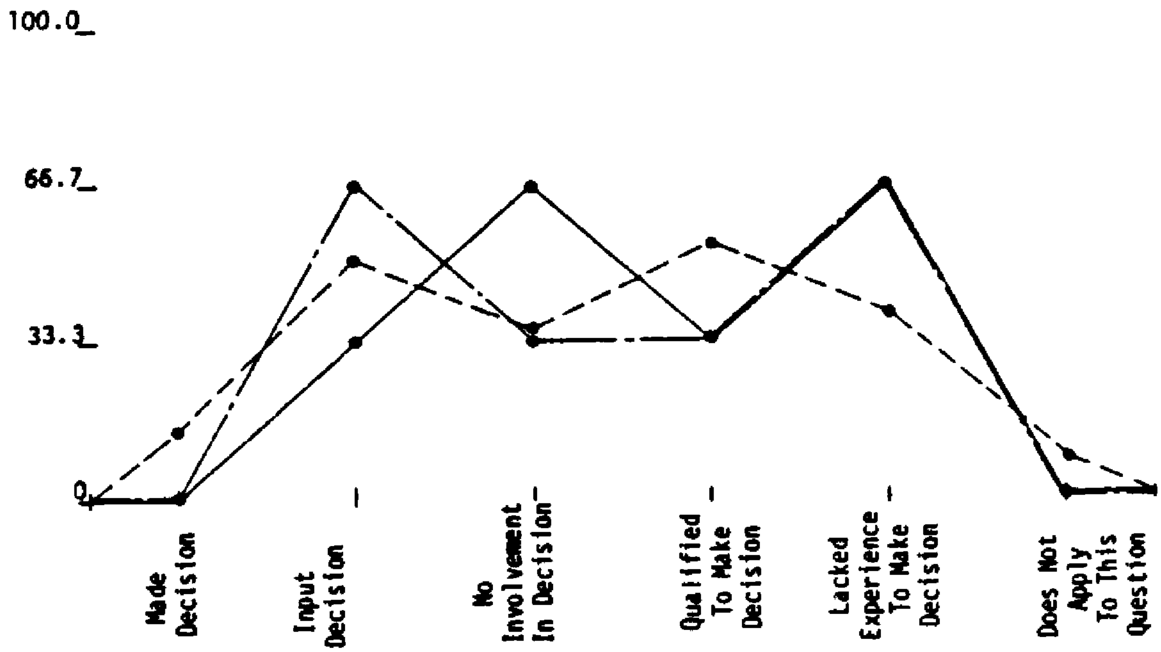

Figure 20B. Establishing the preliminary building costs through value engineering.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

The board representatives were perceived as having a moderately high level of involvement in this decision with 11.1% of the board members responding in the category "Made Decision." Both board representatives and board members responded at the 66.7% level in the category "Input Decision" while 33.3% of the project architects responded in that category. 33.3% of the board representatives, 22.2% of the board members and 66.7% of the project architects indicated that the board representatives had no involvement in the decision (see Figure 20C).

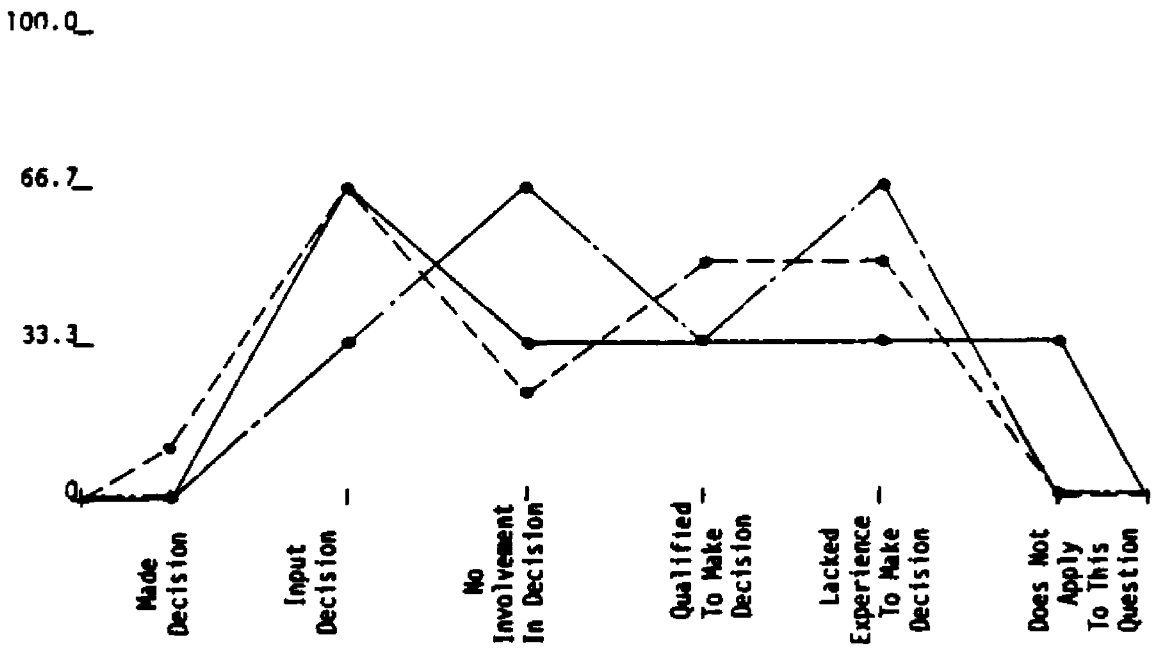

Figure 20C. Establishing the preliminary building costs through value engineering.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

Board representatives were perceived to have a moderate level of competence with 33.3% of the board representatives, 50% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." 33.3% of the board representatives, 50% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives indicated that categories "Qualified to Makd Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 20C).

Because only a moderate level of competence is perceived with yet a moderately high level of involvement in making this decision, the analysis of this part of the question would identify a moderate need for inservice for board representatives.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

A moderately low level of involvement is indicated with no response in the category "Made Decision." 66.7% of the board representatives, 37.5% of the board members and 33.3% of the project architects responded in the category "Input Decision." However, 33% of the board representatives, 62.5% of the board members and 66.7% of the project architects indicated that the board members had no involvement in this decision (see Figure 20D).

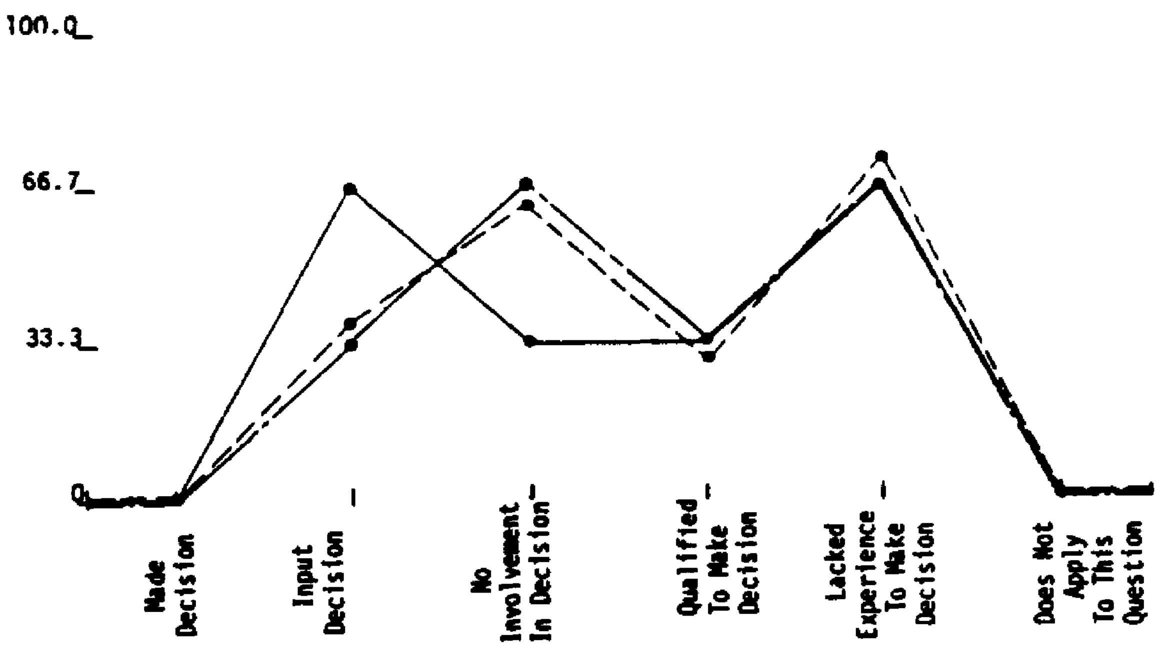

Figure 20D. Establishing the preliminary building costs through value engineering.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Board members are perceived as having a low level of competence in this area with board representatives and project architects responding at the 33.3% level and board members responding at the 28.6% level in the category "Qualified to Make Decision." 66.7% of the board representatives, 71.4% of the board members and 66.7% of the project architects indicated that the board members lacked the experience necessary to make this decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 20D).

The analysis of this part of the question indicates that board members are perceived to have relatively low levels of involvement in this decision. However, because their level of competence is quite low, a moderate need for inservice is indicated.

Decision # 21 - Establishing the Orientation of the Building Taking Into Consideration the Sun, Wind and Noise

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderate level of involvement is indicated with 7.7% of the board members responding in the category "Made Decision," and 33.3% of the board representatives, 76.9% of the board members and 33.3% of the project architects responding in the category "Input Decision." Both board representatives and project architects responded at the 66.7% level in the category "No Involvement in Decision" and 15.4% of the board members responded in that category (see Figure 21A).

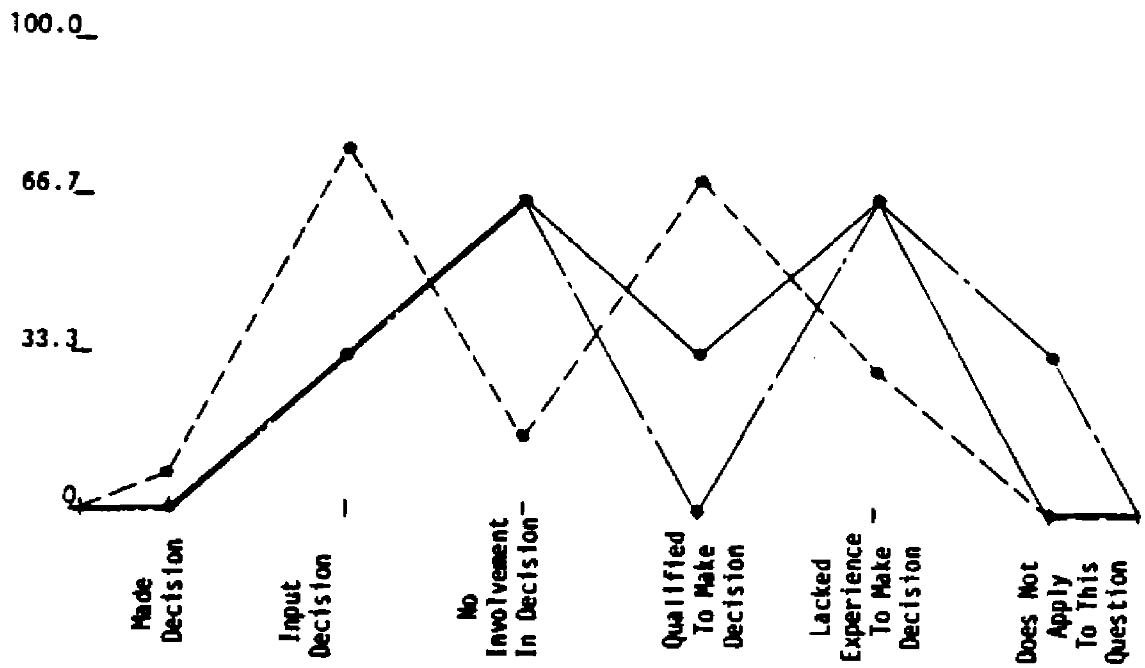

Figure 21A. Establishing the orientation of the building taking into consideration the sun, wind and noise.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

Board representatives were perceived to be only moderately qualified to make the decision. This is supported by a 33.3% response on the part of board representatives and a 69.2% response on the part of board members for that category. Both the board representatives and the project architects agreed at the 66.7% level in the category "Lacked Experience Necessary to Make Decision" and 30.8% of the board members responded in that category. 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 21A).

As a result of the analysis of this part of the question, it would appear that while the level of involvement is moderate, the level of competence is moderately low; therefore, a moderate need for inservice is indicated.

--Perceptions of the board members' level of involvement in making the decision in a construction management project

A relatively low level of involvement is indicated with only 14.3% of the board members responding in the category "Made Decision," while 50% of the board members and 33.3% of the project architects responded in the category "Input Decision." 100% of the board representatives, 35.7% of the board members and 66.7% of the project architects perceived that the board members had no involvement in the decision (see Figure 21B).

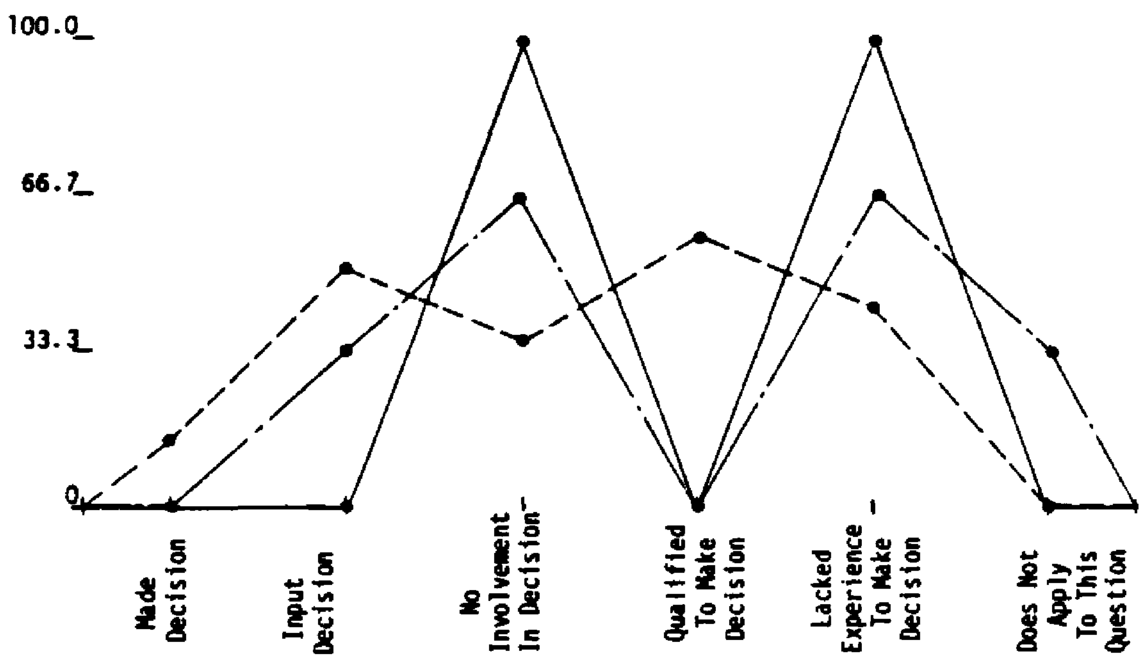

Figure 21B. Establishing the orientation of the building taking into consideration the sun, wind and noise.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence is indicated with only 57.1% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 42.9% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 21B).

The analysis of this part of the question would indicate a low level of involvement in the decision and a very low level of competence to make the decision; therefore, a moderately low need for inservice may be identified.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderately high level of involvement is indicated in this area with 11.1% of the board mebers responding in the category "Made Decision," and 66.7% of the board representatives, 44.4% of the board members and 66.7% of the project architects responding in the category "Input Decision." Both the board representatives and the project architects responded at the 33.3% level in the category "No Involvement in Decision" while board members responded at the 44.4% level in that category (see Figure 21C).

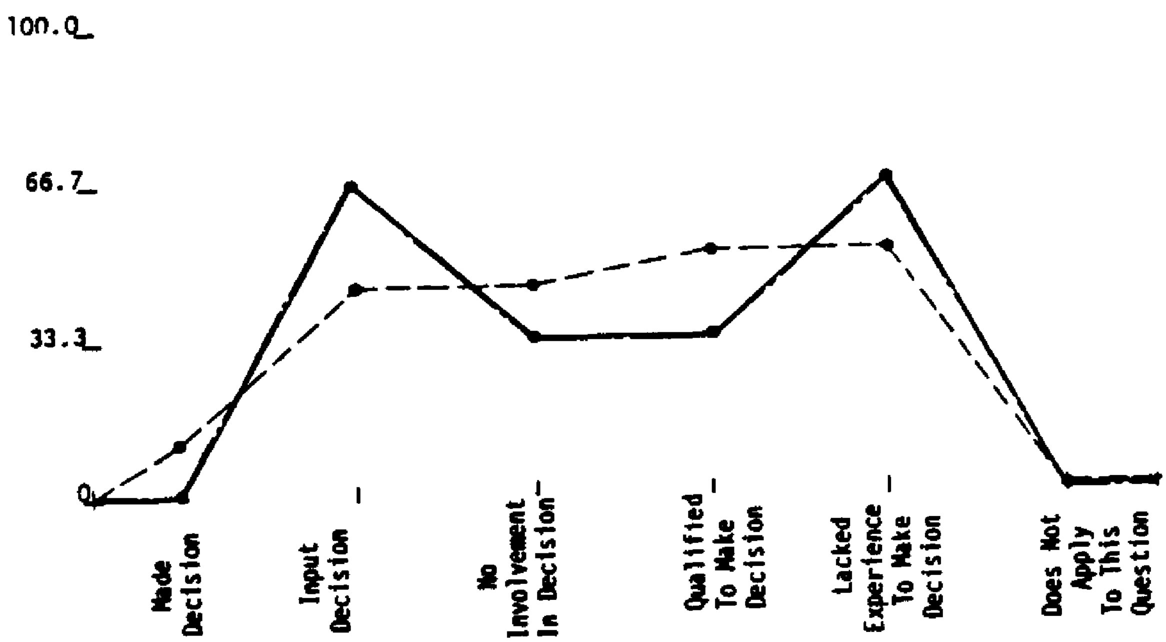

Figure 21C. Establishing the orientation of the building taking into consideration the sun, wind and noise.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A moderate level of competence was indicated with both the board representatives and project architects responding at the 33.3% level in the category "Qualified to Make Decision," while 50% of the board members responded in that category. However, 66.7% of the board representatives, 50% of the board members and 66.7% of the project architects indicated that the board representatives lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 21C).

The analysis of this portion of the question would indicate a moderately high level of involvement in the decision with only a moderate level of competence to make the decision; therefore, a need to inservice board representatives relative to this decision area is indicated.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members are perceived at a very low level of participation with no response in the category "Made Decision" and only 37.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." 100% of the board representatives, 62.5% of the board members and 66.7% of the project architects indicated that the board members were not involved in this decision (see Figure 21D).

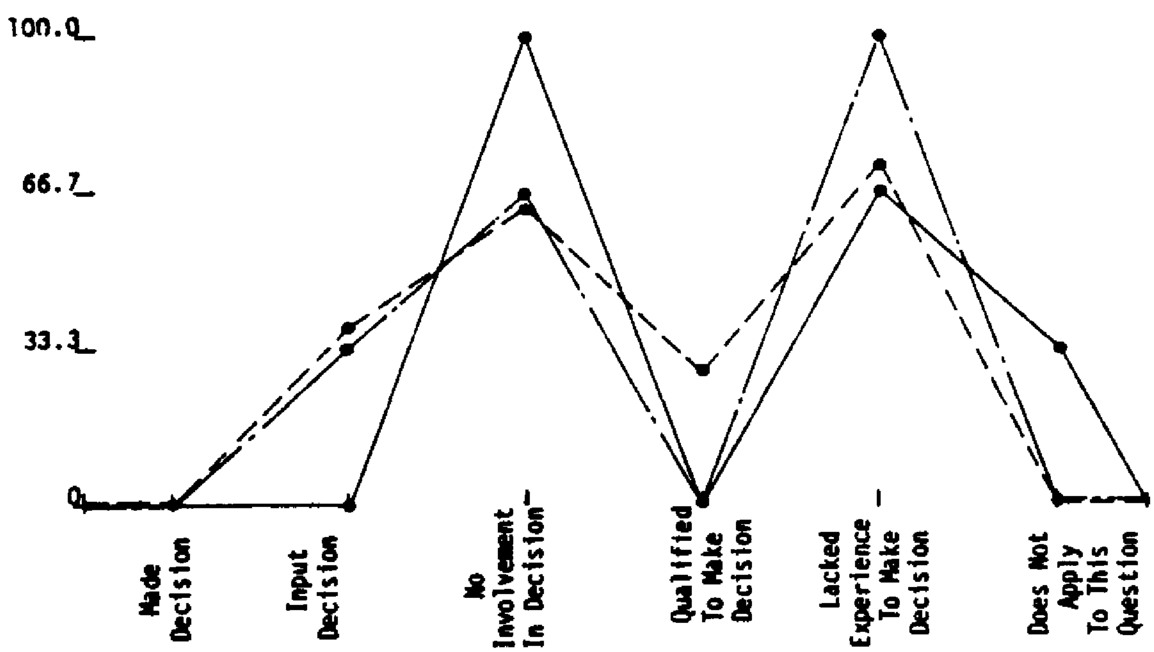

Figure 21D. Establishing the orientation of the building taking into consideration the sun, wind and noise.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Board members are perceived to have a very low level of competence in this decision area. Only 28.6% of the board members responded in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71.4% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 21D).

The analysis of this part of the question indicates that board members are involved at a very low level in this decision and that they lacked the experience necessary to make the decision. As a result, the need for inservice is probably not indicated in this area.

Decision # 22 - Determining Bus and Pedestrian Traffic to the Site

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderately high level of involvement is indicated with 23.1% of the board members responding in the category "Made Decision," and 66.7% of the board representatives, 69.2% of the board members and 33.3% of the project architects responding in the category "Input Decision." Only 33.3% of the board representatives and 7.7% of the board members responded in the category "No Involvement in Decision" while 66.7% of the project architects responded in that category (see Figure 22A).

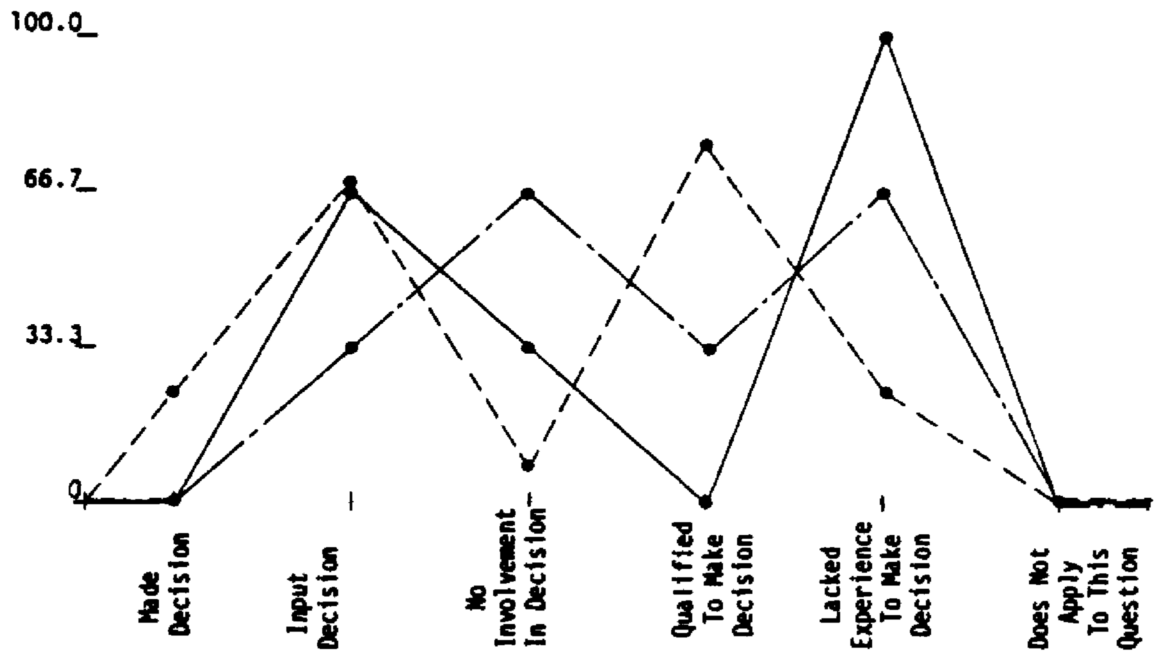

Figure 22A. Determining bus and pedestrian traffic to the site.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately low level of competence is indicated with 76.9% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 100% of the board representatives, 23.1% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this part of the question (see Figure 22A).

Because of the mdoerately high level of involvement and the moderately low level of competence which is indicated, the analysis of this part of the question identifies the need to inservice board representatives in this decision area.

--Perceptions of the board members' level of involvement in making the decision in a construction management project

Board members are perceived to have a moderately high level of involvement in this decision area. This is supported by the response of 14.3% onthe part of the board members in the category "Made Decision," while 33.3% of the board representatives, 64.3% of the board members and 66.7% of the project architects responded in the category "Input Decision." 66.7% of the board representatives, 21.4% of the board members and 33.3% of the project architects indicated that the board members had no involvement in the decision (see Figure 22B).

--Perceptions of the board members' level of competence in making the decision in a construction management project

A relatively low level of competence is indicated with only 33.3% of the board representatives and 53.8% of the board members responding in the category "Qualified to Make Decision." Both board representatives and project architects responded at the 66.7% level in the category "Lacked Experience Necessary to Make Decision" and 38.5% of the board members responded in that category. 7.7% of the board members and

33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this part of the question (see Figure 22B).

Because of the moderately high level of involvement and the moderately low level of competence in this decision area, the analysis indicates a definite need to inservice board members.

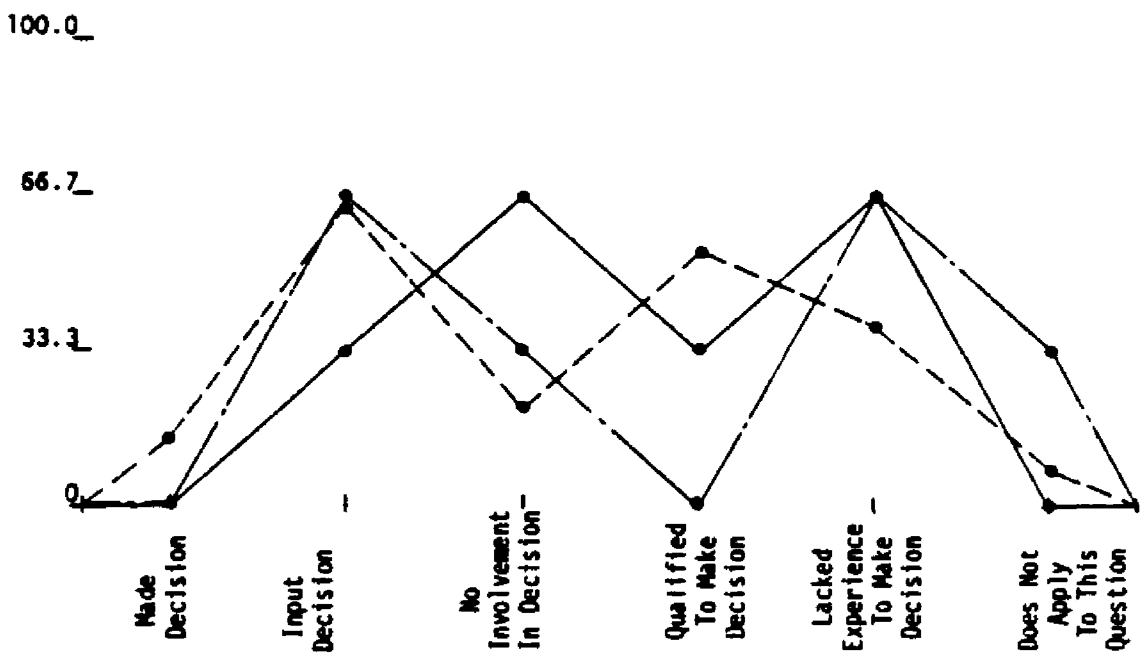

Figure 22B. Determining bus and pedestrian traffic to the site.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A high level of involvement is indicated in this area with 11.1% of the board members responding in the category "Made Decision" and 100% of the board representatives, 66.7% of the board members and 66.7% of the project architects responding in the category "Input Decision." Only 22.2% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 22C).

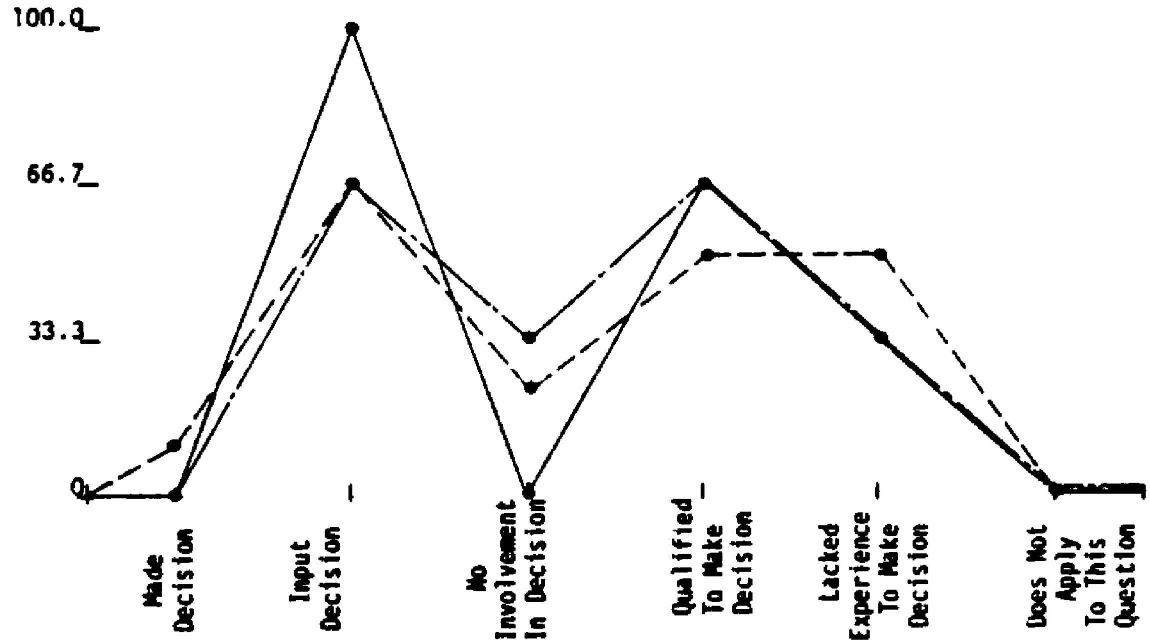

Figure 22C. Determining bus and pedestrian traffic to the site.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A relatively high level of competence is indicated in this area with both the board representatives and the project architects responding at the 66.7% level and the board members responding at the 50% level in the category "Made Decision." Both the board representatives and the project architects responded at the 33.3% level in the category "Lacked Experience Necessary to Make Decision" while 50% of the board members responded in that category. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 22C).

The analysis for this part of the question indicates a high level of involvement in the decision and a moderately high level of competence to make the decision; therefore, only a low level of inservice need is identified in this decision area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members are perceived as having a moderately low level of involvement with no responses in the category "Made Decision." Both the board representatives and the project architects responded at the 33.3% level in the category "Lacked Experience Necessary to Make Decision" while 50% of the board members responded in that category. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 22C).

The analysis for this part of the question indicates a high level of involvement in the decision and a moderately high level of competence to make the decision; therefore, only a low level of inservice need is identified in this decision area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members are perceived as having a moderately low level of involvement with no responses in the category "Made Decision." 66.7% of the board representatives, 37.5% of the board members and 33.3% of the project architects responded in the category "Input Decision." However, 33.3% of the board representatives, 62.5% of the board members and 66.7% of the project architects indicated that the board members had no involvement in the decision (see Figure 22D).

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A moderately high level of competence is indicated in this area with 33.3% of the board representatives, 42.9% of the board members and 66.7% of the project architects responding in the category "Qualified to Make Decision." 66.7% of the board representatives, 57.1% of the board members and 33.3% of the project architects indicated that the board members lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 22D).

The analysis of this question indicates that board members have a moderately low level of involvement in the decision and a moderately high level of competence in making the decision. Therefore, while board members probably should be encouraged to participate at a higher level in this decision area, there is no identifiable need for inservice.

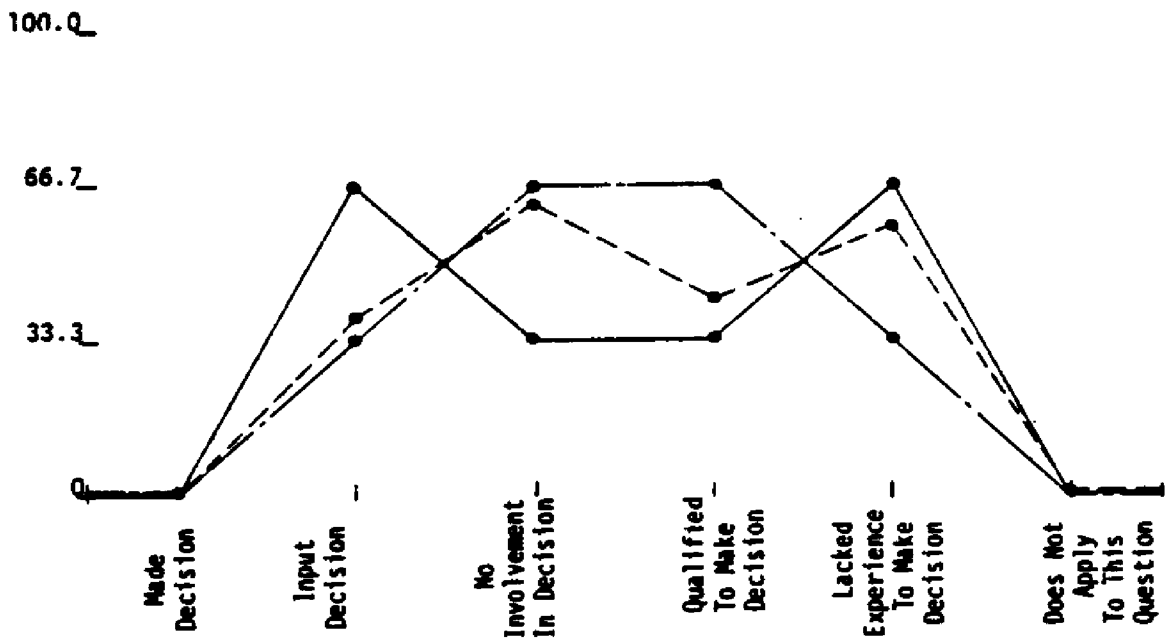

Figure 22D. Determining bus and pedestrian traffic to the site.

<u>Decision # 23</u> - <u>Determining Other Site Uses: Games, Storage, Community Uses, Program Uses, Etc.</u>

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A high level of involvement is indicated in this area with 15.4% of the board members and 33.3% of the project architects responding in the category "Made Decision," and 66.7% of the board representatives, 76.9% of the board members and 33.3% of the project architects responding in the category "Input Decision." Only 7.7% of the board members responded in the category "No Involvement in Decision" while both the board representatives and the project architects responded at the 33.3% level in this category (see Figure 23A).

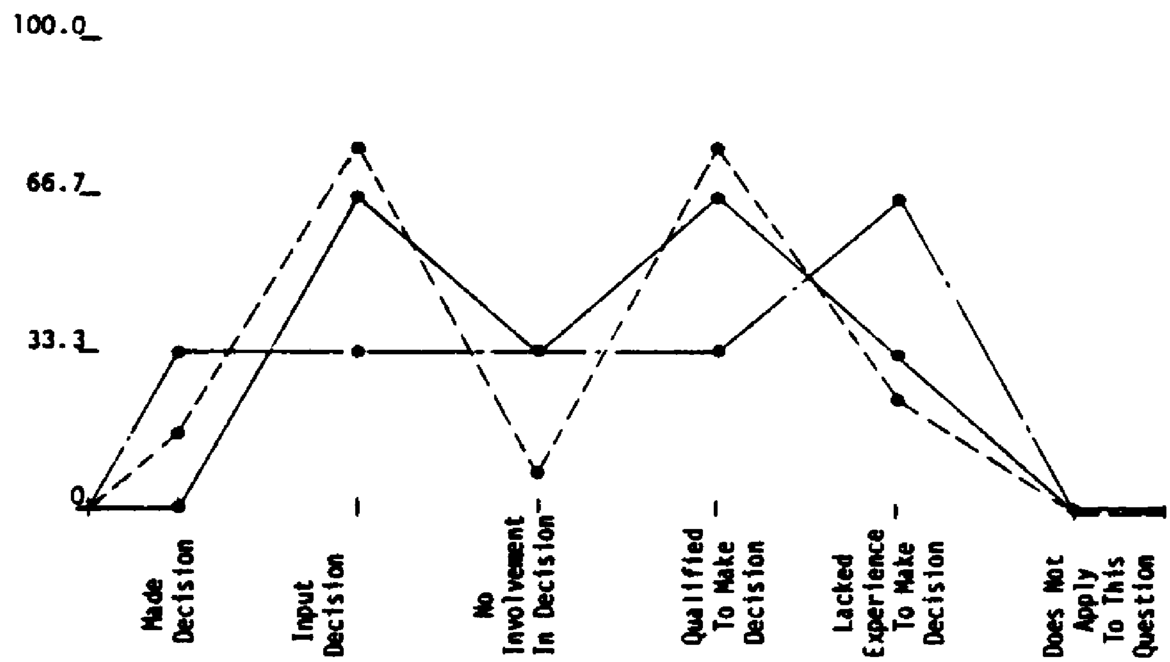

Figure 23A. Determining other site uses: games, storage, community uses, program uses, etc.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A relatively high level of competence is indicated in this area with 66.7% of the board representatives, 76.9% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." 33.3% of the board representatives, 23.1% of the board members and 66.7% of the project architects indicated that the board representatives lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 23A).

The analysis of this part of the question, because of the high level of involvement and the moderately high level of competence, indicates a moderately low need for inservice relative to this decision area.

--Perceptions of the board members' involvement in making the decision in a construction management project

Board members are perceived to have a moderate level of involvement in this decision area with 7.1% of the board members responding in the category "Qualified to Make Decision," while both the board representatives and the project architects responded at the 33.3% level in the category "Input Decision" and board members responded at the 85.7% level in that category. Board representatives responded at the 66.7% level, board members at the 7.1% level and project architects at the 66.7% level in the category "No Involvement in Decision (see Figure 23B).

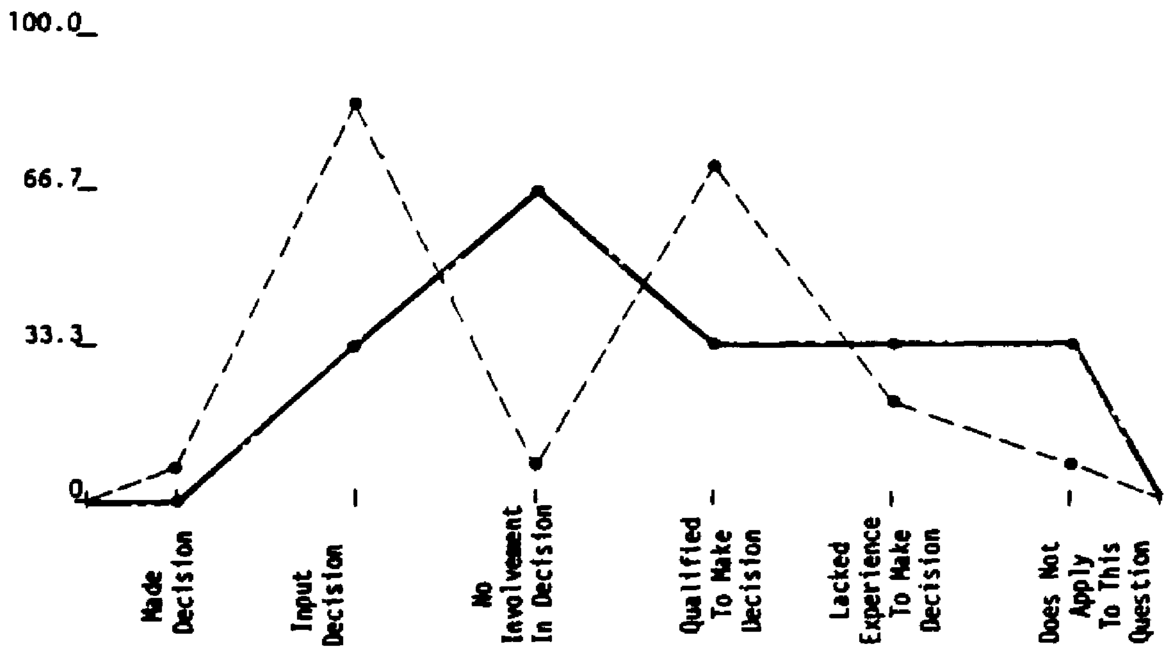

Figure 23B. Determining other site uses: games, storage, community uses, program uses, etc.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A moderate level of competence is indicated in this area with both the board representatives and the project architects responding at the 33.3% level in the category "Qualified to Make Decision" and board members responding at the 71.4% level in that category. 33.3% of the board representatives, 21.4% of the board members and 33.3% of the project architects indicated that the board members lacked the experience necessary to make the decision. Both the board representatives and the project architects indicated at the 33.3% level and board members at the 7.1% level that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 23B).

The analysis of this part of the question would indicate a moderate level of involvement and a moderate level of qualification in this decision area. As a result, only a moderate level of inservice need is identified.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A high level of involvement is indicated in this area with both the board representatives and the board members responding at the 33.3% level in the category "Made Decision," and 66.7% of the board representatives, 44.4% of the board members and 100% of the project architects responding in the category "Input Decision." Only 22.2% of the board members responded in the category "No Involvement in Decision (see Figure 23C).

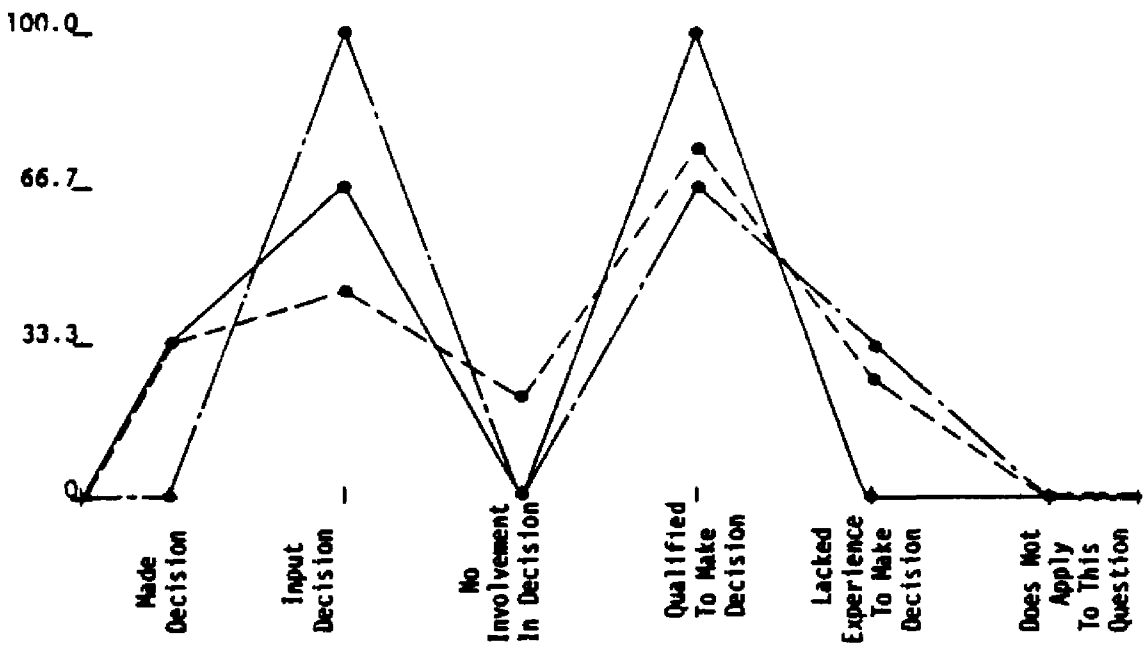

Figure 23C. Determining other site uses: games, storage, community uses, program uses, etc.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A very high level of competence is indicated in this area with 100% o of the board representatives, 75% of the board members and 66.7% of the project architects indicating that the board representatives are qualified to make this decision. Only 25% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 23C).

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

The response in this area indicates a moderately high level of involvement in the decision with board representatives responding at the 33.3% level and board members responding at the 12.5% level in the category "Made Decision." Board representatives responded at the 33.3% level, board members at the 62.5% level and project architects at the 66.7% level in the category "Input Decision." Both the board representatives and the project architects responded at the 33.3% level in the category "No Involvement in Decision" while board members responded at the 25% level in that category (see Figure 23D).

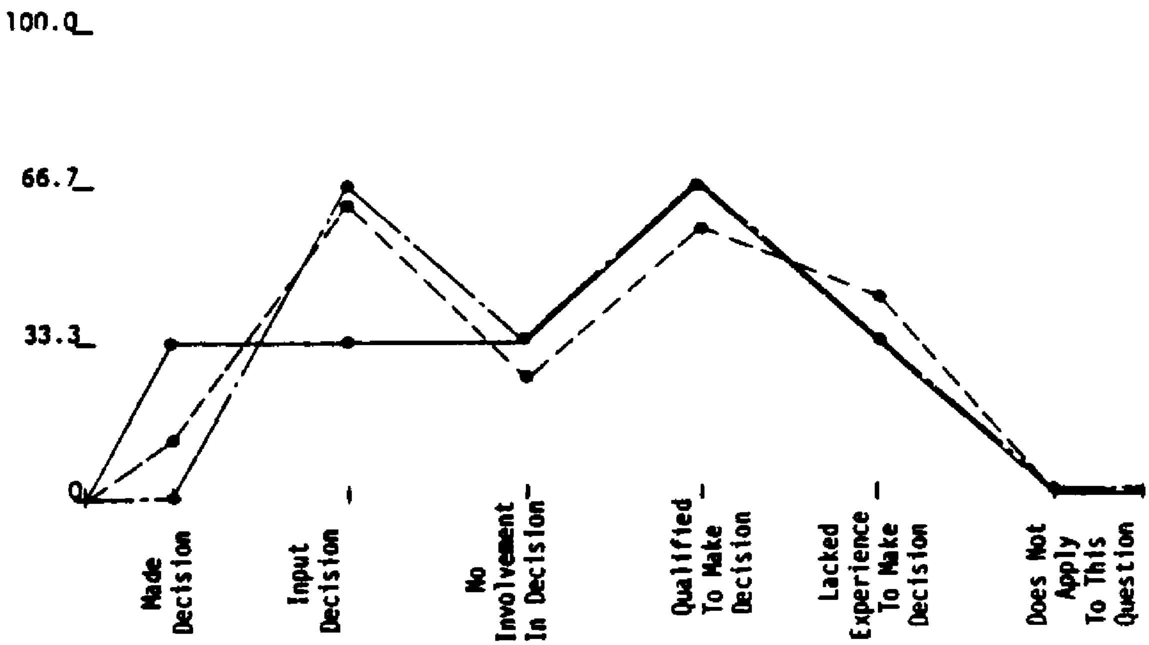

Figure 23D. Determining other site uses: games, storage, community uses, program uses, etc.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Board members are perceived to have a high level of competence in this area with both the project architects and the board representatives responding at the 66.7% level in the category "Qualified to Make Decision" and the board members responding at the 57.1% level in that category. 33.3% of the board representatives, 42.9% of the board members and 33.3% of the project architects indicated that the board members lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" was appropriate for this question (see Figure 23D).

The analysis of this part of the question indicates that board members have a moderately high level of involvement in this decision and that they are qualified to make it; therefore, no inservice need is identified.

Decision # 24 - Determining the Circulation Patterns Within the Building

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A high level of involvement is indicated in this area with 53.8% of the board members and 33.3% of the project architects responding in the category "Made Decision," while 100% of the board representatives, 30.8% of the board members and 33.3% of the project architects responded in the category "Input Decision." Only 15.4% of the board members and 33.3% of the project architects indicated that the board representatives had no involvement in the decision (see Figure 24A).

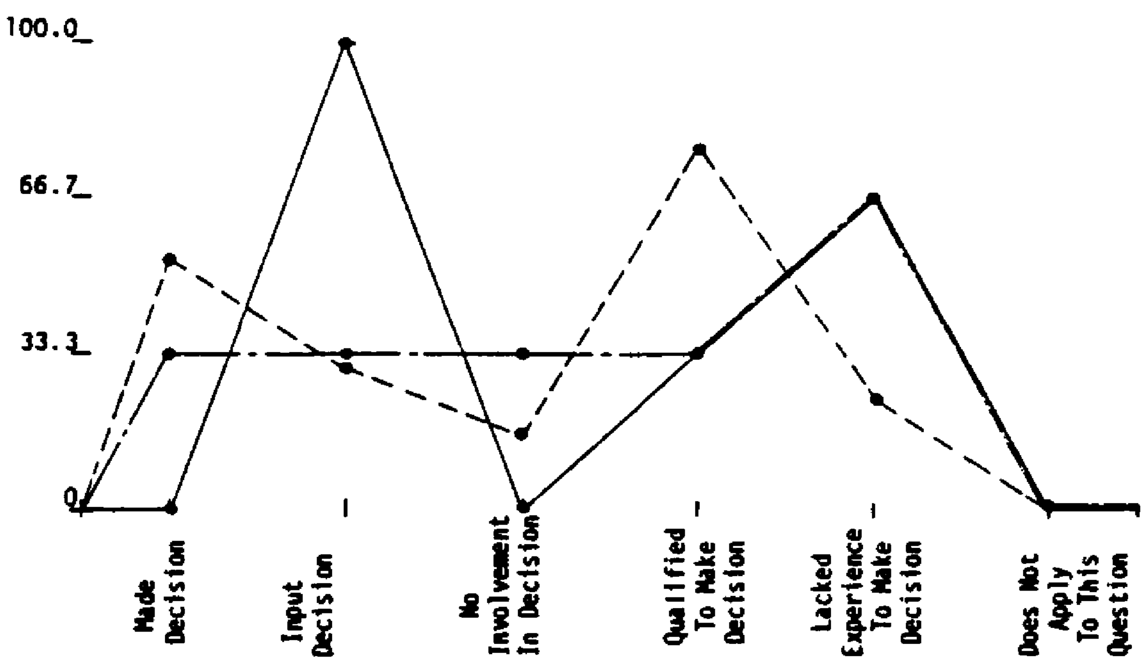

Figure 24A. Determining the circulation patterns within the building.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately low level of competence is indicated with both the board representatives and the project architects responding at the 33.3% level and board members responding at the 76.9% level in the category "Qualified to Make Decision." Both the board representatives and the project architects responded at the 66.7% level in the category "Lacked Experience Necessary to Make Decision" while 23.1% of the board members responded in that category. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 24A).

When the high level of involvement which is indicated is paired with the moderately low level of competence, the analysis in this decision area indicates a need for inservice.

--Perceptions of the board members' level of involvement in making the decision in a construction management project

Only a moderate level of involvement is indicated in this area with 7.1% of the board members responding in the category "Made Decision." 33.3% of the board representatives, 35.7% of the board members and 66.7% of the project architects responded in the category "Input Decision." 66.7% of the board representatives, 57.1% of the board members and 33.3% of the project architects indicated that the board representatives had no involvement in this decision (see Figure 24B).

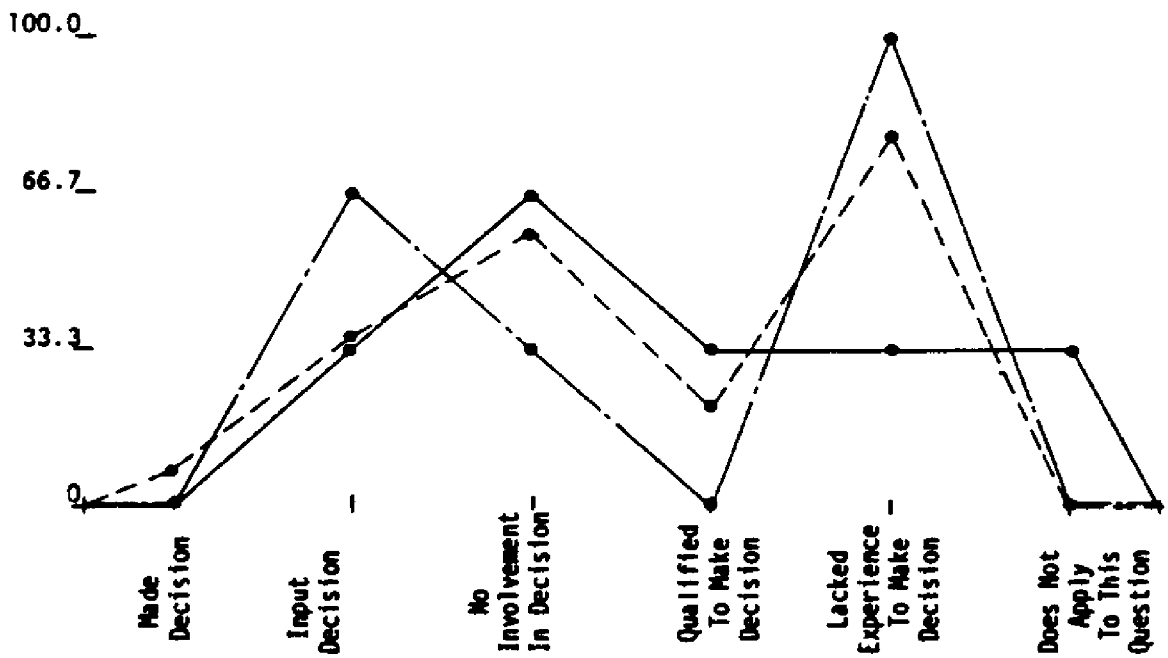

Figure 24B. Determining the circulation patterns within the building.

--Perceptions of the board members' level of competence in making the decision in a construction management project

The board members are perceived to have a low level of competence with only 33.3% of the board representatives and 21.4% of the board members responding in the category "Qualified to Make Decision," while 33.3% of the board representatives, 78.6% of the board members and 100% of the project architects indicated that the board members lacked experience necessary to make this decision. 33.3% of the board representatives indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 24B).

The analysis of this part of the question indicates that the board members are involved at a moderate level; however, they lack the experience necessary to make this decision. A moderately high need for inservice is therefore indicated.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A very high level of involvement is indicated in this area with both the board representatives and the project architects responding at the 66.7% level and the board members responding at the 11.1% level in the category "Made Decision." 33.3% of the board representatives, 66.7% of the board members and 33.3% of the project architects responded in the category "Input Decision." Only 22.2% of the board members indicated that their board representatives had no involvement in this decision (see Figure 24C).

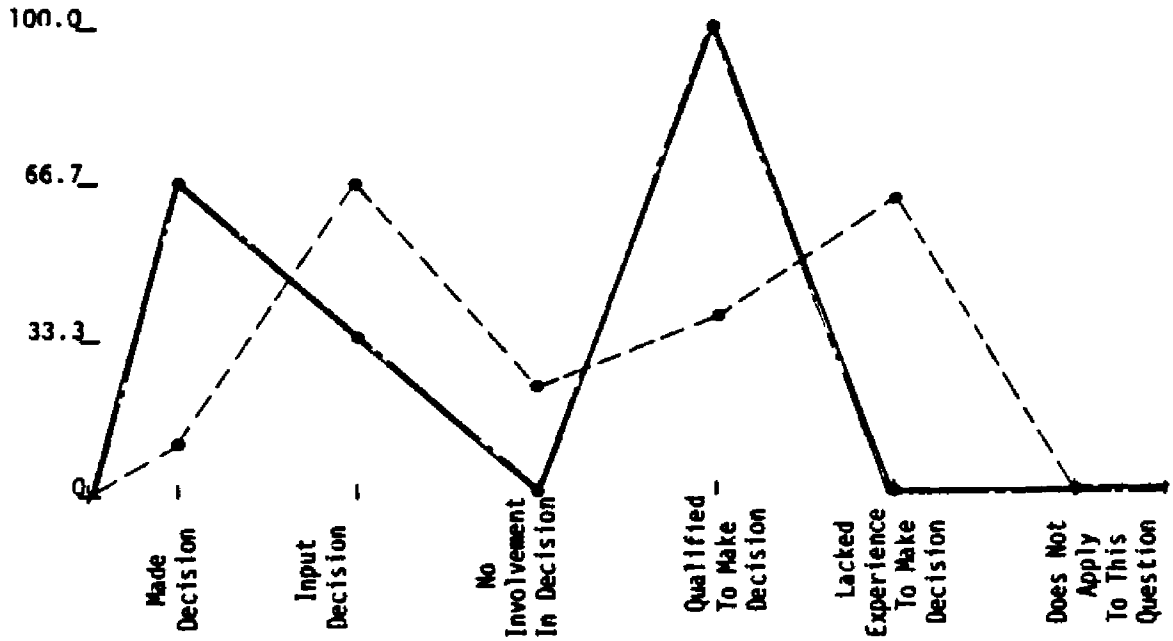

Figure 24C. Determining the circulation patterns within the building.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A very high level of competence is indicated with both the board representatives and project architects responding at the 100% level and the board members responding at the 37.5% level in the category "Qualified to Make Decision." 62.5% of the board members indicated that their board representatives lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 24C).

The analysis of this part of the question indicates that the board representatives are involved in a very high level in this decision and that they are also very qualified to make the decision. Therefore, there is no need for inservice in this decision area.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

Board members are perceived to have a moderately low level of involvement in this decision with 33.3% of the project architects responding in the category "Made Decision" and 33.3% of the board representatives and 75% of the board members responding in the category "Input Decision." 66.7% of the board representatives, 25% of the board members and 66.7% of the project architects indicated that the board members had no involvement in this decision (see Figure 24D).

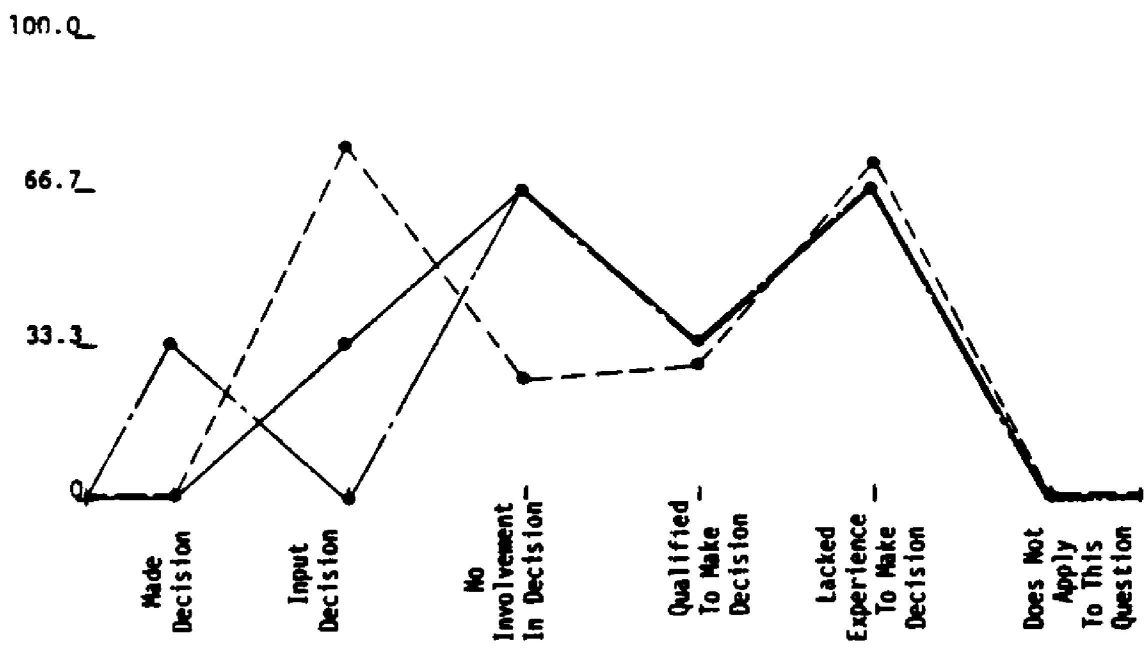

Figure 24D. Determining the circulation patterns within the building.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

The board members are perceived to have a moderately low level of competence in this area with both the board representatives and the project architects responding at the 33.3% level in the category "Qualified to Make Decision" and 28.6% of the board members responding in that category. 66.7% of the board representatives, 71.4% of the board members and 67.6% of the project architects indicated that the board members lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 24D).

The analysis of this question indicates that the board members are involved at a moderately low level in this decision and that they lacked the experience necessary to make this decision. Thus, there is probably only a moderate need for inservice in this decision area.

<u>Decision # 25</u> - <u>Determining the Heating and Cooling Requirements for the Building</u>

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderately high level of involvement is indicated in this area with 7.7% of the board members responding in the category "Made Decision," and 66.7% of the board representatives, 61.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." 33.3% of the board representatives, 30% of the board members and 66.7% of the project architects indicated that the board representatives had no involvement in this decision (see Figure 25A).

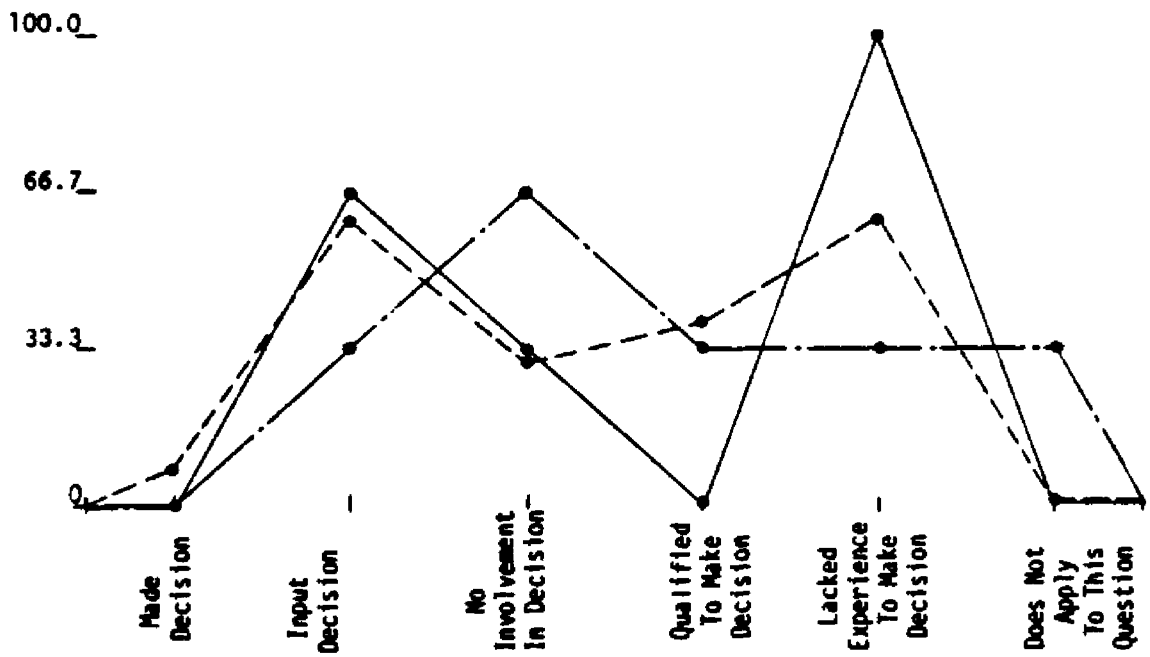

Figure 25A. Determining the heating and cooling requirements for the building.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A low level of competence is indicated in this area with 38.5% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." 100% of the board representatives, 61.5% of the board members and 33.3% of the project architects indicated that the board representatives lacked the experience necessary to make the decision. 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 25A).

The analysis of this part of the question indicates that the board representatives are involved at a moderately high level in this decision. However, they lacked the experience necessary to make the decision; therefore, need for inservice is identified in this area.

--Perceptions of the board members' level of involvement in making the decision in a construction management project

A low level of involvement is indicated with no responses in the category "Made Decision," while only 33.3% of the board representatives and 28.6% of the board members responded in the category "Input Decision." 66.7% of the board representatives, 71.4% of the board members and 100% of the project architects indicated that the board members had no involvement in this decision (see Figure 25B).

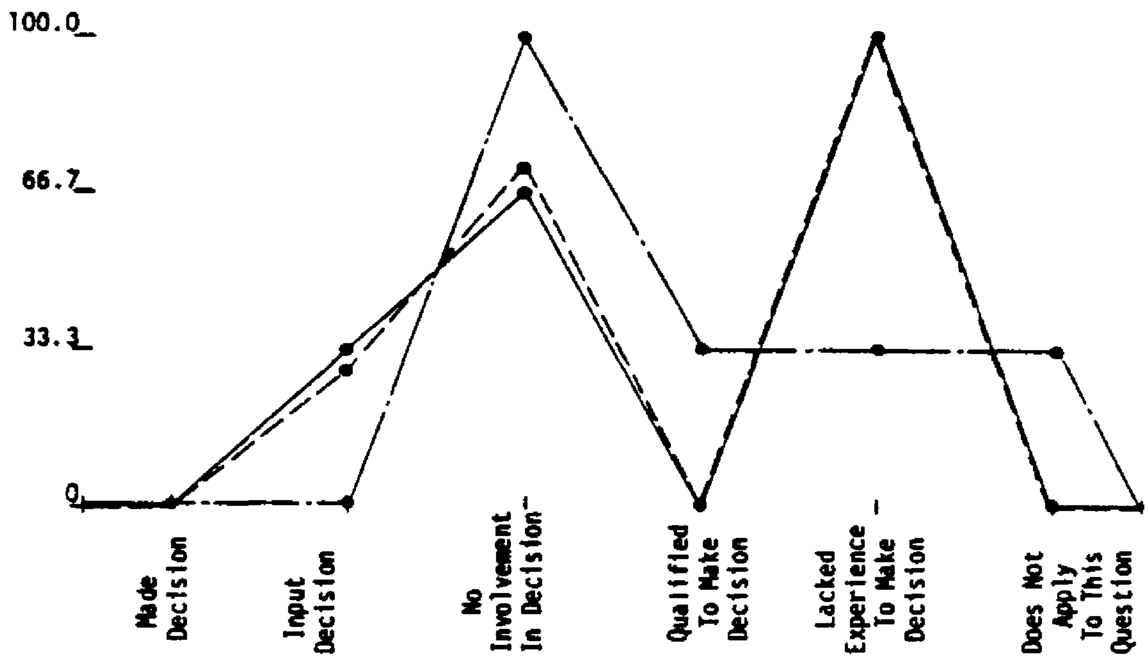

Figure 25B. Determining the heating and cooling requirements for the building.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence is indicated in this area with 33.3% of the project architects responding in the category "Qualified to Make Decision," while 100% of the board representatives, 100% of the board members and 33.3% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the project architects indicated that the categories "Qualified to

Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 25B).

The analysis of this question indicates that while there is a very low level of competence in this decision area, board members also have a very low level of involvement in the decision. Therefore, need for inservice in this area is questionable.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderately high level of involvement is indicated in this area with 11.1% of the board members responding in the category "Made Decision," and 66.7% of the board representatives, 55.6% of the board members and 33.3% of the project architects responding in the category "Input Decision." Both the board representatives and the board members responded at the 33.3% level and the project architects responded at the 66.7% level in the category "No Involvement in Decision (see Figure 25C).

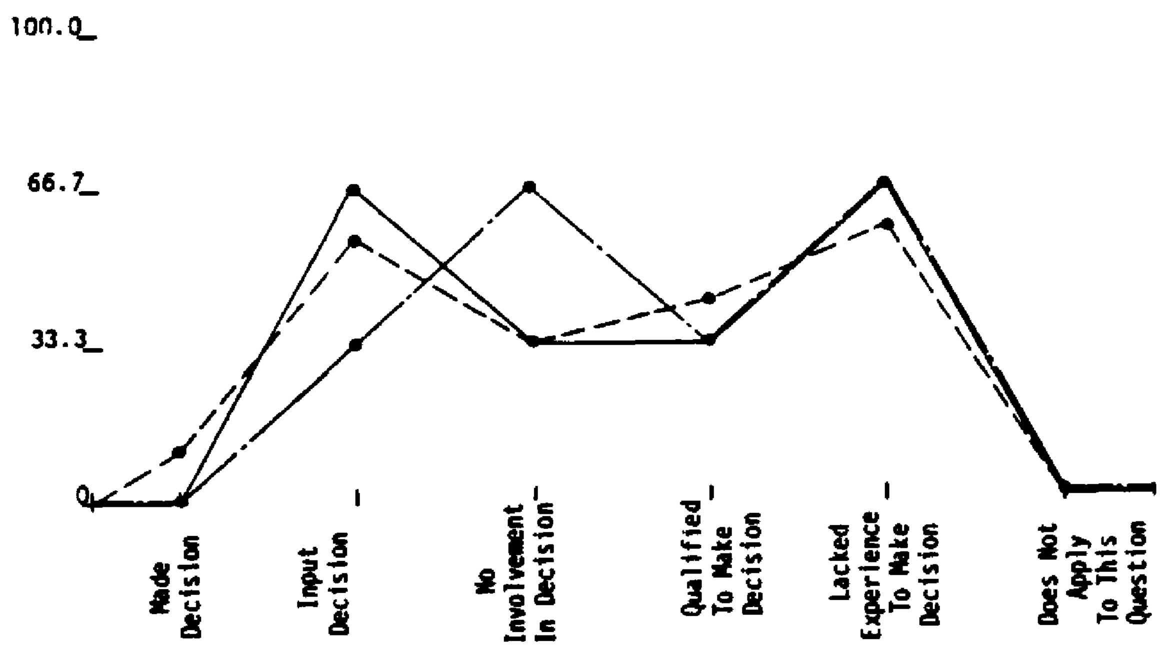

Figure 25C. Determining the heating and cooling requirements for the building.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

Only a moderate level of competence is indicated in this area with both the board representatives and the project architects responding at the 33.3% level and the board members responding at the 42.9% level in the category "Qualified to Make Decision." However, board representatives and project architects responded at the 66.7% level in the category "Lacked Experience Necessary to Make Decision" and board members responded at the 57.1% level in that category. All the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 25C).

The analysis of this part of the question indicates that board representatives have a moderately high level of involvement in this decision; however, they are only moderately qualified to make the decision. Therefore, a moderate need for inservice is identified for this decision area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

Board members are perceived to have a very low level of involvement in this decision with no responses in the category "Made Decision" and only 12.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." 100% of the board representatives, 87.5% of the board members and 66.7% of the project architects indicated that the board members had no involvement in the decision (see Figure 25D).

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

The board members are perceived as lacking the experience necessary to make this decision with only 14.3% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 85.7% of the board members and 66.7% of the project architects indicated that the board members lacked the experience necessary to make the decision. 33.3% of the board representatives felt that the categories "Qualified to Make Decision" and "Lacked the Experience Necessary to Make Decision" were inappropriate for this question (see Figure 25D).

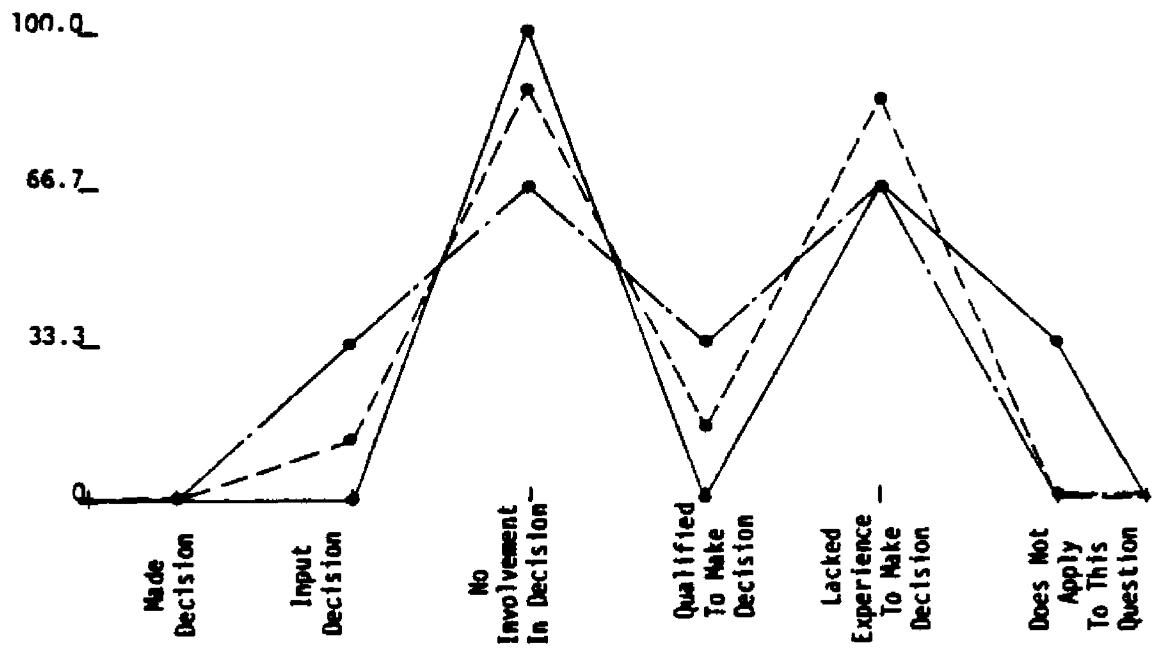

Figure 25D. Determining the heating and cooling requirements for the building.

The analysis of this question indicates that the board members have very little involvement in the decision and lacked qualifications to make the decision. While inservice in this area could increase both the competence and the level of involvement, the responses probably indicate that this is an area that should be the primary responsibility of the architectural and engineering community.

Decision # 26 - Determining the Type of Heating, Cooling and Ventilation System to be Used

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderately high level of involvement is indicated in this area with 8.3% of the board members responding in the category "Qualified to Make Decision," and 66.7% of the board representatives, 91.7% of the board members and 33.3% of the project architects responding in the category "Input Decision." Only 33.3% of the board representatives responded in the category "No Involvement in Decision" while 66.7% of the project architects responded in that category (see Figure 26A).

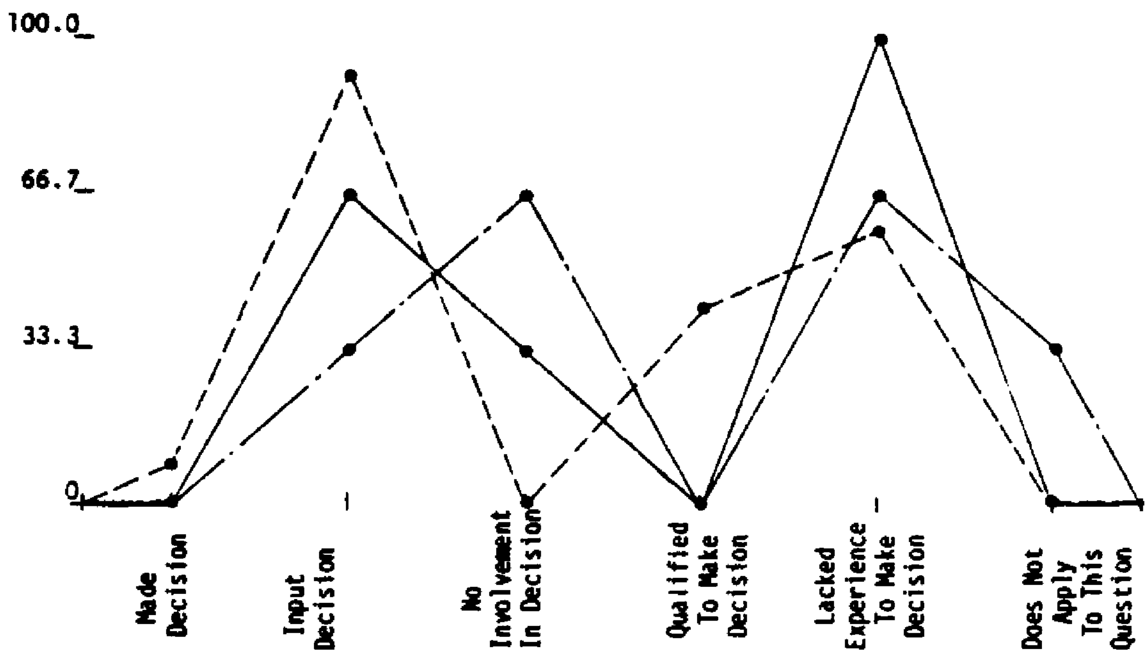

Figure 26A. Determining the type of heating, cooling and ventilation system to be used.

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A low level of competence is indicated in this area with only 41.7% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 58.3% of the board members and 66.7% of the project architects indicated that the board representatives lacked the experience necessary to make the decision. 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were not appropriate for this question (see Figure 26A).

Since the analysis of this question indicates a moderately high level of involvement in the decision with a very low level of competence in the decision area, the inservice need for this area is very high.

--Perceptions of the board member's involvement in making the decision in a construction management project

The responses in this area indicate a moderately low level of involvement with 14.3% of the board members responding in the category "Made Decision," and 33.3% of the board representatives, 50% of the board members and 33.3% of the project architects responded in the category "Input Decision." However, 66.7% of the board representatives, 35.7% of the board members and 66.7% of the project architects indicated that the board members had no involvement in this decision (see Figure 26B).

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence was indicated with only 50% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 50% of the board members and 100% of the project architects indicated that the board members lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 26B).

While the analysis of this part of the question indicates that board members are involved at a moderately low level, it also indicates that they are not qualified to make this decision. Therefore, a moderate need for inservice is identified in this area.

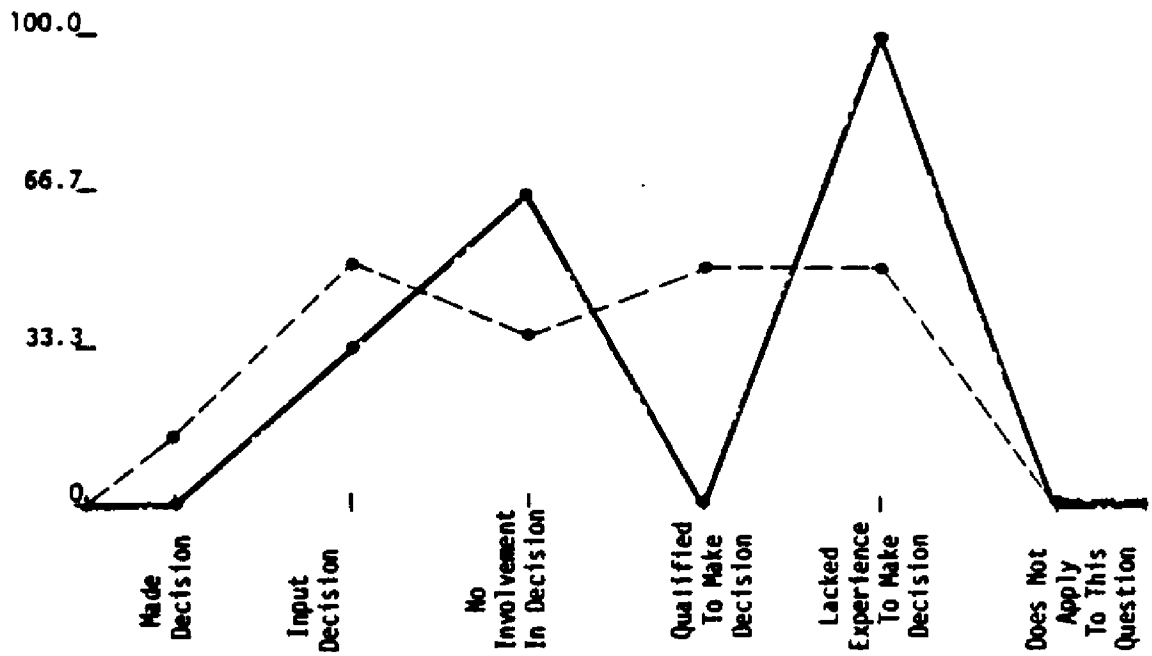

Figure 26B. Determining the type of heating, cooling and ventilation system to be used.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderate level of involvement was indicated in this area with 12.5% of the board members responding in the category "Qualified to Make Decision," and 33.3% of the board representatives, 62.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." 66.7% of the board representatives, 25.5% of the board members and 66.7% of the project architects indicated that the board representatives were not involved in this decision (see Figure 26C).

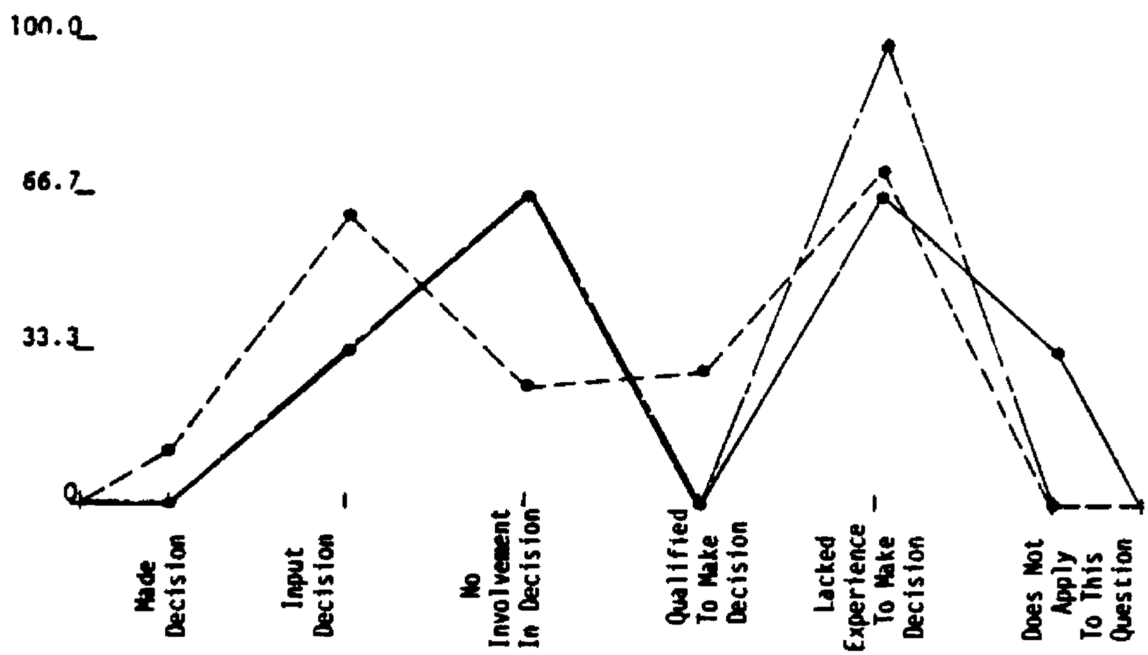

Figure 26C. Determining the type of heating, cooling and ventilation system to be used.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A very low level of competence is indicated in this area with only 28.6% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71.4% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 26C).

When the moderate level of involvement in the decision is paired with the low level of competence which is indicated, the analysis of this question points to the need for inservice of this decision area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

A moderately high level of involvement is indicated in this area with 33.3% of the board representatives and 37.5% of the board members responding in the category "Made Decision," and 33.3% of the board representatives, 37.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." 33.3% of the board representatives, 25.5% of the board members and 66.7% of the project architects indicated that the board members had no involvement in this decision (see Figure 26D).

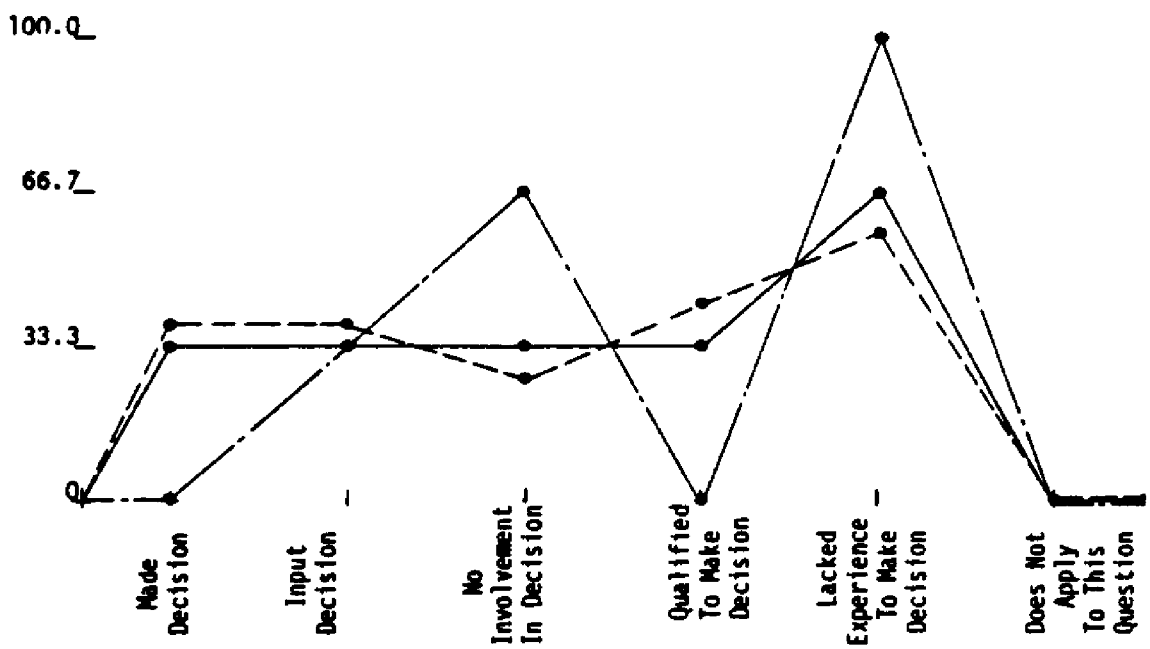

Figure 26D. Determining the type of heating, cooling and ventilation system to be used.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A low level of competence is indicated in this area with only 33.3% of the board representatives and 42.9% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 57.1% of the board members and 100% of the project architects indicated that the board members lacked the experience necessary to make this decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 26D).

The analysis of this part of the question indicates that board members are involved at a moderately high level in this decision but that they have a moderately low level of competence in the area; therefore, the need for inservice is identified.

Decision # 27 - Determining the Design Production Schedule

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A low level of involvement is indicated in this area with no response in the category "Made Decision" and only 33.3% of the board representatives and 61.5% of the board members responding in the category "Input Decision." 66.7% of the board representatives, 38.5% of the board members and 100% of the project architects responded in the category "No Involvement in Decision (see Figure 27A).

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A very low level of competence is indicated in this area with only 33.3% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 66.7% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 27A).

The analysis of this part of the question indicates that while board members have a low level of competence in this decision area they also have a low level of involvement; therefore, no need for inservice is identified.

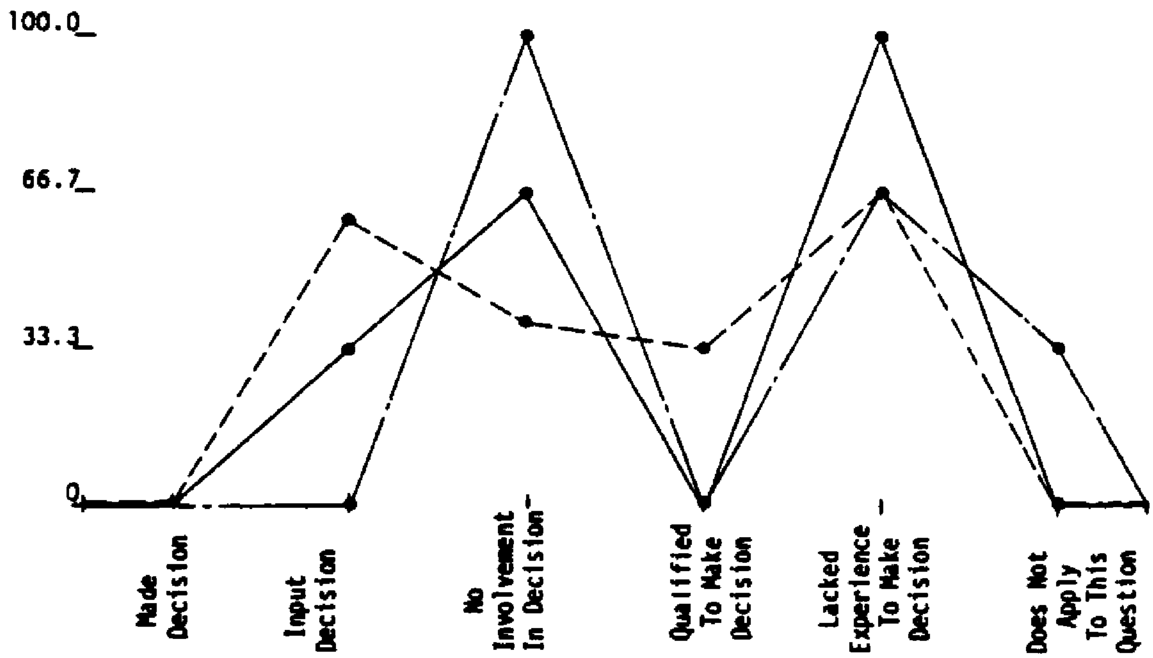

Figure 27A. Determining the design production schedule.

--Perceptions of the board members' level of involvement in making the decision in a construction management project

A moderate level of involvement is indicated in this area with 7.7% of the board members responding in the category "Qualified to Make Decision," and 33.3% of the board representatives, 53.8% of the board members and 33.3% of the project architects responding in the category "Input Decision." 56.7% of the board representatives, 38.5% of the board members and 66.7% of the project architects indicated that the board members had no involvement in the decision (see Figure 27B).

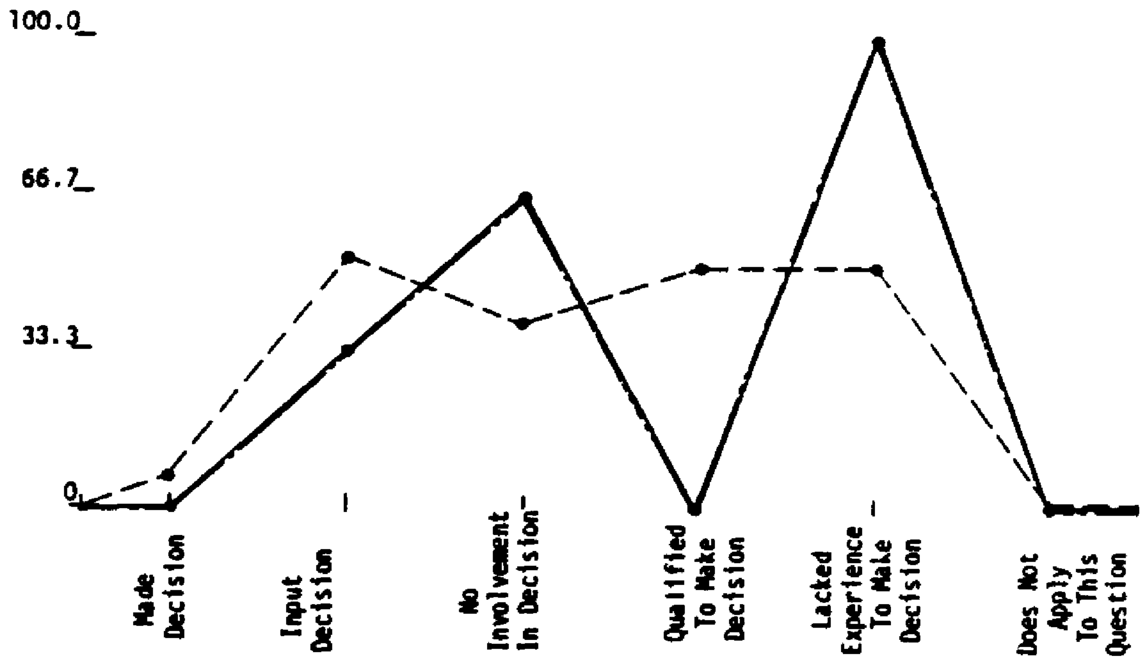

Figure 27B. Determining the design production schedule.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A low level of competence is indicated in this area with only 50% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 50% of the board members and 100% of the project architects indicated that the board members lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for the question (see Figure 27B).

The analysis of this question indicates a need for inservice based on the moderate level of involvement of board members in this decision when paired with their low level of qualification in this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A moderately low level of involvement is indicated in this area with no responses in the category "Made Decision" and 33.3% of the board representatives, 62.5% of the board members and 33.3% of the project architects responding in the category "Input Decision." 66.7% of the board representatives, 37.5% of the board members and 66.7% of the project architects responded in the category "No Involvement in Decision (see Figure 27C).

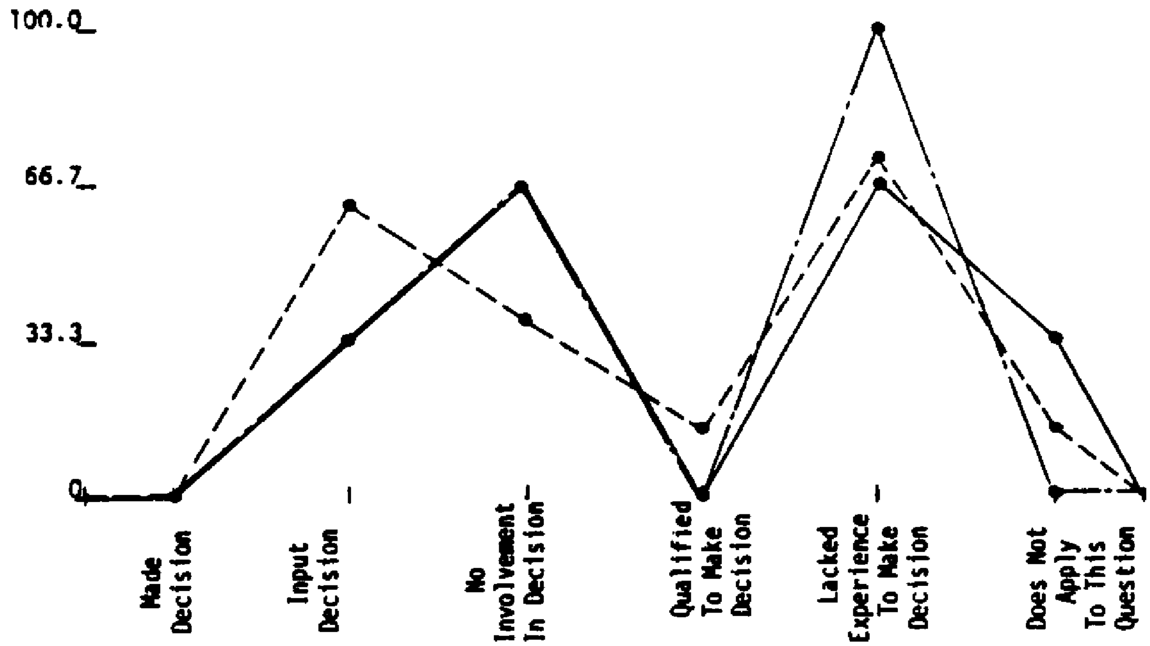

Figure 27C. Determining the design production schedule.

--Perceptions of board representatives' level of competence in making the decision in a traditional construction project

A very low level of competence is indicated with only 14.3% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 71.4% of the board members and 100% of the project architects indicated that the board representatives lacked the experience necessary in this area to make the decision. 33.3% of the board representatives and 14.3% of the board members indicated that the category "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 27C).

While the board representatives are perceived to be involved at a moderately low level, the analysis of this question supports a moderate need for inservice because of the low level of competence which is indicated in this decision area.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

A low level of involvement is indicated in this area with no responses in the category "Made Decision," and 66.7% of the board representatives, 28.6% of the board members and 33.3% of the project architects responding in the category "Input Decision." 33.3% of the board representatives, 71.4% of the board members and 66.7% of the project architects indicated that the board members were not involved in this decision (see Figure 27D).

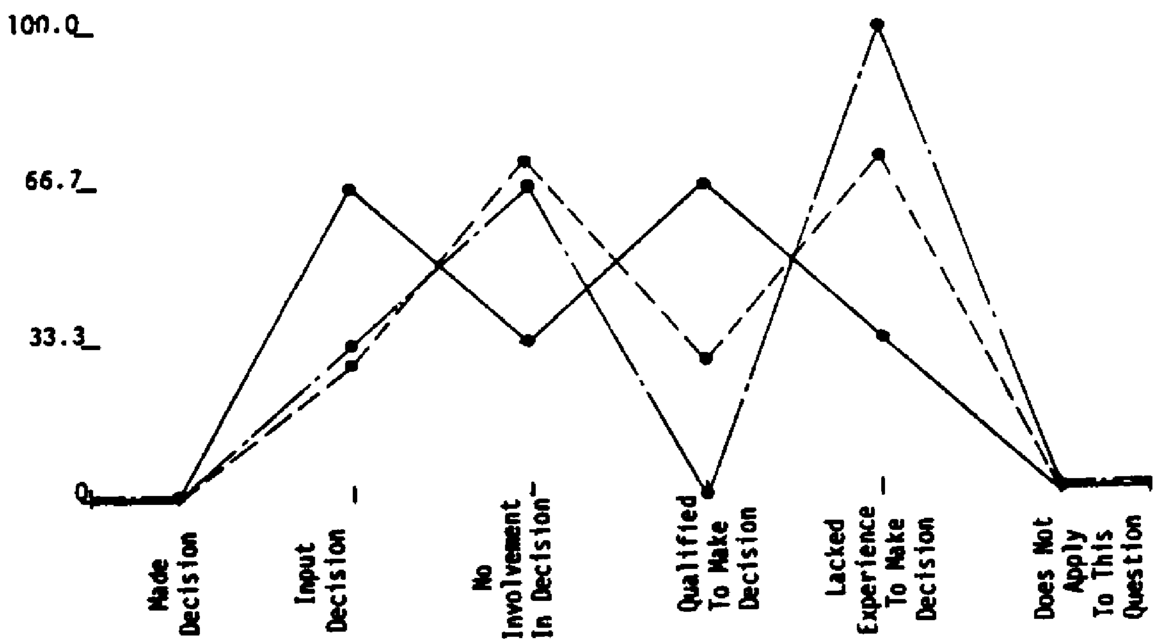

Figure 27D. Determining the design production schedule.

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A moderately low level of competence is indicated in this area with 66.7% of the board representatives and 28.6% of the board members responding in the category "Qualified to Make Decision." 33.3% of the board representatatives, 71.4% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 27D).

When the low level of involvement in this decision is paired with the low level of competence, the analysis indicates a very low need for inservice in this decision area.

Decision # 28 - Determining Both the Arrangement and the Spacial Requirements for the Mechanical Equipment

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A moderate level of involvement is indicated in this area with 33.3% of the board members responding in the category "Made Decision," and 33.3% of the board representatives, 50% of the board members and 33.3% of the project architects responding in the category "Input Decision." 66.7% of the board representatives, 16% of the board members and 66.7% of the project architects indicated that the board representatives had no involvement in this decision (see Figure 28A).

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately low level of competence is indicated in this area with 75% of the board members responding in the category "Qualified to

Make Decision," while 100% of the board representatives, 25% of the board members and 66.7% of the project architects indicated that the board representatives lacked the experience necessary to make this decision. 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 28A).

The analysis of this portion of the question indicates a moderate level of involvement on the part of the board representatives with a moderately low level of competence in this decision area. Therefore, a moderate need for inservice is identified.

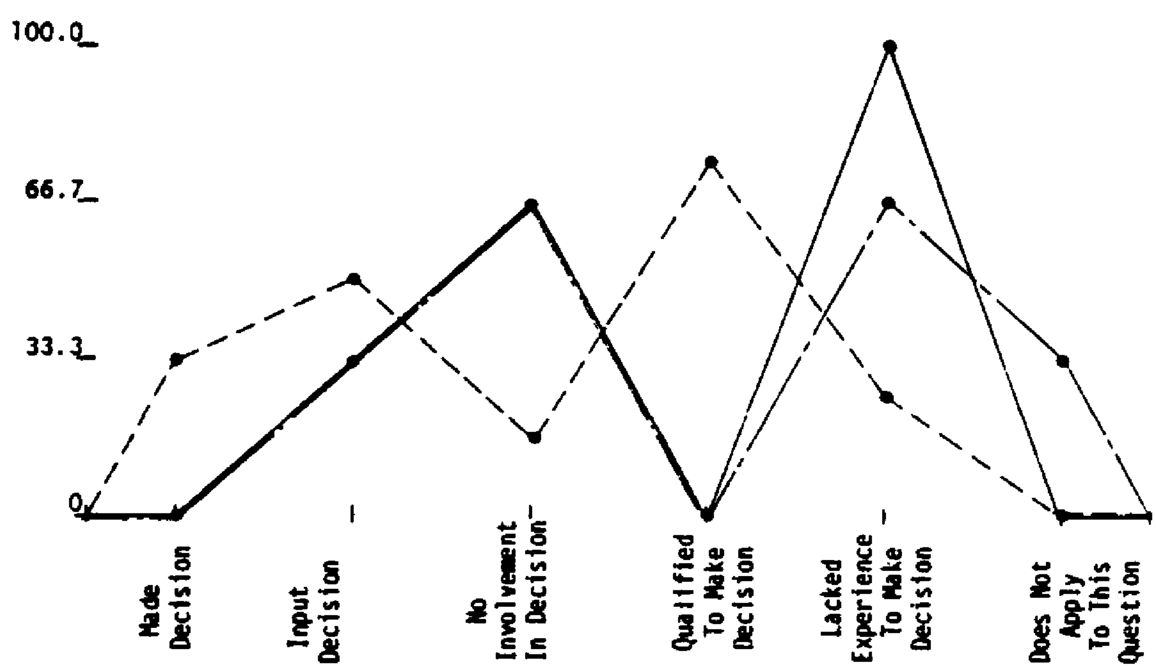

Figure 28A. Determining both the arrangement and the spacial requirements for the mechanical equipment.

--Perceptions of the board members' level of involvement in making the decision in a construction management project

The responses in this area indicate a very low level of involvement with only 7.1% of the board members responding in the category "Made Decision" and 28.6% of the board members responding in the category "Input Decision." 100% of the board representatives, 64.3% of the board members and 100% of the project architects indicated that the board members had no involvement in the decision (see Figure 28B).

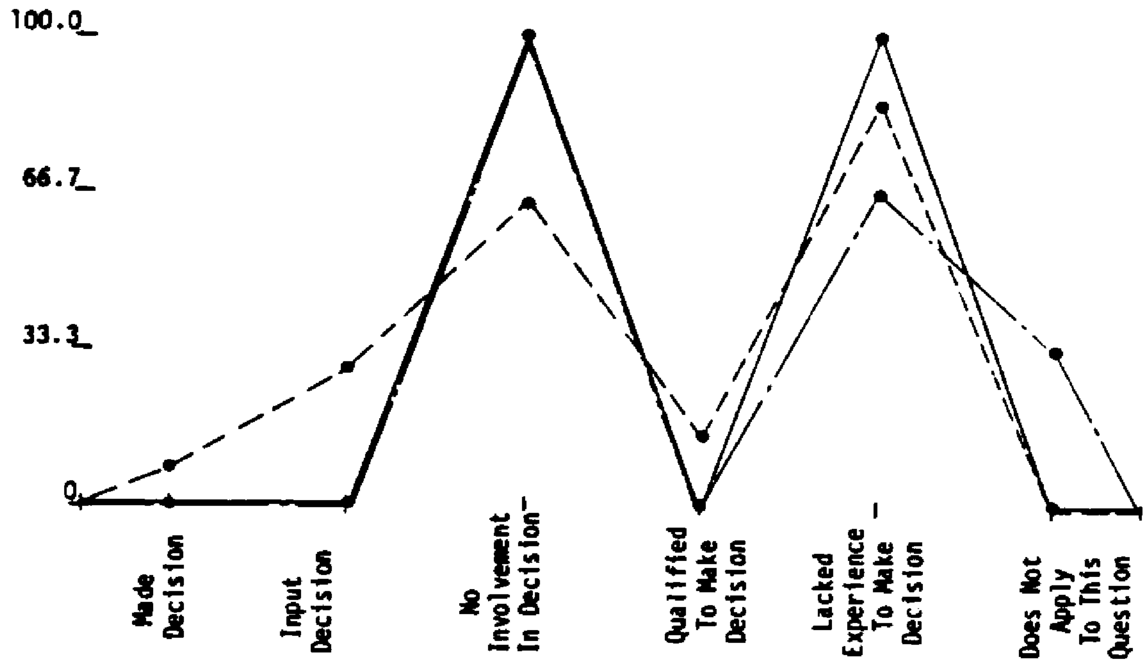

Figure 28B. Determining both the arrangement and the spacial requirements for the mechanical equipment.

--Perceptions of the board members' level of competence in making the decision in a construction management project

A very low level of competence is indicated in this area with only 14.3% of the board members responding in the categegory "Qualified to Make Decision," while 100% of the board representatives, 85.7% of the board members and 66.7% of the project architects indicated that the board members lacked the experience necessary to make the decision. 33.3% of the project architects indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 28B).

The analysis of this part of the question indicates that while board members have a low level of involvement in this decision they also lacked the experience necessary to make the decision. This probably indicates that this decision should be the primary responsibility of the architectural and engineering community; therefore, no need for inservice is indicated.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional construction project

A very low level of involvement is indicated in this area with no responses in the category "Made Decision," and only 33.3% of the board representatives and 37.5% of the board members responding in the category "Input Decision." 66.7% of the board representatives, 62.5% of the board members and 100% of the project architects responded in the category "No Involvement in Decision" (see Figure 28C).

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

An extremely low level of competence is indicated with only 14.3% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 85.7% of the board members and 100% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." 33.3% of the board representatives indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 28C).

The analysis of this part of the question indicates both a low level of involvement and a low level of qualification. Therefore, this decision probably should remain the primary responsibility of the architectural and engineering community. Thus, no need for inservice is identified.

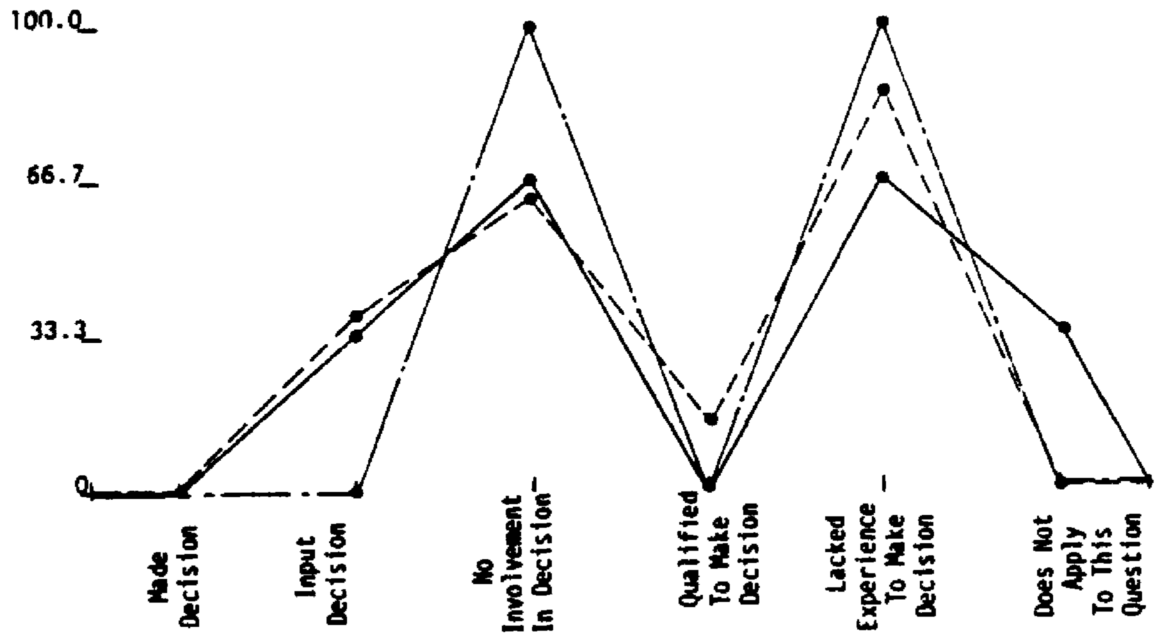

Figure 28C. Determining both the arrangement and the spacial requirements for the mechanical equipment.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

An extremely low level of involvement is indicated with no responses in the category "Made Decision" and only 12.5% of the board members responding in the category "Input Decision." 100% of the board representatives, 87.5% of the board members and 100% of the project architects indicated that the board members had no involvement in this decision (see Figure 28D).

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

An extremely low level of competence is indicated in this area with only 14.3% of the board members responding in the category "Qualified to Make Decision," while 66.7% of the board representatives, 85.7% of the board members and 100% of the project architects indicated that the board members lacked the experience necessary to make the decision. 33.3% of the board representatives felt that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were inappropriate for this question (see Figure 28D).

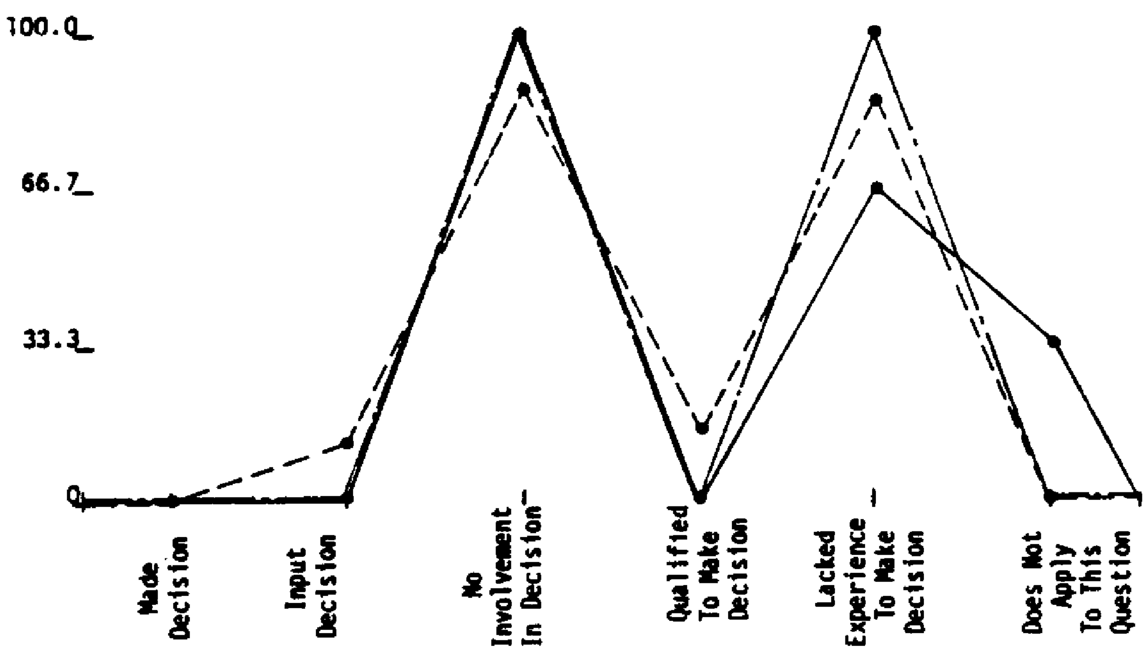

Figure 28D. Determining both the arrangement and the spacial requirements for the mechanical equipment.

The analysis of this part of the question indicates that this decision area should be the primary responsibility of the architectural and engineering community based on the low level of involvement which is indicated and the low level of competence which is perceived; therefore, no inservice needs are identified.

Decision # 29 - Determining the Outline Specifications for the Architectural Portion of the Building Design

--Perceptions of the board representatives' level of involvement in making the decision in a construction management project

A very high level of involvement is indicated in this area with 33.3% of the board representatives, 8.3% of the board members and 33.3% of the project architects responding in the category "Made Decision," and 33.3% of the board representatives, 91.7% of the board members and 33.3% of the project architects responding in the category "Input Decision." Only 33.3% of the board representatives and 33.3% of the project architects indicated that the board representatives were not involved in this decision (see Figure 29A).

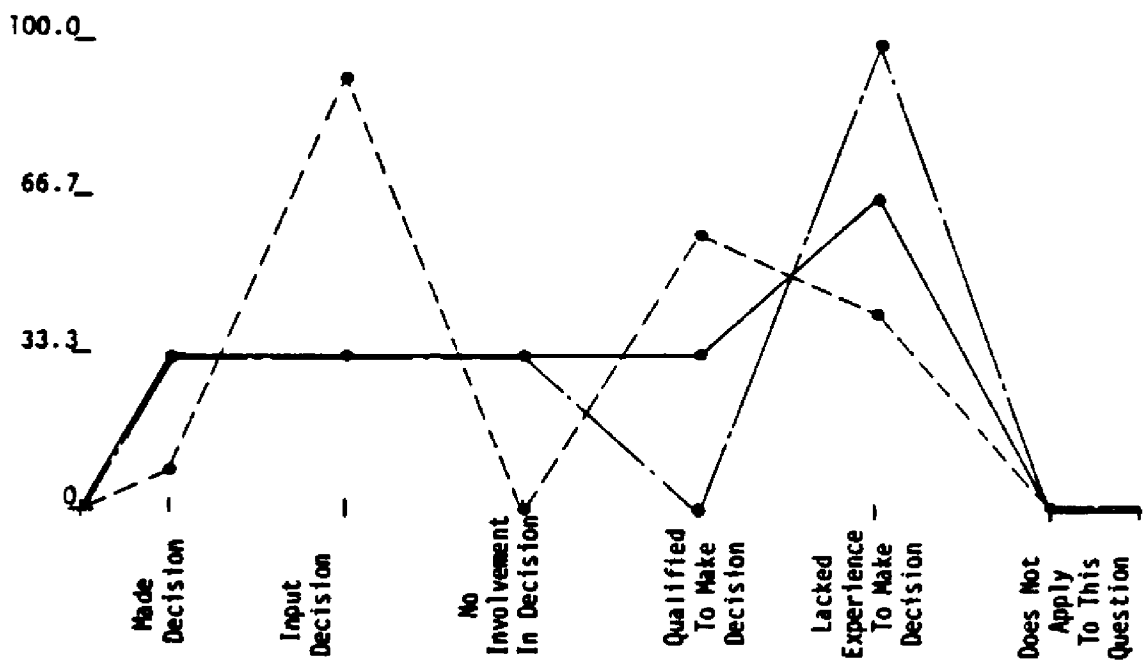

Figure 29A. Determining the outline specifications for the architectural portion of the building design

--Perceptions of the board representatives' level of competence in making the decision in a construction management project

A moderately low level of competence is indicated in this area with only 33.3% of the board representatives and 58.3% of the board members responding in the category "Qualified to Make Decision," while

66.7% of the board representatives, 41.7% of the board members and 100% of the project architects indicated that the board representatives lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked the Experience Necessary to Make Decision" were appropriate for this question (see Figure 29A).

The analysis of this part of the question indicates a very high level of involvement in the decision with a moderately low level of competence perceived. Therefore, a need for inservice is identified for this decision area.

--Perceptions of the board representatives' level of involvement in making the decision in a contruction management project

A mdoerately low level of involvement is indicated in this area with only 7.1% of the board members responding in the category "Qualified to Make Decision," while 57.1% of the board members and 66.7% of the project architects responded in the category "Input Decision." 100% of the board representatives, 35.7% of the board members and 33.3% of the project architects responded in the category "No Involvement in Decision" (see Figure 29B).

--Perceptions of the board members' level of competence in making the decision in a contruction management project

An extremely low level of competence is indicated in this area with only 21.4% of the board members responding in the category "Qualified to Make Decision," while 100% of the board representatives, 78.6% of the board members and 100% of the project architects indicated that the board members lacked the experience necessary to make this decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 29B).

While the analysis of this question indicates a moderately low level of involvement in the decision, because of the extreme low level of competence which is indicated, a moderate need for inservice is identified.

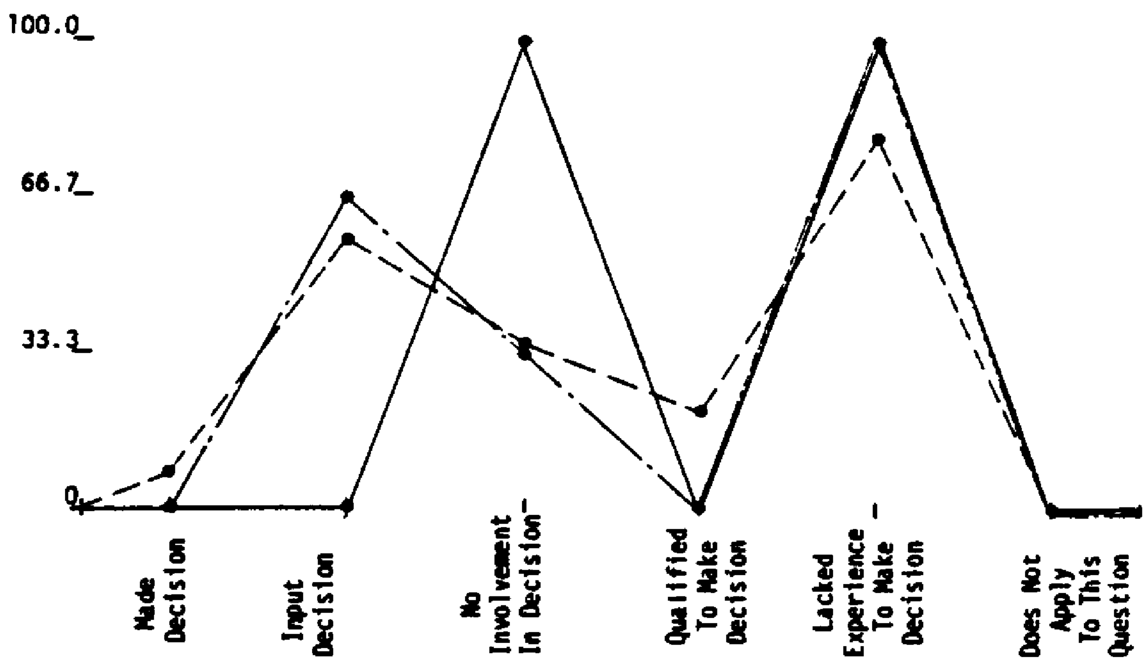

Figure 29B. Determining the outline specifications for the architectural portion of the building design.

--Perceptions of the board representatives' level of involvement in making the decision in a traditional contruction project

A moderately high level of involvement is indicated in this area with 12.5% of the board members responding in the category "Made Decision" and 66.7% of the board representatives, 37.5% of the board members and 66.7% of the project architects responding in the category "Input Decision." 33.3% of the board representatives, 50% of the board members and 33.3% of the project architects indicated that the board representatives had no involvement in the decision (see Figure 29C).

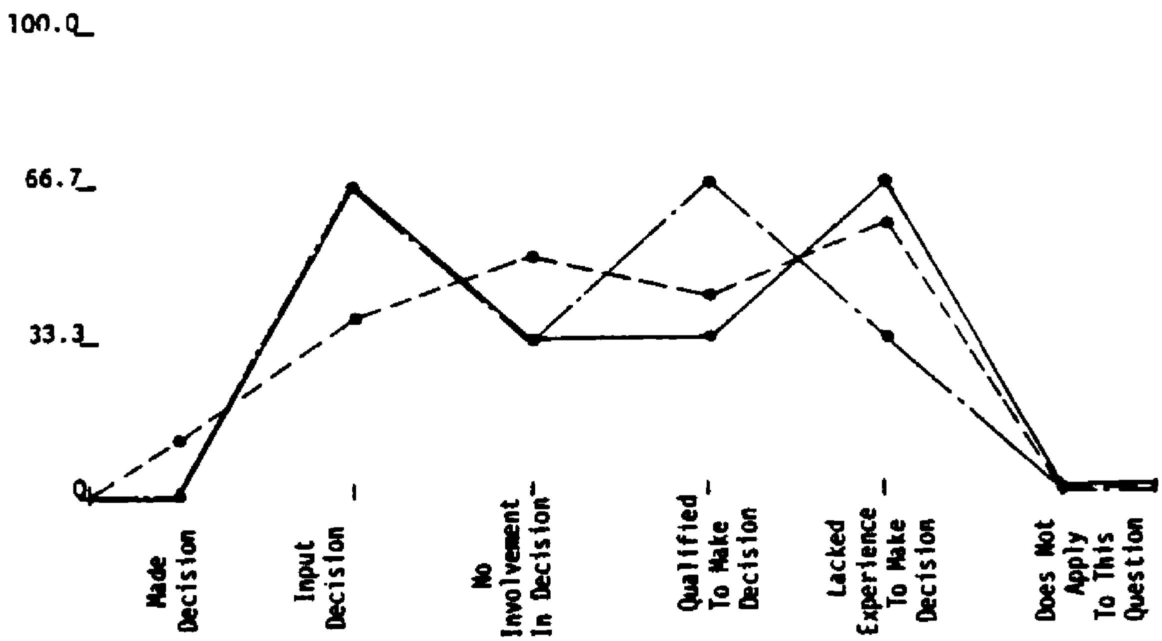

Figure 29C. Determining the outline specifications for the architectural portion of the building design.

--Perceptions of the board representatives' level of competence in making the decision in a traditional construction project

A moderately high level of competence is indicated with 33.3% of the board representatives, 42.9% of the board members and 66.7% of the project architects responding in the category "Qualified to Make Decision." 66.7% of the board representatives, 57.1% of the board members and 33.3% of the project architects indicated that the board representatives lacked the experience necessary to make the decision. All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 29C).

The analysis of this part of the question indicates both a moderately high level of involvement in the decision and a moderately high level of competence in the decision area; therefore, little need for inservice is established.

--Perceptions of the board members' level of involvement in making the decision in a traditional construction project

A high level of involvement is indicated in this area with 33.3% of the board representatives responding in the category "Made Decision" and 33.3% of the board representatives, 37.5% of the board members and 100% of the project architects responding in the category "Input Decision." Only 33.3% of the board representatives and 62.5% of the board members responded in the category "No Involvement in Decision" (see Figure 29D).

--Perceptions of the board members' level of competence in making the decision in a traditional construction project

A moderately low level of competence is indicated in this area with onyl 33.3% of the board representatives, 28.6% of the board members and 33.3% of the project architects responding in the category "Qualified to Make Decision." 66.7% of the board representatives, 71.4% of the board members and 66.7% of the project architects responded in the category "Lacked Experience Necessary to Make Decision." All of the respondents indicated that the categories "Qualified to Make Decision" and "Lacked Experience Necessary to Make Decision" were appropriate for this question (see Figure 29D).

The analysis of this part of the question indicates a high level of involvement in the decision with a moderately low level of competence in the decision area. Therefore, a need for inservice is identified.

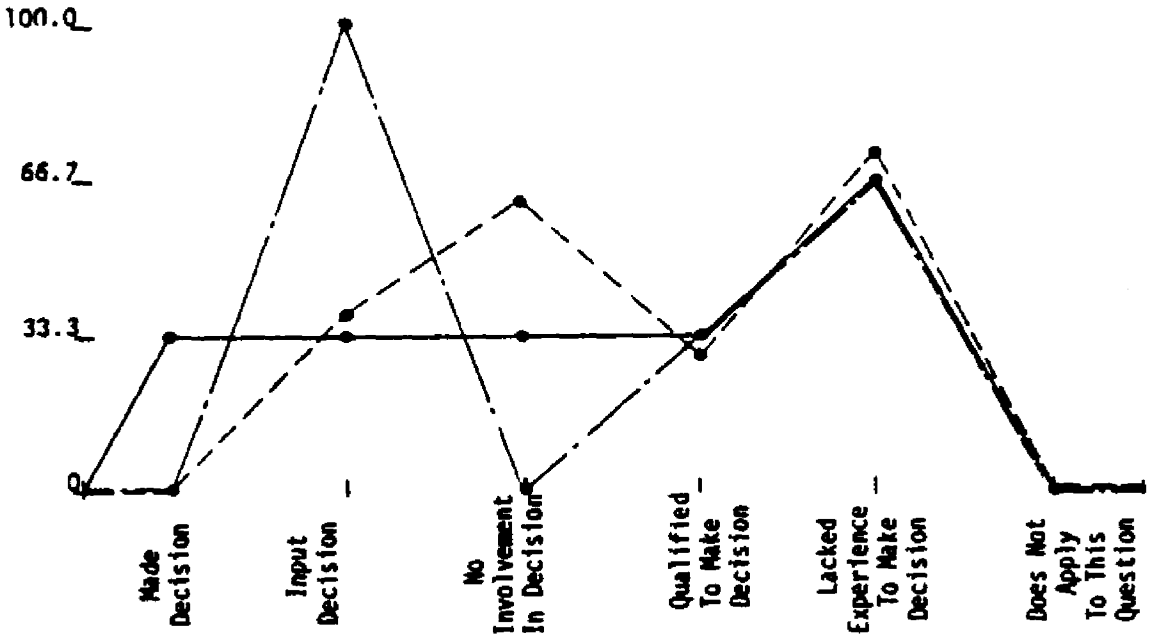

Figure 29D. Determining the outline specifications for the architectural portion of the building design.

Part II

The following legend will be used for the graphs presented in Part II.

Legend:

Construction Management ____________

Traditional Construction - - - - - - -

Decision # 1 - Determining the Space Relationships in Flow Diagrams

--Comparative perceptions of the board representatives' level of involvement in decision-making in construction management projects versus traditional construction projects

Both populations of board representatives perceived the identical level of involvement in this decision; however, the board representatives involved in the traditional approach indicated a higher level of perceived qualification than did the board representatives involved with the construction management projects (see Figure 1E).

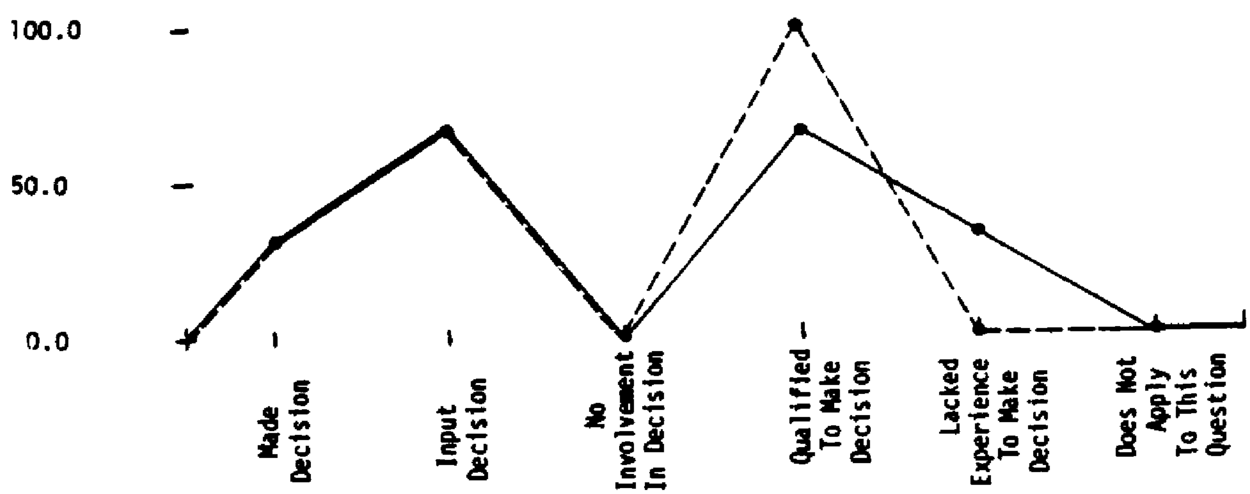

Figure 1E. Determining the space relationships in flow diagrams.

Board members involved in construction management projects perceived their representatives' level of involvement as slightly higher than did those board members involved in the traditional approach. They also perceived that their representatives were more qualified to make the decision than the board members in the traditional projects (see Figure 1F).

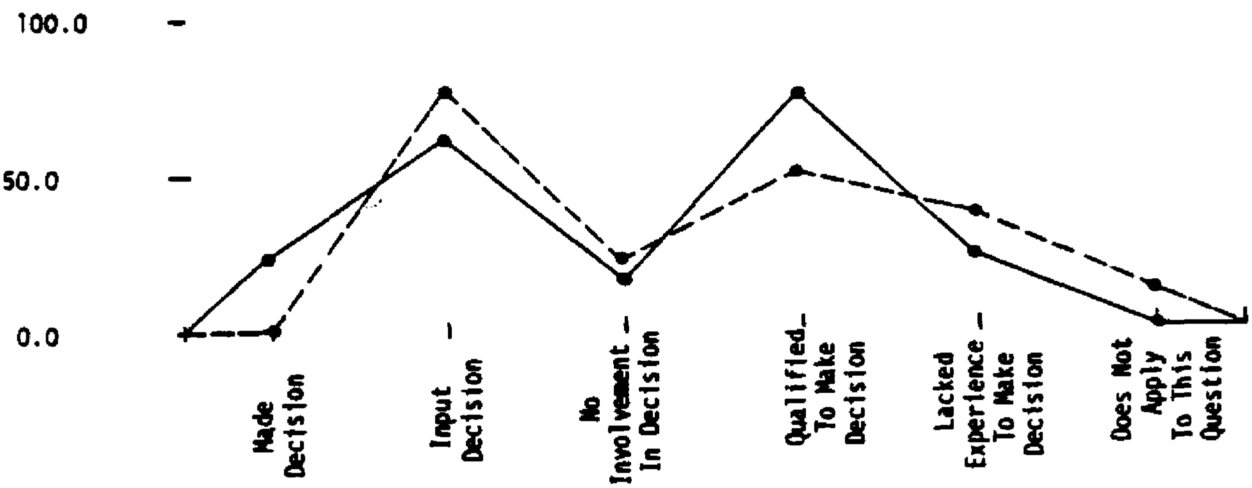

Figure 1F. Determining the space relationships in flow diagrams.

The project architects involved in the traditional projects perceived that the owner's representatives had a higher level of involvement than did the project architects involved in the construction management projects. They also felt that the board representatives involved in the traditional projects were much more qualified than did the project architects working with board representatives in the construction management projects (see Figure 1G).

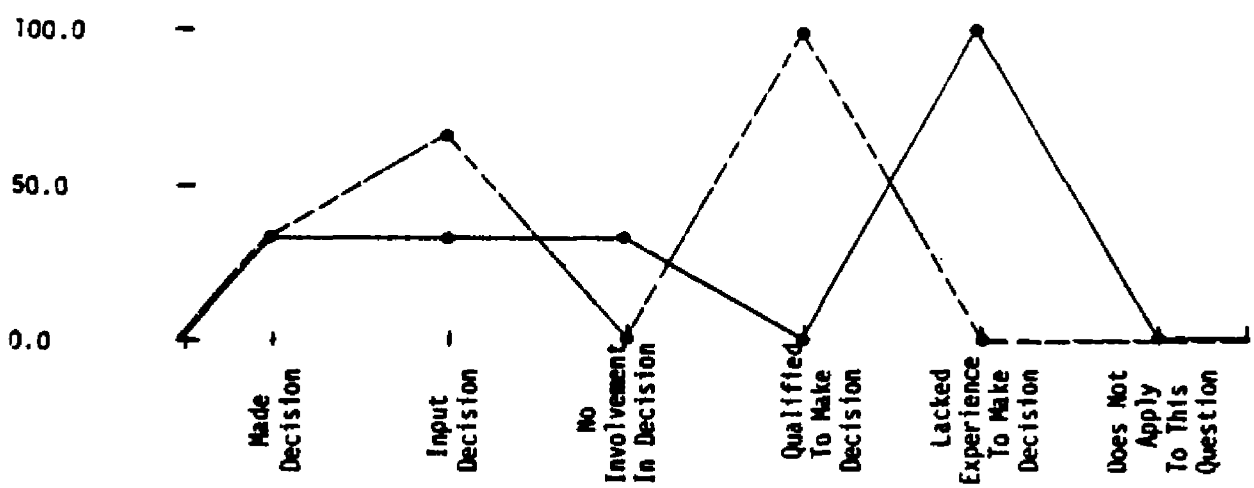

Figure 1G. Determining the space relationships in flow diagrams.

--Comparative perceptions of the board members level of responsibility in decision-making in construction management projects versus traditional construction projects

Board representatives in both the construction management projects and the traditional projects agreed on the level of their board members' involvement in the decision-making process. However, the board representatives involved in the traditional projects viewed their boards as more qualified to make the decisions than did the representatives involved in the construction management project (see Figure 1H).

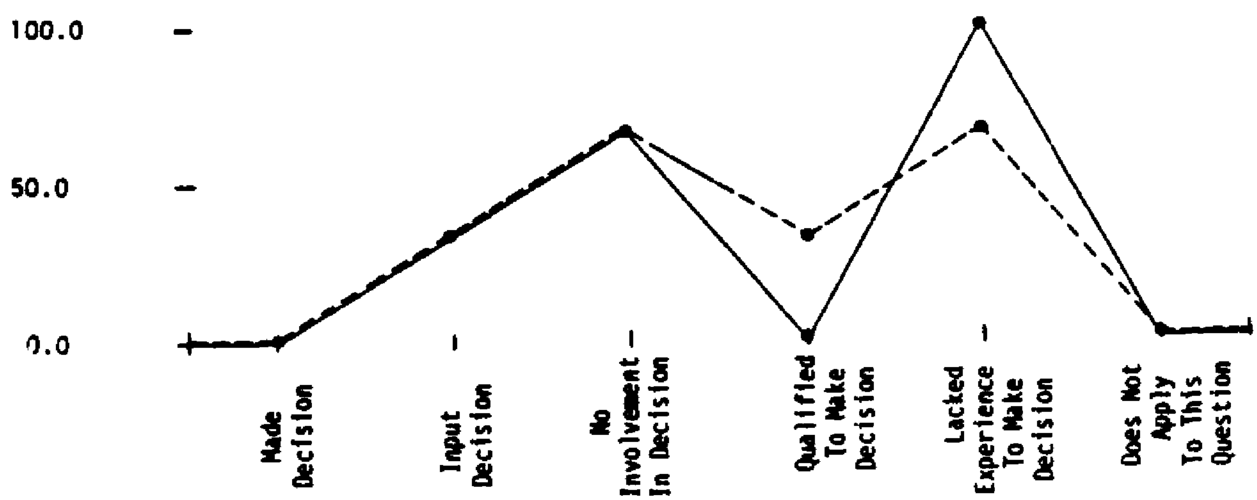

Figure 1H. Determining the space relationships in flow diagrams.

Board members of traditional projects perceived themselves as slightly more involved in decision-making than did board members of construction management projects. The traditional board members also perceived themselves as much more qualified to make the decisions than did the board members of the construction management projects (see Figure 1I).

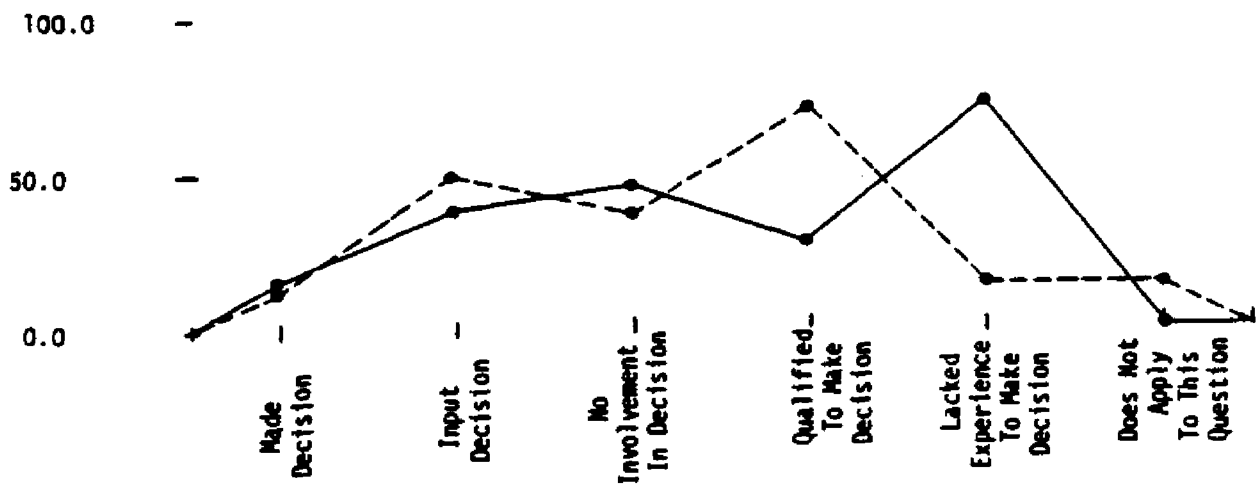

Figure 1I. Determining the space relationships in flow diagrams.

Project architects involved in construction management projects perceived the board members as having a higher level of involvement in the decision-making process than did architects involved in the traditional construction projects. However, the project architects involved in traditional construction projects viewed their board members as more qualified than did the project architects involved in the construction management projects (see Figure 1J).

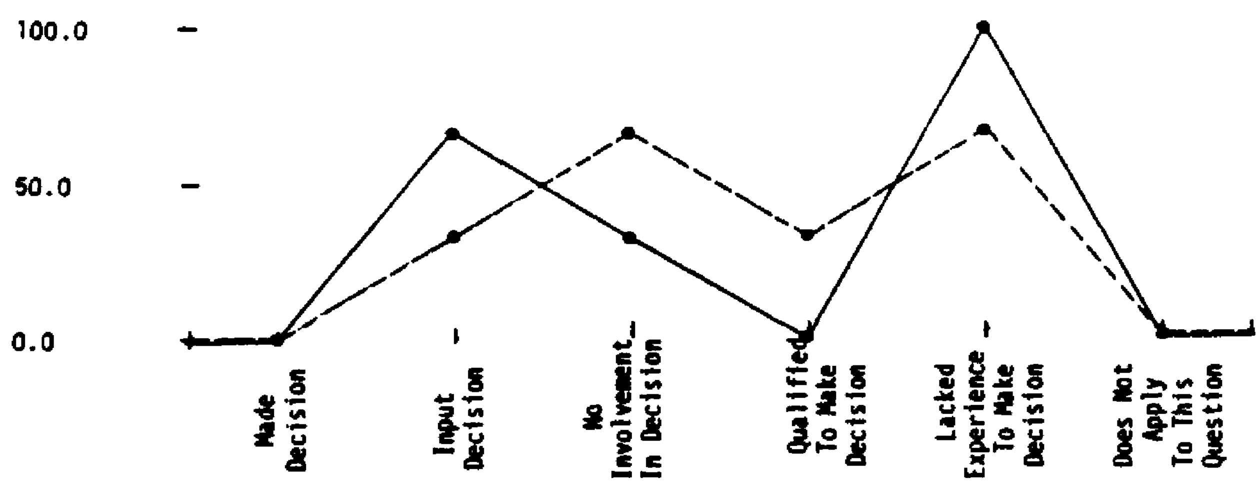

Figure 1J. Determining the space relationships in flow diagrams.

The perceptions of the respondents tend to indicate a slightly higher level of involvement on the part of the board representatives involved in traditional projects. They tend to indicate that those representatives are more qualified to participate in the decision-making process. On the other hand, the respondents indicated that the board members involved in the construction management projects have a greater level of involvement than do the board members involved in the traditional projects while at the same time identifying those board members as less qualified to make those decisions than the board members involved in the traditional projects.

Decision # 2 - Selecting the site

--Comparative perceptions of the board representatives' level of involvement in making the decision in construction management projects versus traditional construction projects

The board representatives participating in traditional construction projects perceived themselves as having more involvement in making the decision than did those board representatives involved in the construction management projects. The board representatives involved in the traditional construction projects also perceived themselves as being much more qualified to make the decision than did those board representatives involved in the construction management projects (see Figure 2E).

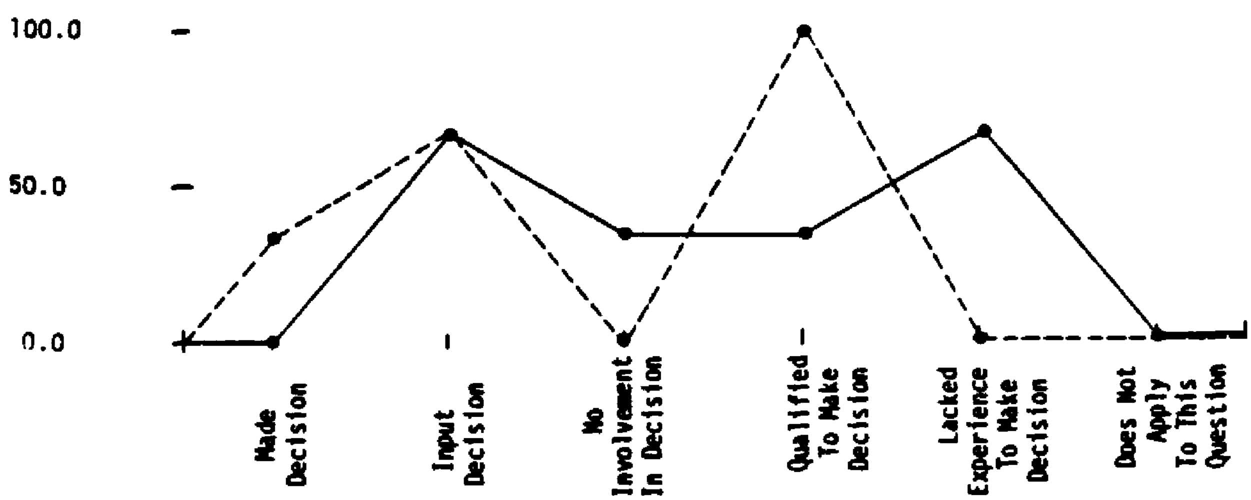

Figure 2E. Selecting the site.

Board members involved in traditional construction projects viewed their representatives as having slightly higher levels of involvement in making the decision than did board members involved in the construction management projects. They also perceived that their representatives were slightly higher qualified to make the decision than did board members involved in the construction management projects (see Figure 2F).

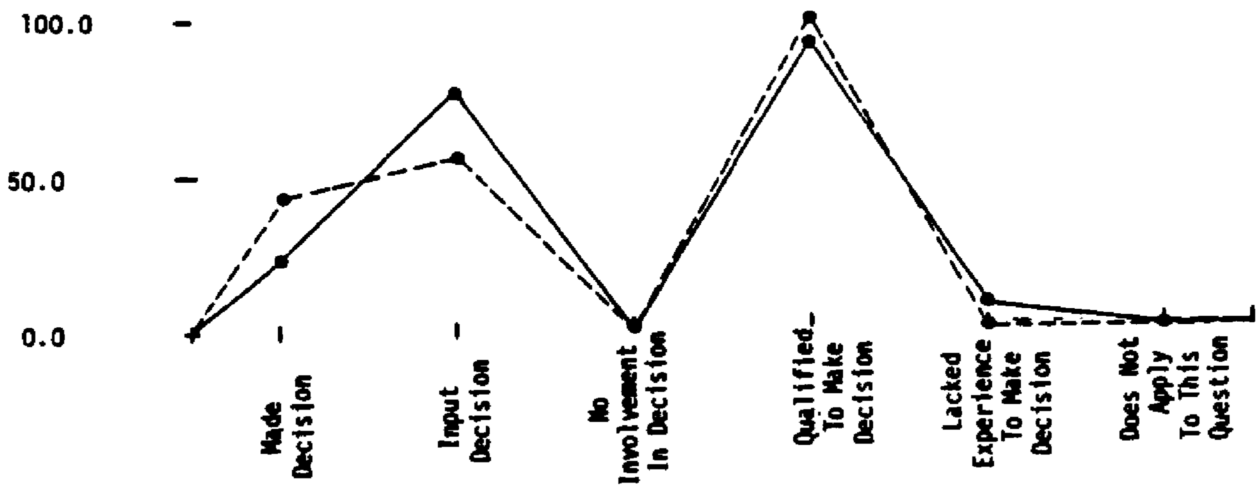

Figure 2F. Selecting the site.

The project architects involved in traditional construction projects perceived the board representatives as having a much higher level of involvement in making the decision than did project architects involved in the construction management projects. However, both populations agreed that their board representatives were highly qualified to make the decision (see Figure 2G).

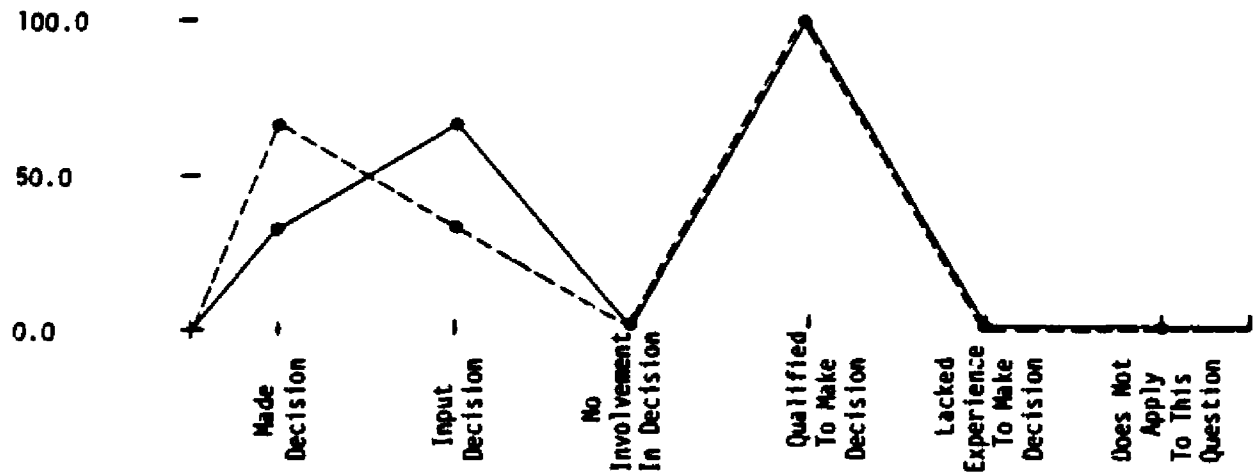

Figure 2G. Selecting the site.

An analysis of this part of the question indicates clearly the board representatives involved in traditional construction projects are perceived to have a higher level of involvement in making the decision and the board representatives involved in construction management projects were perceived as being somewhat more qualified to make the decision.

--Comparative perceptions of the board members' level of involvement in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects perceived their board members as having a lower level of involvement in making the decision than did board representatives involved in the traditional construction projects. However, board representatives involved in the traditional construction projects viewed their board members as having a lower level of competence in this decision area than did the board representatives involved in the construction management projects (see Figure 2H).

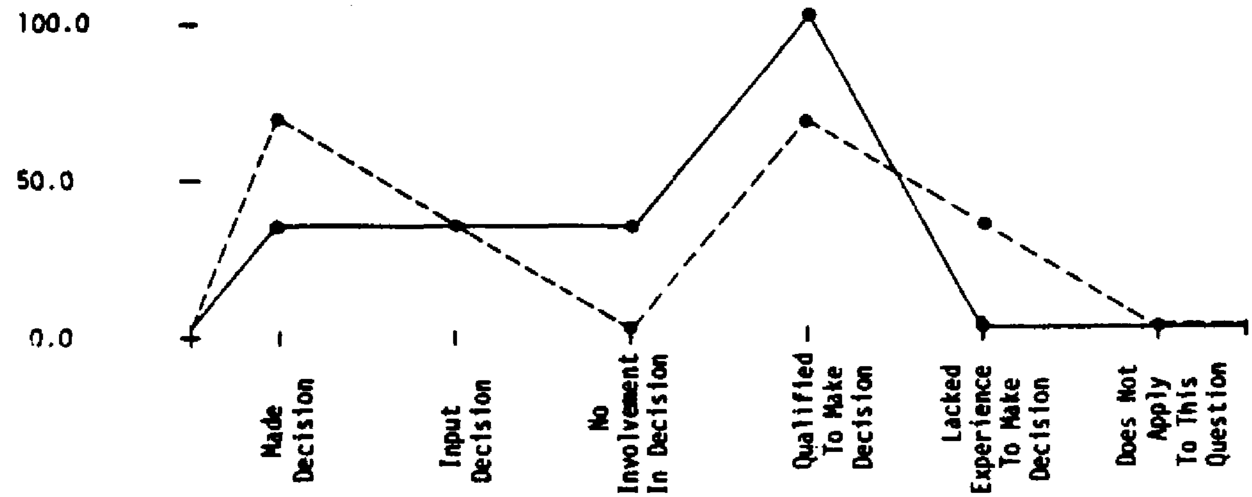

Figure 2H. Selecting the site.

Board members involved in traditional construction projects perceived themselves as having a slightly higher level of involvement in the decision than did board members involved in the construction management projects. Both populations, however, perceived themselves as highly qualified to make this decision (see Figure 2I).

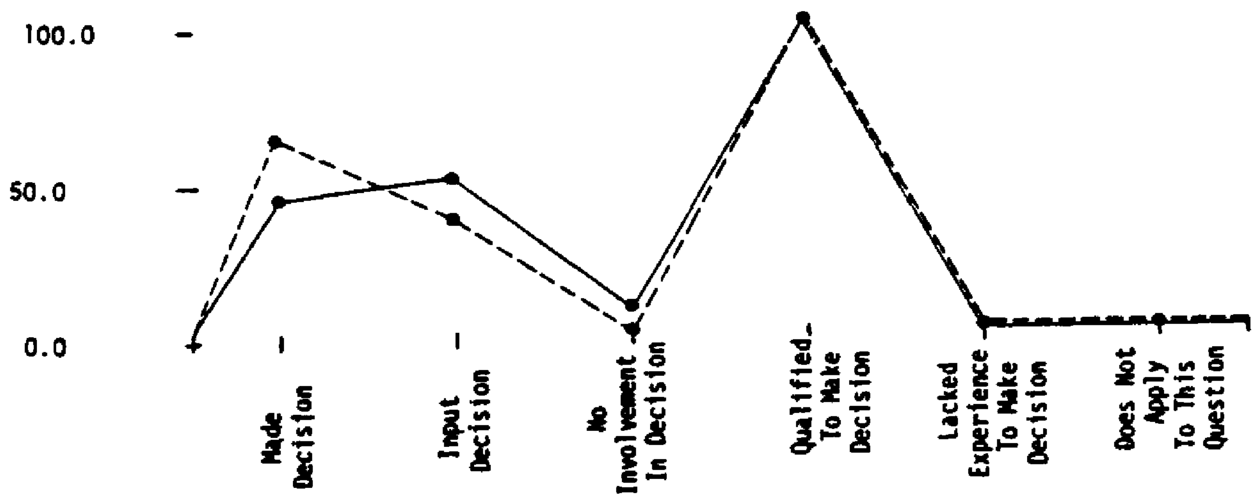

Figure 2I. Selecting the site.

Project architects involved in construction management projects, on the other hand, viewed their board members as having a higher level of involvement than did project architects involved in the traditional construction projects. Both populations agreed that the board members were highly qualified to make the decision (see Figure 2J).

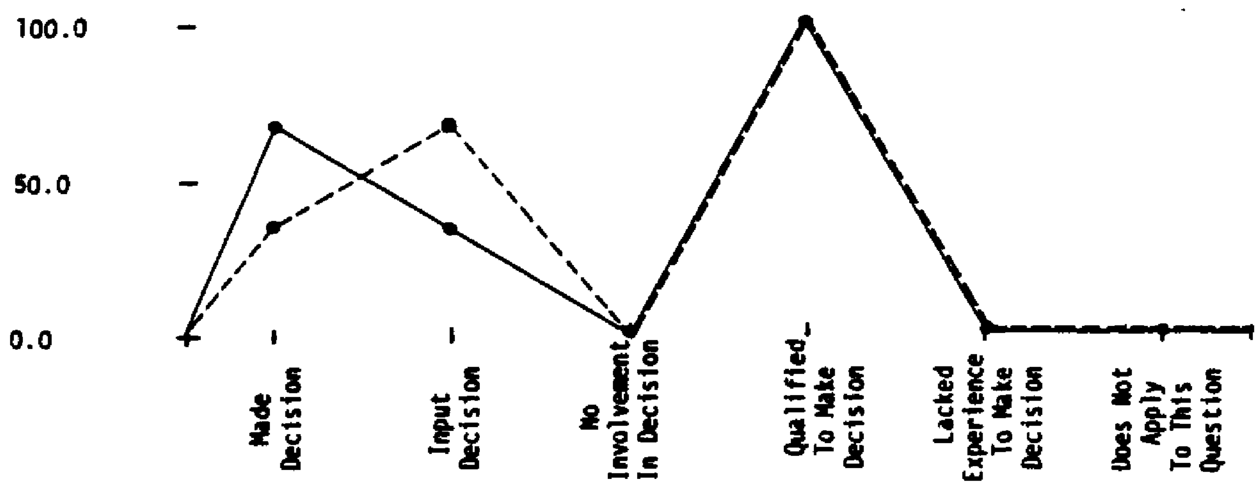

Figure 2J. Selecting the site.

An analysis of this part of the question is somewhat mixed with the board members involved in traditional construction projects being perceived as having a slightly higher level of involvement in making the decision and with the board members involved in the construction management projects being perceived as having a slightly higher level of competence in the decision area.

Decision # 3 - Determining Major Entrances

--Comparative perceptions of board representatives' level of involvement in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived themselves as being slightly more involved in making the decision than did the board representatives involved in the construction management pfojects. They also perceived themselves as being more qualified to make the decision than did board representatives involved in the construction management projects (see Figure 3E).

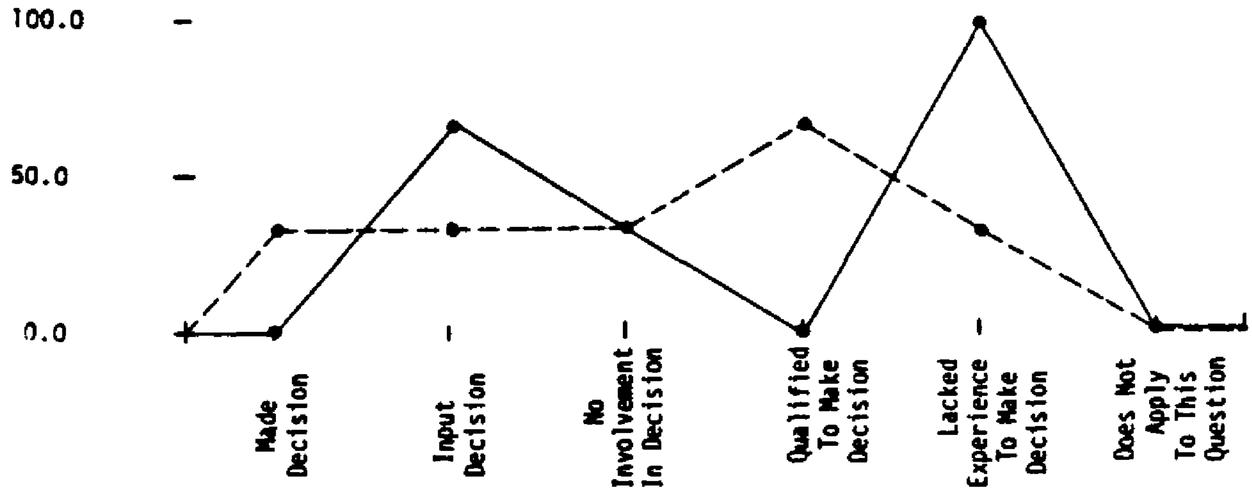

Figure 3E. Determining major entrances.

Board members involved in construction management projects perceived the board representatives as having a higher level of involvement in making the decision than did board members involved in traditional construction projects. They also perceived their board representatives as being more qualified to make the decisions than did board members involved in traditional construction projects (see Figure 3F).

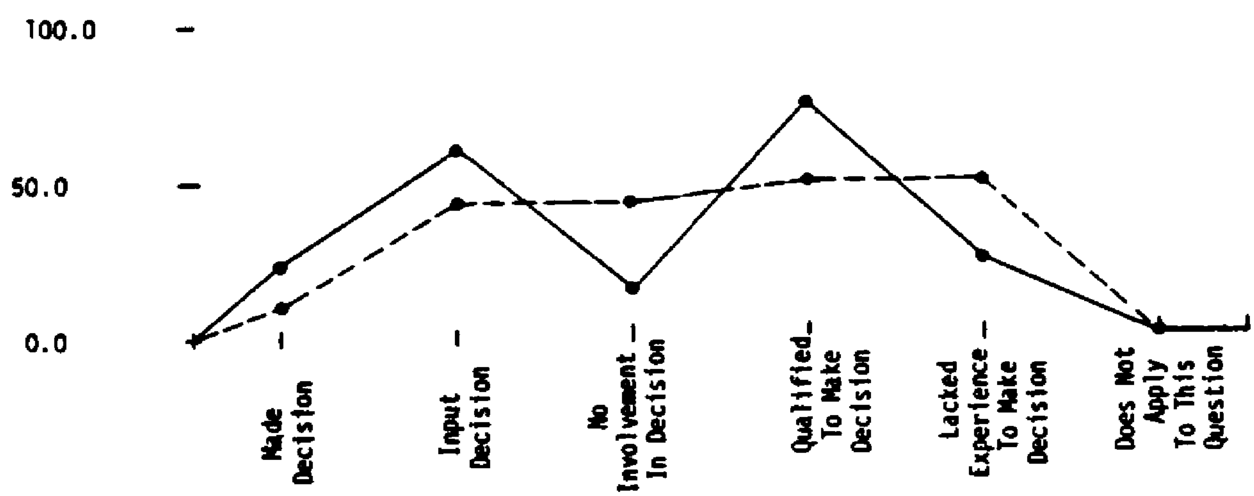

Figure 3F. Determining major entrances.

Project architects involved in construction management projects perceived their board representatives as having a higher level of involvement in the decision than did project architects involved in the traditional construction projects. The project architects involved in the construction management projects perceived their board representatives as being more qualified to make the decision than did project architects involved in the traditional construction projects.

An analysis of this part of the question would indicate that the board representatives in traditional projects perceived themselves as being slightly more involved in making the decision than did board representatives in the construction management project. Board members and project architects perceived the board representatives involved in the construction management projects as being more involved in making the decision. They also indicated that their board representatives were more qualified to make the decision than board representatives involved in traditional construction projects which is again in disagreement with the perceptions of the board representatives themselves (see Figure 3G).

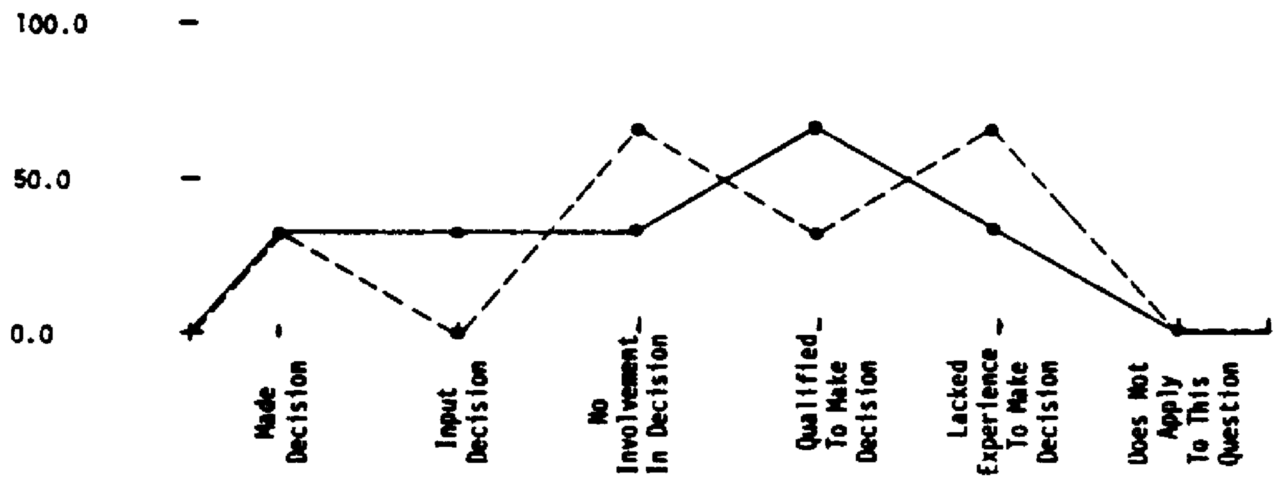

Figure 3G. Determining major entrances.

Therefore, it would appear that the board representatives involved in the construction management projects are perceived to have a greater overall involvement in the decision and to be more qualified to make the decision than board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of responsibility in making the decision in a construction management project versus a traditional construction project

Board representatives of construction management projects perceived the board members as having a higher level of involvement in the decision than did board representatives of traditional construction projects. However, the board representatives involved in traditional construction projects perceived their board members as being more qualified to make the decision than did board representatives involved in the construction management projects (see Figure 3H).

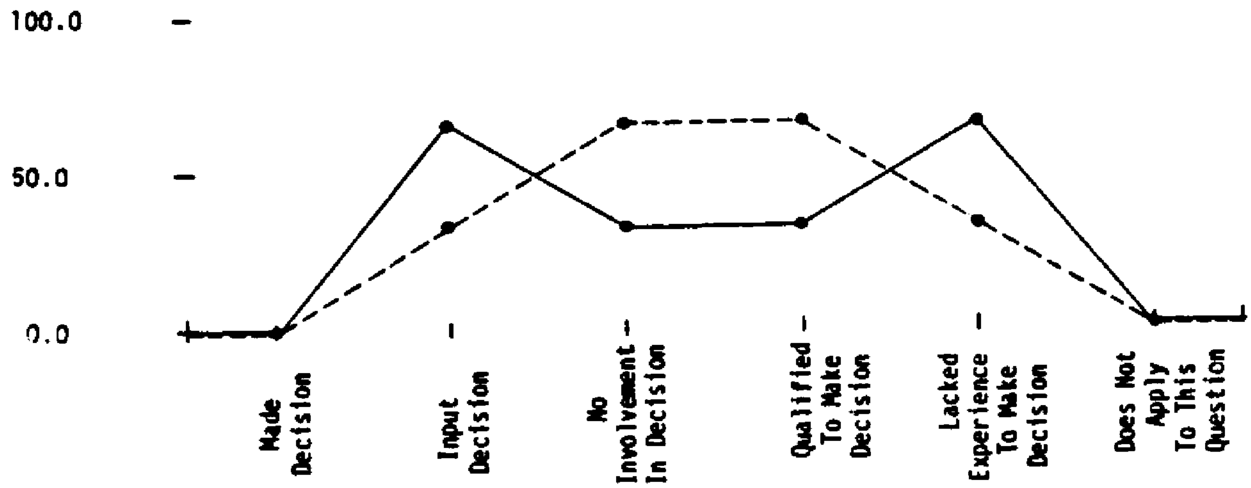

Figure 3H. Determining major entrances.

There was very little difference in the level at which the board members perceived themselves as being involved, with both indicating a moderately high level of involvement. Similarly, there was little difference in their perceived level of competence in the decision area. Boards involved in the traditional construction projects perceived themselves as being only slightly more qualified to make the decision than did board members involved in the construction management projects (see Figure 3I).

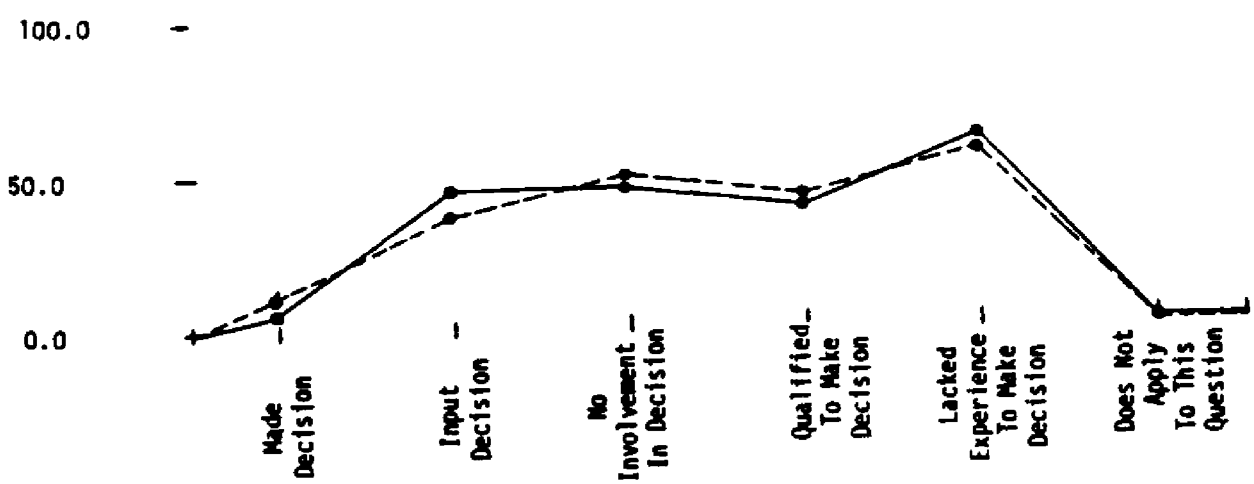

Figure 3I. Determining major entrances.

Project architects involved in construction management projects perceived their board representatives as having a higher level of involvement in the decision than did project architects involved in the traditional construction projects. They also viewed their board representatives as being more qualified to make the decision than did project architects involved in traditional construction projects (see Figure 3J).

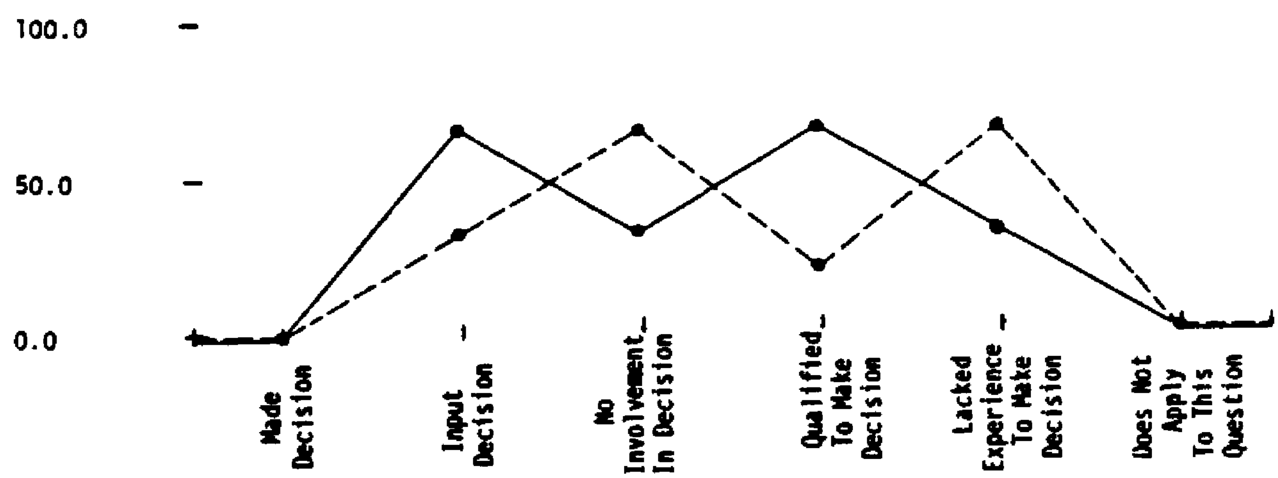

Figure 3J. Determining major entrances.

An analysis of this part of the question indicates that the board members involved in construction management projects were perceived to have a higher level of participation in the decision; however, they were perceived to be slightly less qualified to make the decision in this area than were board members involved in the traditional construction projects.

Decision # 4 - Establishing Drives and Entrances Off Major Streets

--Comparative perceptions of the board representatives' level of involvement in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects perceived themselves as having a much higher level of involvement in the decision than did board representative involved in construction management projects. They also perceived themselves as being much more qualified to make the decision than did board representatives involved in the construction management projects (see Figure 4E).

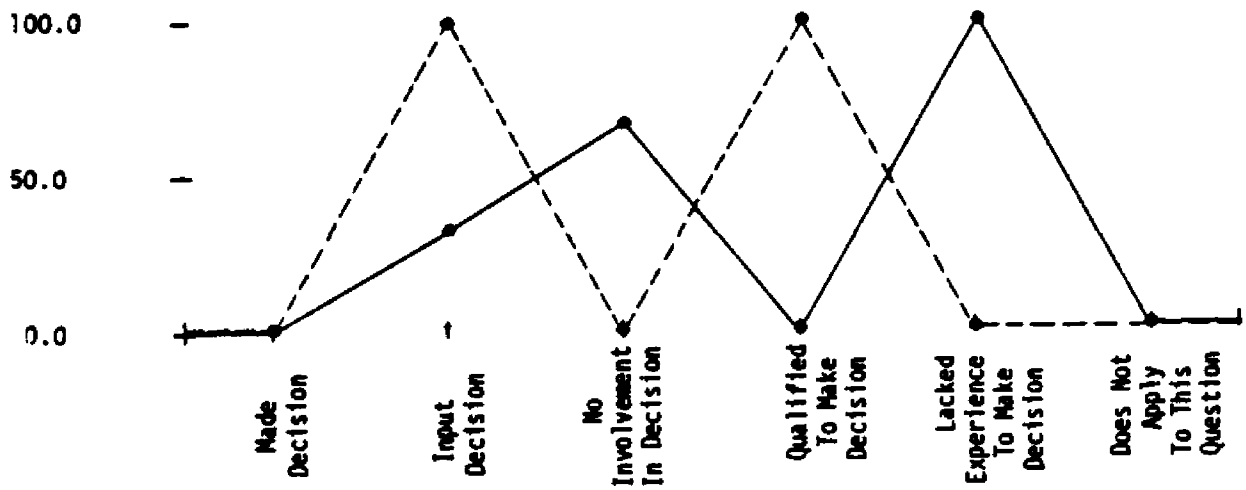

Figure 4E. Establishing drives and entrances off major streets.

Board members involved in construction management projects and board members involved in traditional construction projects saw very little difference in either the level of involvement their board representatives had in the decision or the competence of their board representatives to make the deicsion. The members involved in the traditional construction approach perceived their board representatives as having only a slightly higher level of involvement in making the decision and a slightly higher level of competence in making the decision (see Figure 4F).

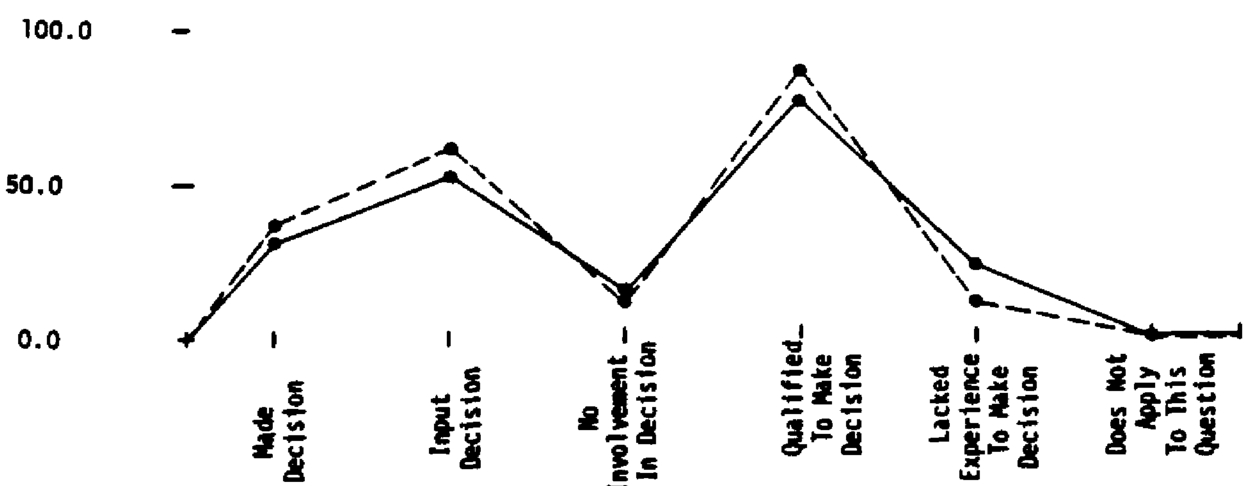

Figure 4F. Establishing drives and entrances off major streets.

Project architects involved in both the construction management projects and the traditional construction projects concurred on all points, perceiving a moderately high level of involvement in the decision on the part of their board representatives and a relatively high level of competence in making the decision (see Figure 4G).

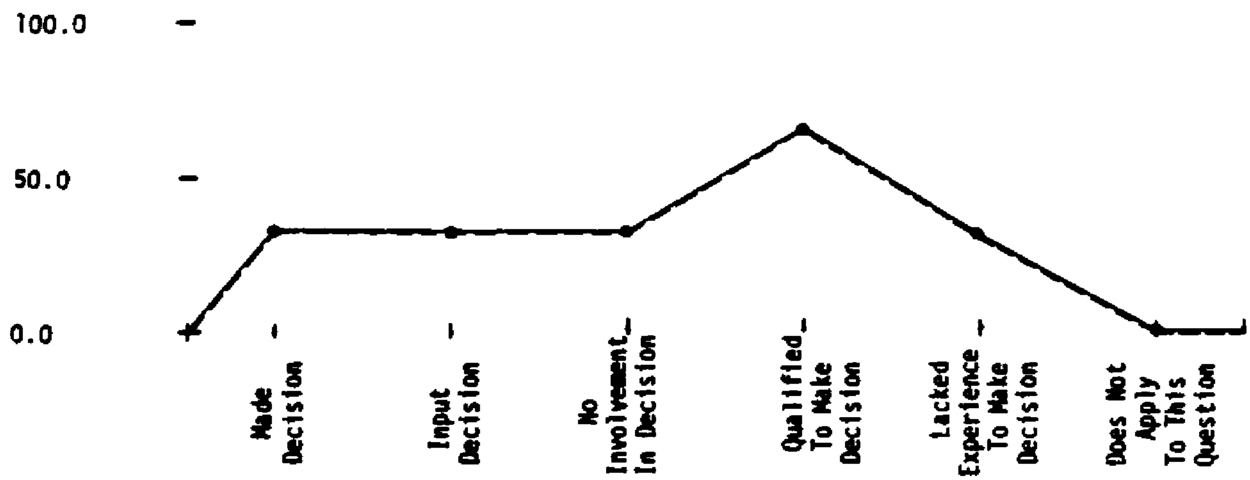

Figure 4G. Establishing drives and entrances off major streets.

Even though the board members and the project architects perceived little comparative difference in the involvement of their respective board representatives because of the strong feelings of the board representatives involved in the traditional construction projects, the analysis of this part of the question would indicate a higher level of involvement on their part as well as a higher level of perceived competence in the decision area.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects perceived their board members as having a higher level of involvement in the decision than did board representatives involved in the construction management projects. They also perceived that the board members were more qualified to make the decision than did the board representatives involved in the construction management projects (see Figure 4H).

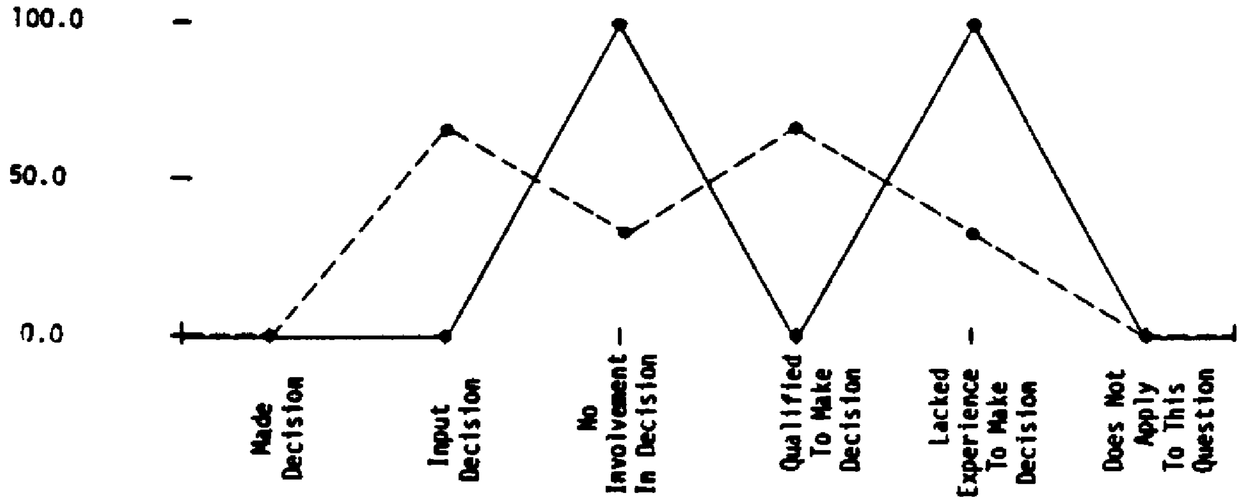

Figure 4H. Establishing drives and entrances off major streets.

Both the board members involved in the traditional construction projects and the board members involved in construction management projects perceived themselves in a similar way on all points with the pattern indicating only a slightly higher level of involvement on the part of board members involved in the traditional construction projects and a slightly higher level of competence also perceived (see Figure 4I).

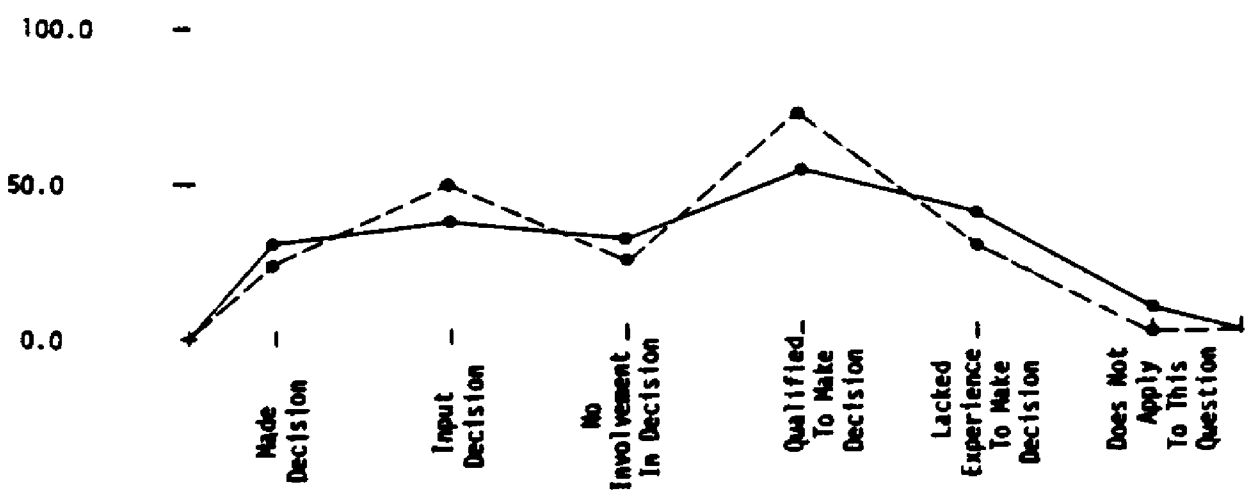

Figure 4I. Establishing drives and entrances off major streets.

Project architects involved in the construction management projects on the other hand, viewed their board members as having a higher level of involvement in making the decision. However, they agreed with the project architects involved in the traditional construction projects on the level of competence the board members were perceived to have relative to this decision area (see Figure 4J).

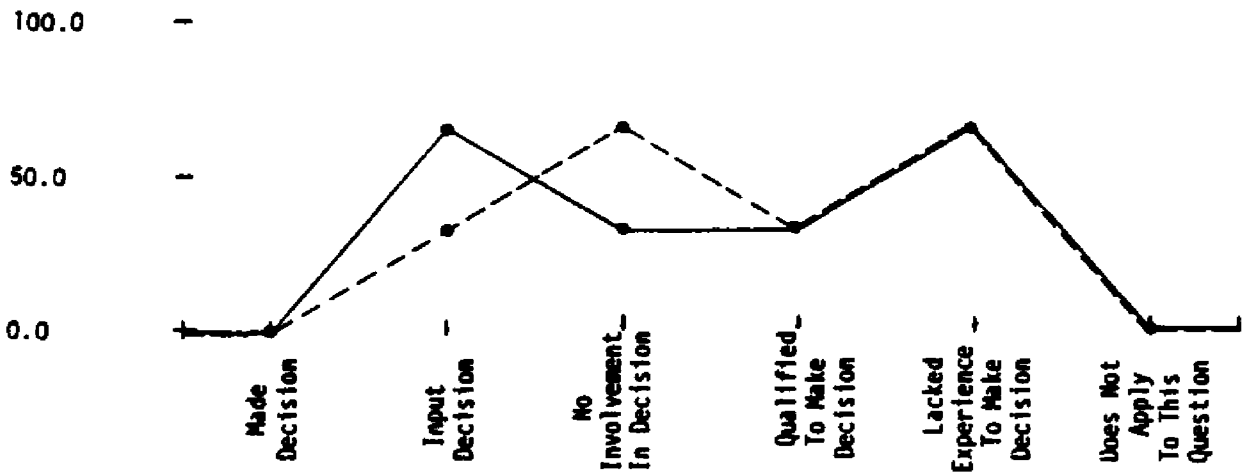

Figure 4J. Establishing drives and entrances off major streets.

Analysis of this part of the question would indicate that board members involved in the traditional construction projects were perceived to have both a higher level of involvement in making the decision and a higher level of competence to do so.

Decision # 5 - Determining Considerations of Future Expansion

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects perceived themselves as having a higher level of involvement in the decision than did board representatives involved in traditional construction projects. However, the board representatives involved in traditional construction projects perceived themselves as being more qualified to make the decision than did the board representatives involved in construction management projects (see Figure 5E).

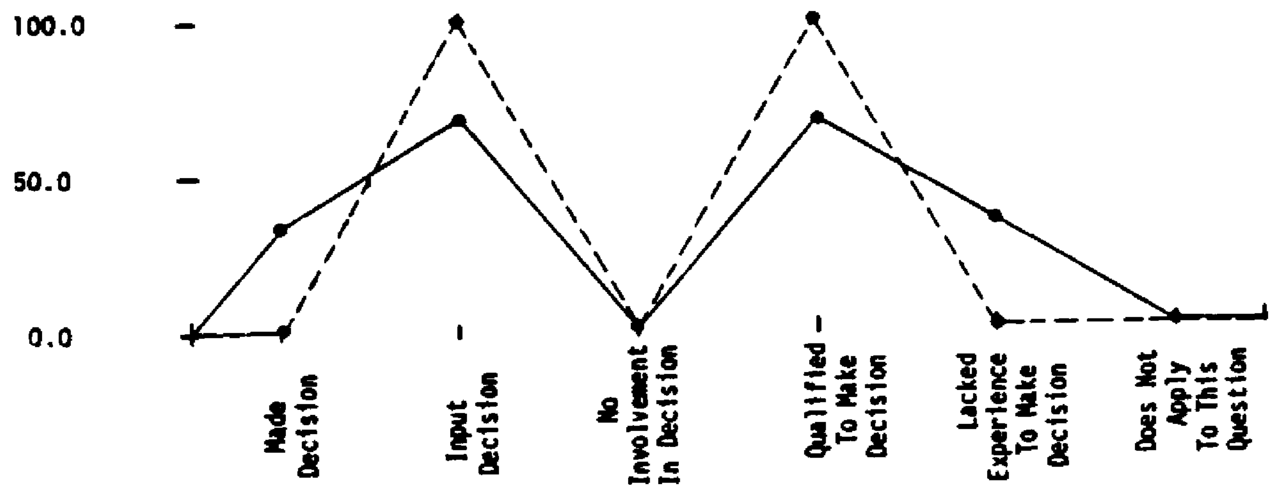

Figure 5E. Determining considerations of future expansion.

Board members involved in construction management projects perceived their representatives as having slightly more involvement in the decision than did board members involved in the traditional construction projects. They also perceived their board representatives as being more qualified to make the decision than did the board members involved in the traditional construction projects (see Figure 5F).

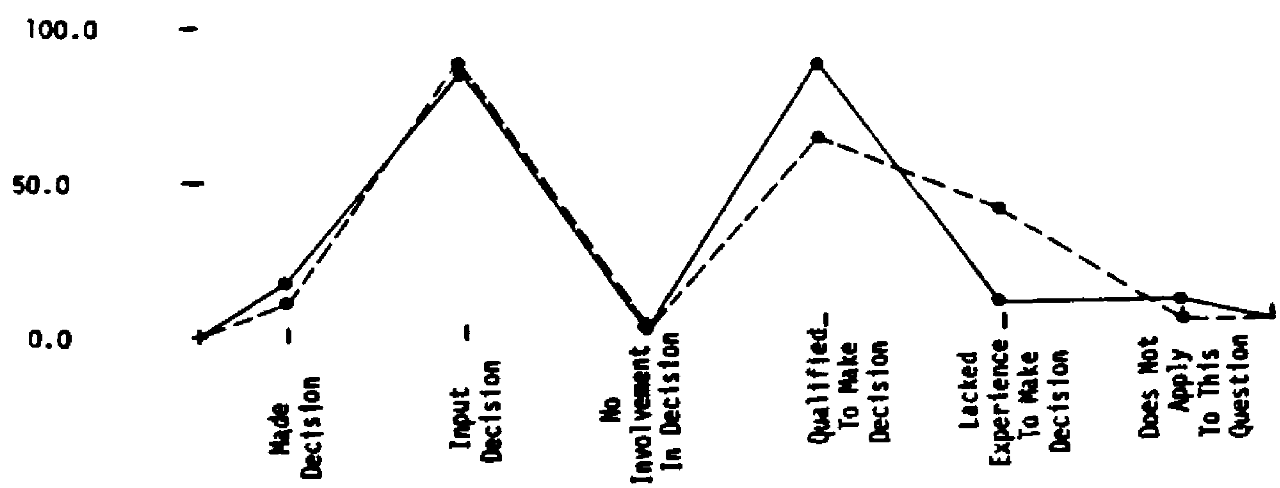

Figure 5F. Determining considerations of future expansion.

Project architects involved in traditional construction projects perceived their representatives as being more involved than project architects involved in construction management projects. They also perceived them to be much more qualified to make the decision than did the project architects involved in construction management projects (see Figure 5G).

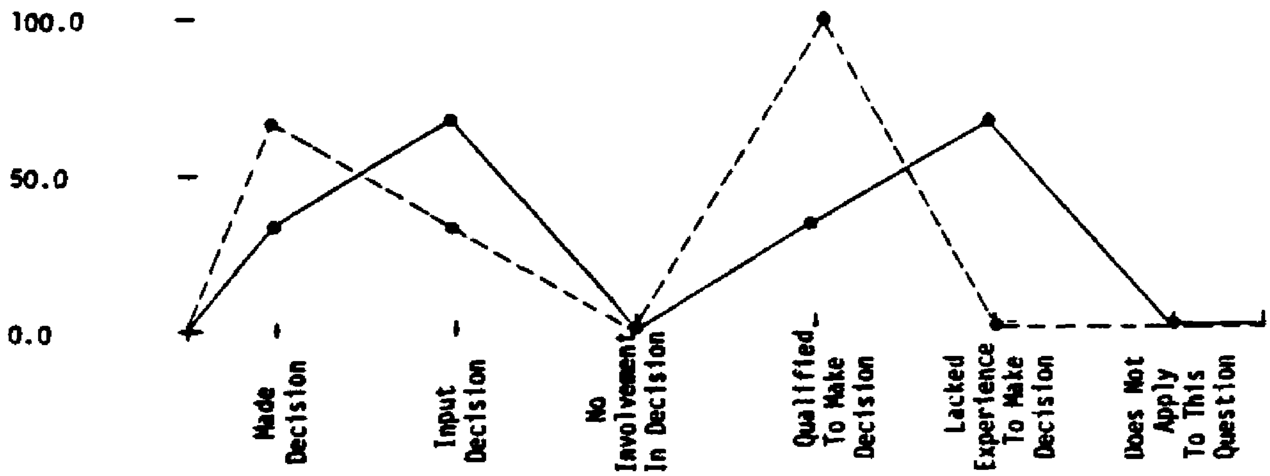

Figure 5G. Determining considerations of future expansion.

Analysis of this part of the question indicates that the representatives involved in construction management projects are perceived to be involved at a slightly higher level than the board representatives involved in traditional construction projects while they are perceived to be less qualified to make the decision than are the board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects perceived their board members as being more involved in the decision than did board representatives involved in traditional construction projects. However, both agreed on the perceived level of competence of their board members (see Figure 5H).

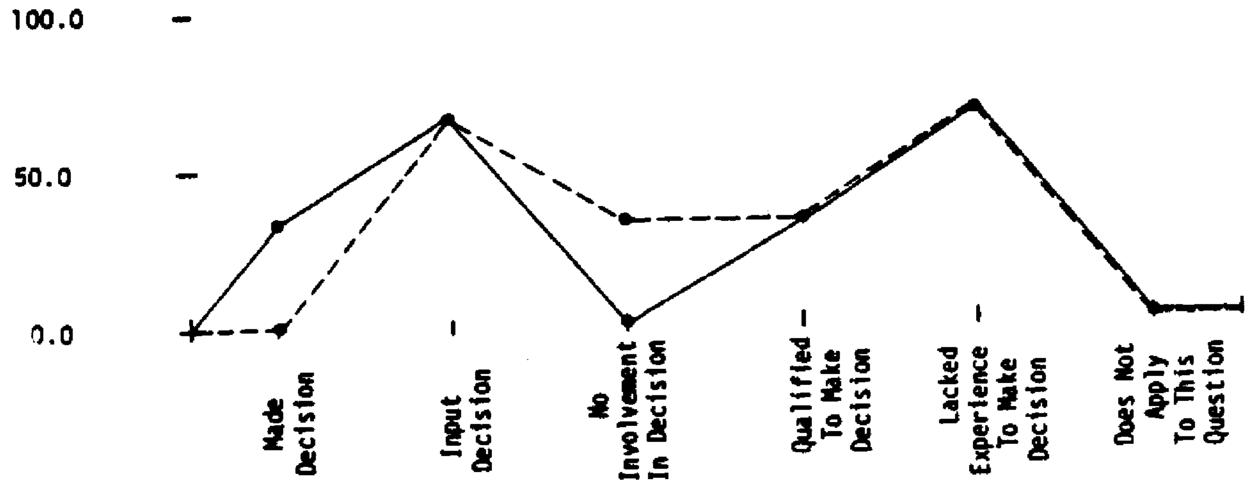

Figure 5H. Determining considerations of future expansion.

Board members involved in construction managment projects perceived themselves as being more involved in the decision than did board members involved in traditional construction projects. They also perceived themselves as being more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 5I).

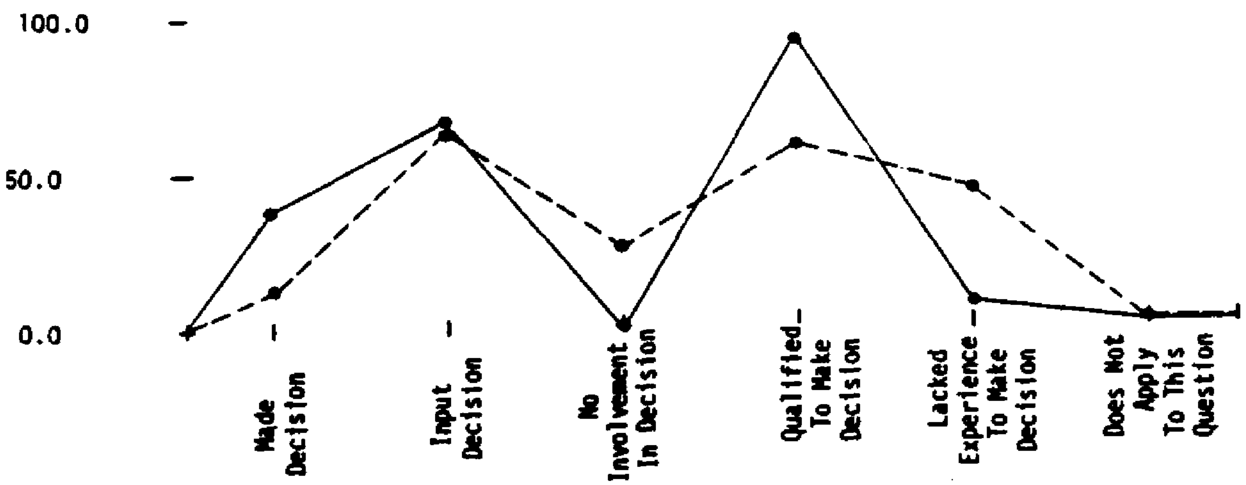

Figure 5I. Determining considerations of future expansion.

Project architects involved in construction management projects perceived their board members as being more involved in the decision than did project architects involved in the traditional construction projects.

However, they perceived their board members as being less qualified to make the decision than did project architects involved in traditional construction projects (see Figure 5J).

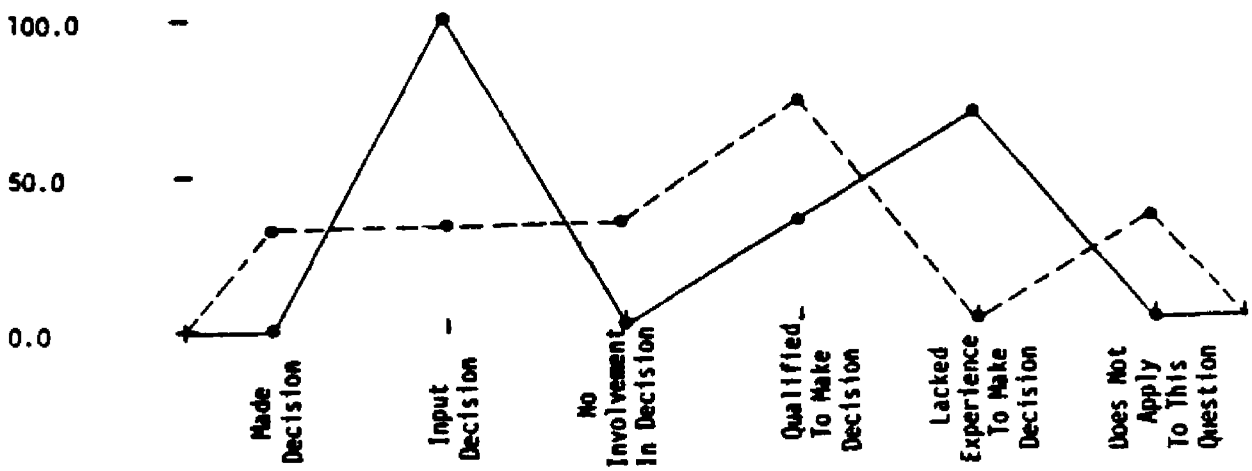

Figure 5J. Determining considerations of future expansion.

The analysis of this part of the question would indicate that board members involved in construction management projects are perceived as having a higher level of input than board members involved in the traditional construction projects. The comparative perceptions relative to the level of competence are extremely close with the board members involved in construction management projects being perceived as slightly less competent to make the decision than board members involved in traditional construction projects.

Decision # 6 - Determining the Integration of Architectural and Mechanical Systems

--Comparative perceptions of the board representatives' level of involvement in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived themselves being involved at a higher level than did board representatives involved in construction management projects. Neither the board representatives involved in traditional construction projects nor the board representatives involved in construction management projects perceived themselves as qualified to make this decision (see Figure 6E).

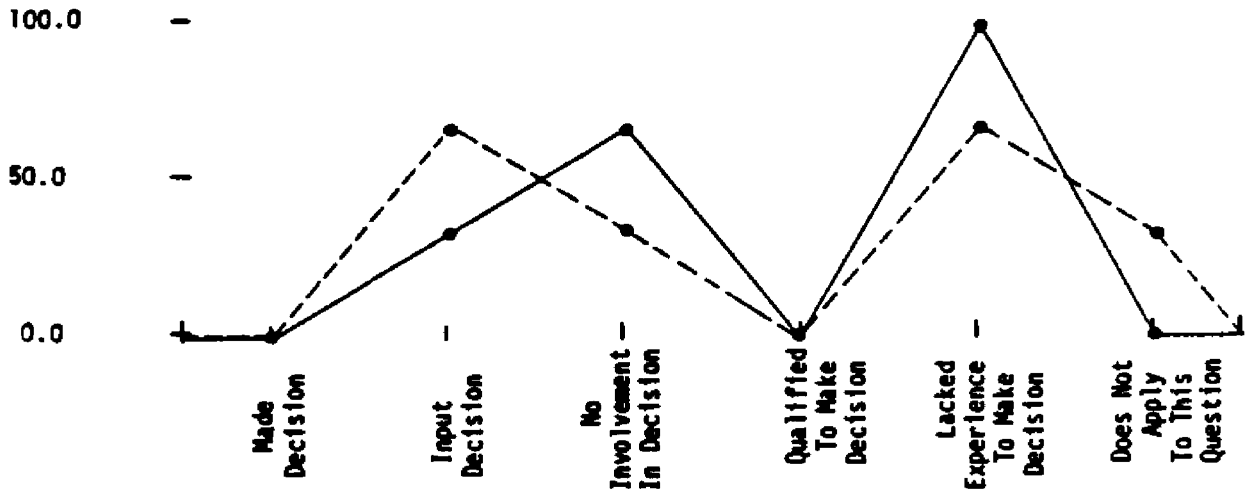

Figure 6E. Determining the integration of architectural and mechanical systems.

Board members involved in construction management projects perceived their representatives as being more involved in the decision than did board members involved in traditional construction projects. They also perceived their board representatives as being more qualified to make the decision than did board members involved in traditional construction projects (see Figure 6F).

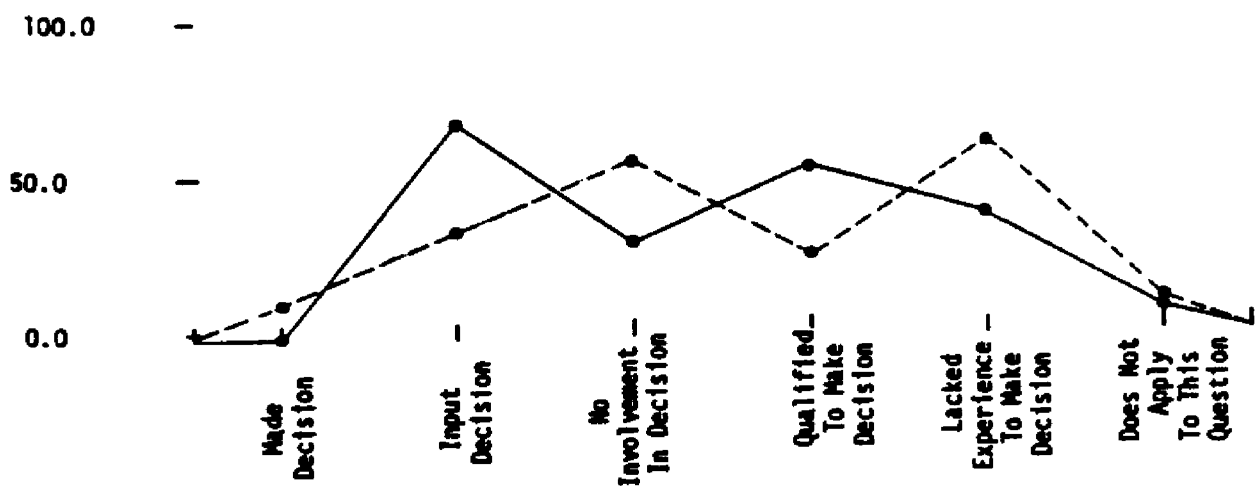

Figure 6F. Determining the integration of architectural and mechanical systems.

Both the project architects involved in traditional construction projects and the project architects involved in construction management projects agreed on all points with board representatives being moderately involved but not qualified to make the decision (see Figure 6G).

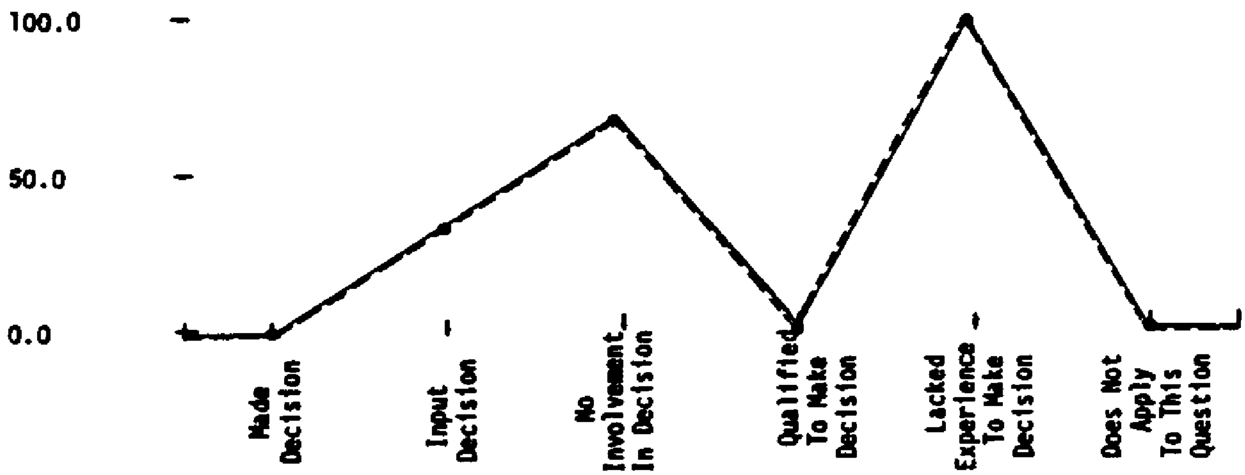

Figure 6G. Determining the integration of architectural and mechanical systems.

The analysis of this part of the question would indicate that board representatives involved in traditional construction projects are perceived to be slightly more involved in the decision than are board representatives involved in construction management projects. However, board representatives involved in construction management projects are perceived to be more qualified to make the decision than are board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects

Board representatives involved in traditional construction projects perceived their board members as being more involved in the decision than did board representatives involved in construction management projects. Both indicated that their board members were not qualified to make the decision (see Figure 6H).

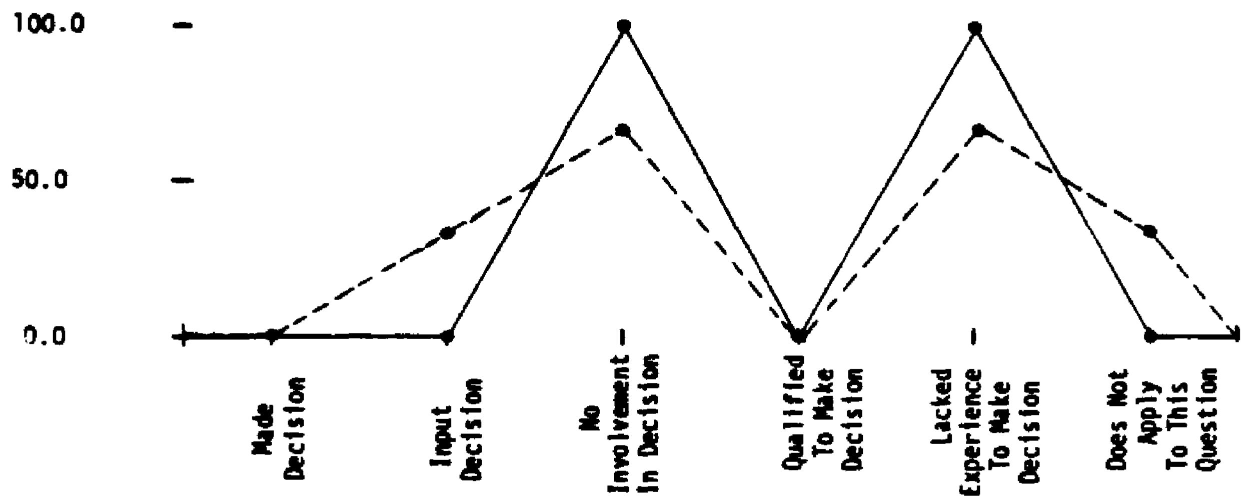

Figure 6H. Determining the integration of architectural and mechanical systems.

Board members involved in construction management projects perceived themselves as being more involved in the decision than did board members involved in traditional construction projects. They also perceived that they were less qualified to make the decision than did board members involved in traditional construction projects (see Figure 6I).

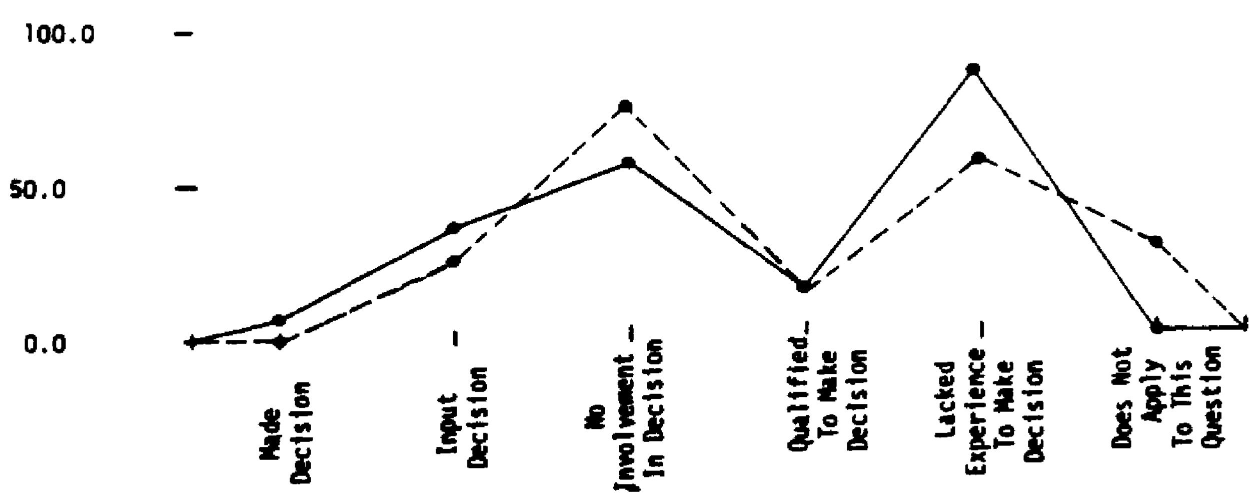

Figure 6I. Determining the integration of architectural and mechanical systems.

Project architects involved in both types of projects indicated that the board members were not involved in the decision and were not qualified to make the decision (see Figure 6J).

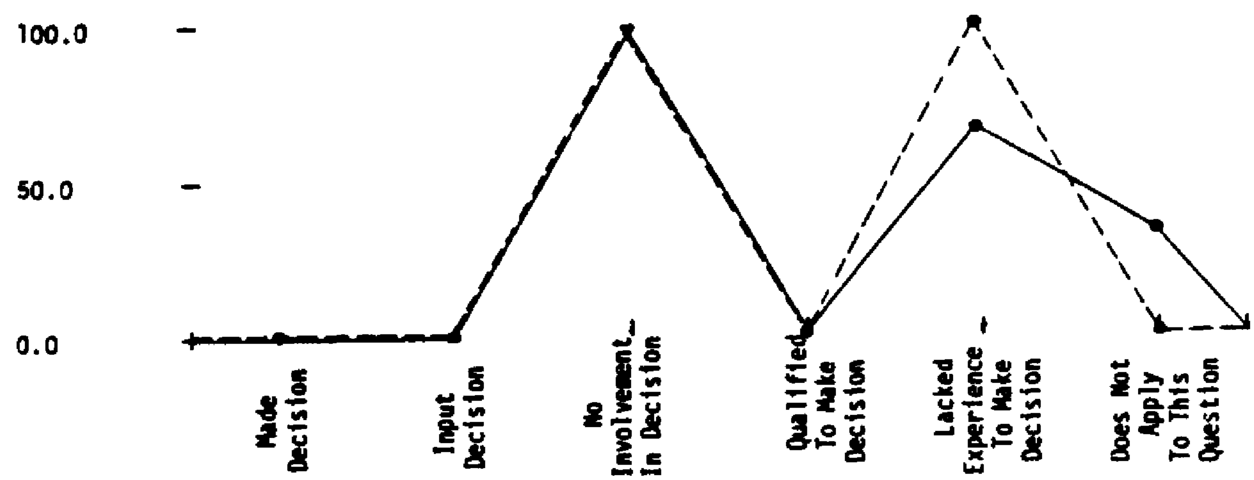

Figure 6J. Determining the integration of architectural and mechanical systems.

The analysis of this part of the question would indicate that the board members involved in the construction maangement projects are slightly more involved in the decision and slightly less qualified to make the decision.

Decision # 7 - Determining the Interface Between the Electrical and the Mechanical Systems

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects viewed themselves as more involved in the decision than did board representatives involved in construction management projects. Neither the board representatives involved in the construction management projects nor the board representatives involved in the traditional construction projects indicated that they were qualified to make the decision (see Figure 7E).

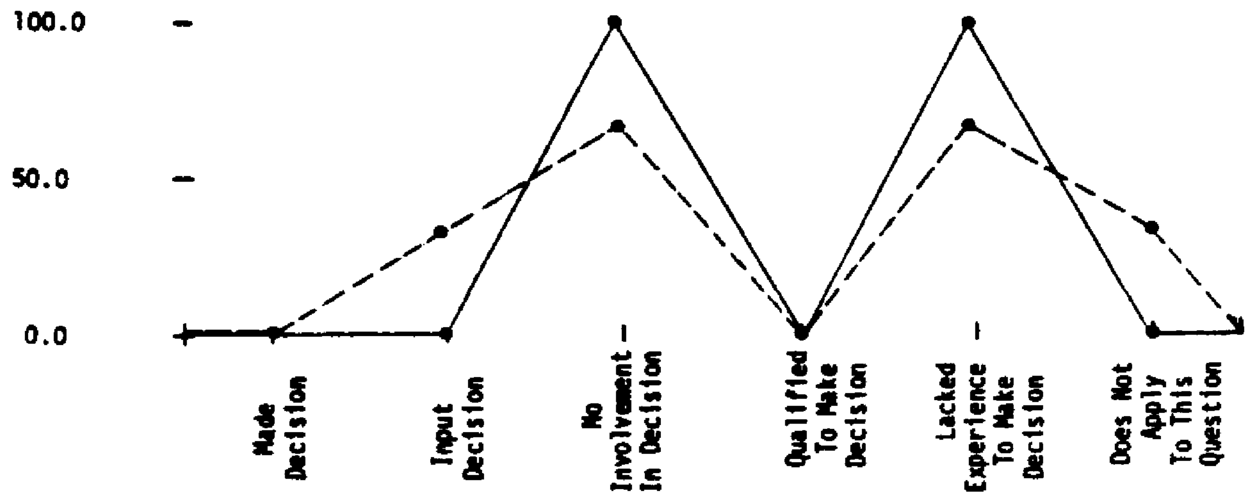

Figure 7E. Determining the interface between the electrical and the mechanical systems.

Board members involved in construction management projects perceived their board representatives as being slightly more involved in the decision than did board members involved in traditional construction projects. They also indicated their board representatives were more qualified to make the decision than did board members involved in traditional construction projects (see Figure 7F).

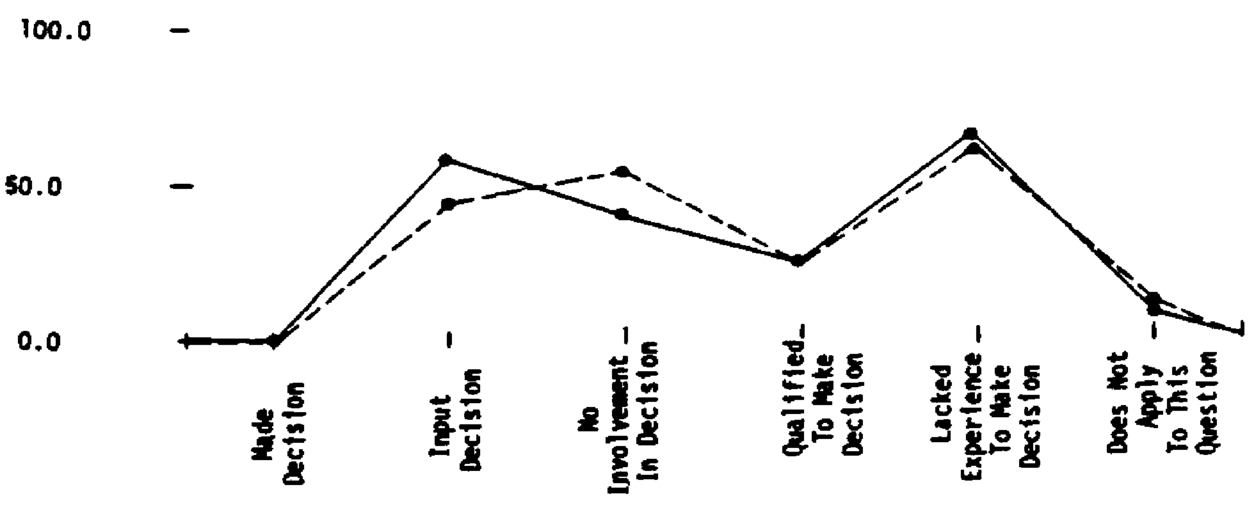

Figure 7F. Determining the interface between the electrical and the mechanical systems.

Both the project architects involved in construction management projects and the project architects involved in traditional construction projects agree on all points, indicating that board representatives were involved in a moderate level but lacked the experience necessary to make the decision (see Figure 7G).

Figure 7G. Determining the interface between the electrical and the mechanical systems.

The analysis of this question would indicate that the board representatives involved in construction management projects are perceived to be slightly more involved but qualified at the same level as board representatives involved in traditional construction projects. Note: Modify statement "Unqualified to Make Decision" relative to board members' perceptions.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both the board representatives involved in construction management projects and the board representatives involved in traditional construction projects perceived their board members as having no involvement in the decision. However, the board representatives involved in the traditional construction projects indicated that their board members were more qualified to make the decision than did the board representatives involved in construction management projects (see Figure 7H).

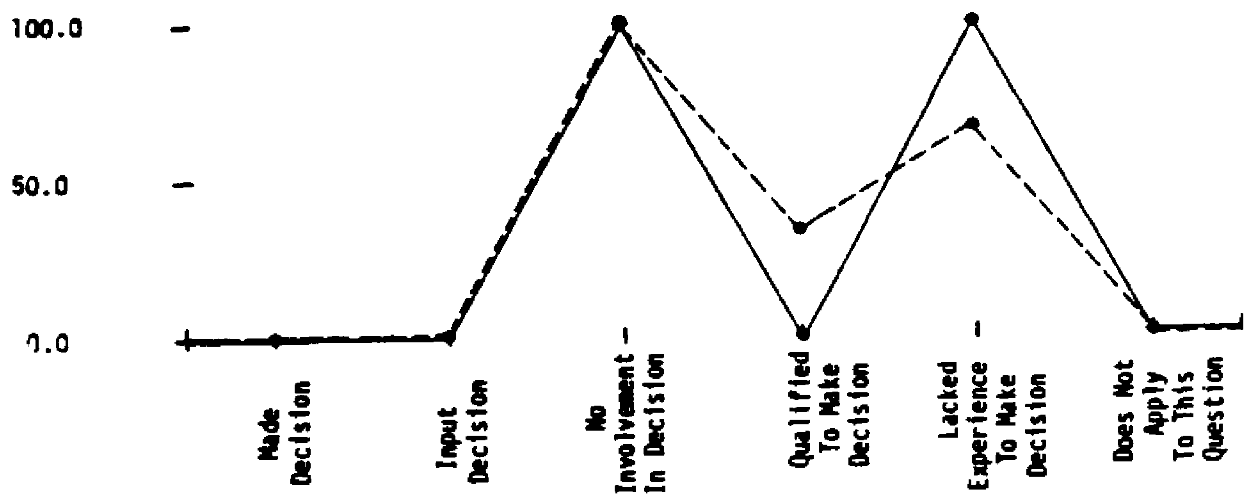

Figure 7H. Determining the interface between the electrical and the mechanical systems.

Board members involved in construction management projects perceived themselves as having a slightly higher level of involvement in this decision and being slightly more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 7I).

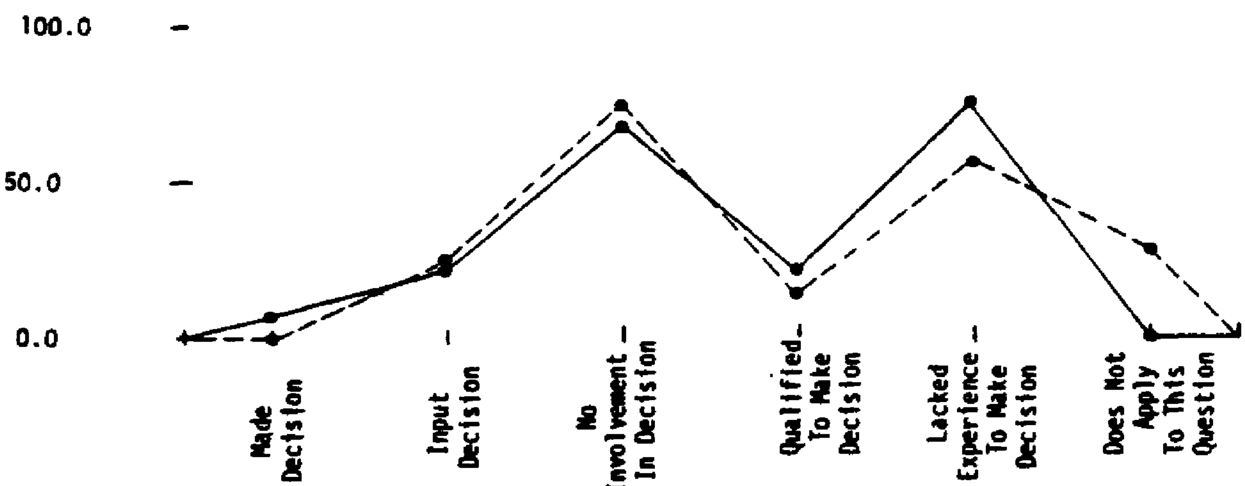

Figure 7I. Determining the interface between the electrical and the mechanical systems.

Both the project architects involved in construction management projects and the project architects involved in traditional construction projects indicated that the board members were not involved in this decision and were not qualified to make this decision (see Figure 7J).

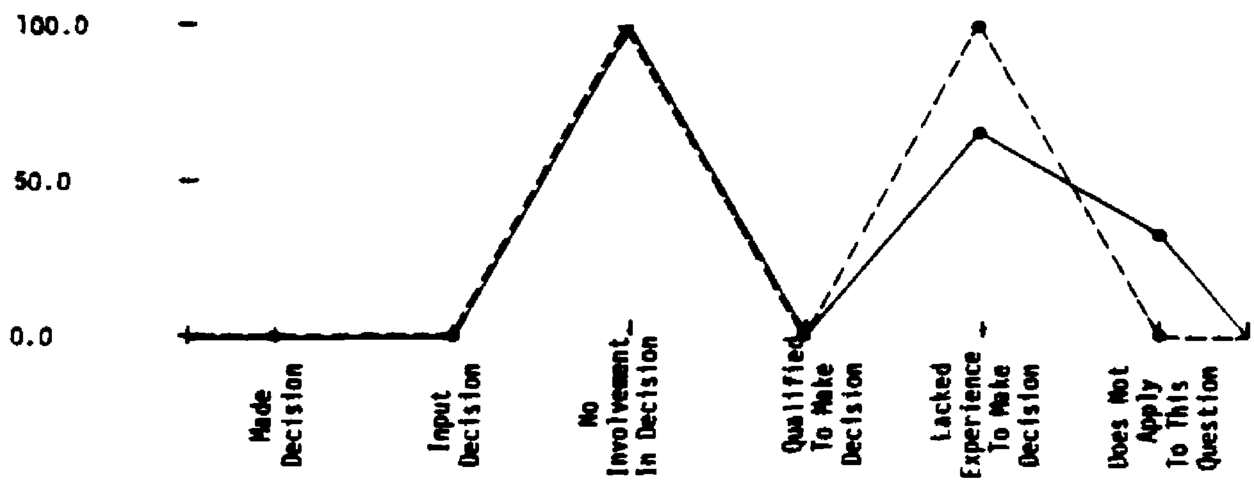

Figure 7J.

Analysis of this part of the question indicates that board members involved in construction management projects perceived themselves as being slightly more involved in the decision than did board members involved in the traditional construction projects, while board members involved in the traditional construction projects were perceived as being slightly more qualified to make the decision than were board members involved in the construction management projects.

Decision # 8 - Determine the Structural System

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in construction management projects perceived themselves as participating at a higher level in the decision than did board representatives involved in traditional construction projects. Both the board representatives involved in the construction management projects and the board representatives involved in traditional construction projects indicated that tehy were not qualified to make this decision (see Figure 8E).

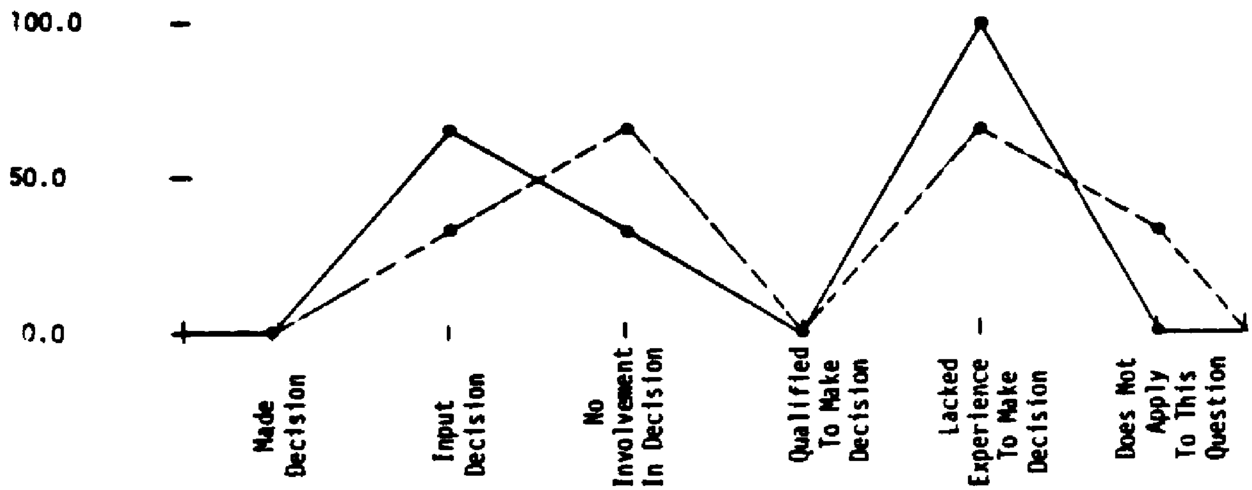

Figure 8E. Determine the structural system.

Board members involved in construction management projects perceived their board representatives as having a higher level of involvement in the decision; however, they indicated that their board representatives were slightly less qualified to make the decision than did the board members involved in the traditional construction projects (see Figure 8F).

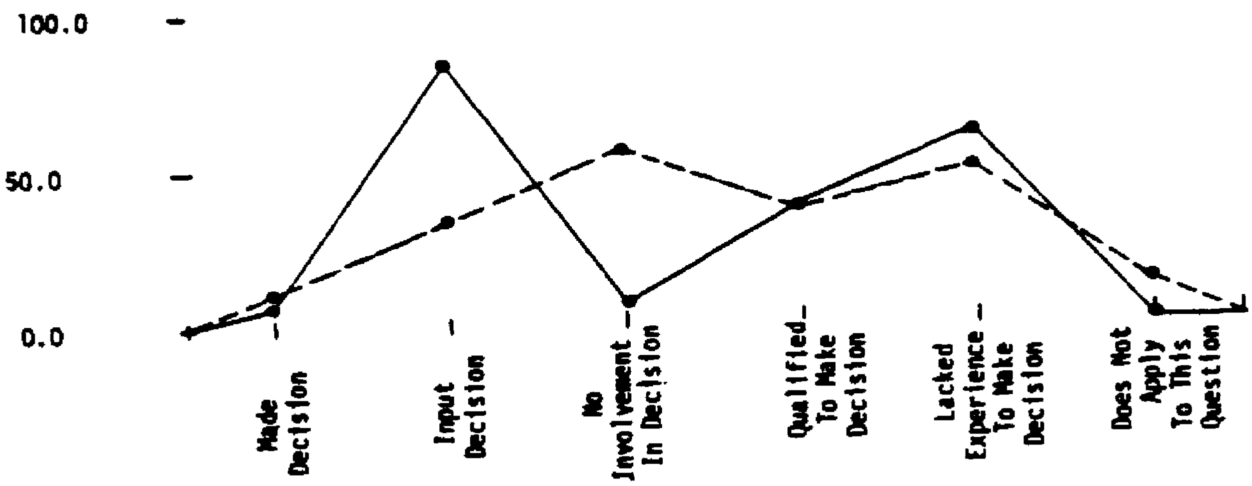

Figure 8F. Determine the structural system.

Project architects involved in construction management projects indicated that the board representatives had a higherlevel of input in the decision than did the project architects involved in traditional construction projects, while they both agreed that the board representatives were not qualified to make the decision (see Figure 8G).

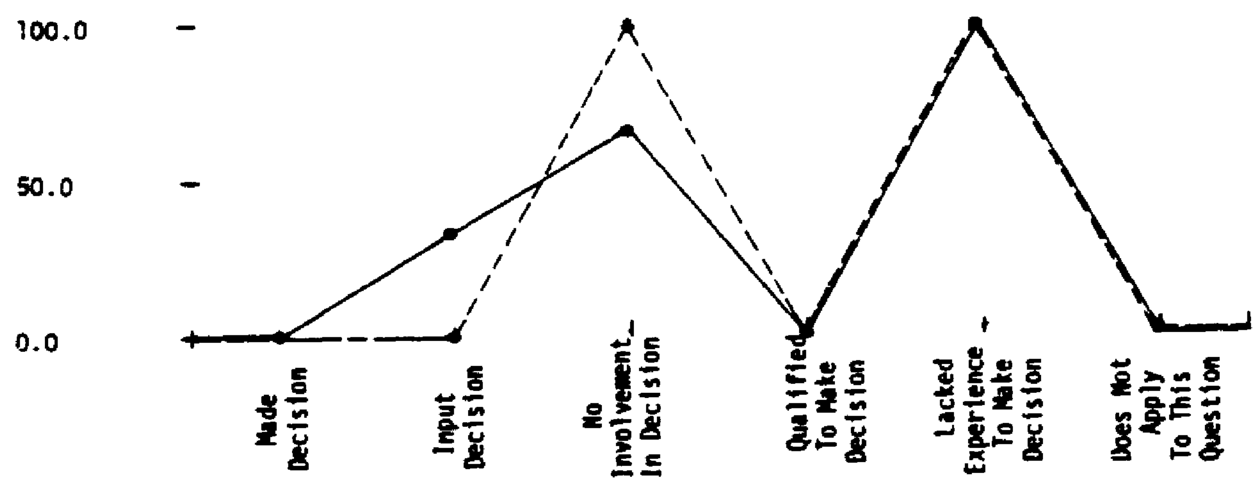

Figure 8G. Determine the structural system.

Analysis of this part of the question would indicate that board representatives involved in construction management projects had a higher involvement in the decision, while they were perceived as being less qualified to make the decision than were board representatives involved in the traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects perceived their board members as having a higher level of involvement in the decision than did board representatives involved in traditional construction projects. They also indicated that their board members were more qualified to make the decision than did the board representatives involved in the traditional construction projects (see Figure 8H).

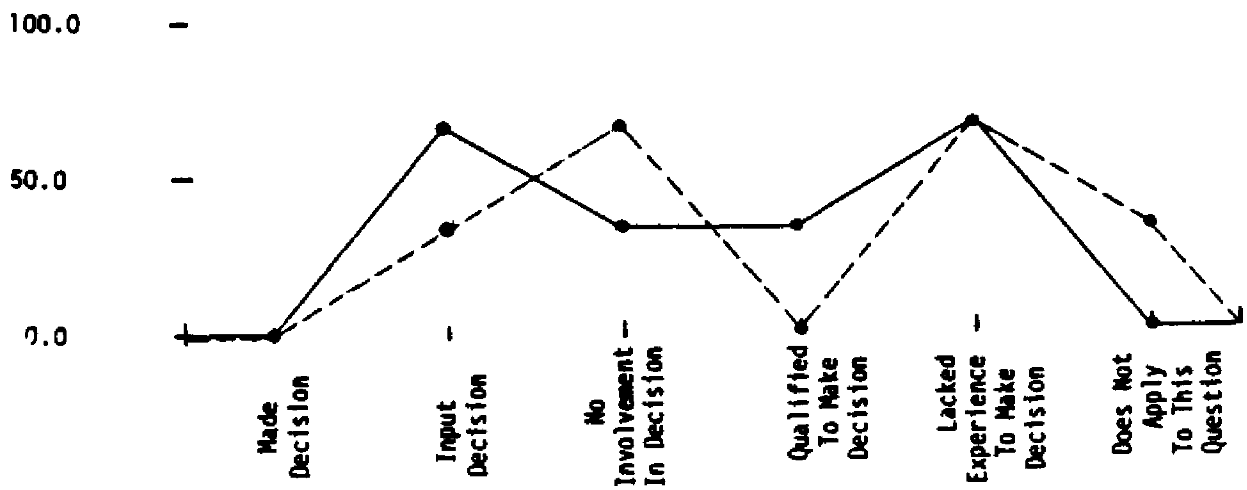

Figure 8H. Determine the structural system.

The board members involved in construction management projects perceived themselves as having a higher level of involvement in this decision than did the board members involved in the traditional construction projects. They also indicated that they felt more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 8I).

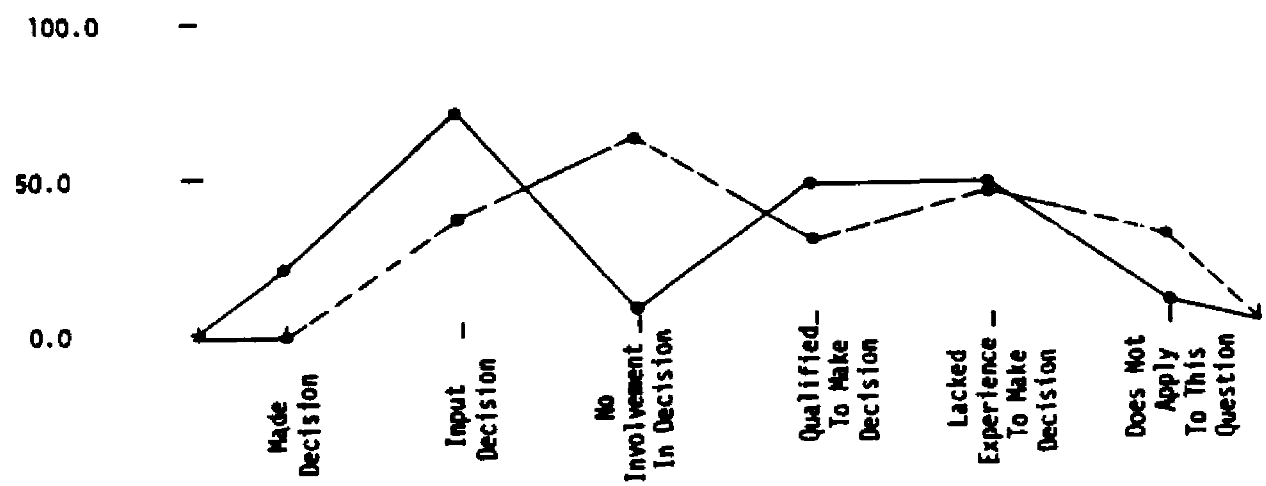

Figure 8I. Determine the structural system.

While project architects involved in construction management projects perceived their board members as being more involved than did the project architects involved in traditional construction projects, they both indicated that their board members were not qualified to make the decision (see Figure 8J).

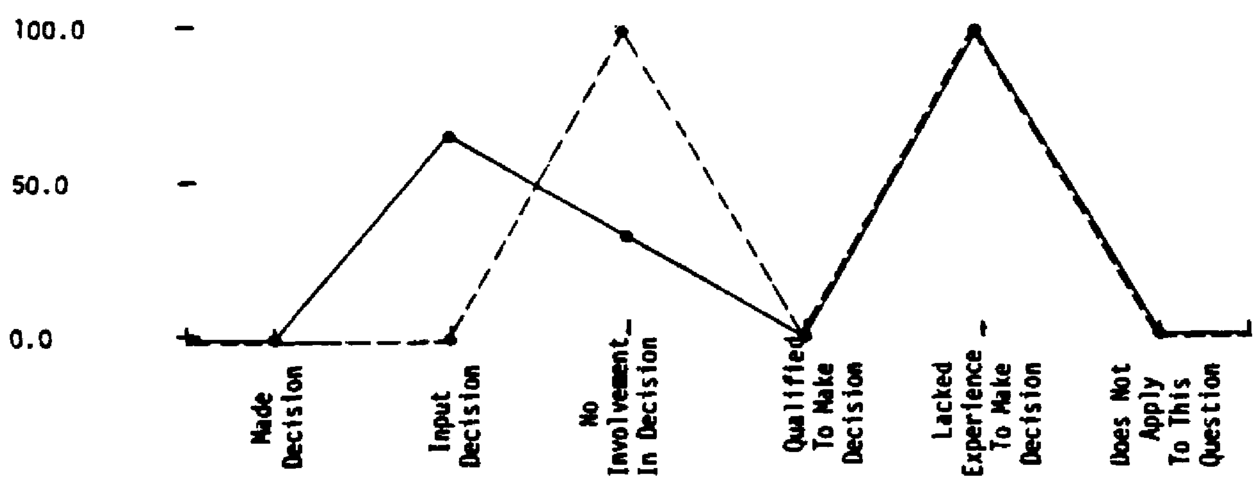

Figure 8J. Determine the structural system.

The analysis of this part of the question indicates that the board members involved in construction management projects are perceived to have a greater level of involvement and to be more qualified to make the decision than are the board members involved in traditional construction projects.

Decision # 9 - Establishing Access to Building Staff, Students and Public

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived themselves as having a higher level of involvement in the decision and being more qualified to make the decision than did the board representatives involved in traditional construction projects (see Figure 9E).

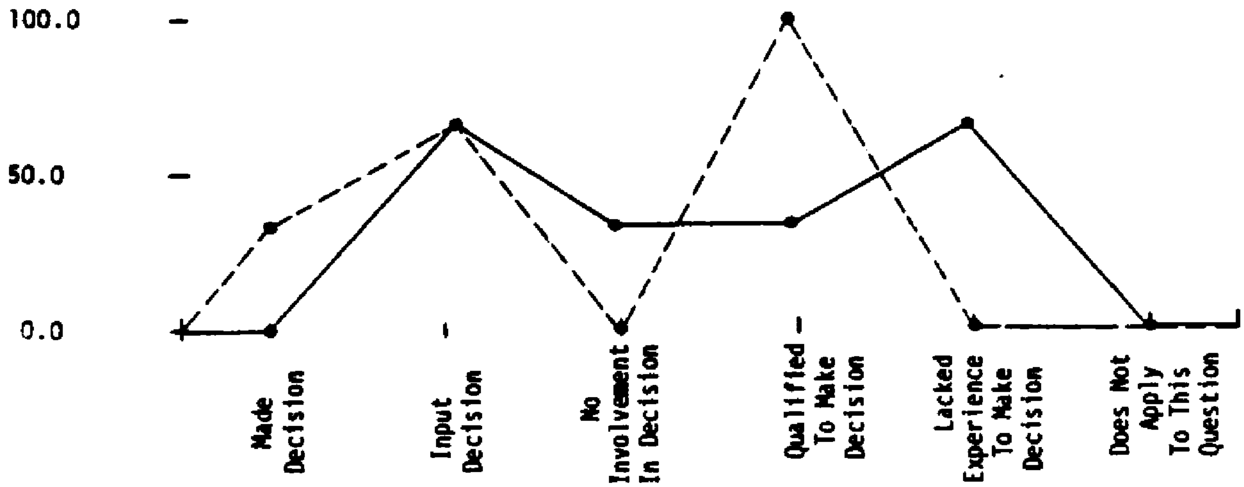

Figure 9E. Establishing access to building (staff, students and public).

Board members involved in construction management projects perceived their board representatives as having a slightly higher level of involvement in this decision and being more qualified to make the decision than did board members involved in traditional construction projects (see Figure 9F).

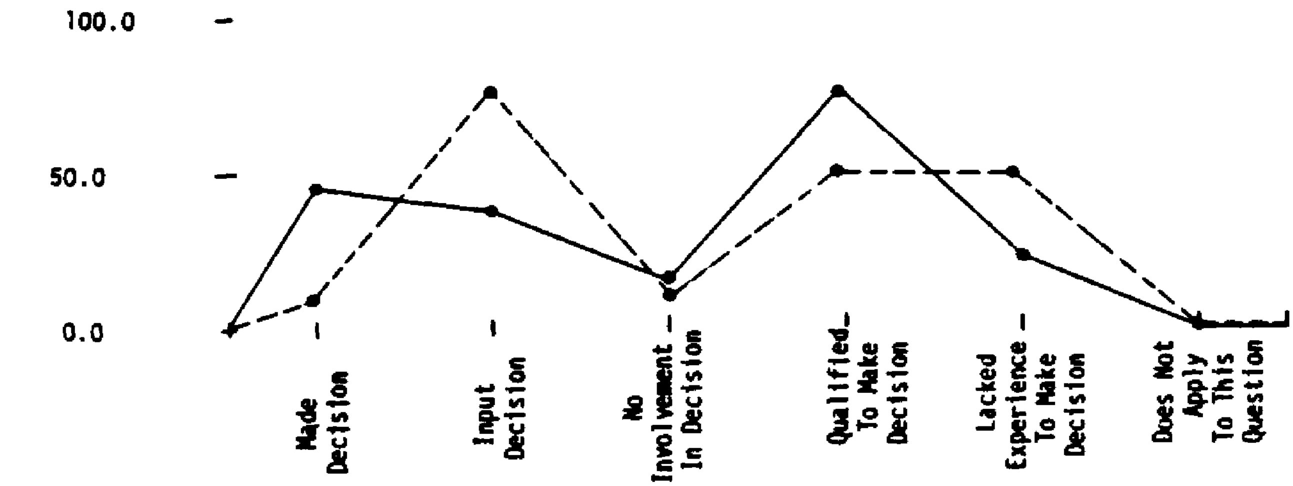

Figure 9F. Establishing access to building (staff, students and public).

Project architects involved in construction management projects perceived their board representatives as being more involved in the decision but less qualified to make the decision than did the project architects involved in traditional construction projects (see Figure 9G).

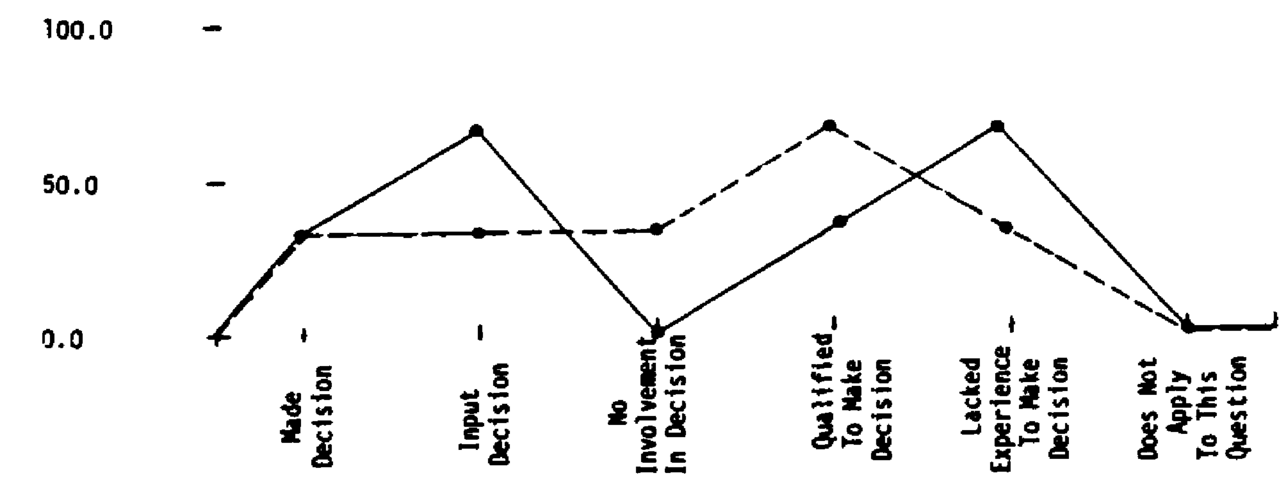

Figure 9G. Establishing access to building (staff, students and public).

Analysis of this part of the question would indicate that the board representatives involved in construction management projects had a higher level of involvement in the decision but were perceived to be less qualified to make the decision than were board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both the board representatives involved in the construction management projects and the board representatives involved in the traditional construction projects agreed on the perceived level of input of their board members relative to this decision. However, the board representatives involved in the traditional construction projects indicated that their board members are more qualified to make the decision (see Figure 9H).

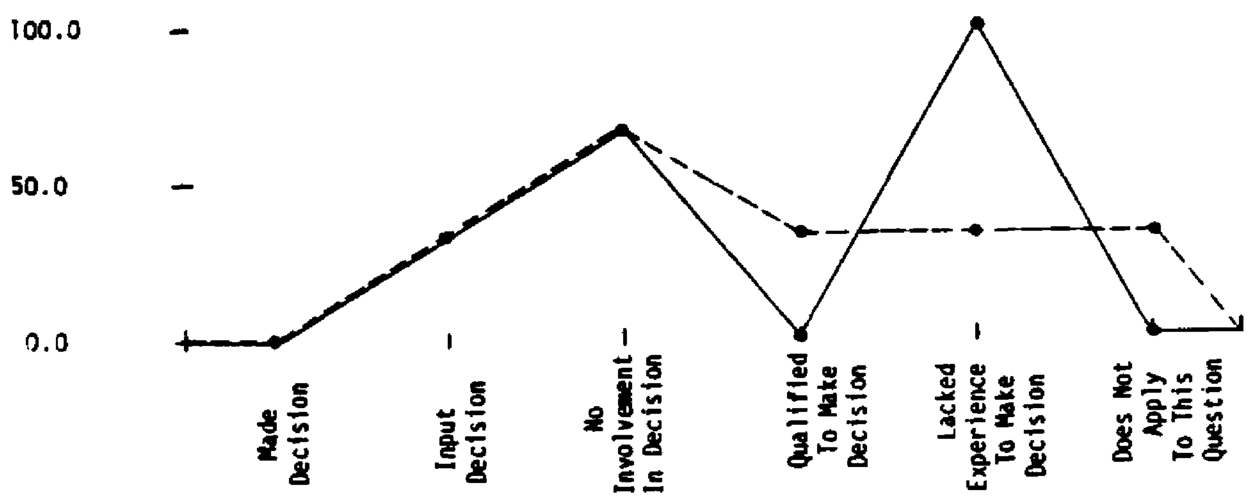

Figure 9H. Establishing access to building (staff, students and public).

Board members involved in traditional construction projects indicated a slightly higher level of involvement in this decision than did board members involved in construction management projects. They also perceived themselves as being more qualified to make the decision than did board members involved in construction management projects (see Figure 9I).

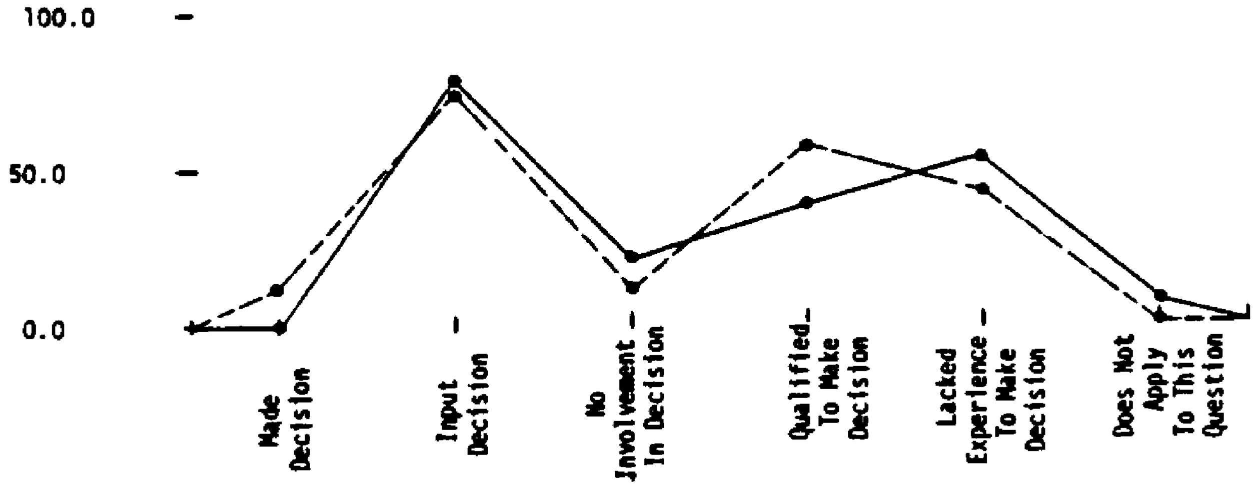

Figure 9I. Establishing access to building (staff, students and public).

Project architects involved in the construction management projects indicated that their board members were much more involved in the decision than were the board members of the traditional construction projects. They also indicated that these board members were more qualified to make the decision than did the project architects involved in the traditional construction projects (see Figure 9J).

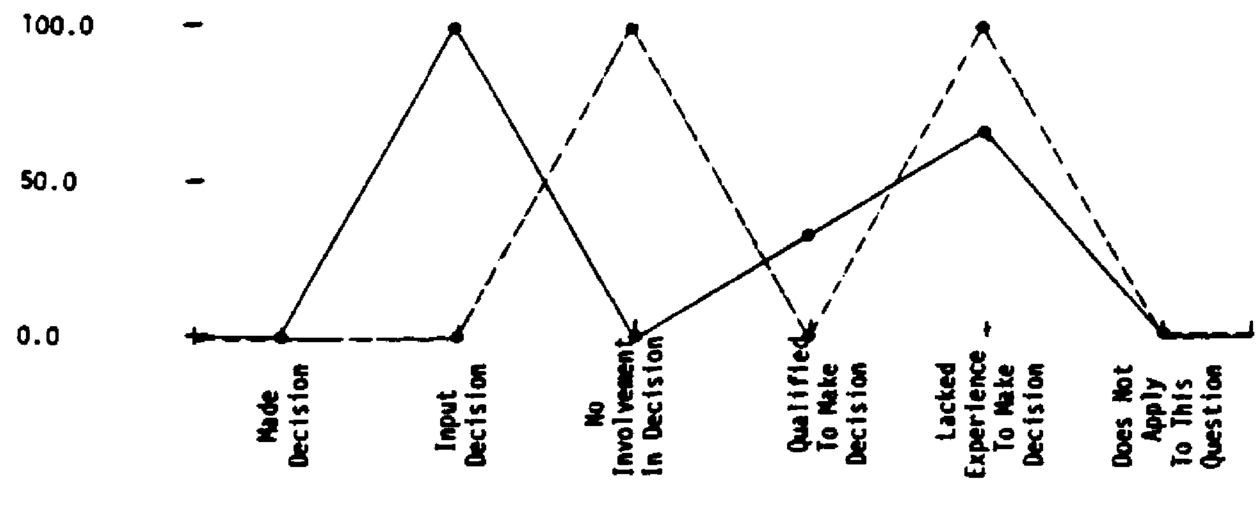

Figure 9J. Establishing access to building (staff, students and public).

Analysis of this part of the question would indicate that the board members involved in construction management projects are more involved in this decision than are the board members involved in the traditional construction projects. However, they are perceived to be slightly less qualified to make the decision.

Decision # 10 - Determining Instructional Layouts, Both Moveable and Fixed

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects perceived themselves as being more involved in the decision than did the board representatives involved in construction management projects. They also indicated that they felt more qualified to make the decision than did the board representatives involved in construction management projects (see Figure 10E).

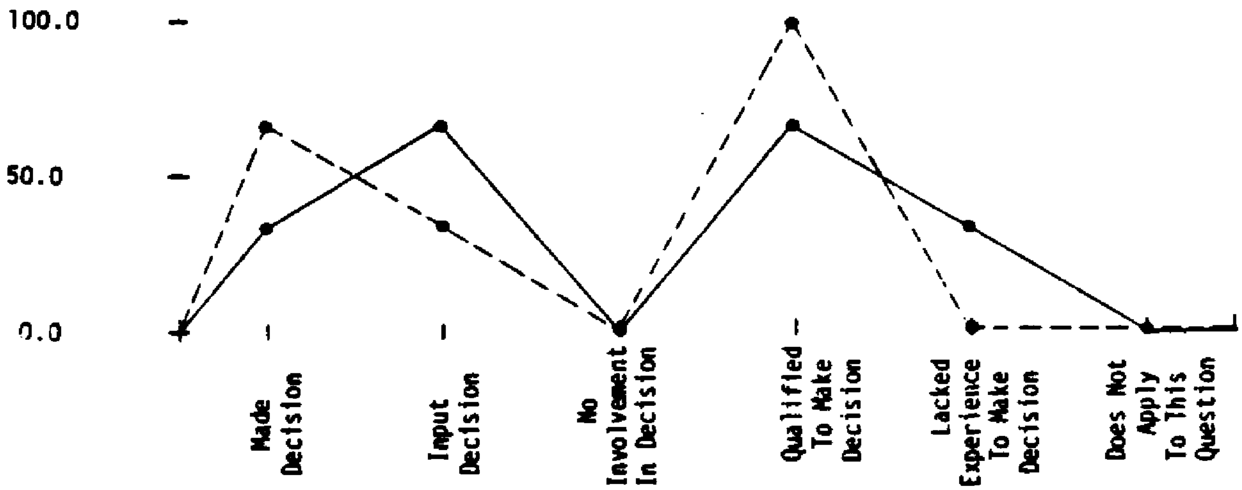

Figure 10E. Determining instructional layouts, both moveable and fixed.

Board members involved in construction management projects perceived their board representatives as having a higher level of involvement in the decision than did the board members involved in the traditional construction projects. They also indicated that they perceived their board representatives as being more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 10F).

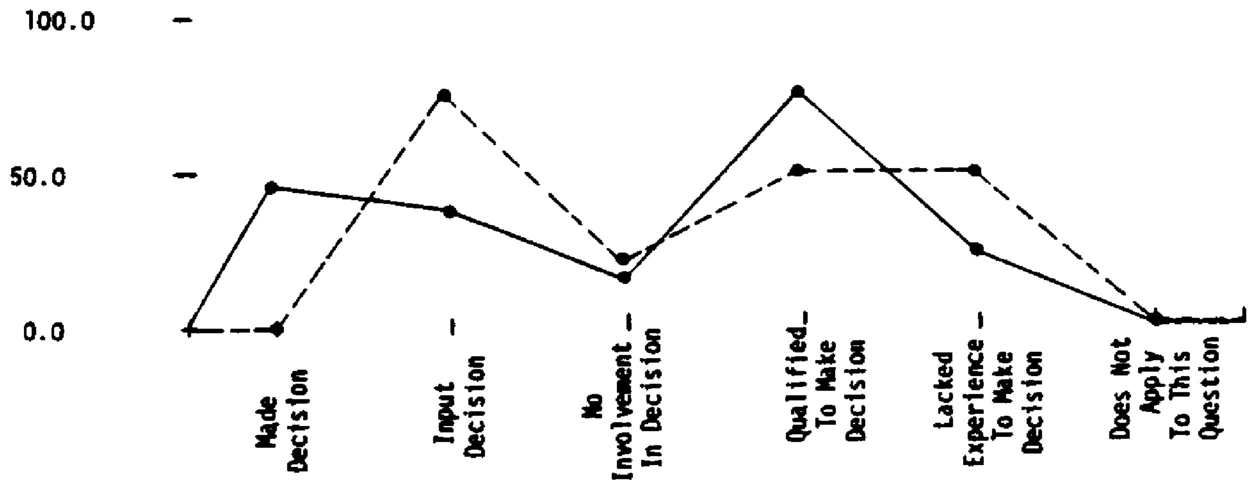

Figure 10F. Determining instructional layouts, both moveable and fixed.

Both the project architects involved in traditional construction projects and the project architects involved in construction management projects perceived the same level of involvement on the part of the board representatives. However, the project architects involved in traditional construction projects indicated that the board representatives were much more qualified to participate in the decision than did the project architects involved in the construction management projects (see Figure 10G).

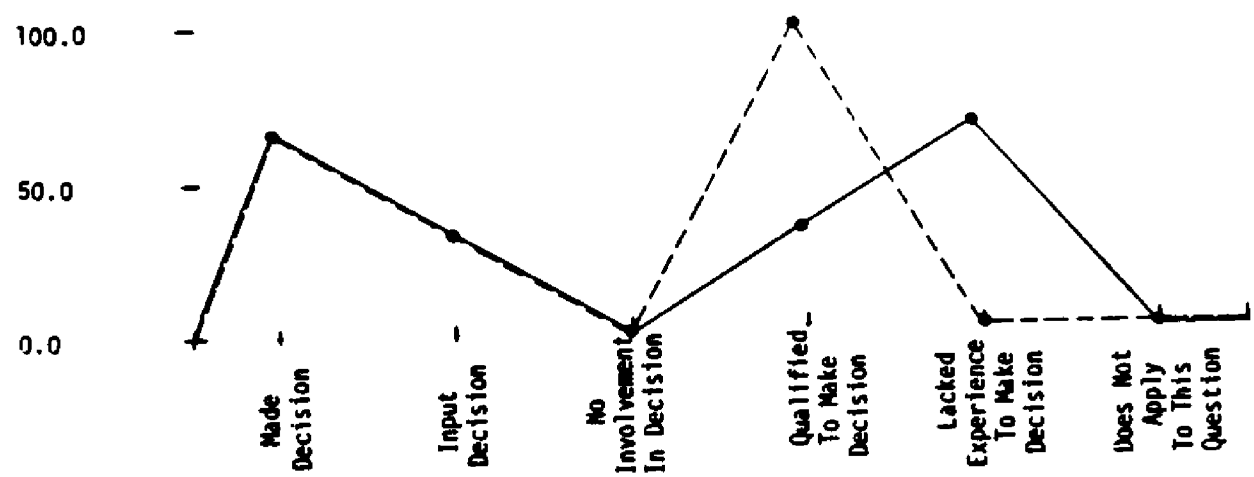

Figure 10G. Determining instructional layouts, both moveable and fixed.

Analysis of this part of the question would indicate that board representatives involved in the traditional construction projects were slightly more involved in this decision and are much more qualified to make the decision than are board representatives involved in the construction management projects.

--Comparative perceptions of the board members' level of involvement and and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in construction management projects perceived their board members as having a higher level of participation in the decision than did the board representatives involved in the traditional construction projects. Both the board representatives involved in the traditional construction projects and the board representatives involved in the construction management projects indicated that their board members were not qualified to make the decision (see Figure 10H).

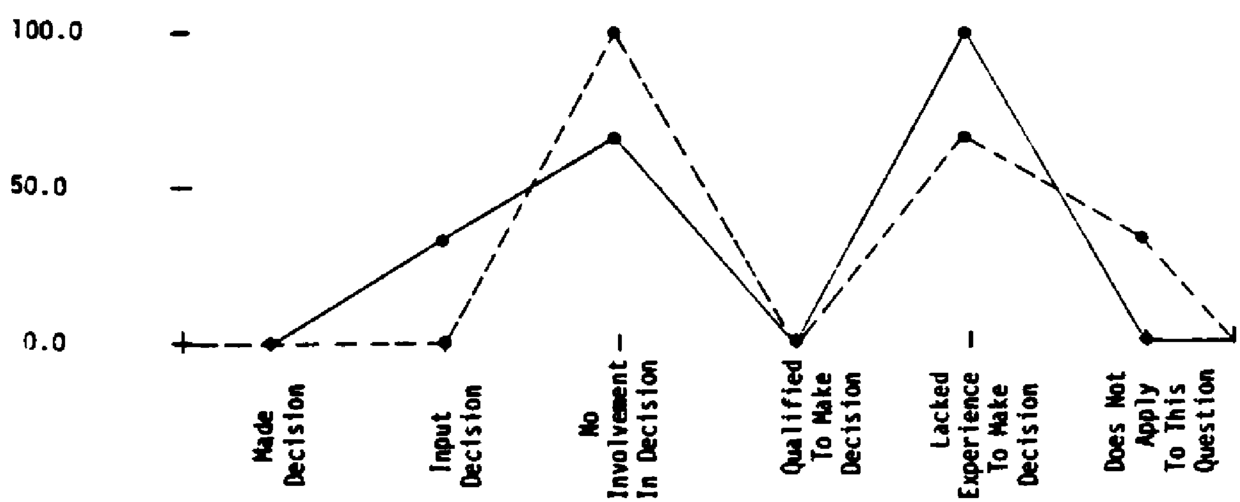

Figure 10H. Determining instructional layouts, both moveable and fixed.

The board members involved in the traditional construction projects indicated a slightly higher level of involvement in the decision and also perceived themselves as being more qualified to make the decision than did the board members involved in the construction management projects (see Figure 10I).

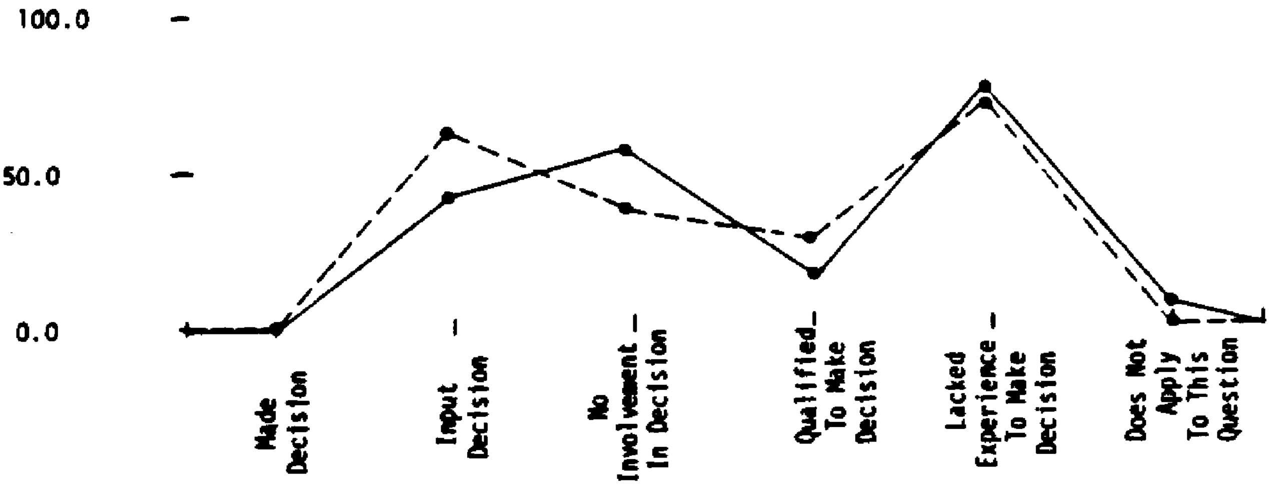

Figure 10I. Determining instructional layouts, both mvoeable and fixed.

The project architects involved in the construction management projedts indicated that the board members had a higher level of involvement in the decision than did the project architects involved in the traditional construction projects. However, they indicated that the board members were less qualified to make the decision than did the project architects involved in the traditional construction projects (see Figure 10J).

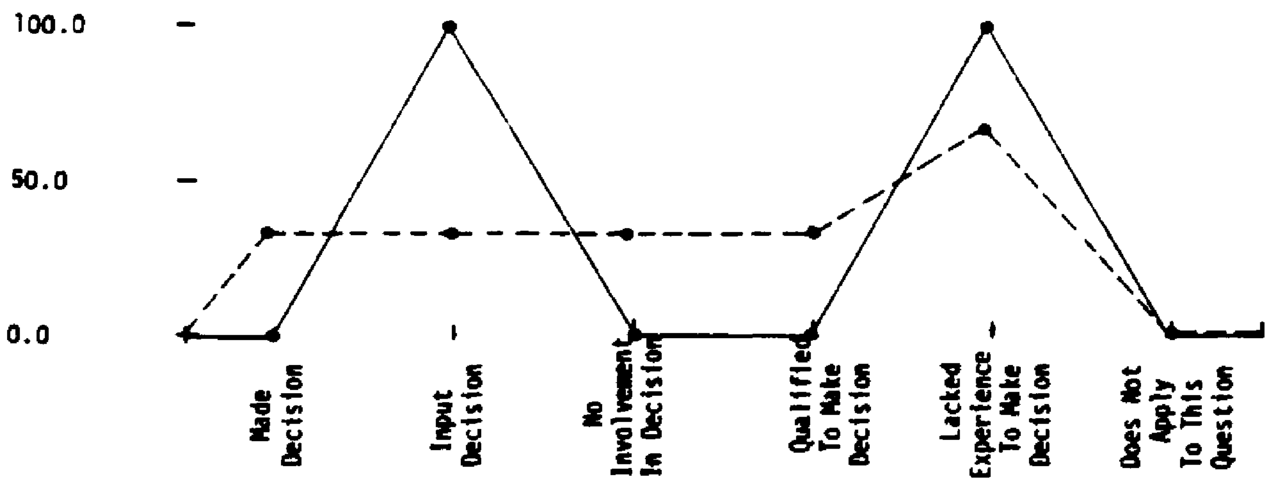

Figure 10J. Determining instructional layouts, both moveable and fixed.

Analysis of this part of the question would indicate that while the board members involved in construction management projects are perceived to have a higher level of involvement in the decision, they are also perceived as being less qualified to make the decision.

Decision # 11 - Establishing the Project Development Schedule

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects perceived themselves as having a higher level of involvement in the decision than did the board representatives involved in the construction management projects. They also perceived themselves to be more qualified to make the decision than did board representatives involved in construction management projects (see Figure 11E).

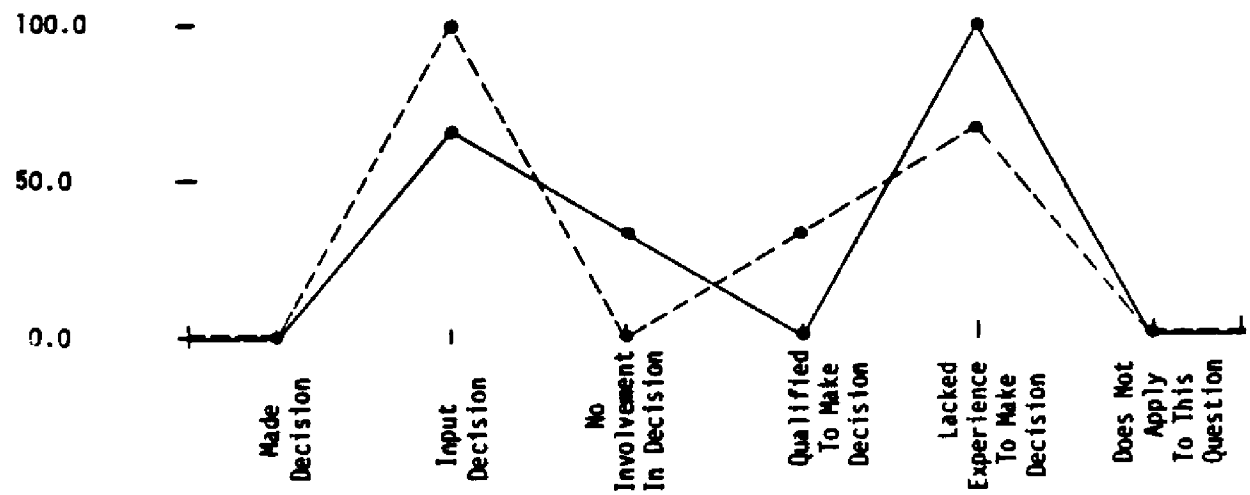

Figure 11E. Establishing the project development schedule.

The board members involved in construction management projects perceived their representatives as having a higher level of involvement in the decision than did board members involved in traditional construction projects. They also indicated that they felt that their board representatives were more qualified to make the decision than did board members involved in the traditional construction projects (see Figure 11F).

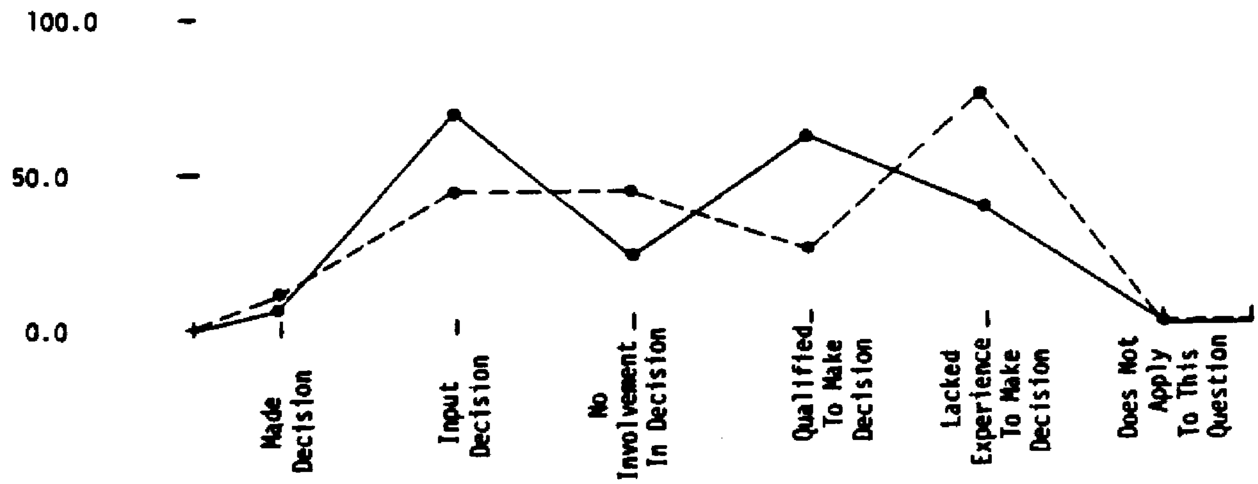

Figure 11F. Establishing the project development schedule.

Project architects involved in construction management projects indicated that their board representatives were slightly more involved in making the decision than did the project architects involved in the traditional construction projects. However, the project architects involved in the traditional construction projects indicated that the board representatives were much more qualified to make the decision than did the project architects involved in the construction management projects (see Figure 11G).

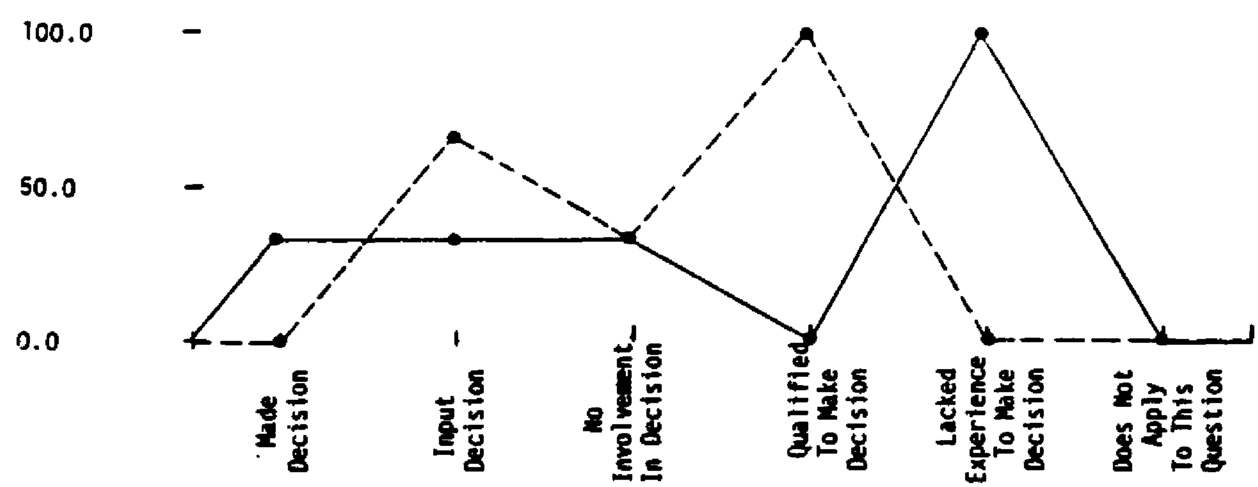

Figure 11G. Establishing the project development schedule.

Analysis of this part of the question would indicate that the board representatives involved in the construction management projects are perceived to have a slightly higher level of involvement in the decision than did the board representatives involved in the traditional construction projects. However, the board representatives involved in the traditional construction projects were perceived to be more qualified to make the decision than were the board representatives involved in the construction management projects.

--Comparative perceptions of the board member's level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived their board members as having a higher level of involvement in the decision than did the board representatives involved in the construction management projects. They also indicated that they felt their board members were more qualified to make the decision than did the board representatives involved in the construction management projects (see Figure 11H).

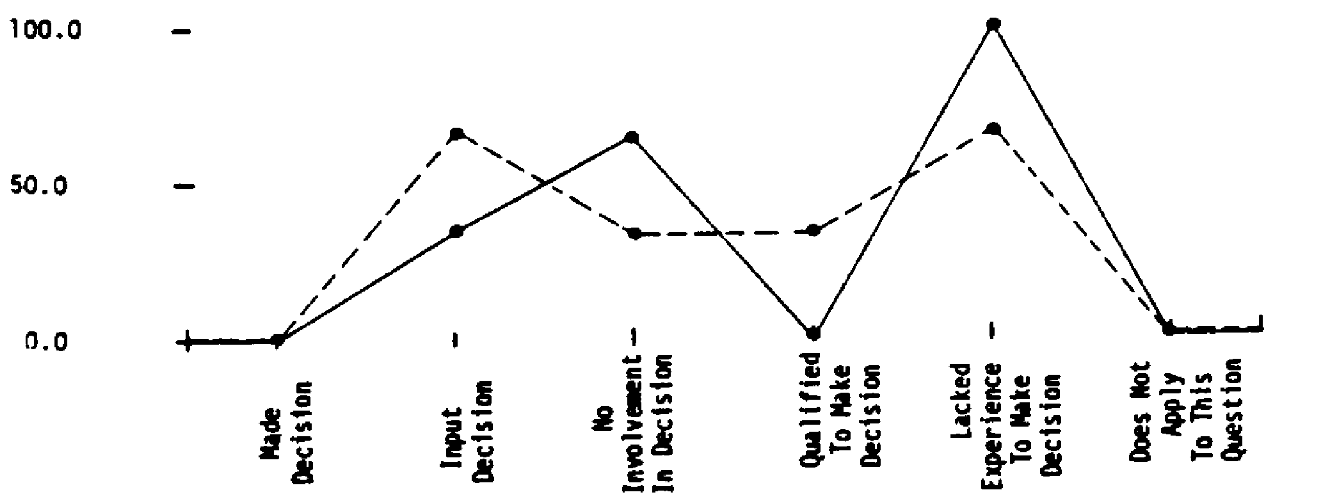

Figure 11H. Establishing the project development schedule.

Board members involved in the construction management projects indicated a slightly higher level of involvement in the decision than did board members involved in the traditional construction projects.

Thay also indicated that they felt more qualified to make the decision than did board members involved in the traditional construction projects (see Figure 11I).

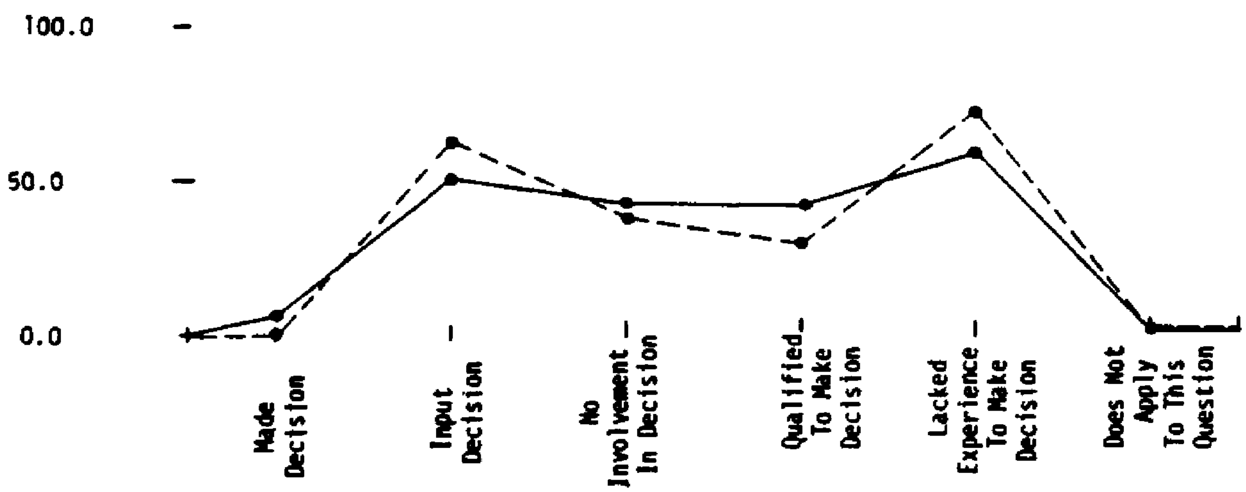

Figure 11I. Establishing the project development schedule.

Project architects involved in traditional construction projects indicated that their board members were more involved in the decision than did project architects involved in the construction management projects. They also indicated that the board members were more qualified to make the decision than did the project architects involved in construction management projects (see Figure 11J).

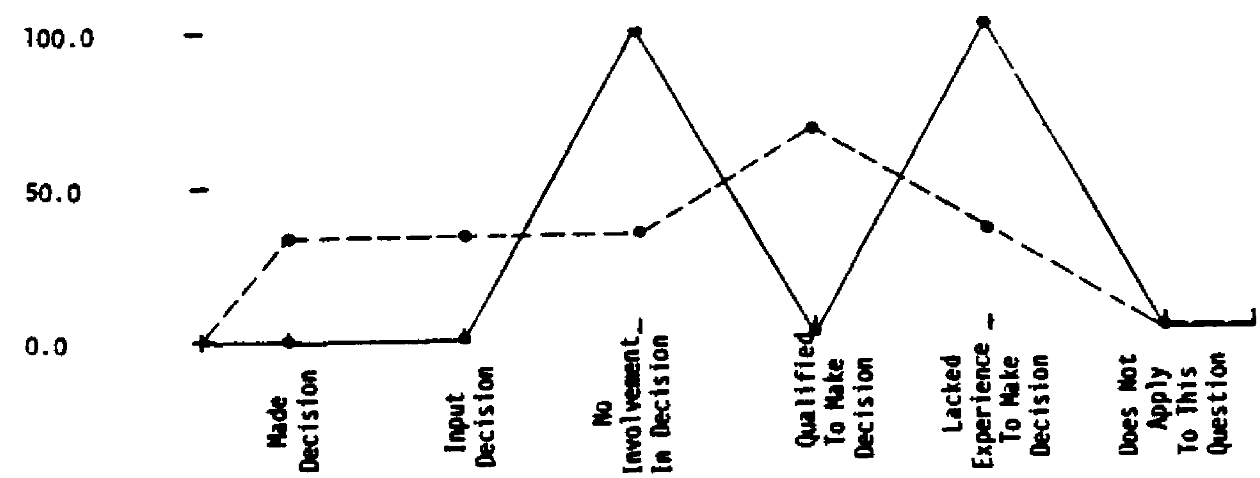

Figure 11J. Establishing the project development schedule.

The analysis of this part of the question would indicate that board members involved in traditional construction projects are perceived to have more involvement in the decision and to be more qualified to make the decision than are board members involved in the construction management projects.

Decison # 12 - Determining the Mechanical Trades Budget

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in the construction management projects indicated a higher level of involvement in this decision than did board representatives involved in the traditional construction projects (see Figure 12E).

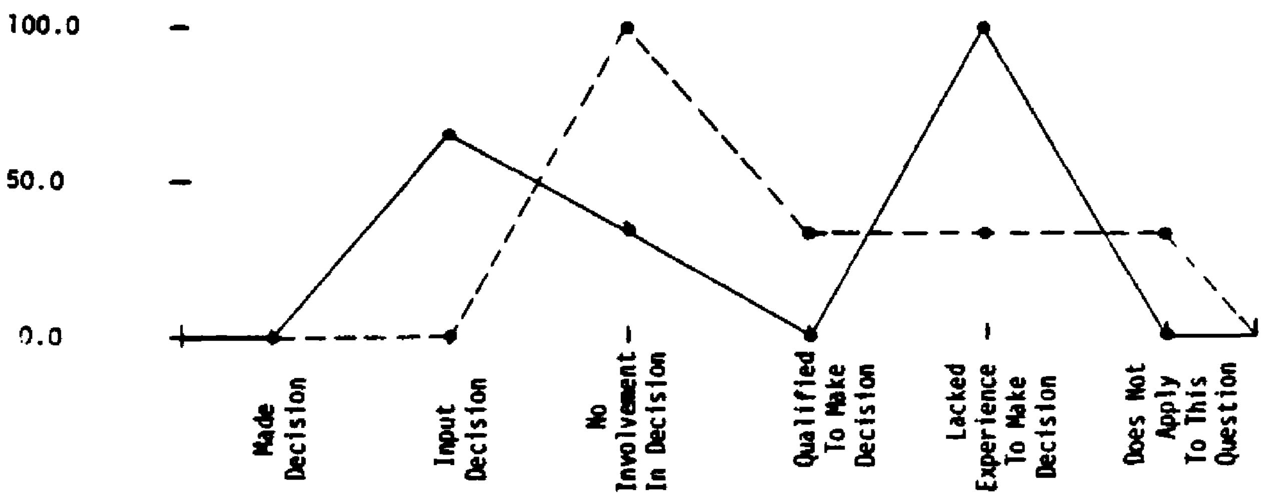

Figure 12E. Determining the mechanical trades budget.

Board members involved in construction management projects perceived their representatives as having a much higher level of involvement in the decision than did board members involved in traditional construction projects. They also indicated that they perceived their board representatives as being more qualified to make the decision than did the board members involved in the traditional construction projects (see Figure 12F).

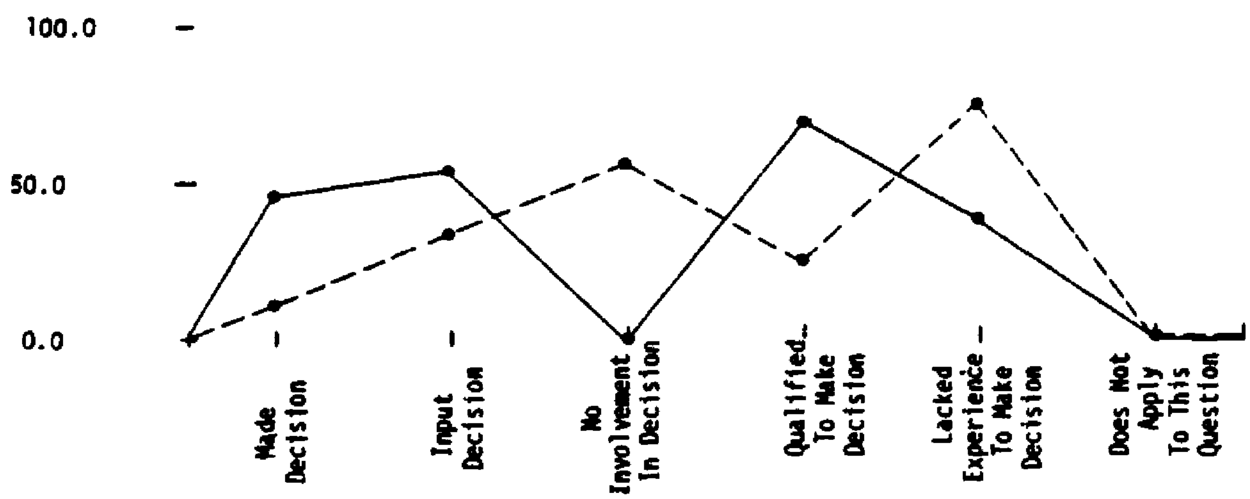

Figure 12F. Determining the mechanical trades budget.

Project architects involved in construction maangement projects indicated that the board representatives had a higher level of involvement in this decision than did the project architects involved in traditional construction projects. Both the project architects involved in construction management projects and the project architects involved in traditional construction projects indicated that the board representatives were not qualified to make this decision (see Figure 12G).

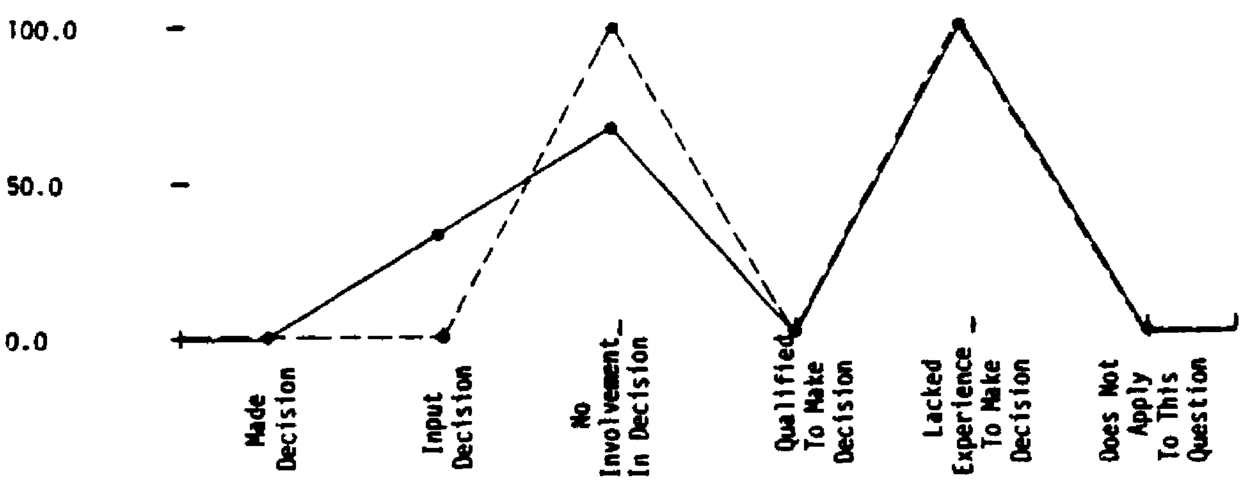

Figure 12G. Determining the mechanical trades budget.

An analysis of this part of the question would indicate that the board representatives involved in construction management projects were considerably more involved in making the decision than were board representatives involved in the traditional construction projects. However, they were perceived to lack the experience necessary to make the decision.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects perceived their board members as having a higher level of involvement in the decision than did board representatives involved in traditional construction projects. Both the board members involved in traditional construction projects and the board members involved in construction management projects indicated that their board members lacked the experience necessary to make the decision (see Figure 12H).

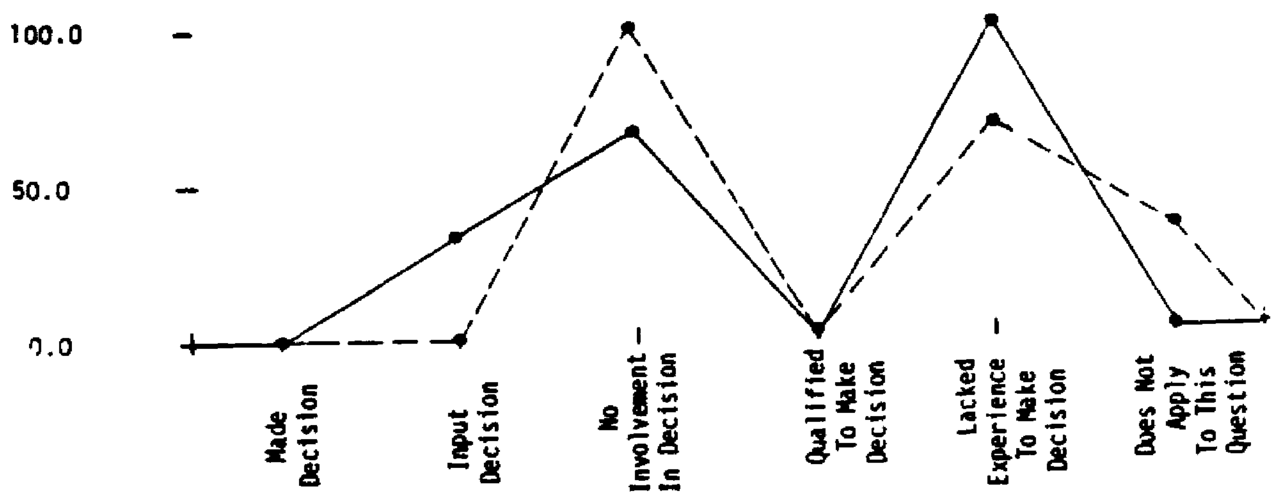

Figure 12H. Determining the mechanical trades budget.

Board members involved in construction management projects perceived themselves as having a higher level of involvement in the decision than did board members involved in the traditional construction projects. They also indicated that they were more qualified to make the decision than did board members involved in traditional construction projects (see Figure 12I).

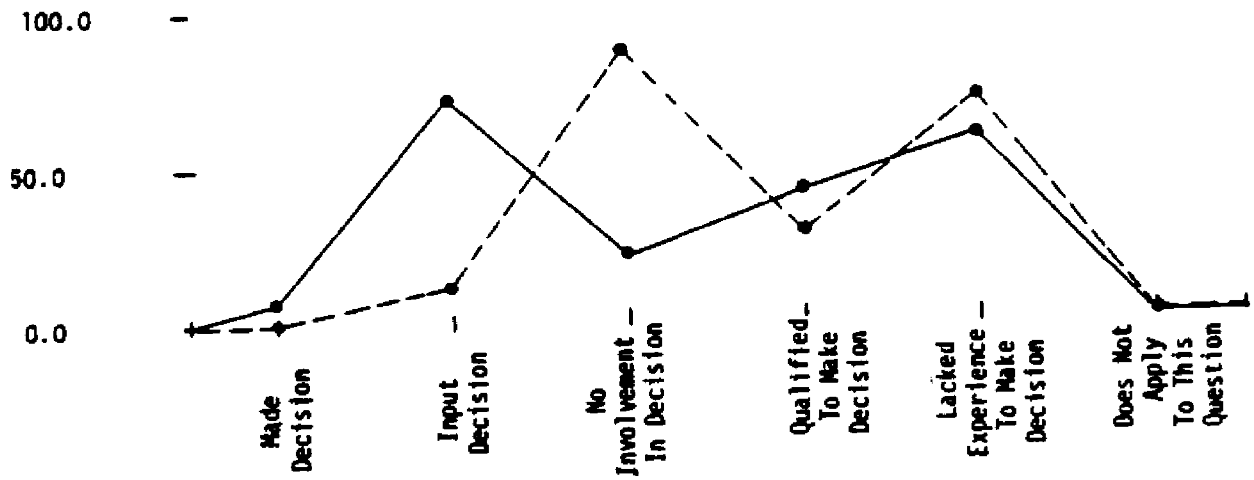

Figure 12I. Determining the mechanical trades budget.

The project architects involved in the construction management projects and the project architects involved in the traditional construction projects indicated that they perceived the board members to have no involvement in the decision and to lack the experience necessary to make the decision (see Figure 12J).

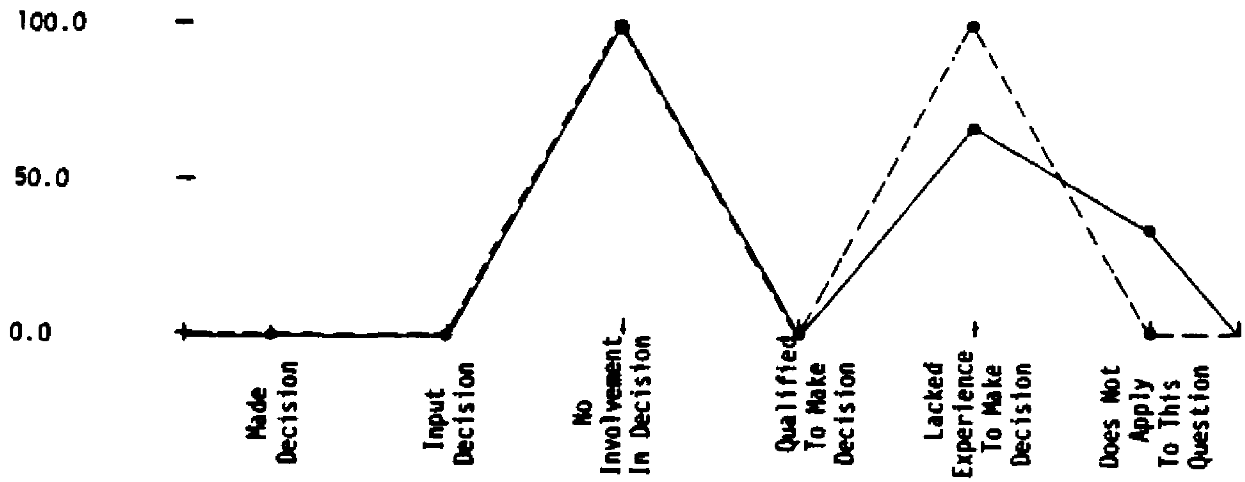

Figure 12J. Determining the mechanical trades budget.

Analysis of this part of the question would indicate that while the board members involved in construction management projects were perceived as having a higher level of involvement than were board members involved in traditional construction projects, they were perceived as being only slightly qualified to make the decision in this area.

Decision # 13 - Determining the Actual Building Location

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived themselves as having a higher level of involvement in the decision than did board representatives involved in construction management projects. They also indicated that they felt more qualified to make the decision than did board representatives involved in construction management projects (see Figure 13E).

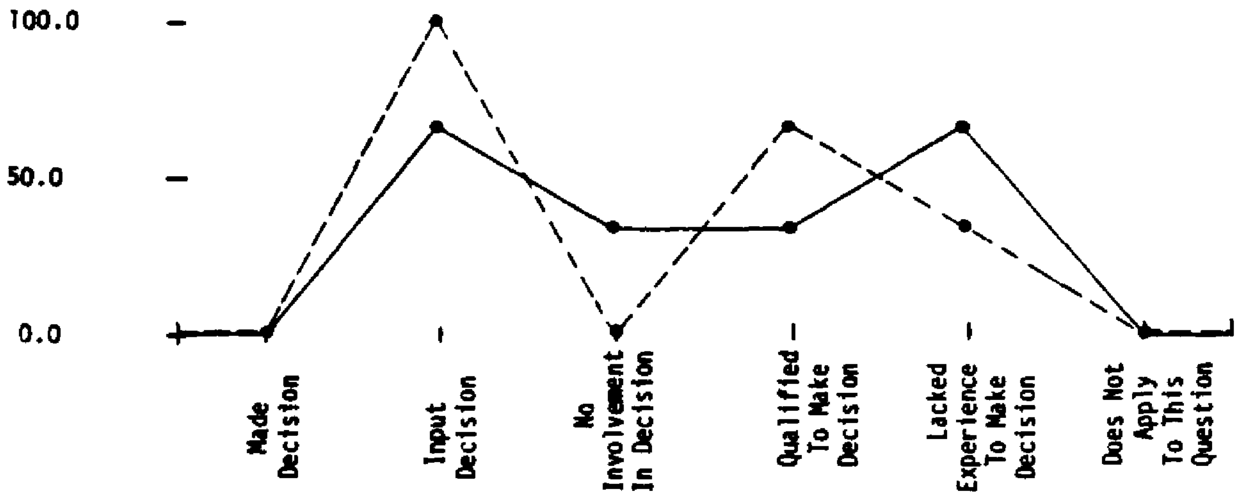

Figure 13E. Determining the actual building location.

Board members involved in construction management projects indicated that their board representatives were slightly more involved in the decision than did board members involved in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than were board members involved in traditional construction projects (see Figure 13F).

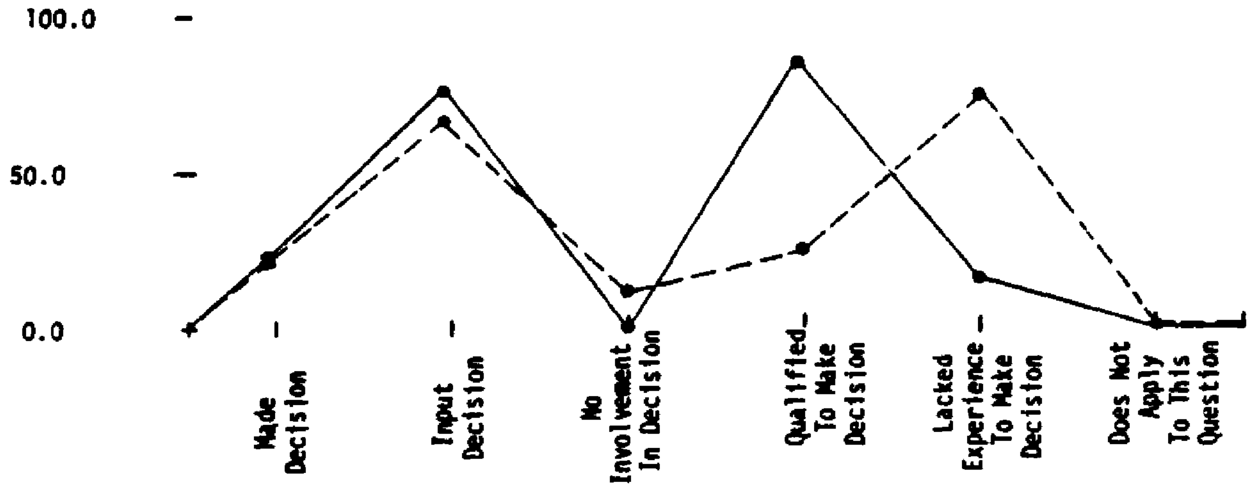

Figure 13F. Determining the actual building location.

Project architects involved in construction management projects perceived the board representatives as having a higher level of involvement in the decision than did project architects involved in traditional construction projects. They also indicated that the board representatives were more qualified to make the decision than did project architects involved in the traditional construction projects (see Figure 13G).

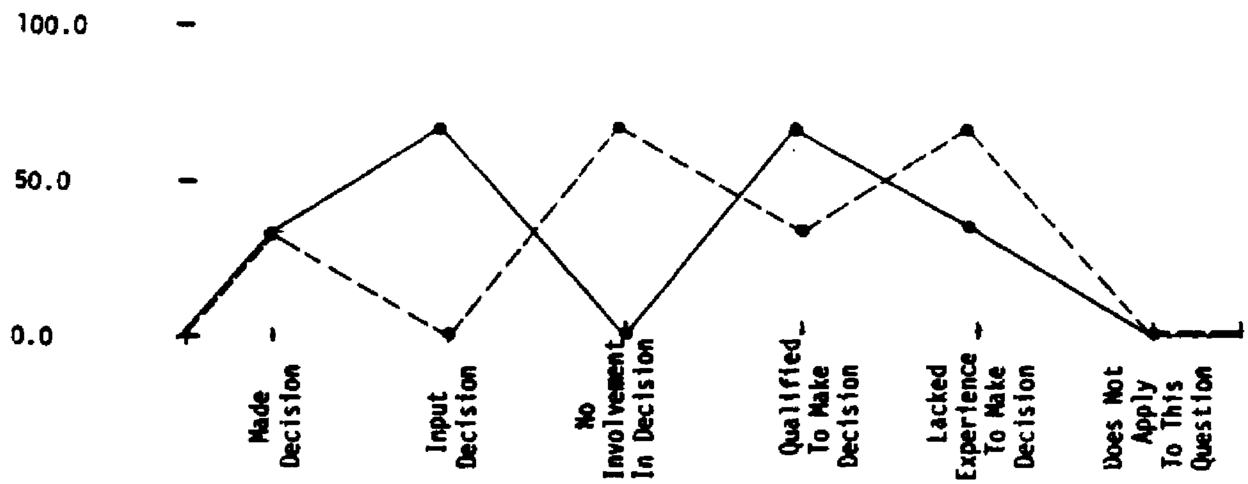

Figure 13G. Determining the actual building location.

The analysis of this part of the question indicates board representatives in construction management projects have a slightly higher level of involvement in the decision than board representatives involved in traditional projects. They were also perceived to be more qualified.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects perceived their board members as having a higher level of involvement in the decision than did board representatives involved in traditional construction projects. However, both board representatives involved in traditional construction projects and board representatives involved in construction management projects indicated an equal level of competence on the part of their board members in the decision area (see Figure 13H).

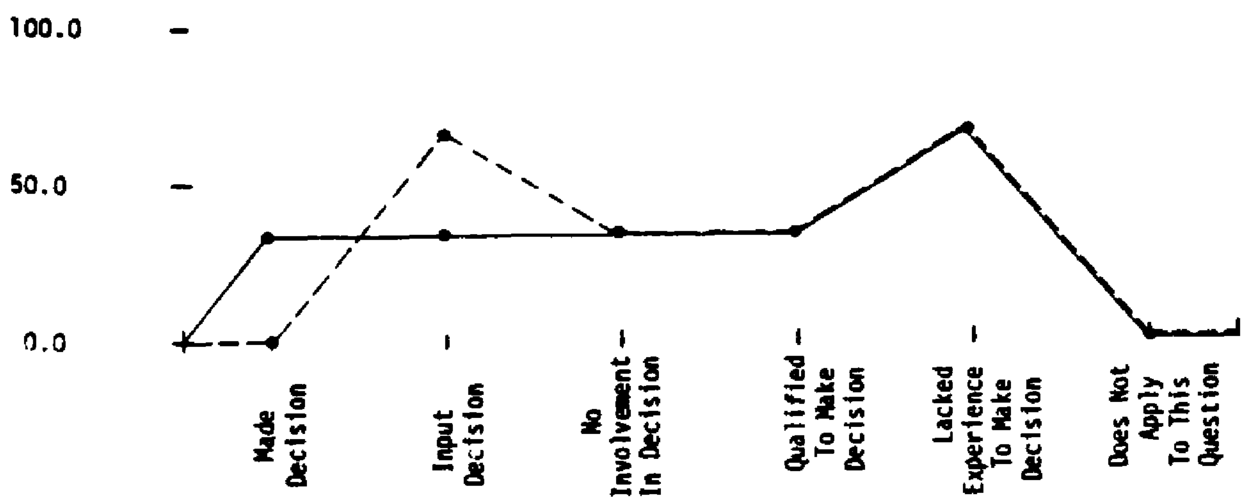

Figure 13H. Determining the actual building location.

Board members participating in the construction management projects indicated a higher level of involvement in the decision and a higher level of competence to make the decision than did board members involved in traditional construction projects (see Figure 13I).

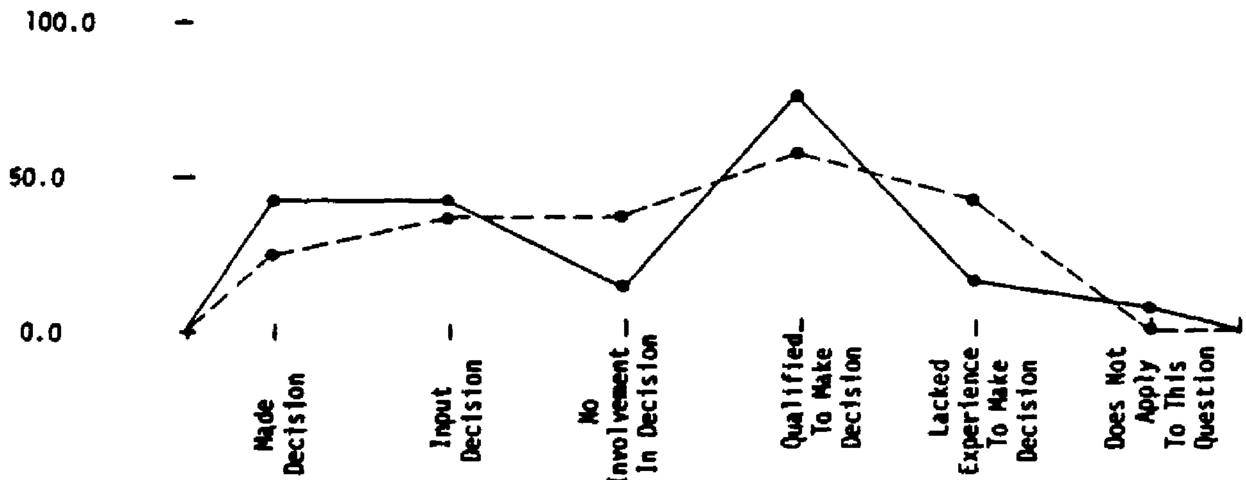

Figure 13I. Determining the actual building location.

Project architects involved in construction maangement projects indicated that board members were more involved in the decision than did the project architects involved in traditional construction projects. Both the project architects involved in construction management projects and the project architects involved in traditional construction projects perceived the same level of competence on the part of the board members (see Figure 13J).

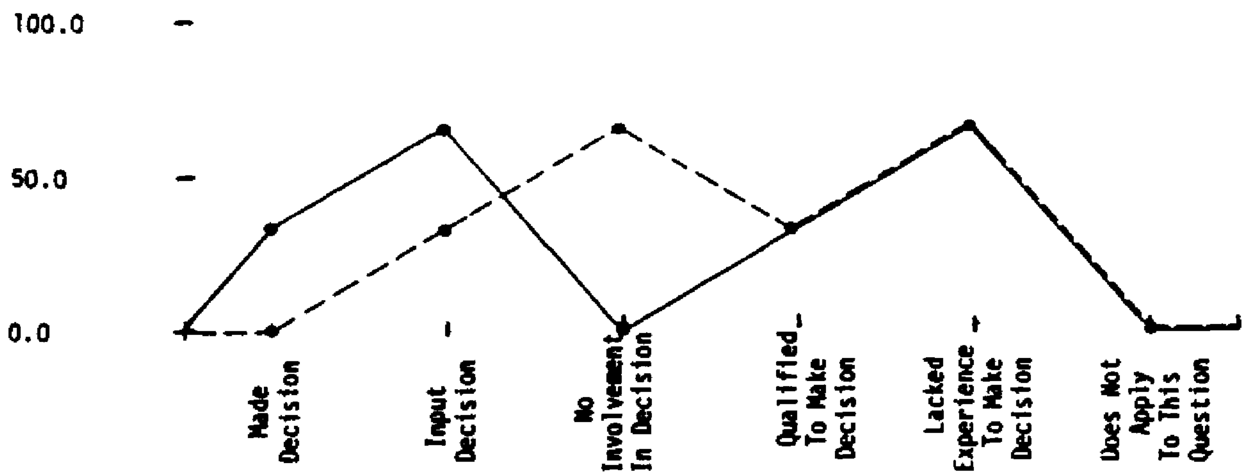

Figure 13J. Determining the actual building location.

The analysis of this part of the question would indicate that board members involved in construction management projects are slightly more qualified to make the decision than are board members involved in the traditional construction projects. They were also perceived as having a higher level of involvement in the decision.

Decision # 14 - Determining the Contouring for Purposes of Landscaping and Storm Drainage

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects indicated a higher level of input in the decision than did the board representatives involved in the construction management projects. (see Figure 14E).

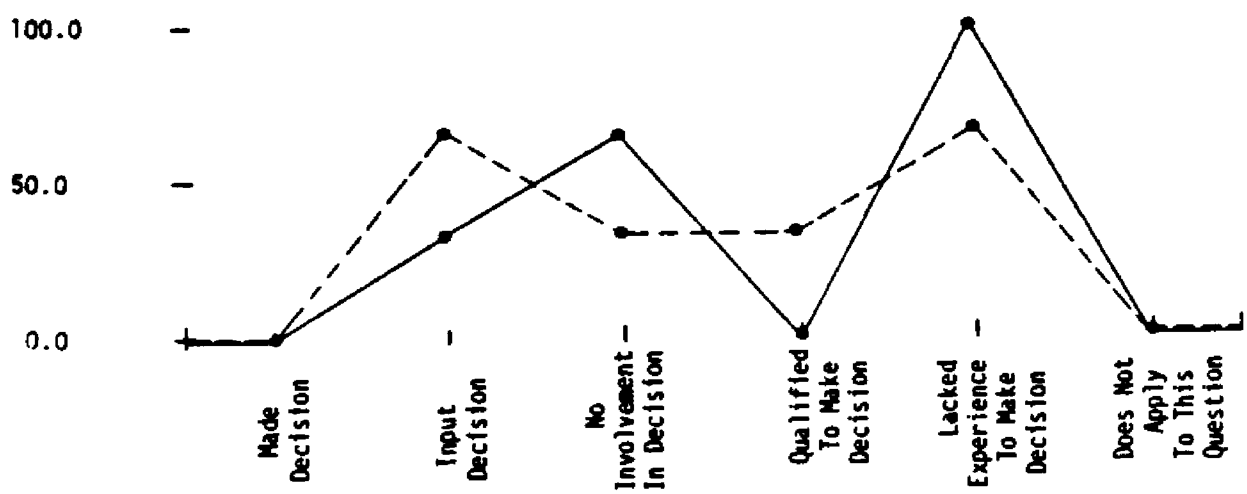

Figure 14E. Determining the contouring for purposes of landscaping and storm drainage.

Board members involved in construction management projects perceived their representatives as having a higher level of involvement in the decision than did board members involved in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than did board members involved in traditional construction projects (see Figure 14F).

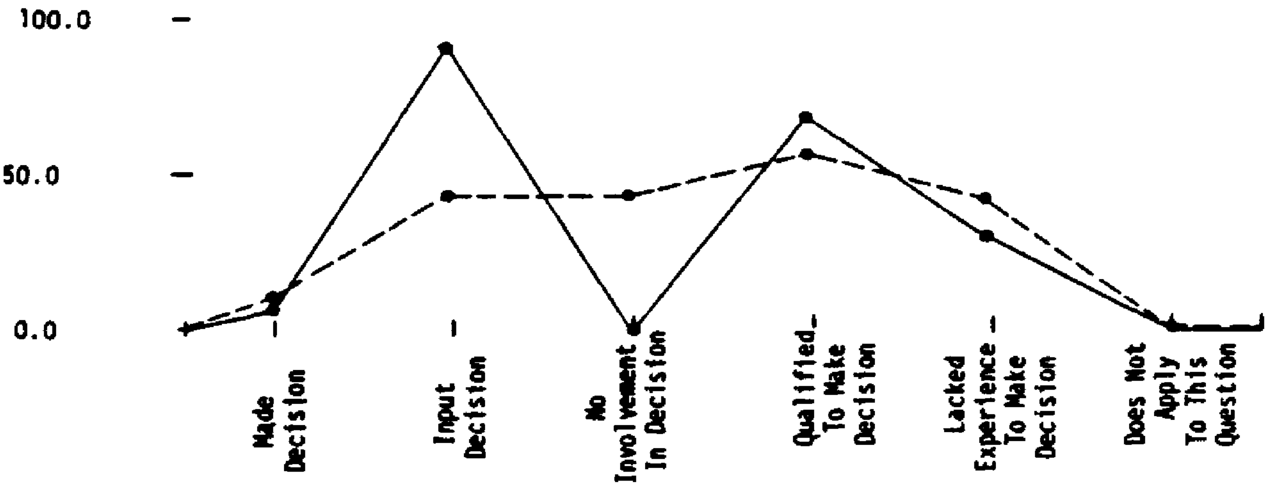

Figure 14F. Determining the contouring for purposes of landscaping and storm drainage.

Project architects involved in traditional construction projects and project architects involved in construction management projects perceived the board representatives to be involved at the same level in this decision, while both indicated that the respective board representatives were not qualified to make the decision (see Figure 14G).

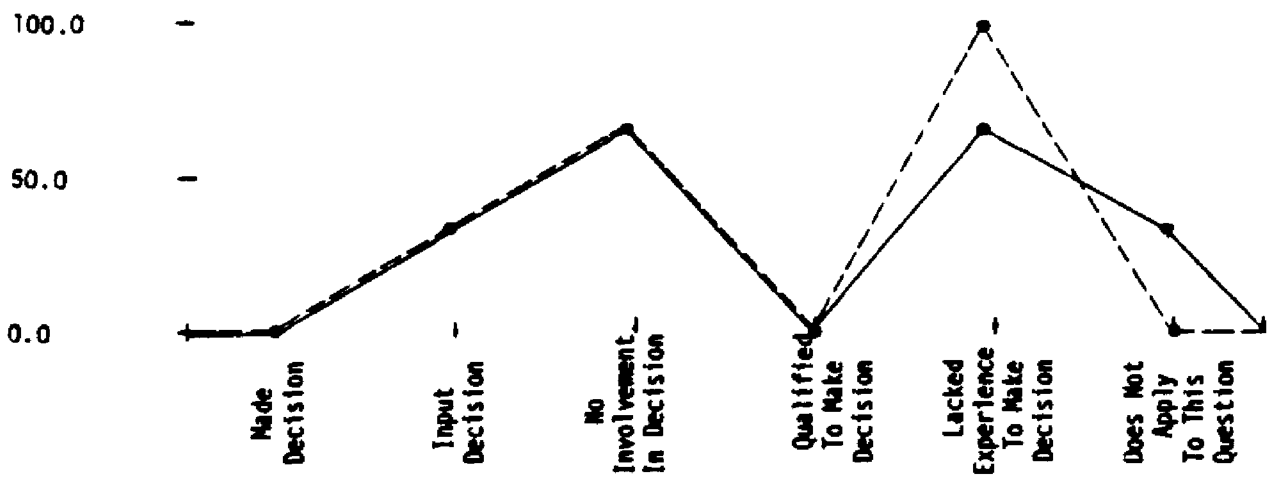

Figure 14G. Determining the contouring for purposes of landscaping and storm drainage.

The analysis of this part of the question would indicate that board representatives involved in construction management projects are perceived to have a slightly higher level of involvement in the decision but to be less competent to make the decision than board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects indicated that their board members had a higher level of involvement in the decision than did board representatives involved in construction management projects. They also indicated that their board members were more qualified to make the decision than did the board representatives involved in the construction management projects (see Figure 14H).

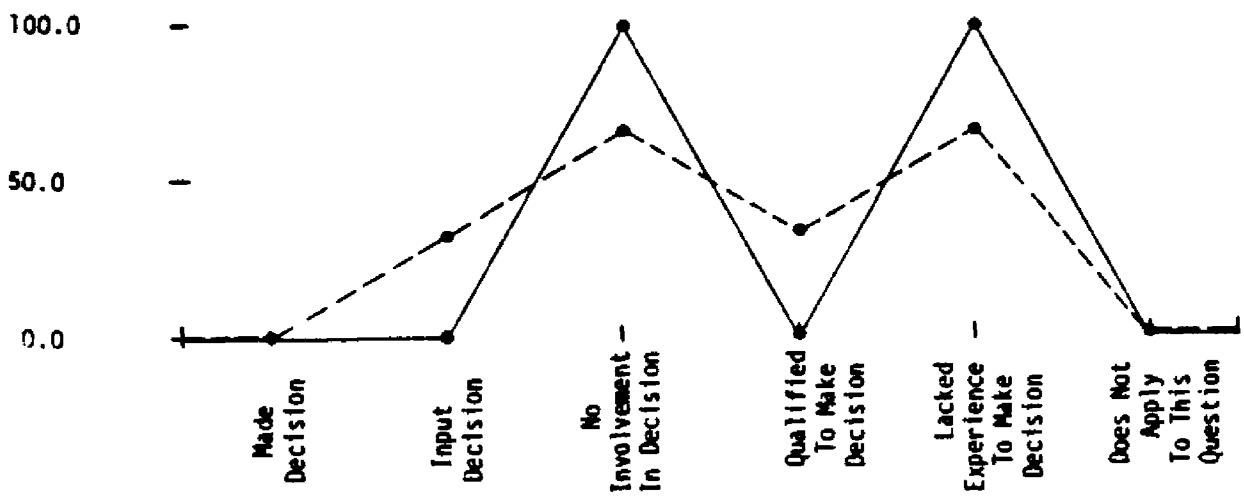

Figure 14H. Determining the contouring for purposes of landscaping and storm drainage.

Board members involved in construction management projects perceived themselves as having a higher level of involvement in the decision than did the board members involved in the traditional construction projects. They also perceived themselves to be more qualified to make the decision than did board members involved in the traditional construction projects (see Figure 14I).

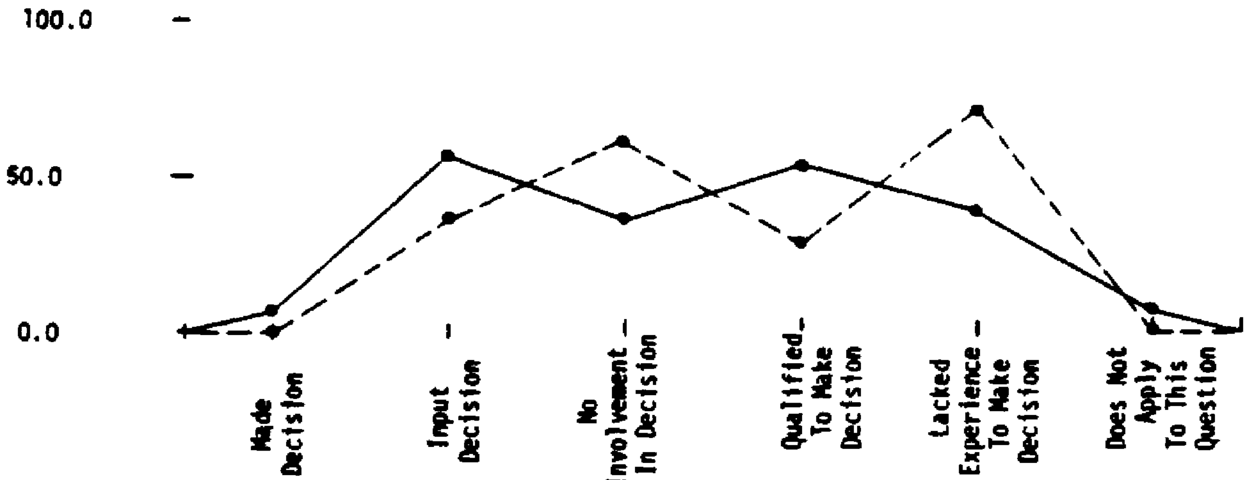

Figure 14I. Determining the contouring for purposes of landscaping and storm drainage.

Project architects involved in construction management projects and project architects involved in the traditional construction projects perceived the level of involvement of the board members to be the same, while the project architects involved in the traditional construction projects indicated that the board members were more qualified to make the decision than did the project architects involved in the construction management projects (see Figure 14J).

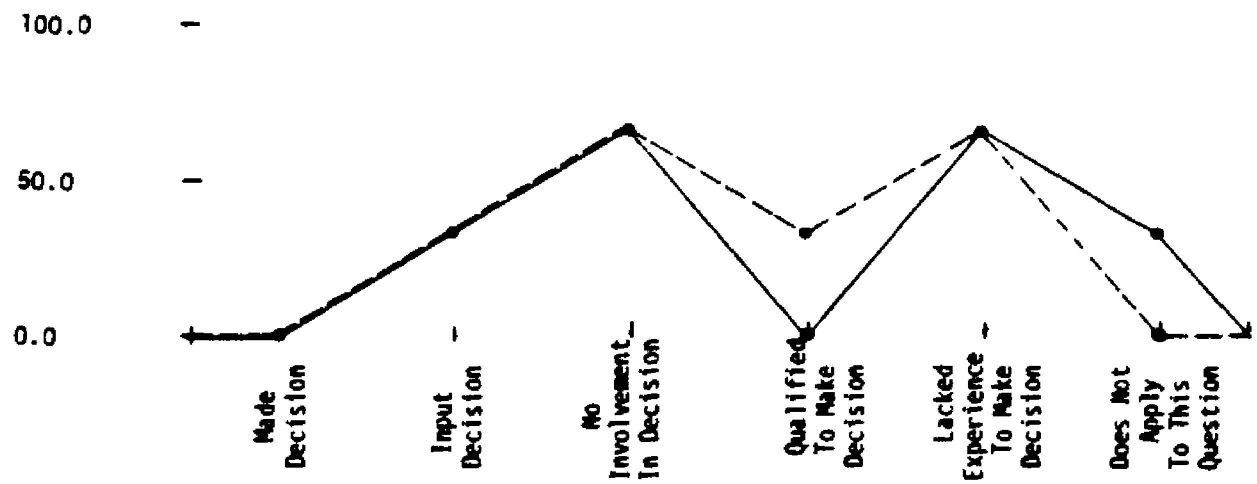

Figure 14J. Determining the contouring for purposes of landscaping and storm drainage.

The analysis of this part of the question would indicate that the board members involved in the traditional construction projects are slightly more involved in the decision than board members involved in the construction management projects. They are also perceived to be more qualified to make the decision than are the board members involved in the construction management projects.

Decision # 15 - Determining the Final Building Cost Estimates Based on Value Engineering

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in construction management projects indicated a much higher level of involvement in the decision than did the board representatives involved in the traditional construction projects. They also indicated that they were more qualified to make the decision than did board members involved in traditional construction projects (see Figure 15E).

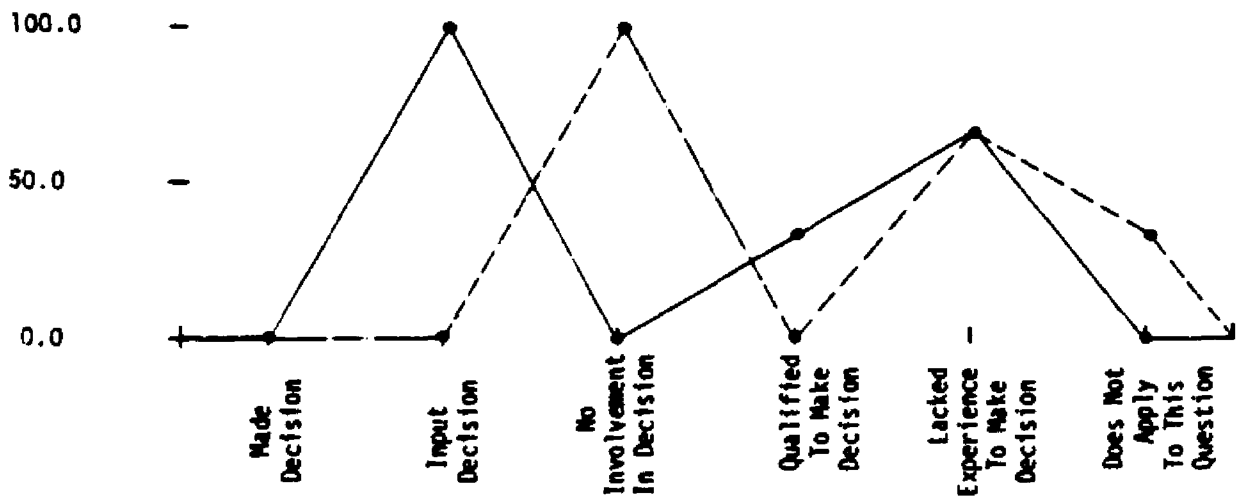

Figure 15E. Determining the final building cost estimates based on value engineering.

The board members involved in construction management projects perceived their board representatives as being involved at a slightly higher level in this decision than did the board members involved in the traditional construction projects. They also indicated that their board representatives were slightly more qualified to make the decision than did board members involved in traditional construction projects (see Figure 15F).

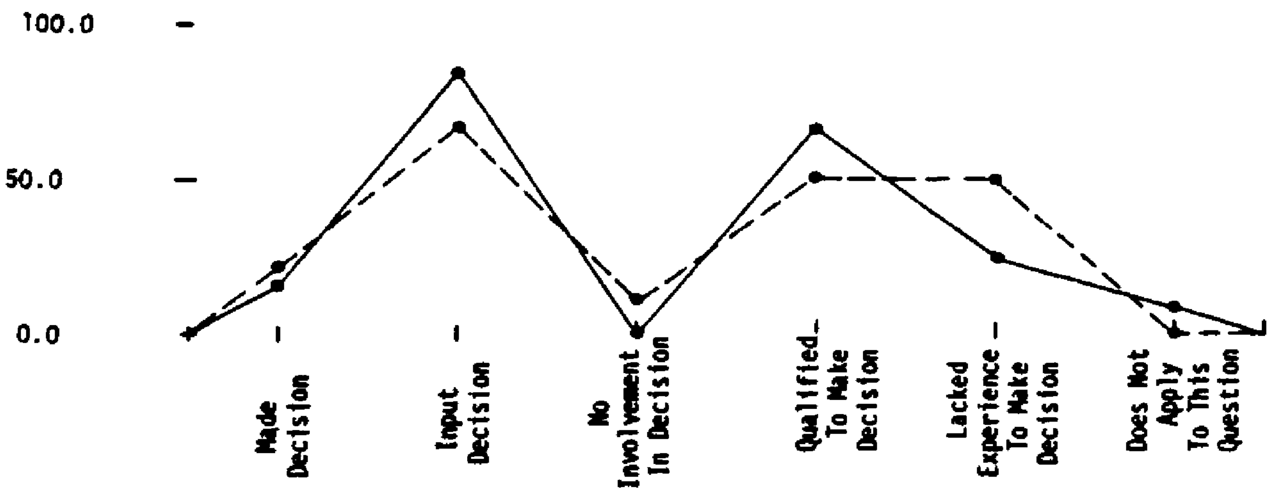

Figure 15F. Determining the final building cost estimates based on value engineering.

Project architects involved in construction management projects and project architects involved in traditional construction projects perceived the same levels of involvement of the board representatives. However, the project architects involved in traditional construction projects indicated that the board representatives were more qualified to make the decision than did the project architects involved in the construction management projects (see Figure 15G).

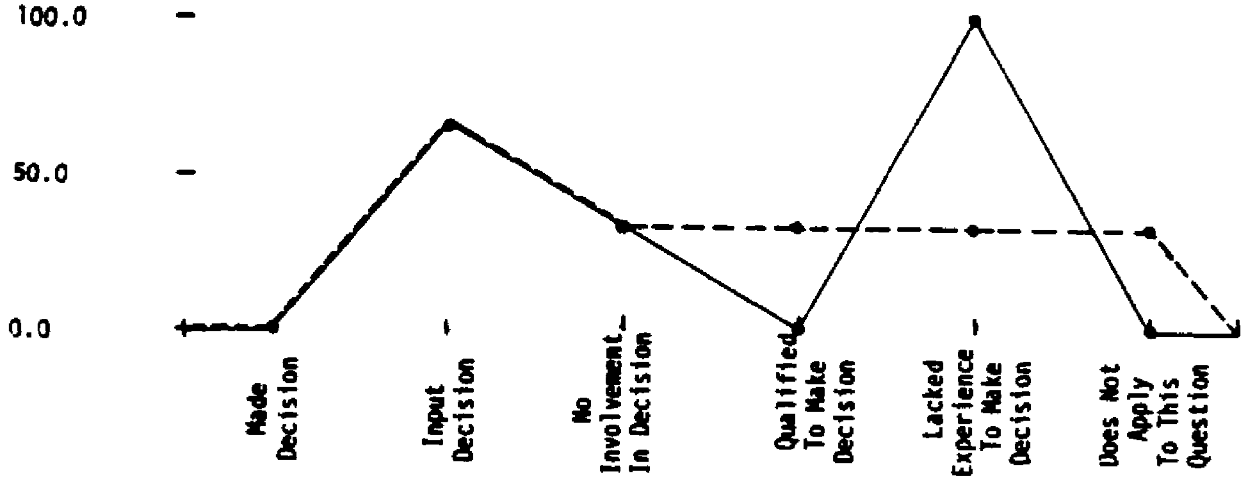

Figure 15G. Determining the final building cost estimates based on value engineering.

The analysis of this part of the question would indicate that board representatives participating in construction management projects are perceived to have a higher level of involvement in the decision than are board representatives participating in traditional construction projects. It would also indicate that board representatives involved in construction management projects are slightly more qualified to make the decision than are board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects indicated that their board members had a higher level of involvement in the decision than did board representatives involved in construction management projects. They also perceived that their board members were more qualified to make the decision than did board representatives involved in the construction management projects (see Figure 15H).

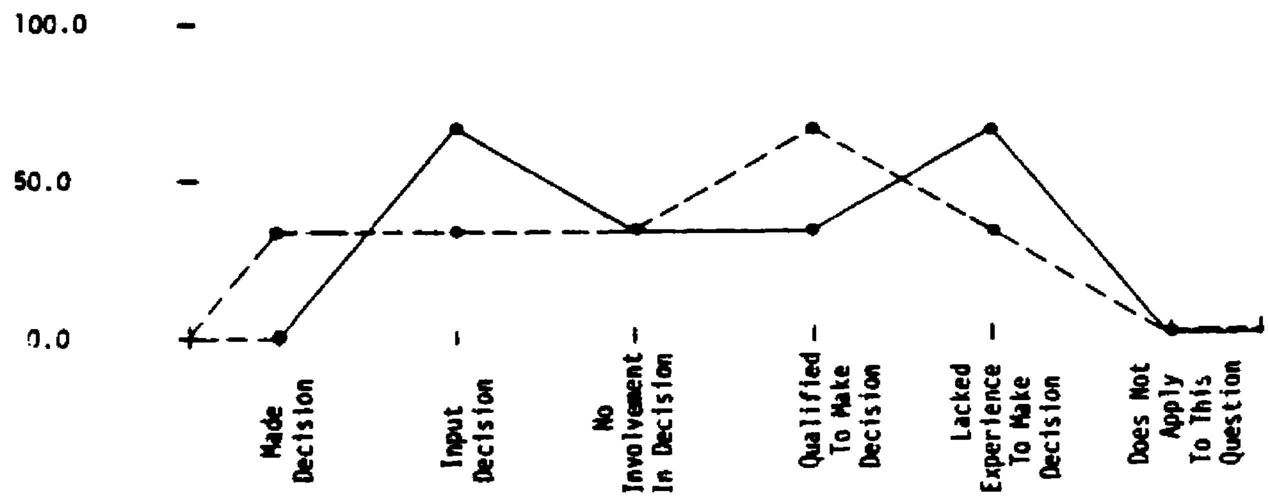

Figure 15H. Determining the final building cost estimates based on value engineering.

Board members participating in construction management projects perceived themselves to be slightly more involved in the decision than did board members participating in traditional construction projects. They also indicated that they were more qualified to make the decision than did board members participating in traditional construction projects (see Figure 15I).

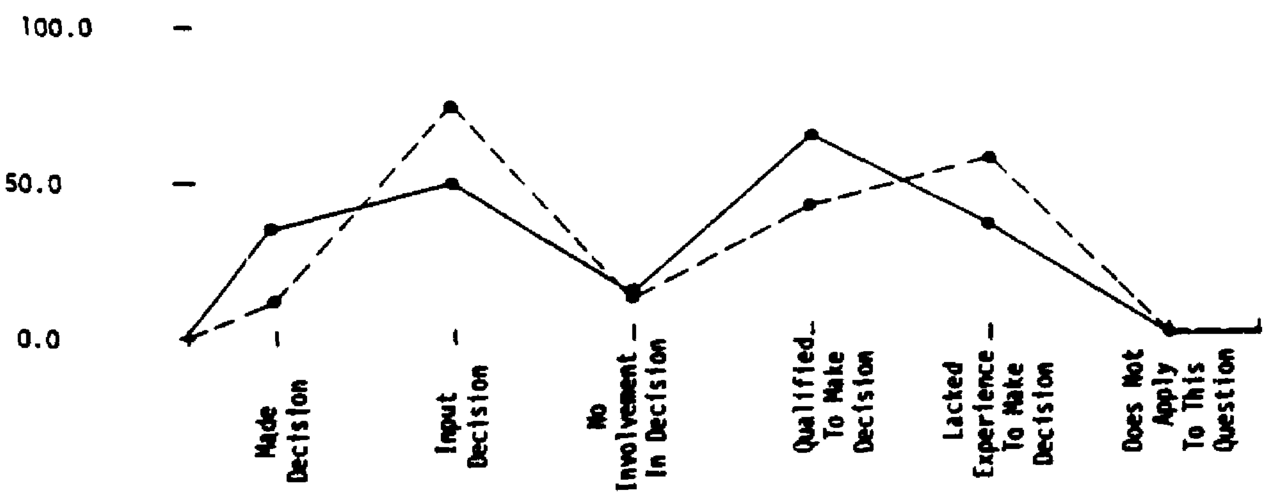

Figure 15I. Determining the final building cost estimates based on value engineering.

Project architects involved in construction management projects perceived the board members as having a much higher level of involvement than did the project architects involved in the traditional construction projects. However, they agreed that board members in both types of projects were only moderately qualified to make the decision (see Figure 15J).

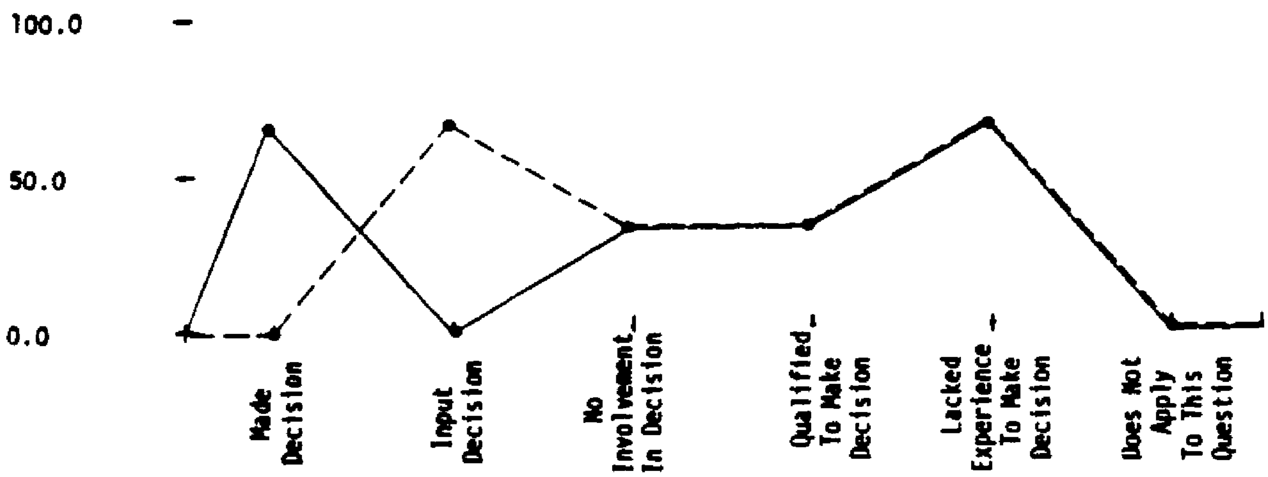

Figure 15J. Determining the final building cost estimates based on value engineering.

Analysis of this part of the question would indicate that board members participating in construction management projects are perceived to have a higher level of involvement in the decision than are those participating in traditional construction projects. There was very little difference in their perceived level of competence; however, board members involved in traditional construction projects are perceived to be slightly more qualified than board members involved in construction management projects.

<u>Decision # 16</u> - <u>Determining the Characteristics of the Exterior Envelope</u>

--Comparative perceptions of the baord representatives' level of involvement and competence in making the decision in a construction management project versus the traditional construction project

Board representatives involved in construction management projects perceived themselves as having a higher level of involvement than did board representatives involved in traditional construction projects.

However, both indicated that they were qualified at the same level to make make the decision (see Figure 16E).

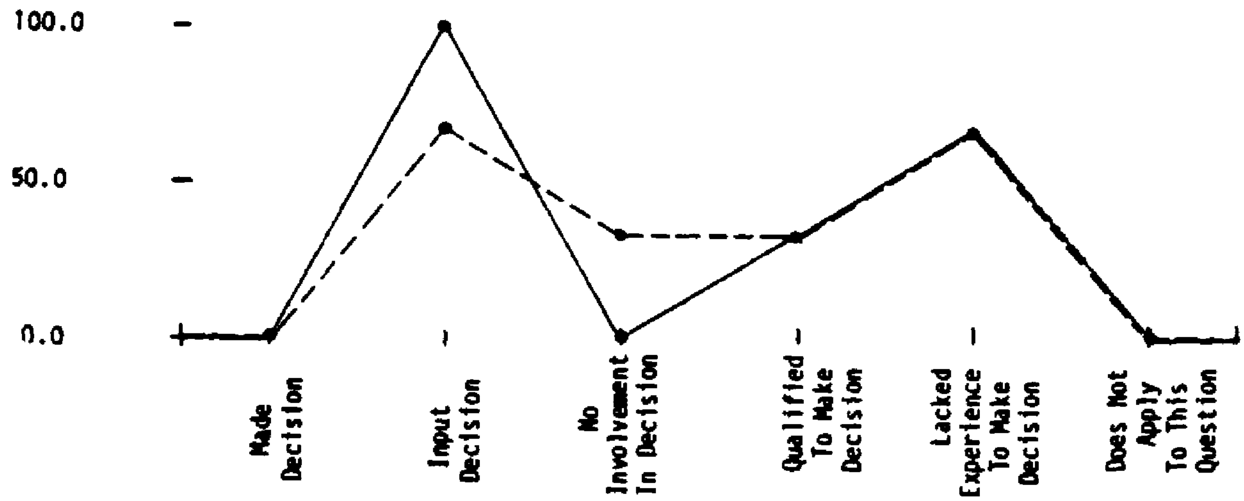

Figure 16E. Determining the characteristics of the exterior envelope.

Board members involved in construction management projects indicated that their board representatives had a slightly higher level of involvement in the decision than did the board members involved in the traditional construction projects. Both sets of board members perceived their representatives to be competent at the same level (see Figure 16F).

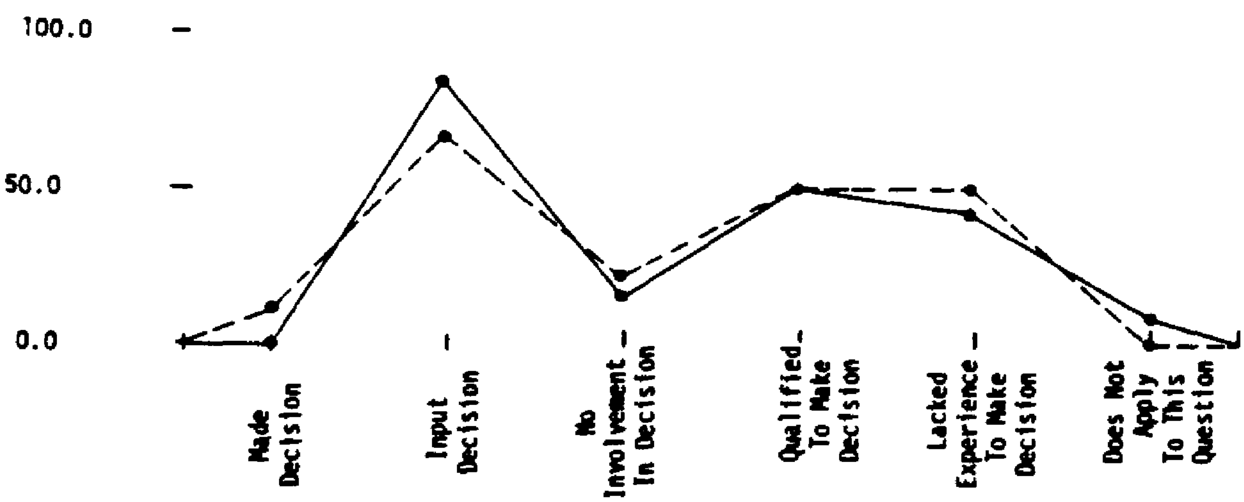

Figure 16F. Determining the characteristics of the exterior envelope.

Project architects involved in traditional construction projects perceived their board representatives to be involved at a higher level than did project architects involved in construction management projects.

They also indicated that the board representatives were more qualified than did the project architects involved in construction management projects (see Figure 16G).

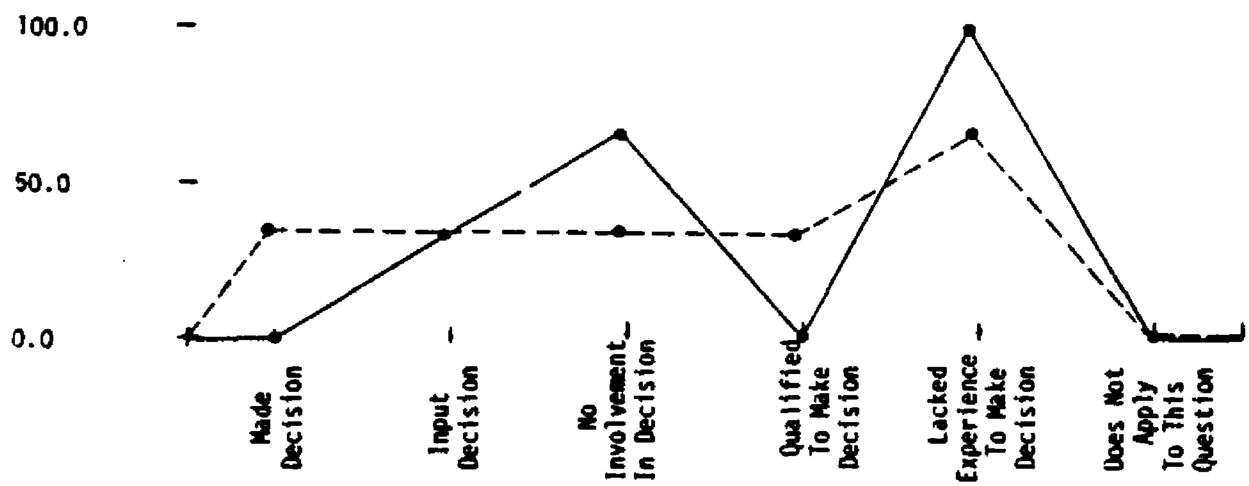

Figure 16G. Determining the characteristics of the exterior envelope.

Analysis of this part of the question would indicate that board representatives involved in traditional construction projects were slightly more involved in the decision and somewhat more competent in making the decision than were board representatives involved in the construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects perceived their board members as having a higher level of involvement in the decision than did board representatives involved in traditional construction projects. Both sets of board representatives indicated that their board members were competent at the same level (see Figure 16H).

Figure 16H. Determining the characteristics of the exterior envelope.

Board members involved in construction management projects perceived themselves as having a higher level of involvement in the decision than did board members involved in the traditional construction projects and also indicated that they were more qualified to make the decision than did board members involved in the traditional construction projects (see Figure 16I).

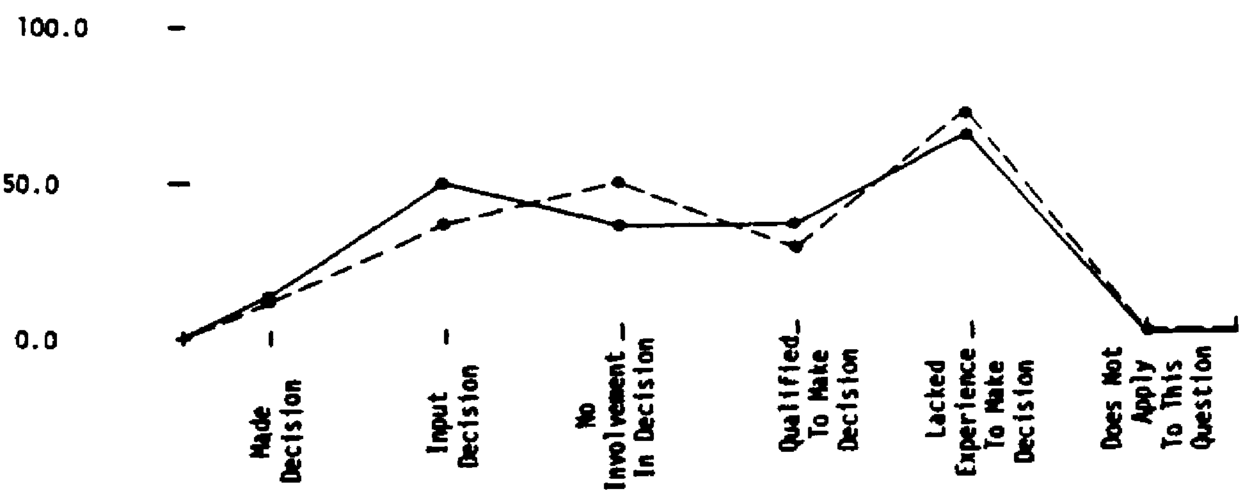

Figure 16I. Determining the characteristics of the exterior envelope.

Project architects involved in traditional construction projects and project architects involved in construction management projects agreed on all points indicating a moderate level of input by the board members with no qualification to make the decision (see Figure 16J).

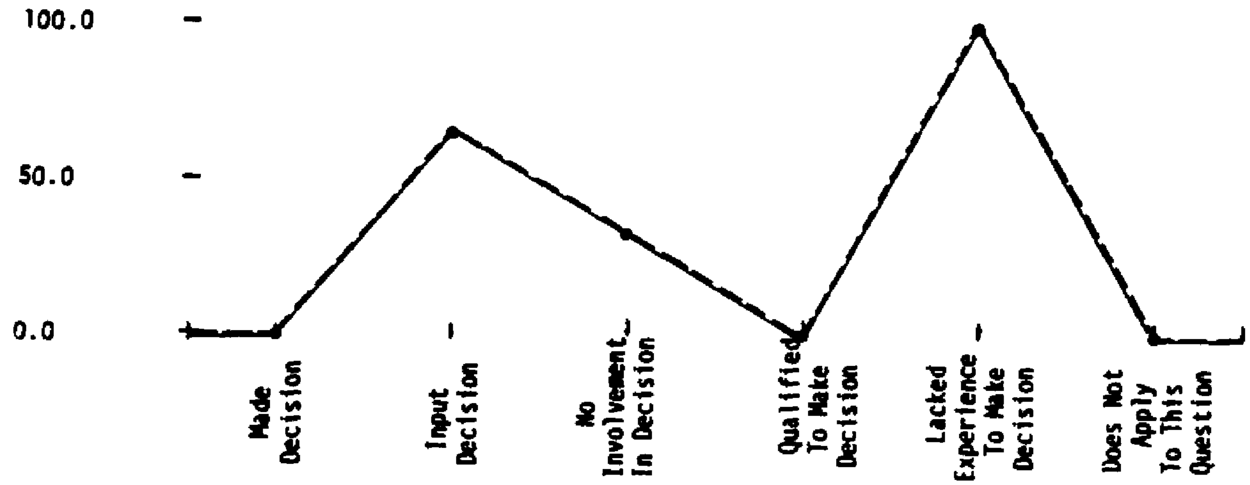

Figure 16J. Determining the characteristics of the exterior envelope.

Analysis of this part of the question indicates that board members involved in the construction management projects are perceived to play a greater role in making the decision than are board members involved in the traditional construction projects. They are also perceived to be slightly more qualified to make the decision.

Decision # 17 - Determining the Exterior Treatment and Fenestration of the Building

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives participating in traditional construction projects indicated a higher level of involvement than did the board representatives participating in construction management projects. Both sets of board representatives agreed on their level of competence to make the decision (see Figure 17E).

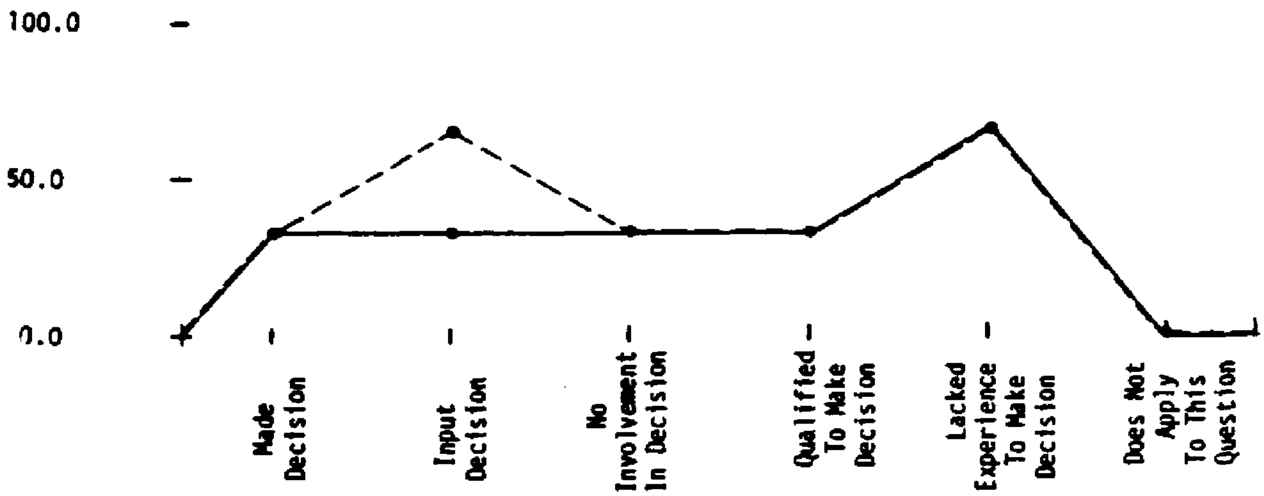

Figure 17E. Determining the exterior treatment and fenestration of the building.

Board members participating in construction management projects indicated that their board representatives had a higher level of involvement than did the board members participating in traditional construction projects (see Figure 17F).

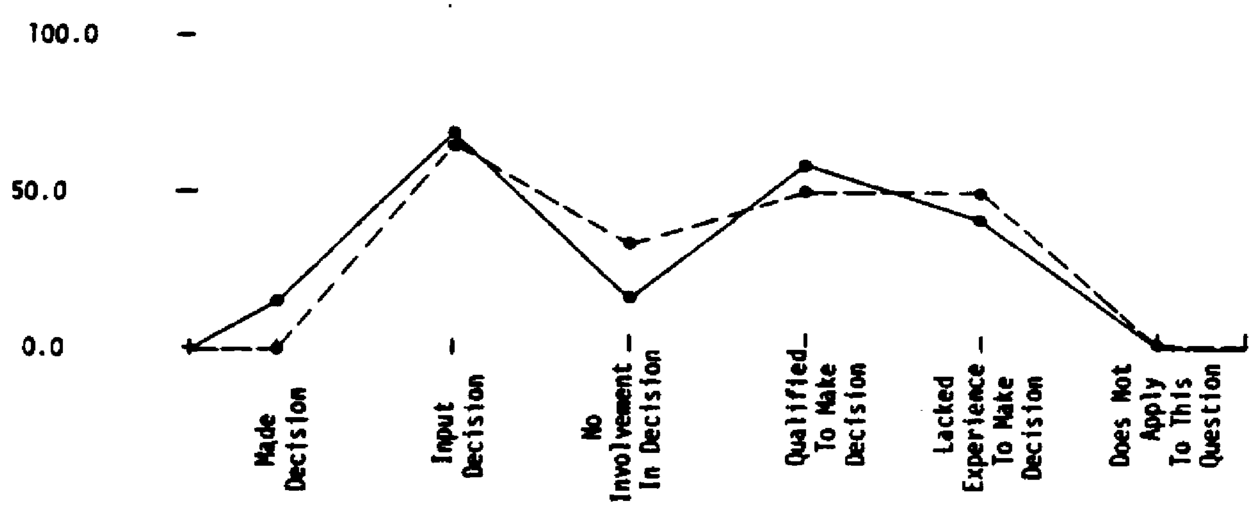

Figure 17F. Determining the exterior treatment and fenestration of the building.

Project architects participating in traditional construction projects indicated that the board representatives were involved at a higher level than did the project architects participating in construction management projects. They also indicated that the board representatives were more qualified to make the decision than were the board representatives participating in construction management projects (see Figure 17G).

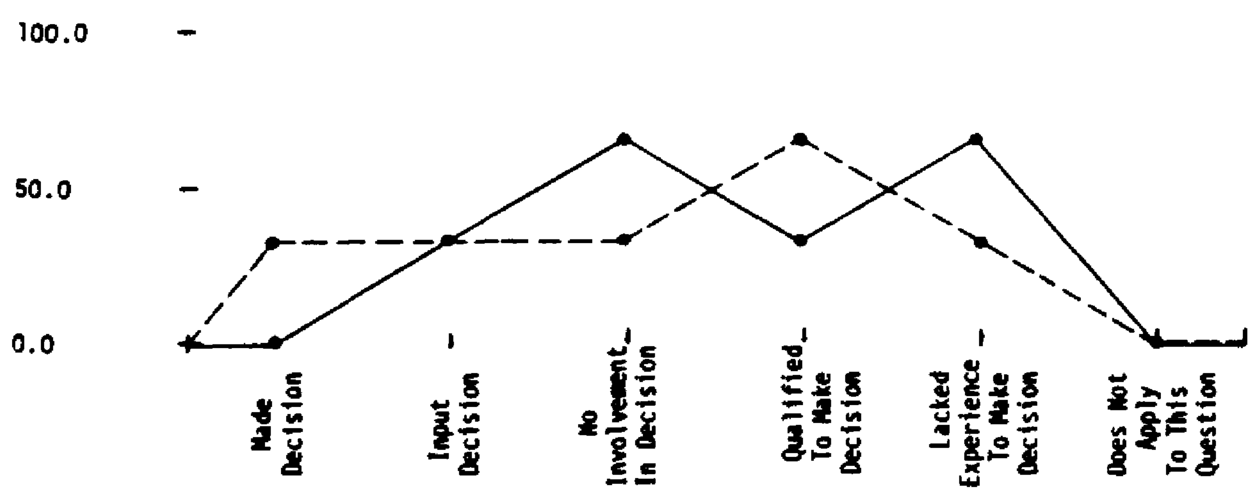

Figure 17G. Determining the exterior treatment and fenestration of the building.

The analysis of this question would indicate that board representatives involved in traditional construction projects are perceived to have a higher level of involvement in the decision than board representatives involved in construction management projects. They were also perceived as being more qualified than board representatives involved in construction

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives perceived their respective board members to be involved at the same level in making the decision. However, the board representatives participating in construction management projects perceived their board members to be more qualified to make the decision than did board representatives participating in traditional construction projects (see Figure 17H).

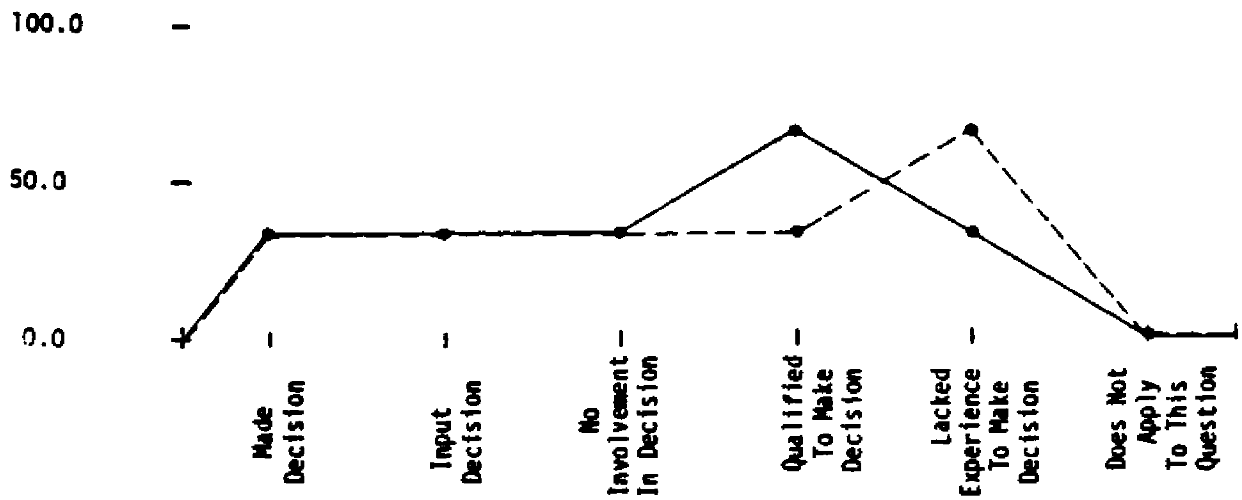

Figure 17H. Determining the exterior treatment and fenestration of the building.

Board members involved in construction management projects indicated a higher level of involvement in the decision than did board members participating in traditional construction projects. They also felt more qualified in making the decision than did the board members participating in the traditional construction projects (see Figure 17I).

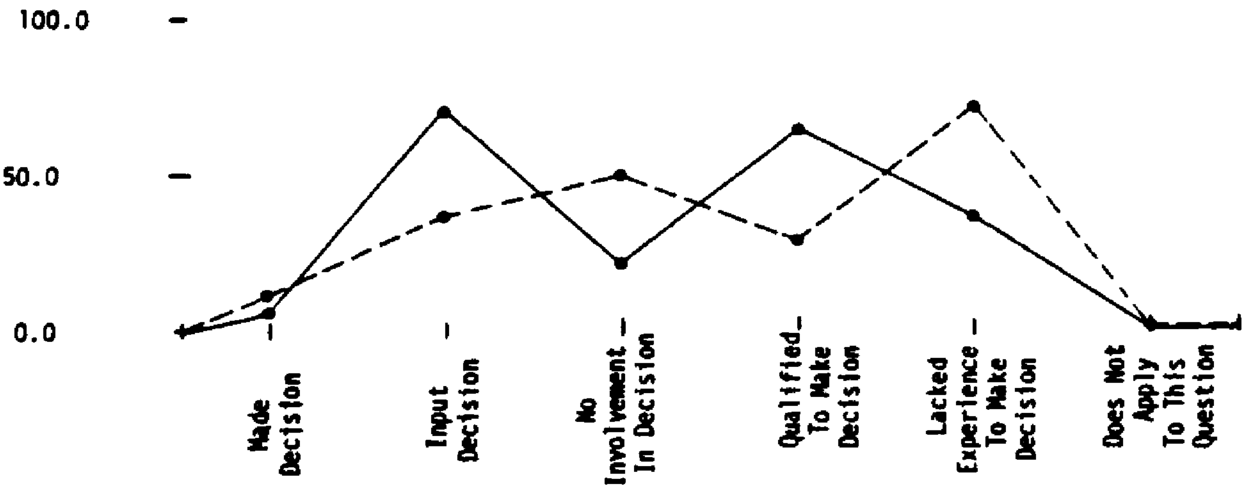

Figure 17I. Determining the exterior treatment and fenestration of the building

Project architects involved in construction management projects indicated a higher level of participation in the decision by the board members than did the project architects involved in the traditional construction projects. However, the project architects involved in traditional construction projects felt that the board members were more qualified to make the decision than did the project architects (see Figure 17J).

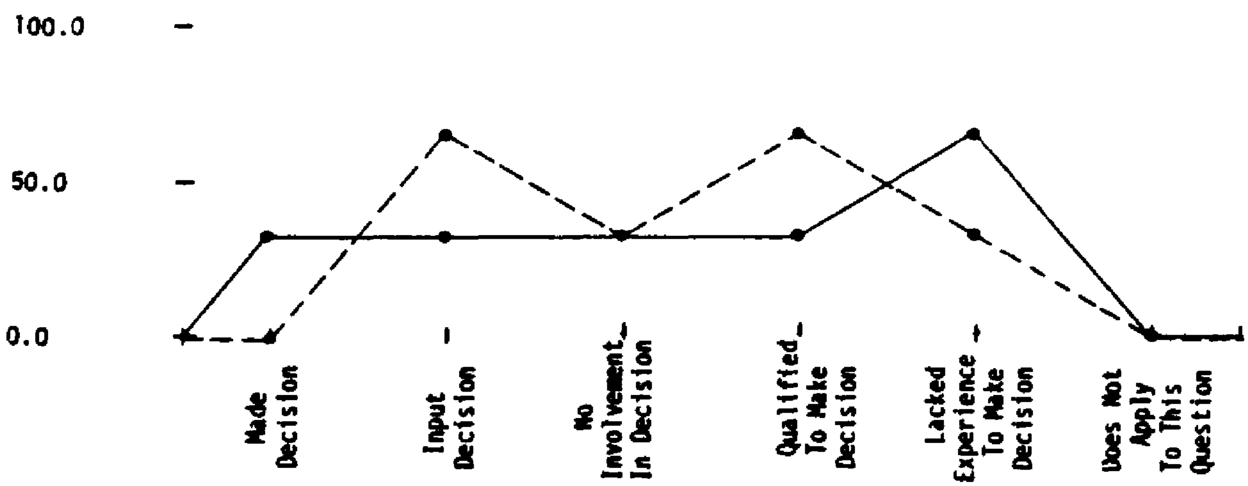

Figure 17J. Determining the exterior treatment and fenestration of the building.

The analysis of this part of the question would indicate that board members involved in construction management projects are perceived to have a higher level of participation and they are also perceived to be more qualified to make the decision than are board members involved in the traditional construction projects.

Decision # 18 - Determining a Site Master Plan for the Purpose of Future Growth

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives agreed upon the level of involvement in the decision, while the board representatives involved in the traditional construction projects indicated a higher level of competence than did the board representatives involved in construction management projects (see Figure 18E).

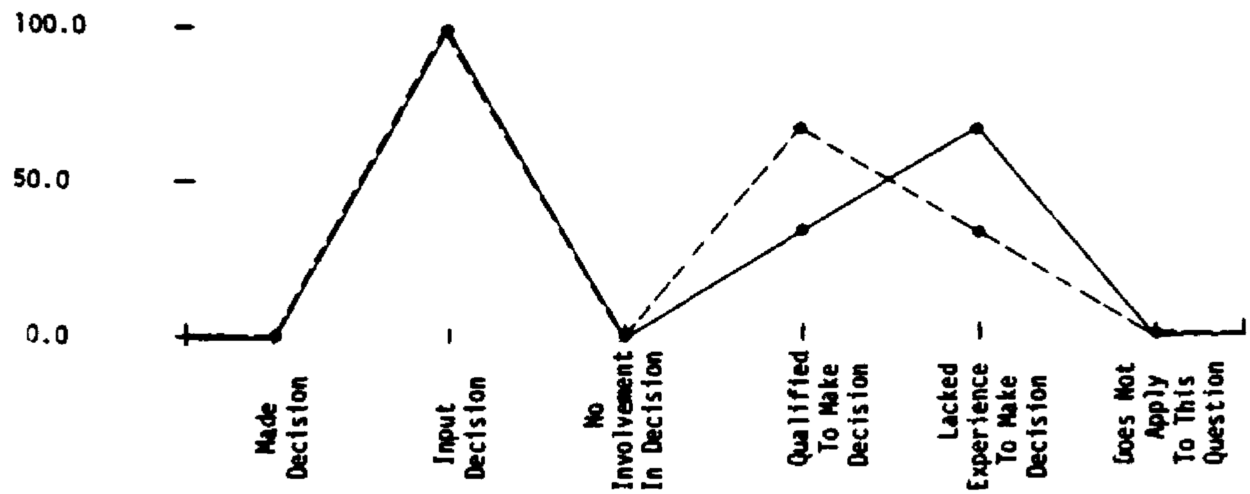

Figure 18E. Determining a site master plan for the purpose of future growth.

Board members involved in construction management projects indicated that their board representatives were only slightly more involved in the decision than did the board members involved in traditional construction projects. They did, however, indicate that their board representatives were more qualified to make the decision in this area than did the board members involved in traditional construction projects (see Figure 18F).

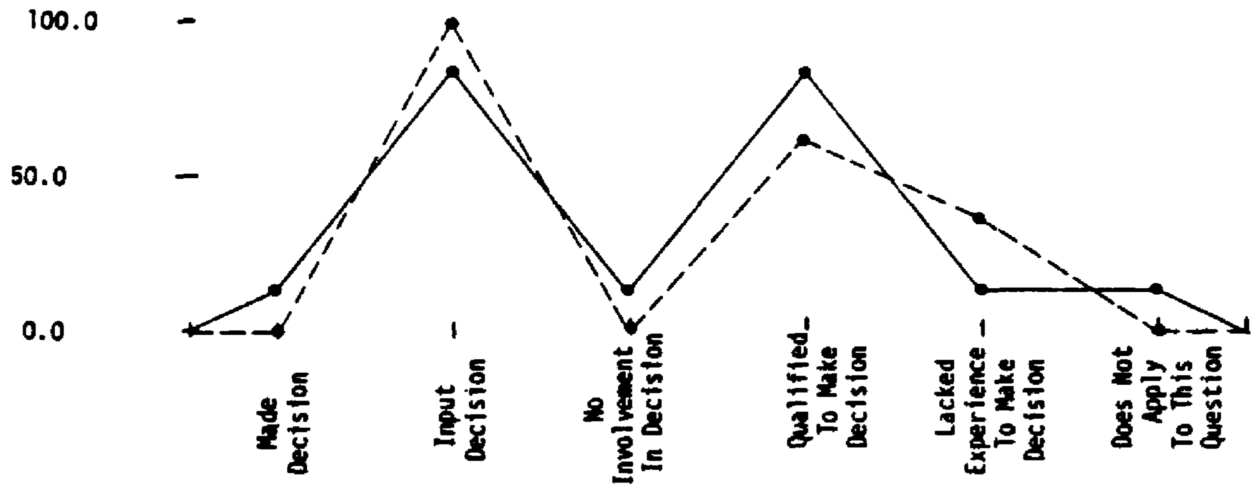

Figure 18F. Determining a site master plan for the purpose of future growth.

Project architects involved in the traditional construction projects perceived that the board representatives were involved at a higher level than did the project architects involved in the construction management projects. They also indicated that their board representatives were more qualified to make the decision than did project architects involved in construction management projects (see Figure 18G).

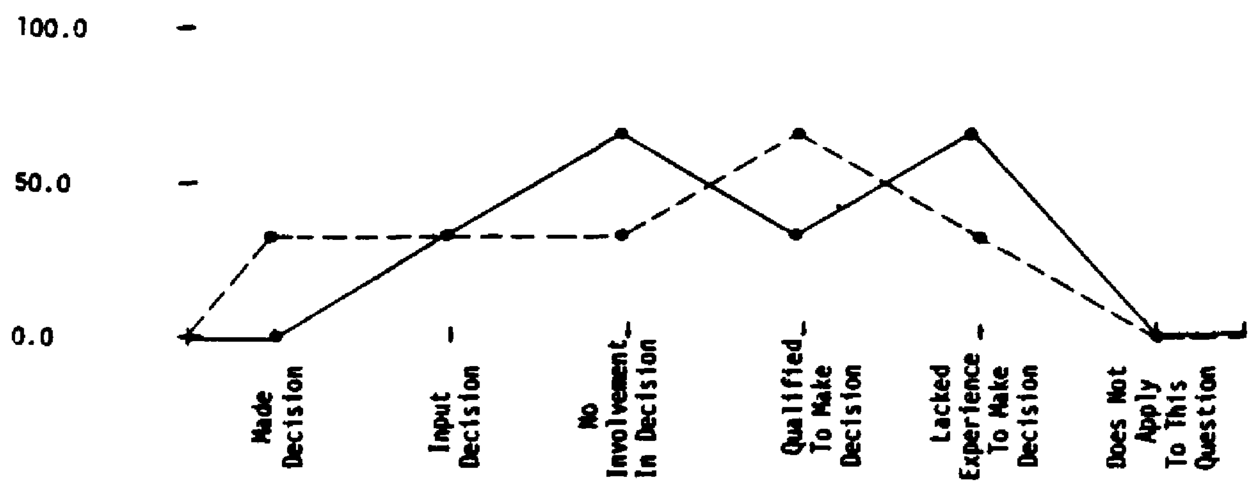

Figure 18G. Determining a site master plan for the purpose of future growth.

An analysis of this part of the question would indicate that board representatives involved in traditional construction projects are perceived as having a higher level of involvement in the decision and as being more qualified to make the decision than are board representatives involved in construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives agreed on all points relative to the involvement and the competence of the board members indicating a relatively high level of input and also a high level of competence in making the decision (see Figure 18H).

Figure 18H. Determining a site master plan for the purpose of future growth.

Board members involved in traditional construction projects perceived themselves as being slightly more involved in the decision than board members involved in construction management projects. However, the board members involved in the construction management projects felt more qualified to make the decision than did board members involved in traditional construction projects (see Figure 18I).

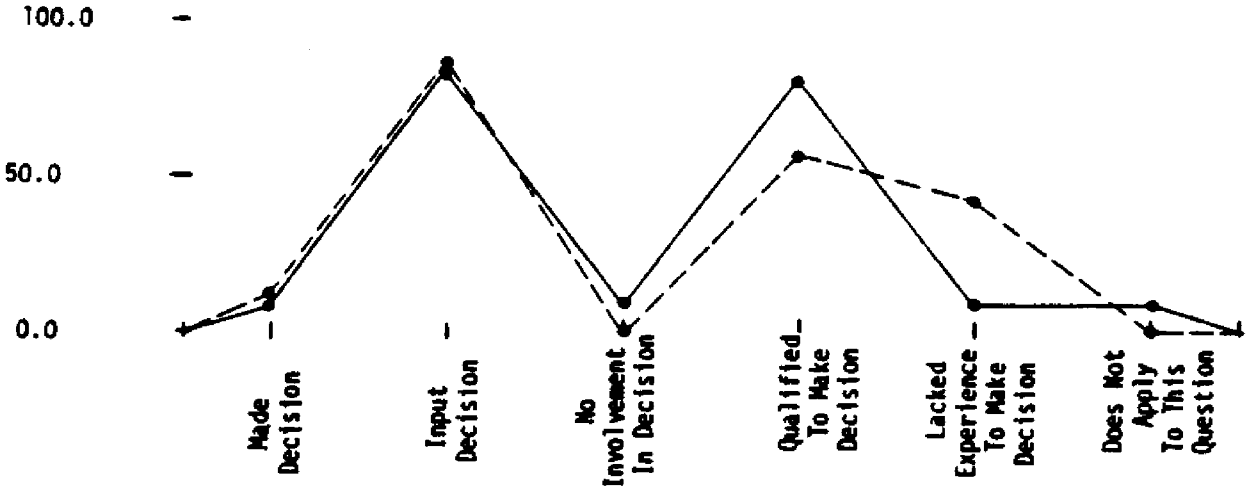

Figure 18I. Determining a site master plan for the purpose of future growth.

Both sets of project architects agreed on the perceived level of involvement of the board members, while those project architects involved in traditional construction projects indicated that the board members were more qualified to make the decision than did the project architects involved in the construction management projects (see Figure 18J).

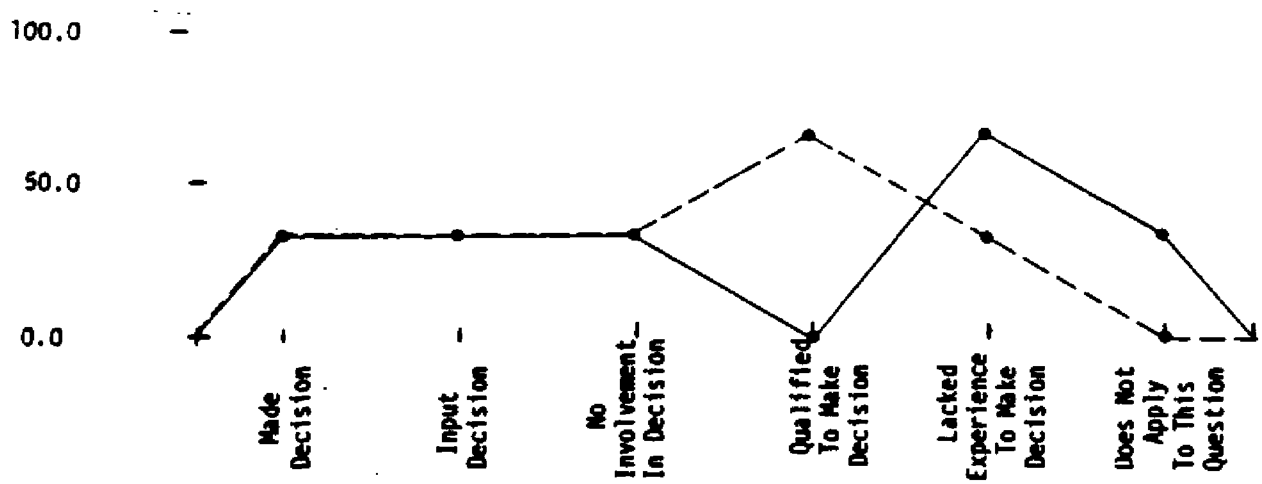

Figure 18J. Determining a site master plan for the purpose of future growth.

Analysis of this part of the question would indicate that board members are perceived to be slightly more involved in the decision and more qualified to make the decision.

Decision # 19 - Establishing the "U" Factor for the Exterior Walls

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives agreed that they were not involved in the decision while the board representatives involved in the construction management projects indicated a greater lack of experience to make the decision than did board representatives involved in the traditional construction projects (see Figure 19E).

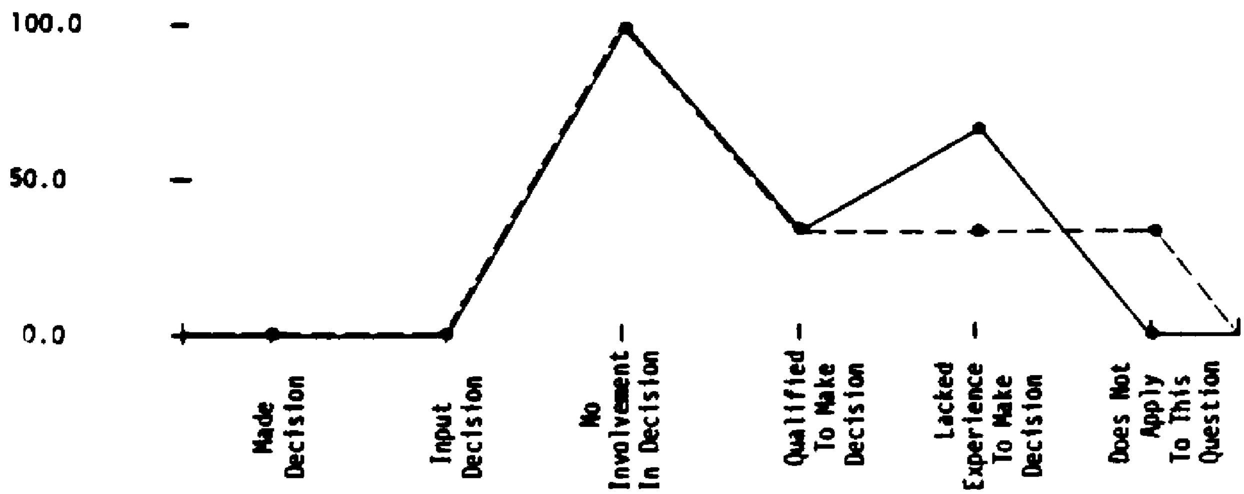

Figure 19E. Establishing the "U" factor for the exterior walls.

Board members involved in traditional construction projects indicated that their board representatives were involved at a slightly higher level than did the board members involved in the construction management projects. They also indicated that their board representatives were more qualified than did the board members involved in the construction management projects (see Figure 19F).

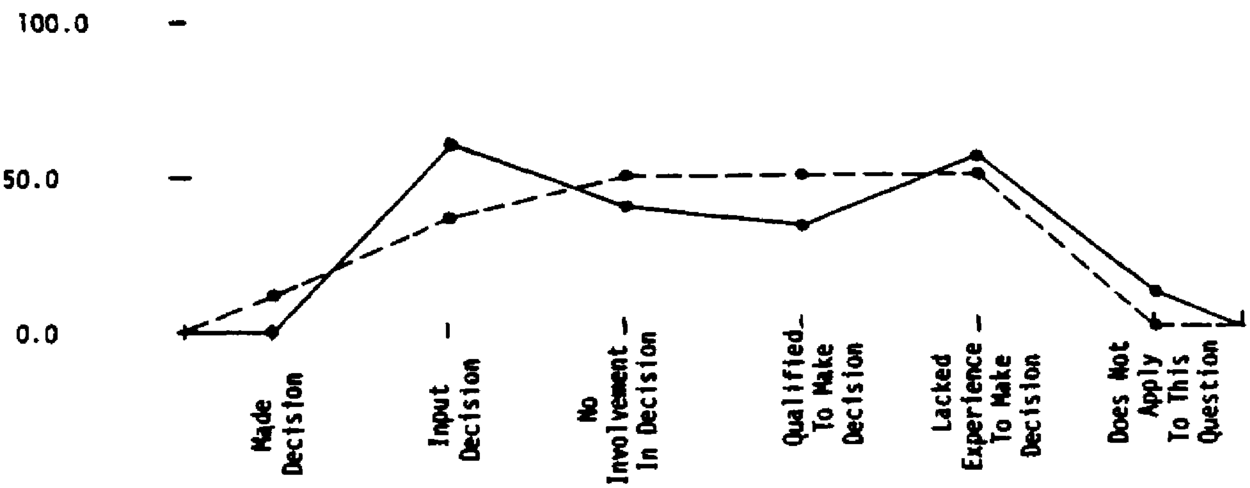

Figure 19F. Establishing the "U" factor for the exterior walls.

Project architects involved in traditional construction projects perceived the board representatives to be involved at a higher level than did project architects involved in construction management projects. They also indicated that the board representatives were more qualified to make the decision than did the project architects involved in construction management projects (see Figure 19G).

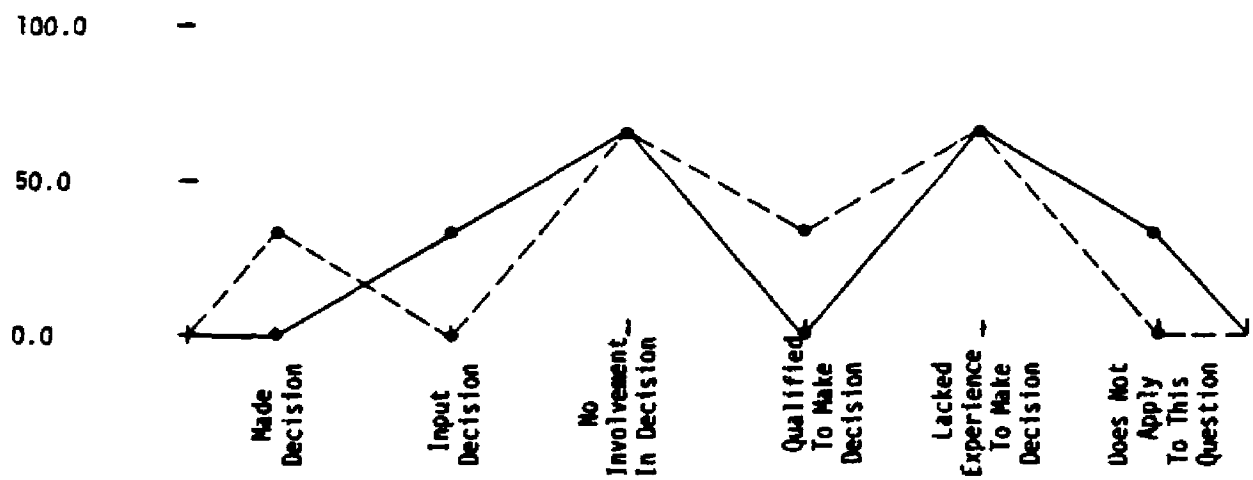

Figure 19G. Establishing the "U" factor for the exterior walls.

The analysis of this part of the question would indicate that board representatives involved in traditional construction projects are perceived to be more qualified to make the decision and more involved in making the decision than are board representatives participating in construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived their board members as having a higher level of involvement in the decision than did board representatives involved in construction management projects. They also indicated that their board members were more qualified to make the decision than did board representatives involved in traditional construction projects (see Figure 19H).

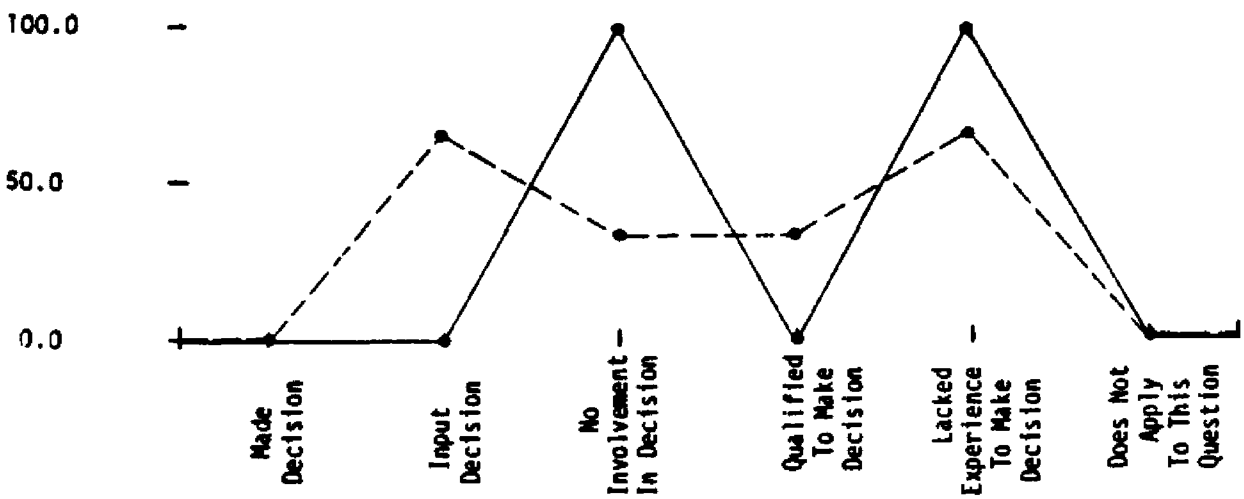

Figure 19H. Establishing the "U" factor for the exterior walls.

Board members involved in traditional construction projects indicated that they had a higher level of involvement in the decision than did board members involved in the construction management projects. They also felt that they were more qualified to make the decision than did board members involved in construction management projects (see Figure 19I).

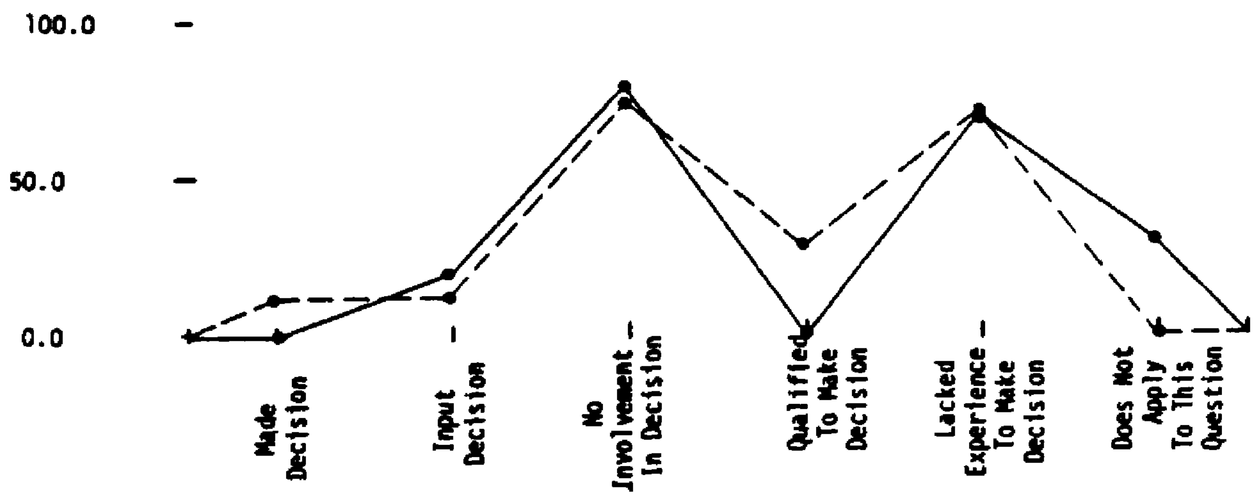

Figure 19I. Establishing the "U" factor for the exterior walls.

Project architects involved in traditional construction projects perceived the board members as having a higher level of involvement in the decision than did project architects involved in the construction management projects. They also indicated that board members were more qualified to make the decision than did the project architects involved in construction management projects (see Figure 19J).

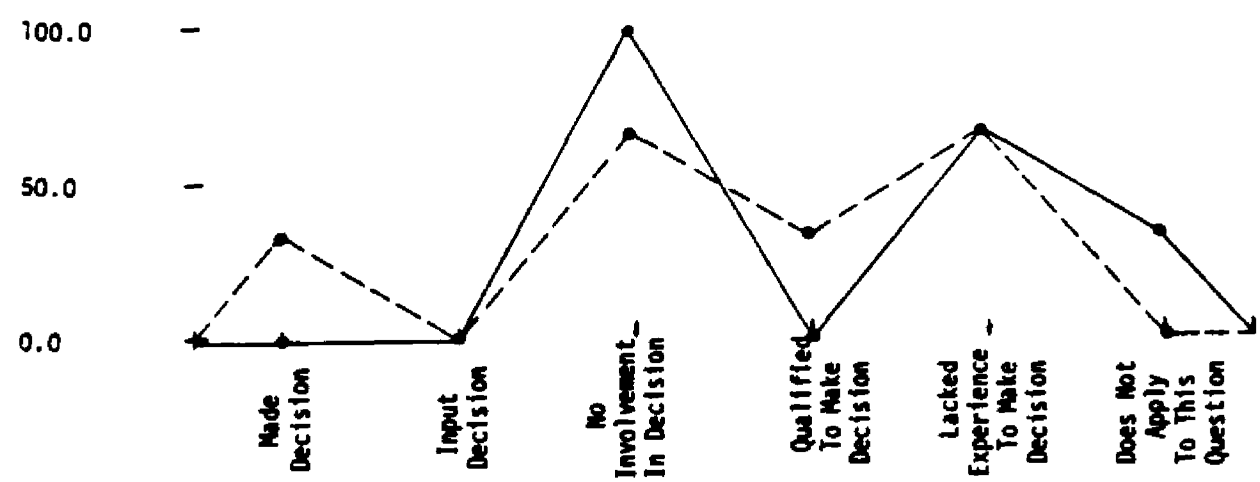

Figure 19J. Establishing the "U" factor for the exterior walls.

Analysis of this part of the question indicates that board members involved in traditional construction projects are not only perceived to have a higher level of involvement in the decision, but are also perceived to be more qualified to make the decision.

Decision # 20 - Establishing the Preliminary Building Costs Through Value Engineering

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects indicated a higher level of involvement in the decision than did board representatives involved in construction management projects. The board representatives involved in construction management projects indicated a greater lack of experience necessary to make the decision than did board representatives involved in traditional construction projects (see Figure 20E).

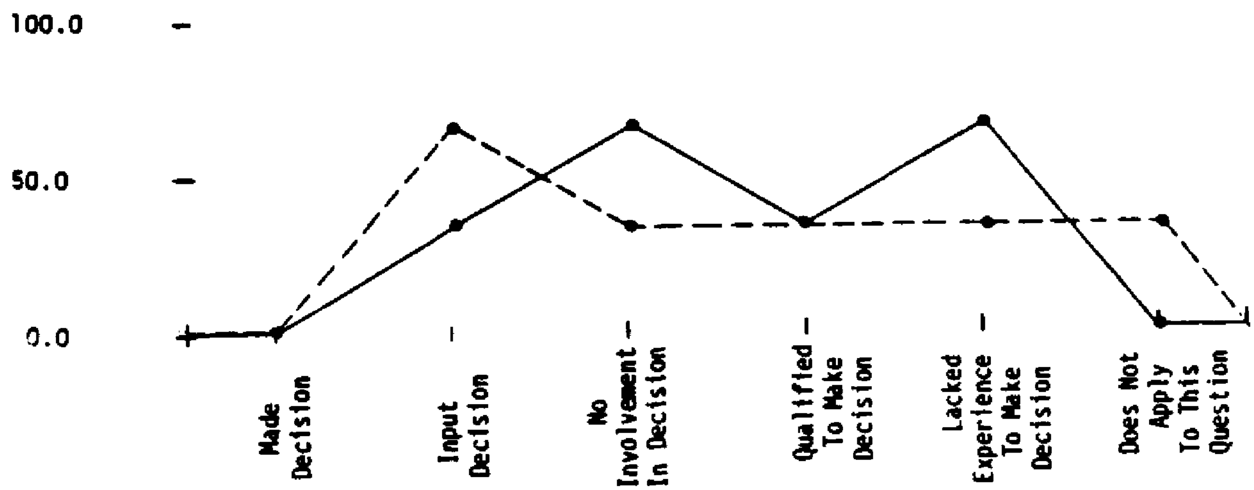

Figure 20E. Establishing the preliminary building costs through value engineering.

Board members involved in construction management projects perceived their board representatives as participating at a higher level in the decision than did board members involved in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than did board members involved in traditional construction projects (see Figure 20F).

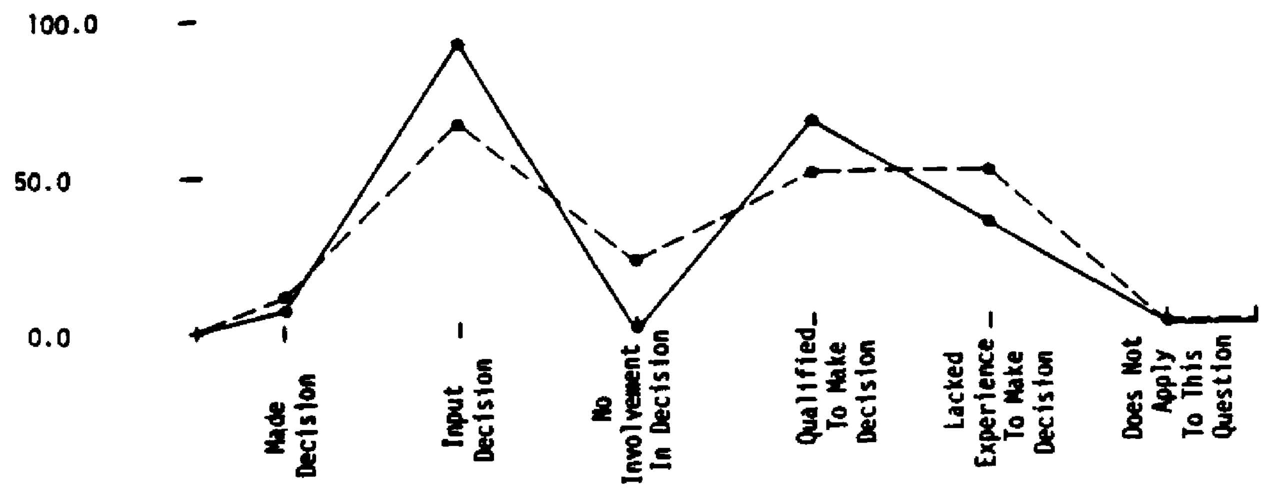

Figure 20F. Establishing the preliminary building costs through value engineering.

Project architects involved in construction management projects perceived the board representatives as having a higher level of involvement in the decision than did project architects involved in traditional construction projects. However, the project architects involved in traditional construction projects indicated that they perceived the board representatives as being more qualified to make the decision than did the project architects involved in construction management projects (see Figure 20G).

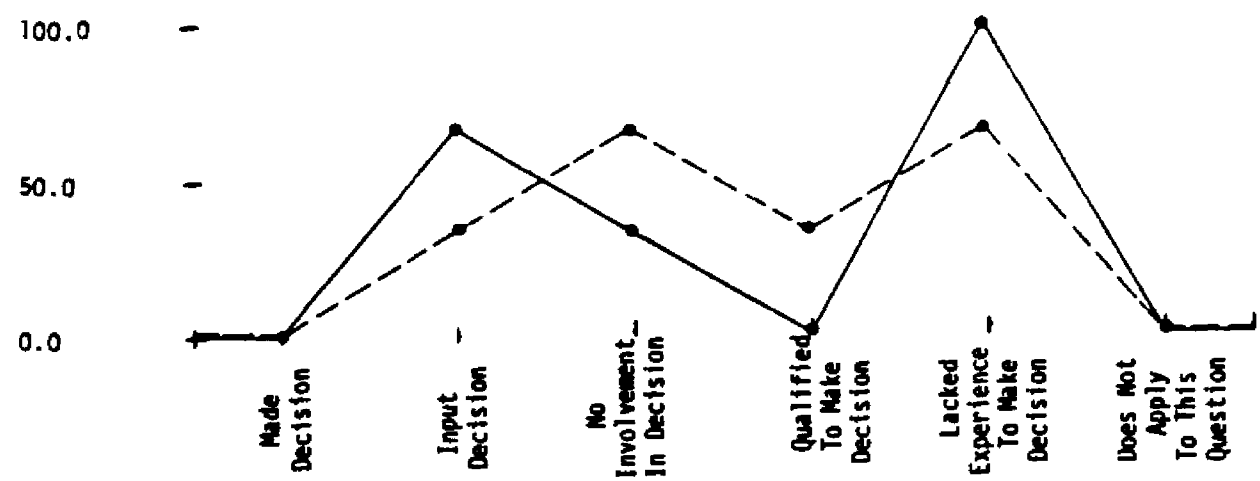

Figure 20G. Establishing the preliminary building costs through value engineering.

Analysis of this part of the question would indicate that the board representatives involved in construction management projects were perceived as participating at a higher level in the decision than were board representatives involved in traditional construction projects, while the board representatives involved in traditional construction projects were perceived as being more qualified to make the decision than were board representatives involved in the construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects indicated that their board members were involved at a higher level in the decision than the board representatives involved in construction management projects. Both sets of board representatives agreed that their board members had the same level of competence in making the decision (see Figure 20H).

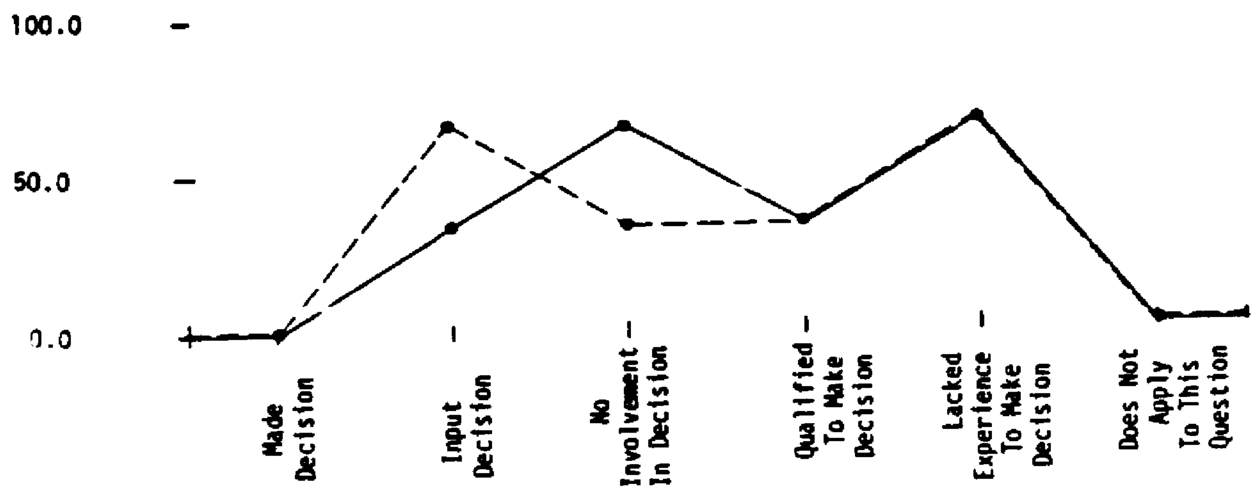

Figure 20H. Establishing the preliminary building costs through value engineering.

Board members involved in construction management projects indicated that they participated at a higher level in the decision than did board members involved in traditional construction projects. They also indicated that they were more qualified to make the decision than did board members involved in the traditional construction projects (see Figure 20I).

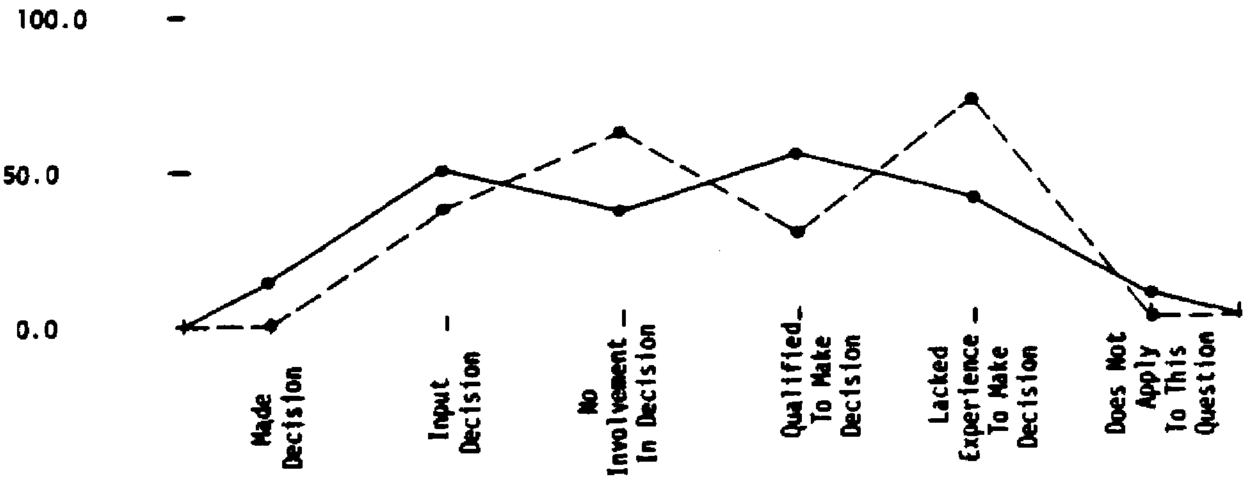

Figure 20I. Establishing the preliminary building costs through value engineering.

Project architects involved in construction management projects perceived their board members as more highly involved in the decision than did project architects involved in traditional construction projects. Both sets of project architects agreed as to the level of competence of board members (see Figure 20J).

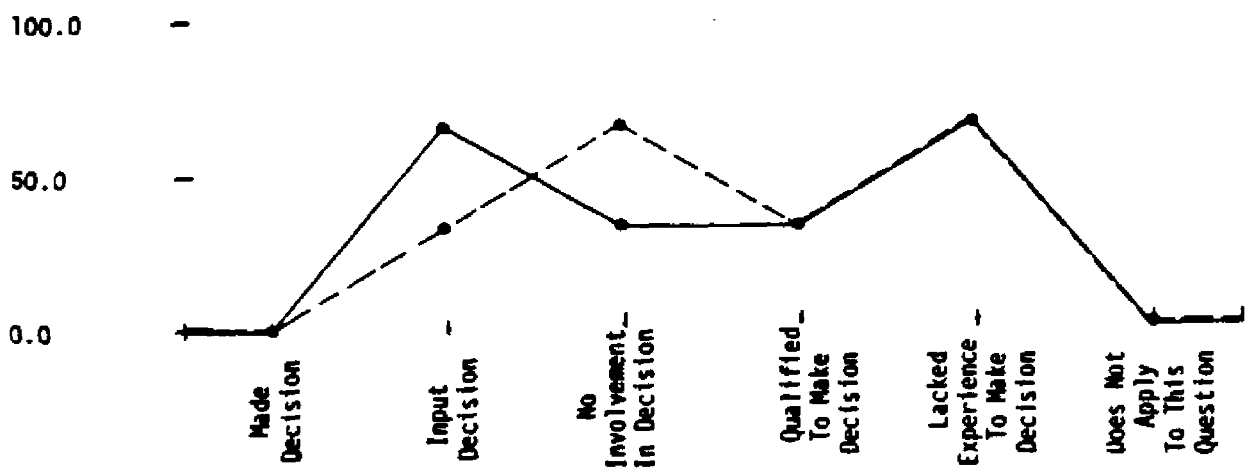

Figure 20J. Establishing the preliminary building costs through value engineering.

An analysis of this part of the question indicates that board members involved in construction management projects are perceived as participating at a higher level in the decision and having a slightly higher level of competence to make the decision.

Decision # 21 - Establishing the Orientation of the Building, Taking Into Consideration Sun, Wind and Noise

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects indicated a higher level of participation than did board representatives involved in construction management projects. Both sets of board representatives agreed on the level of competence (see Figure 21E).

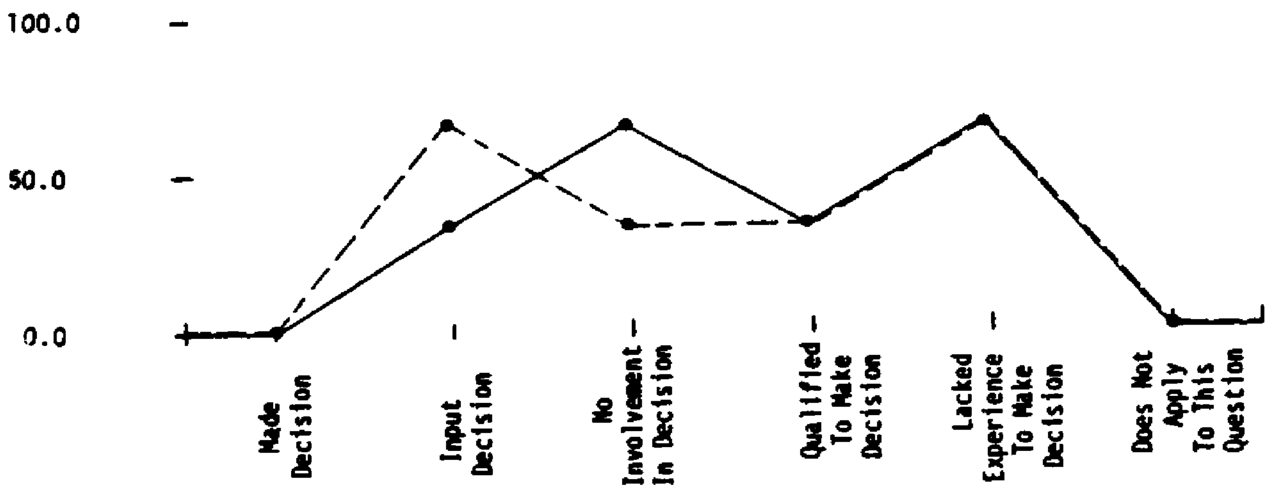

Figure 21E. Establishing the orientation of the building, taking into consideration sun, wind and noise.

Board members involved in the construction management projects perceived their board representatives as participating at a higher level in the decision than did board members involved in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than did the board members in traditional construction projects (see Figure 21F).

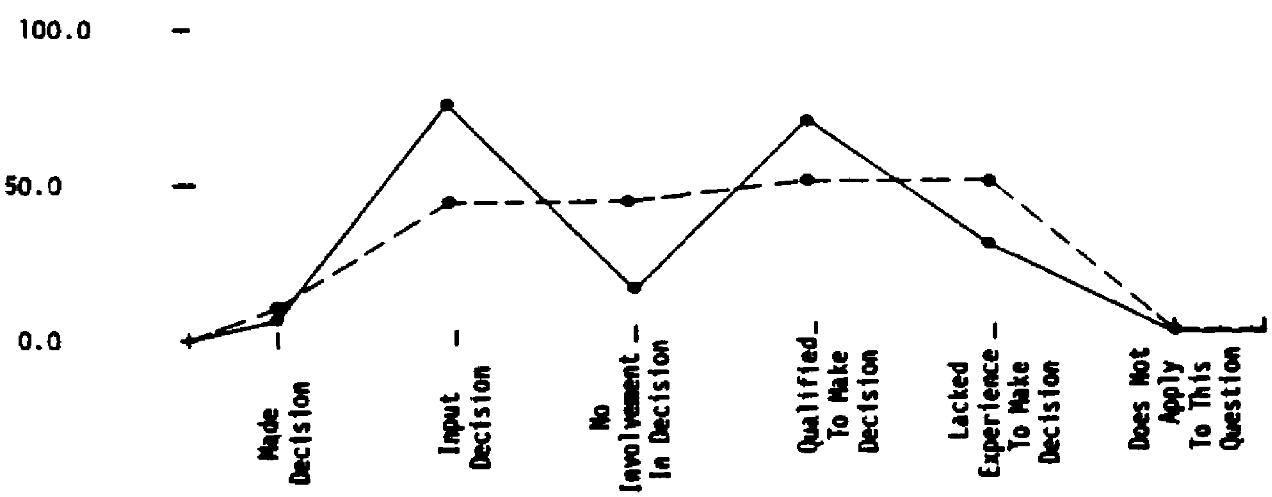

Figure 21F. Establishing the orientation of the building, taking into consideration sun, wind and noise.

Project architects involved in traditional construction projects perceived the board representatives as having a higher level of involvement in the decision than did project architects involved in the construction management projects. They also indicated that the board representatives were more qualified to make the decision than did the project architects involved in construction management projects (see Figure 21G).

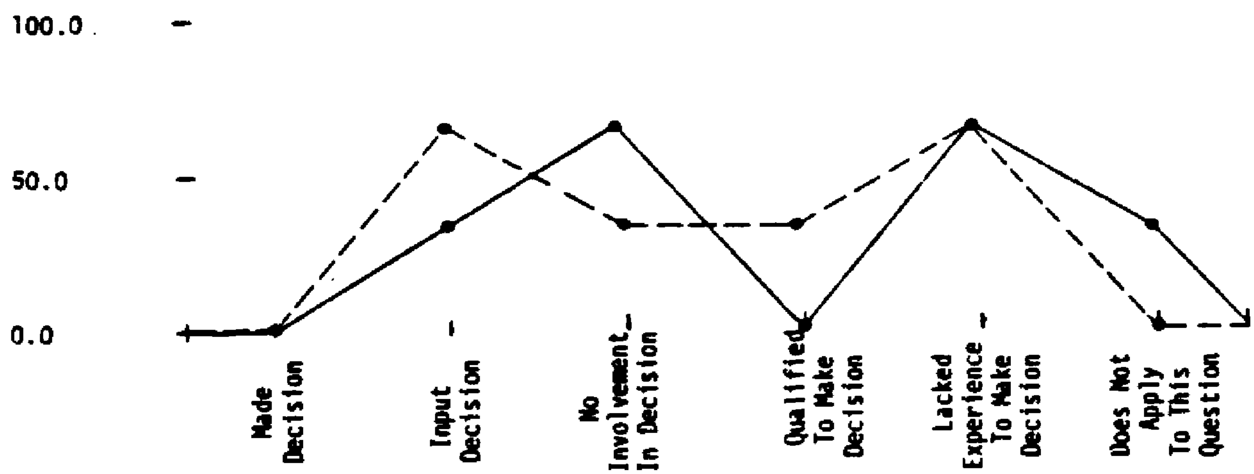

Figure 21G. Establishing the orientation of the building, taking into consideration sun, wind and noise.

The analysis of this part of the question would indicate that board representatives involved in traditional construction management projects are perceived to have a higher level of involvement in the decision than are board representatives involved in construction management projects. They are also perceived to be slightly more qualified to make the decision than are board representatives involved in construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives perceived their board members as having no involvement in the decision. They both also indicated that they were not qualified to make the decision (see Figure 21H).

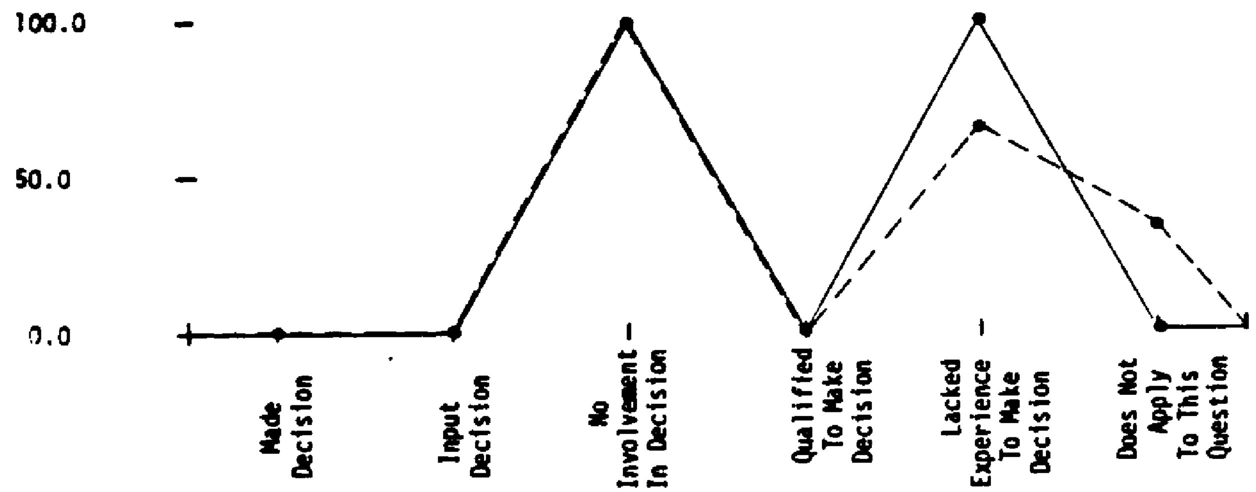

Figure 21H. Establishing the orientation of the building, taking into consideration sun, wind and noise.

Board members involved in construction management projects perceived their level of participation as higher than did board members involved in the traditional construction projects. They also indicated that they felt more qualified to make the decision than did board members involved in traditional construction projects (see Figure 21I).

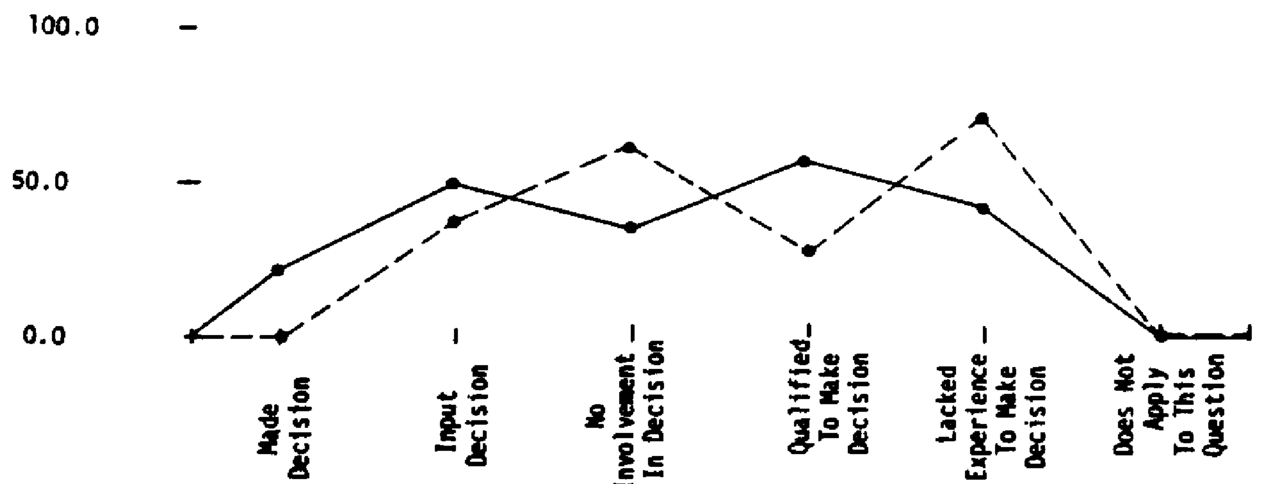

Figure 21I. Establishing the orientation of the building, taking into consideration sun, wind and noise.

Both sets of project architects agreed that the board members had a moderate level of involvement in the decision and that neither set of board members were qualified to make the decision (see Figure 21J).

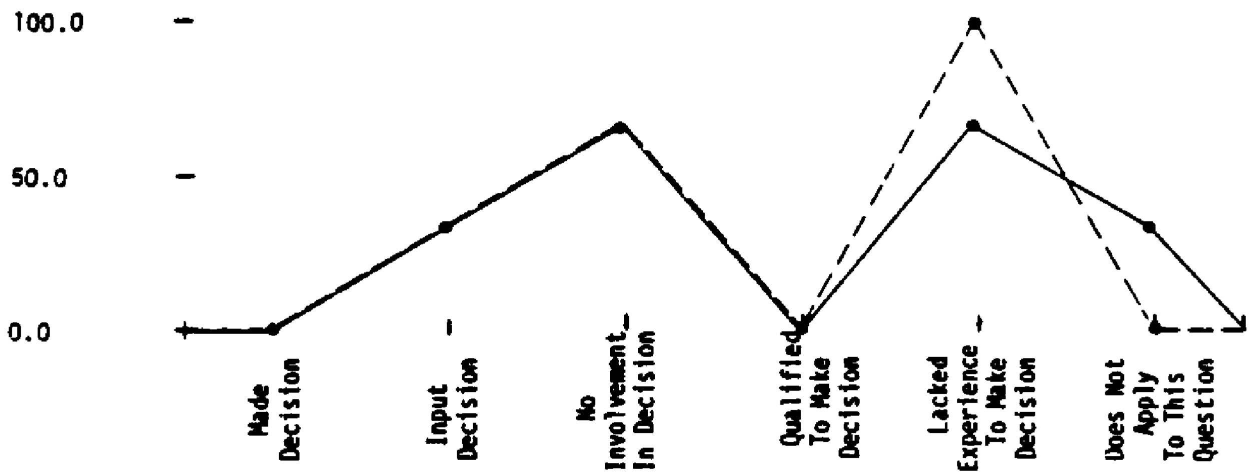

Figure 21J. Establishing the orientation of the building, taking into consideration sun, wind and noise.

Analysis of this part of the question would indicate that board members participating in construction management projects are perceived to be slightly more involved in making the decision and slightly more qualified to make the decision than are board members involved in traditional construction projects.

Decision # 22 - Determining Bus and Pedestrian Traffic to the Site

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives participating in traditional construction projects indicated a higher level of involvement in the decision than did board representatives participating in construction management projects. They also indicated that they felt more qualified to make the decision than did board representatives involved in construction management projects (see Figure 22E).

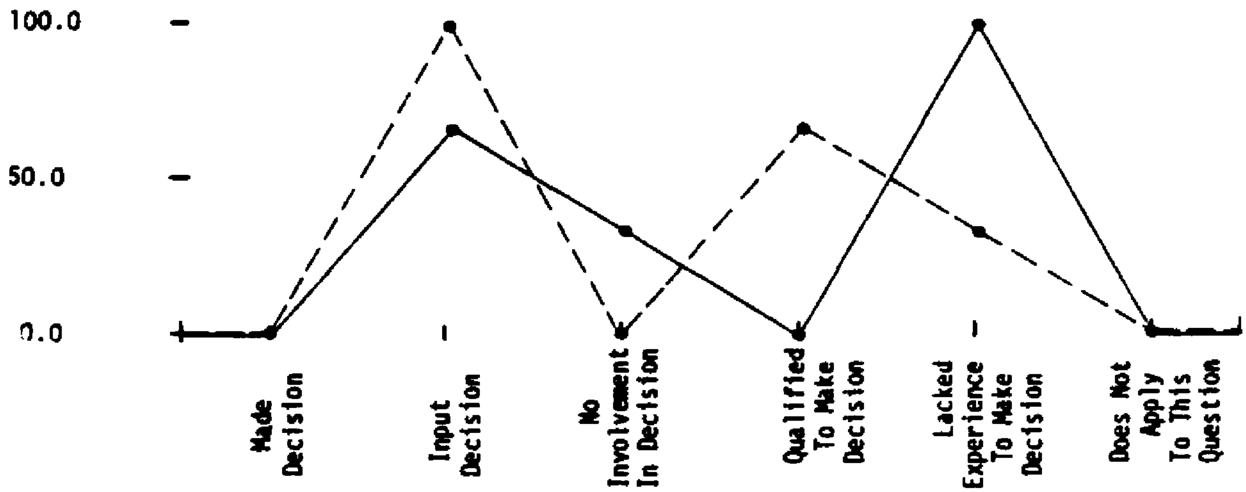

Figure 22E. Determining bus and pedestrian traffic to the site.

Board members involved in construction management projects indicated that they perceived their board representatives involved at a slightly higher level than did the board members involved in traditional construction projects. They also indicated that they felt their board representatives were more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 22F).

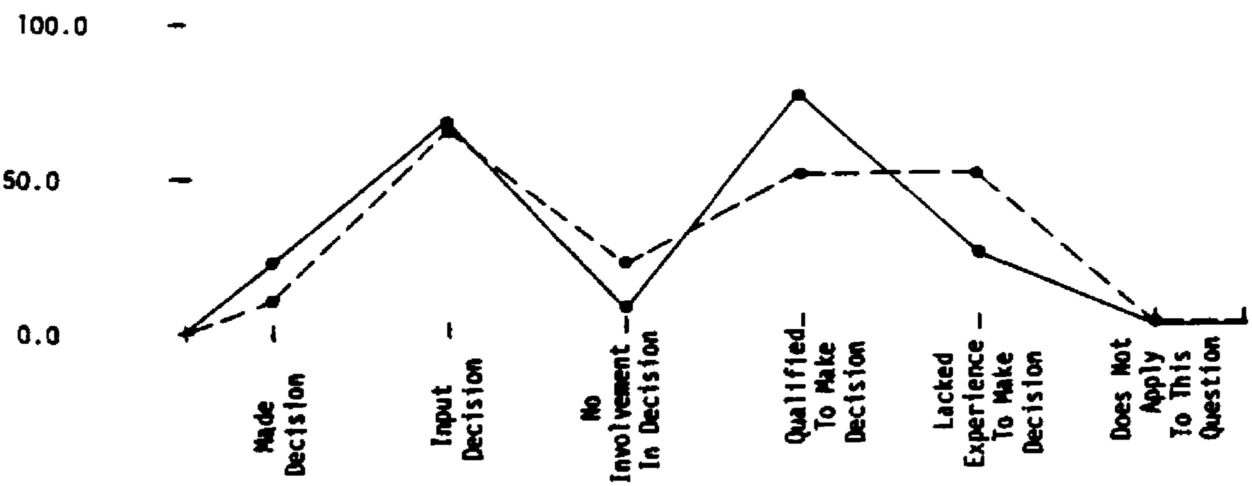

Figure 22F. Determining bus and pedestrian traffic to the site.

Project architects participating in traditional construction projects indicated that they perceived their board representatives to be involved at a higher level in the decision than did project architects involved in construction management projects. They also felt that the board representatives were more qualified to make the decision than did the project architects involved in the construction management projects (see Figure 22G).

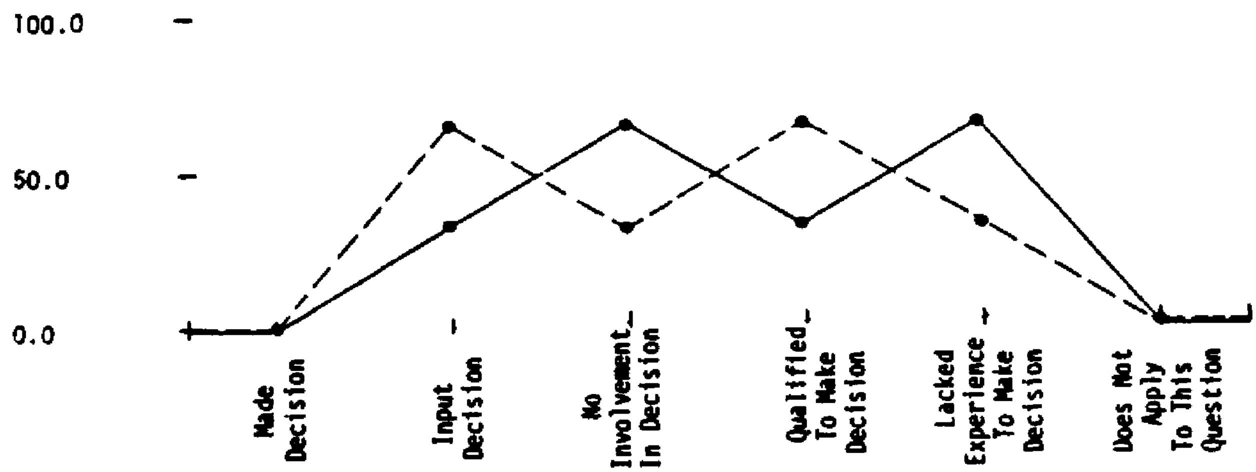

Figure 22G. Determining bus and pedestrian traffic to the site.

The analysis of this part of the question indicates that board representatives involved in traditional construction projects are perceived to have a higher level of involvement in the decision than are board representatives involved in construction management projects. They also indicated that they are perceived to be more qualified to make the decision than are board representatives involved in construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects indicated that their board members participated at a higher level in the decision than did board representatives involved in construction management projects. Both sets of board representatives agreed on the level of competence of their respective board members (see Figure 22H).

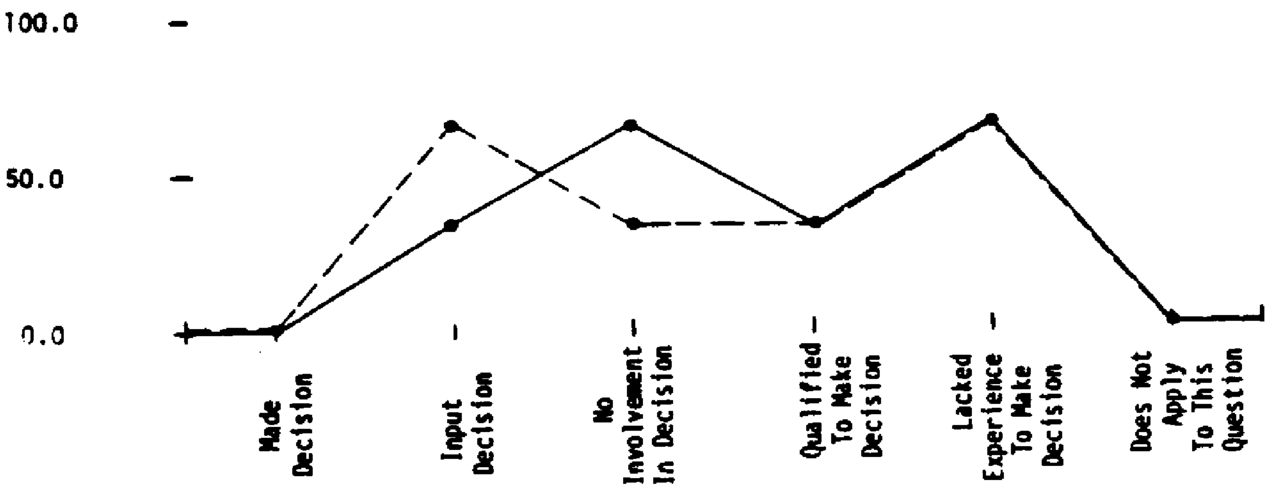

Figure 22H. Determining bus and pedestrian traffic to the site.

Board members involved in construction management projects indicated that they participated at a higher level in the decision than did the board members involved in traditional construction projects. They also felt more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 22I).

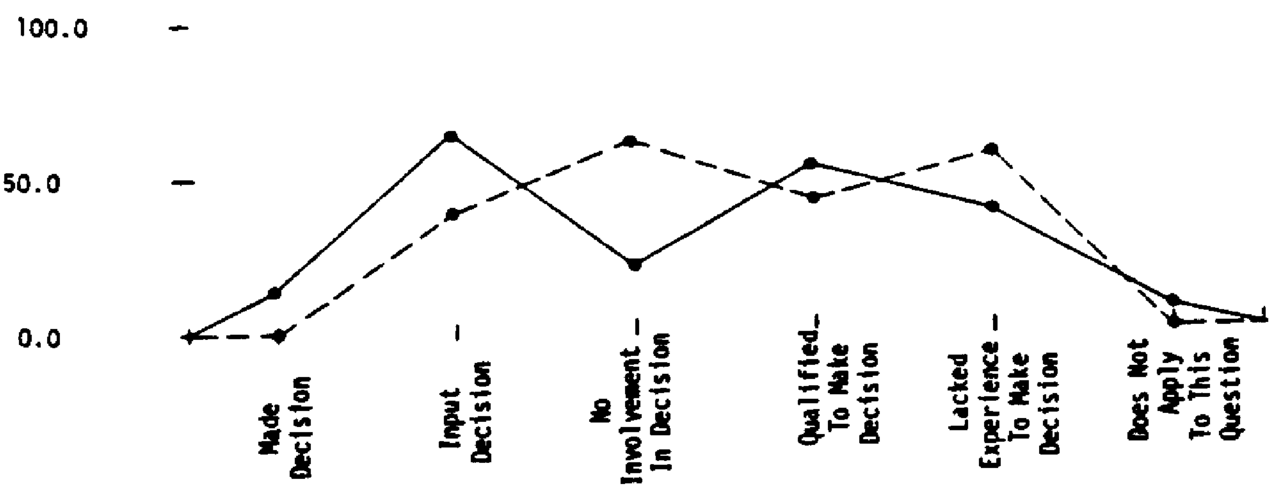

Figure 22I. Determining bus and pedestrian traffic to the site.

Project architects involved in construction management projects perceived the board members as having a higher level of involvement in the decision than did the project architects involved in traditional construction projects. However, the project architects involved in traditional construction projects perceived the board members as having a much higher level of competence than did the project architects involved in construction management projects (see Figure 22J).

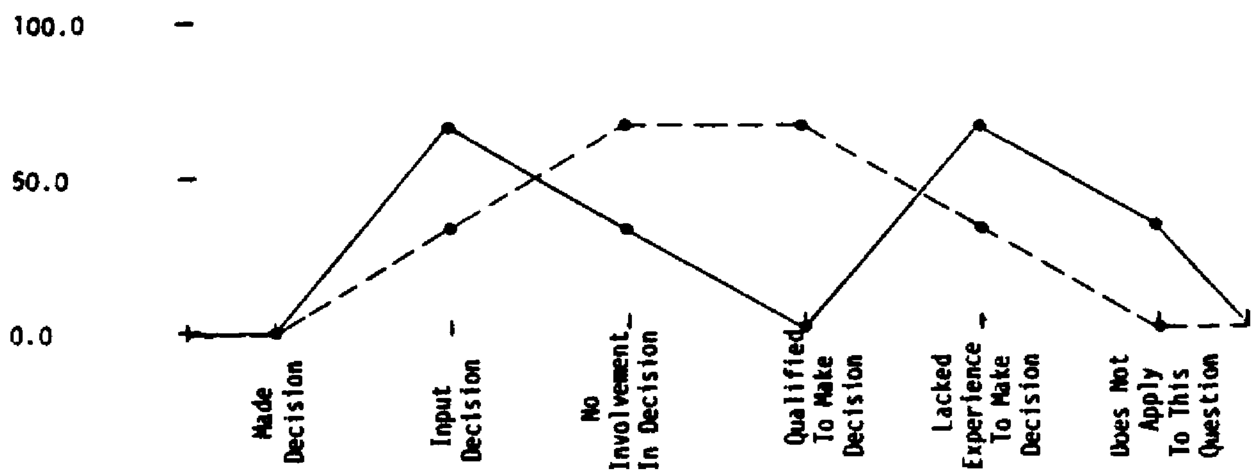

Figure 22J. Determining bus and pedestrian traffic to the site.

In analyzing this question it would appear that board members involved in construction management projects are perceived to have a higher level of involvement in the decision than are board members involved in the traditional construction projects. However, the board members involved in the traditional construction projects are perceived as having a slightly higher level of competence to make the decision than are the board members involved in the construction management projects.

<u>Decision # 23</u> - <u>Determining Other Site Uses: Games, Storage, Community Uses, Program Uses, Etc.</u>

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects indicated that their level of participation was higher than the board representatives involved in construction management projects.

They also indicated that they felt more qualified to make the decision than did the board representatives involved in the construction management projects (see Figure 23E).

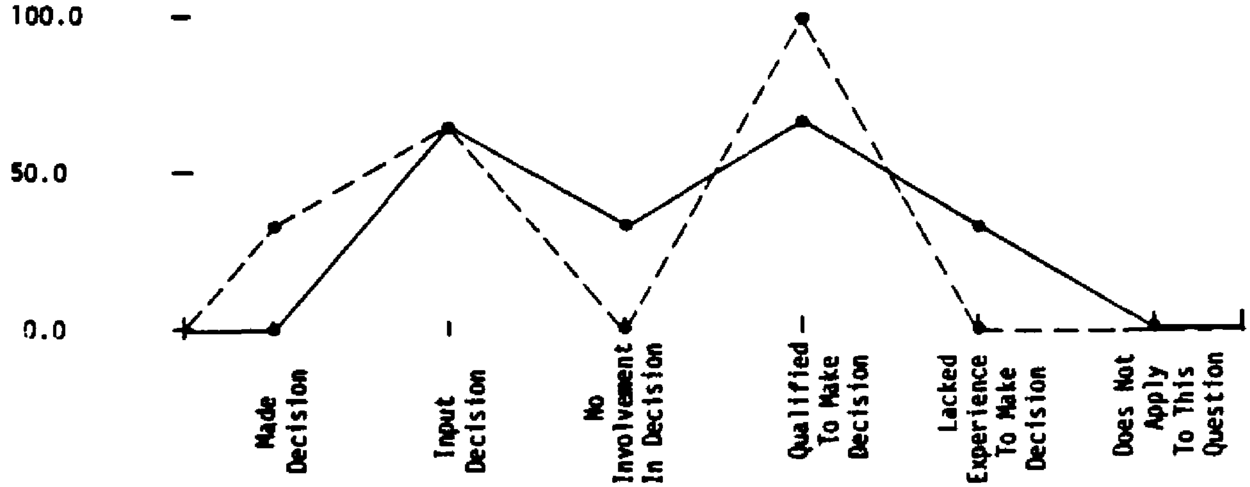

Figure 23E. Determining other site uses: games, storage, community uses, program uses, etc.

Board members involved in traditional construction projects indicated that they perceived their board representatives to be slightly more involved in the decision than did board members participating in construction management projects. However, the board members participating in construction management projects perceived their representatives as being slightly more qualified to make the decision than did board members involved in traditional construction projects (see Figure 23F).

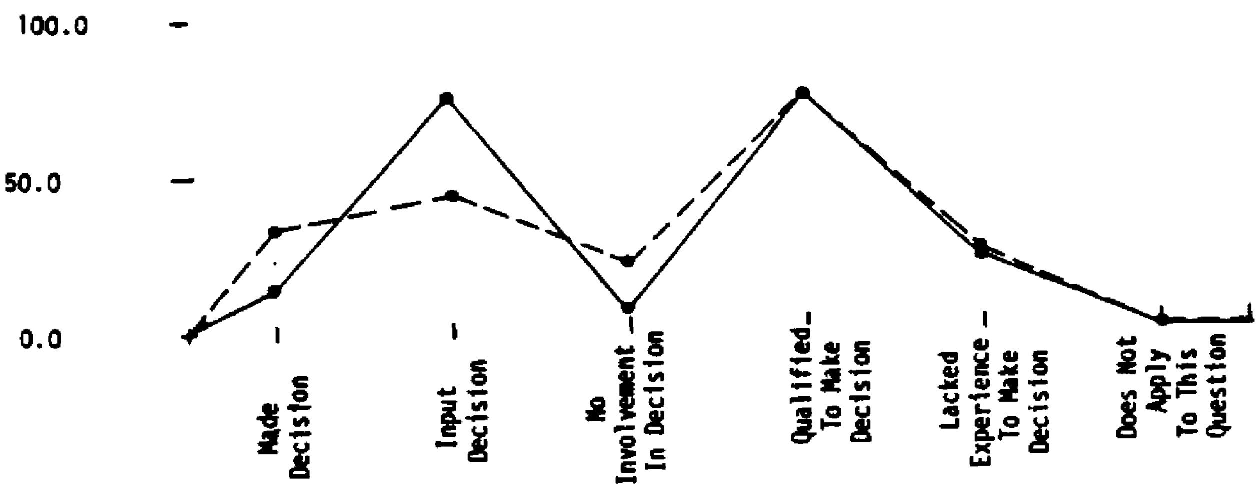

Figure 23F. Determining other site uses: games, storage, community uses, program uses, etc.

Project architects involved in the traditional construction projects indicated that they perceived the board representatives as being slightly more involved in the decision than did the project architects involved in construction management projects. They also indicated that the board representatives were more qualified to make the decision than did the project architects involved in the construction management projects (see Figure 23G).

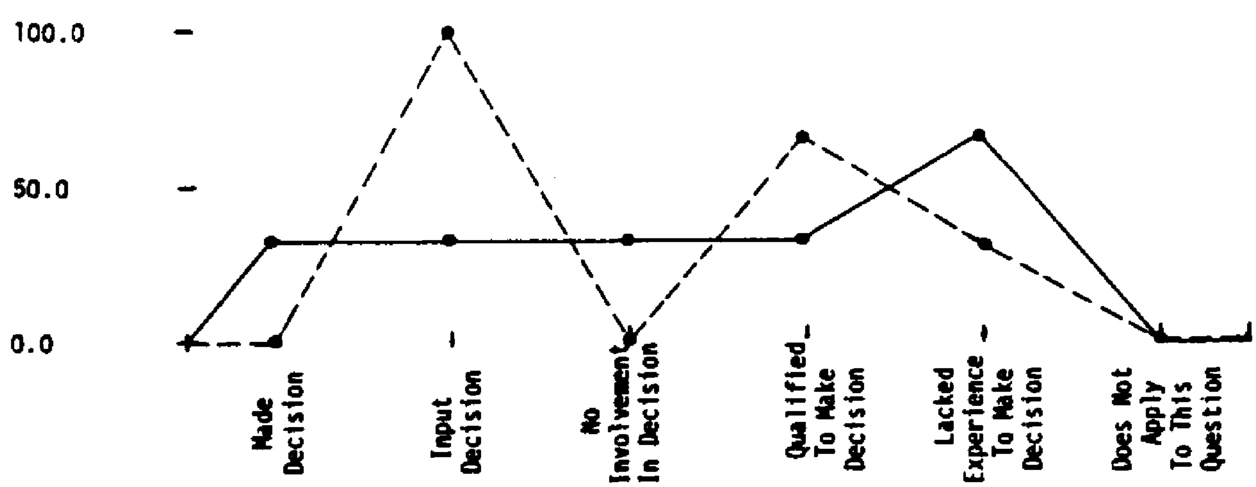

Figure 23G. Determining other site uses: games, storage, community uses, program uses, etc.

In analyzing this part of the question it would appear that board representatives involved in traditional construction projects are perceived as participating at a higher level than are board representatives involved in construction management projects and they are perceived to be more qualified to make the decision than are the board representatives involved in construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived their board members as participating at a higher level in the decision than did the board representatives involved in construction management projects. They also indicated that they were more qualified to make the decision than did the board representatives involved in construction management projects (see Figure 23H).

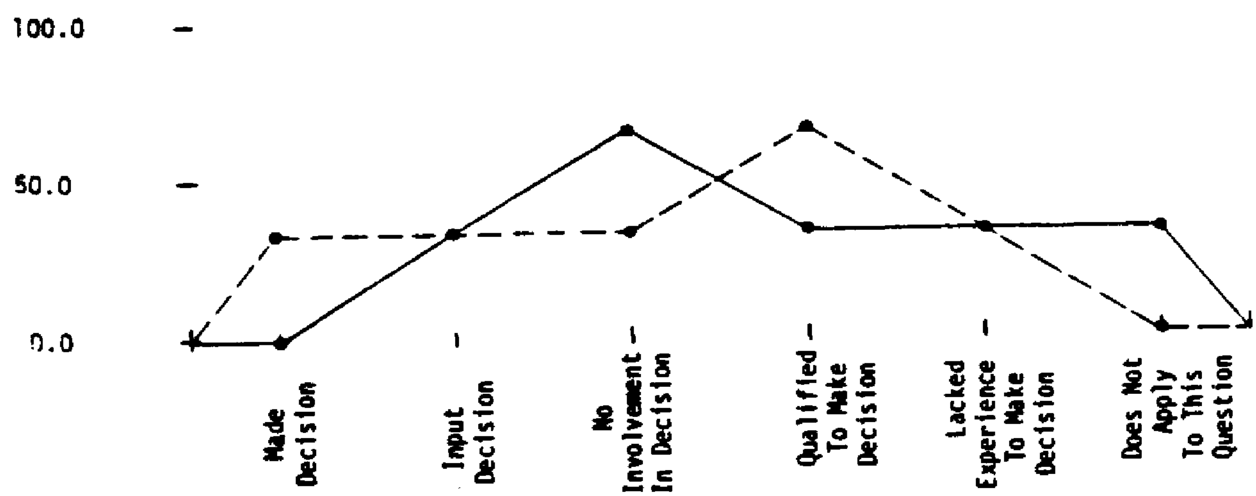

Figure 23H. Determining other site uses: games, storage, community uses, program uses, etc.

Board members participating in construction management projects perceived themselves as having a slightly higher level of involvement in the decision than did board members participating in traditional construction projects. They also indicated that they were slightly more qualified to make the decision than did the board members participating in traditional construction projects (see Figure 23I).

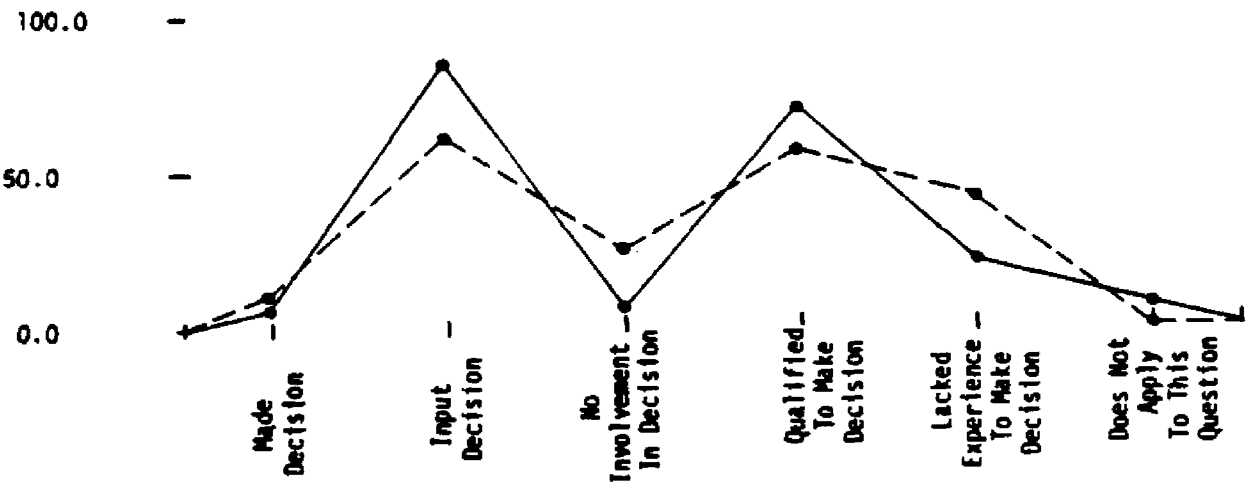

Figure 23I. Determining other site uses: games, storage, community uses, program uses, etc.

Project architects involved in traditional construction projects perceived board representatives as having a higher level of involvement in the decision than did project architects involved in construction management projects. They also indicated that the board representatives were more qualified to make the decision than did the project architects involved in construction management projects (see Figure 23J).

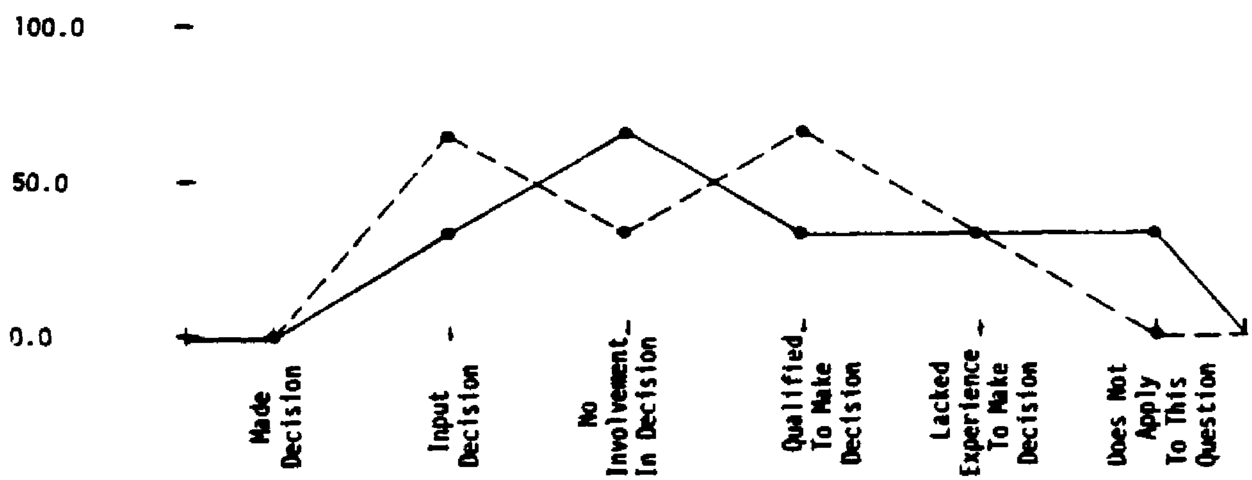

Figure 23J. Determining other site uses: games, storage, community uses, program uses, etc.

The analysis of this part of the question would indicate that board members involved in traditional construction projects are perceived to have a higher level of participation in the decision and also to be more qualified to make the decision than are board members involved in construction management projects.

<u>Decision # 24</u> - <u>Determining the Circulation Patterns Within the Building</u>

--Comparative perceptions of the board representatives' involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives participating in traditional construction projects indicated a higher level of involvement in the decision than did the board representatives participating in the construction management projects. They also perceived themselves as being much more qualified to make the decision than did the board representatives participating in the construction management projects (see Figure 24E).

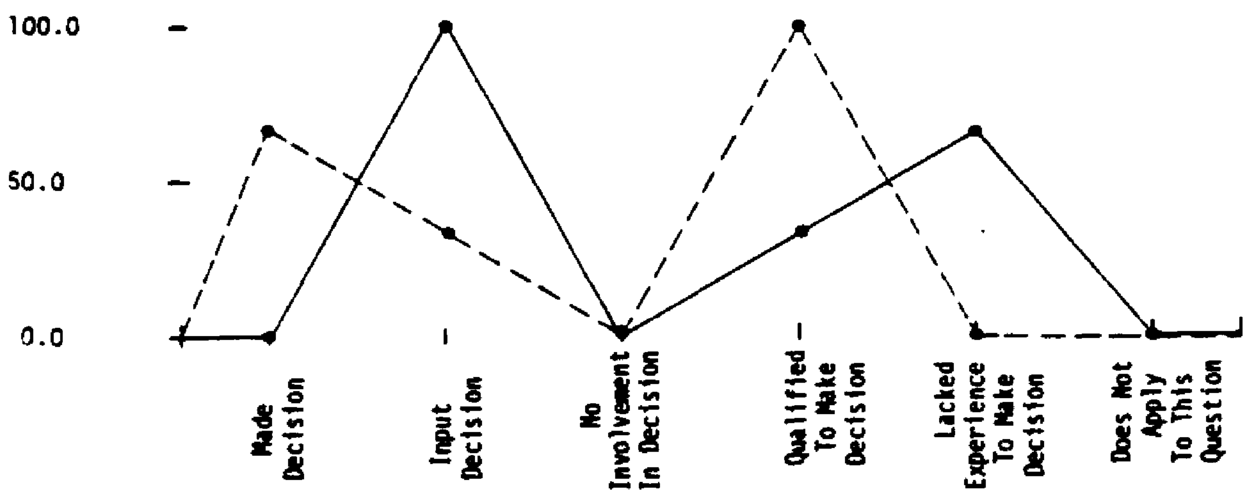

Figure 24E. Determining the circulation patterns within the building.

Board members participating in construction management projects perceived their board representatives to have a higher level of involvement in the decision than did board members participating in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than did the board members involved in the traditional construction projects (see Figure 24F).

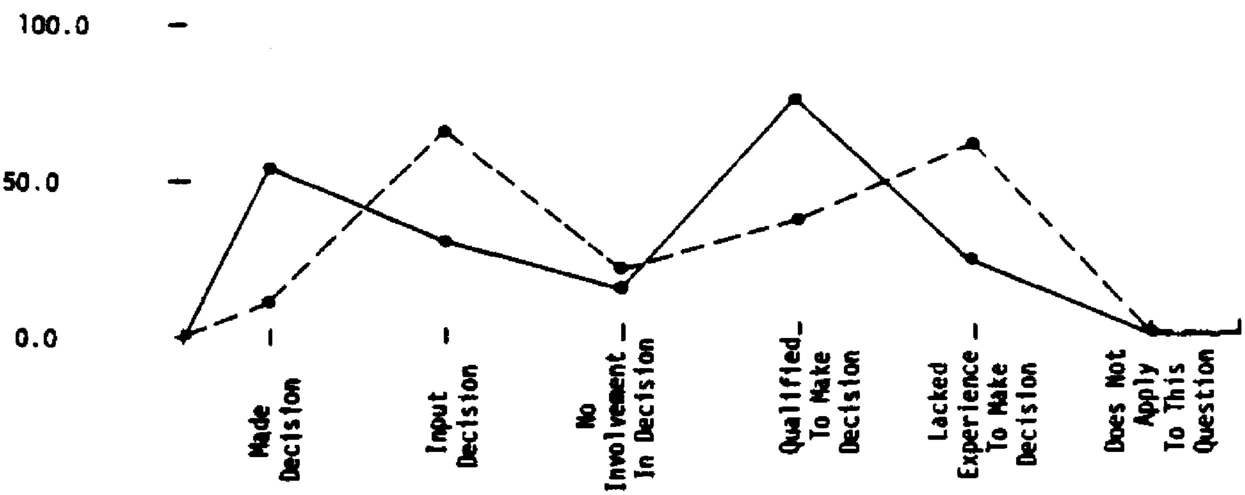

Figure 24F. Determining the circulation patterns within the building.

Project architects involved in traditional construction projects perceived the board representatives to have a higher level of participation in the decision than did the project architects involved in construction management projects. They also indicated that the board representatives were more qualified to make the decision than did the project architects involved in the construction management projects (see Figure 24G).

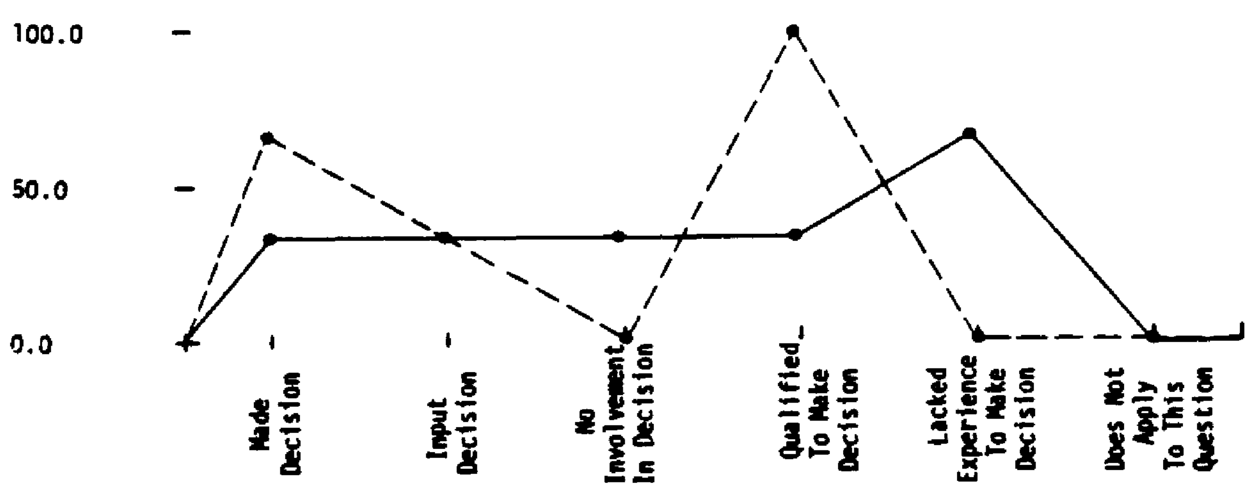

Figure 24G. Determining the circulation patterns within the building.

Analysis of this portion of the question would indicate that board representatives involved in traditional construction projects are perceived to have a higher level of participation than are board representatives involved in construction management projects. Board representatives involved in traditional construction projects are perceived to have a higher level of competence to make the decision than are board representatives involved in construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives perceived their board members as participating at the same level in the decision. They also indicated that their board members were qualified at the same level to make the decision (see Figure 24H).

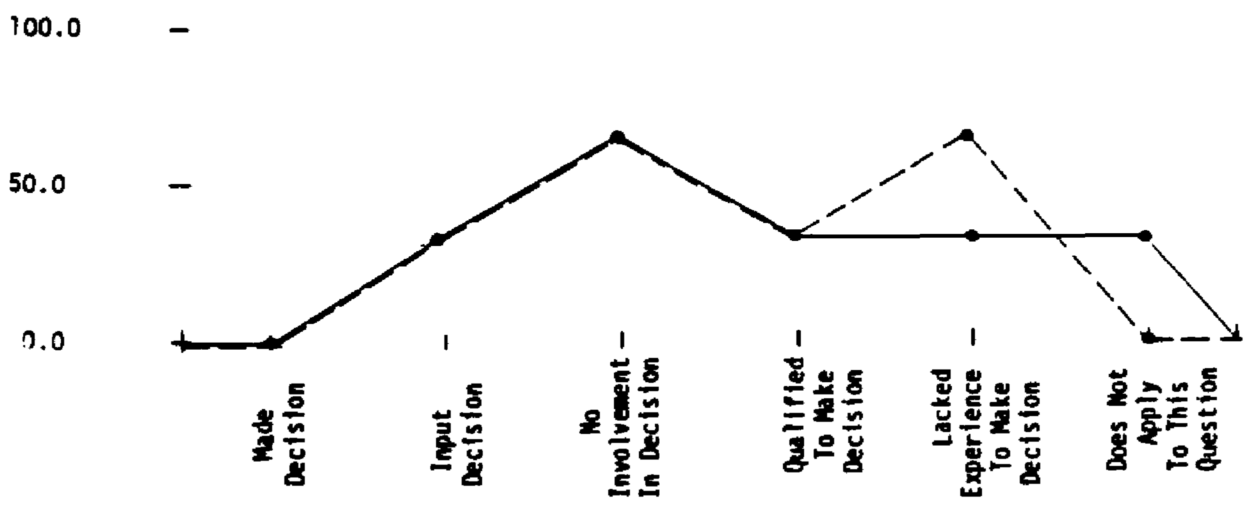

Figure 24H. Determining the circulation patterns within the building.

Board members participating in traditional construction projects perceived themselves as having a higher level of involvement in the decision than did board members participating in construction management projects. They also indicated that they were slightly more qualified to make the decision than did board members participating in construction management projects (see Figure 24I).

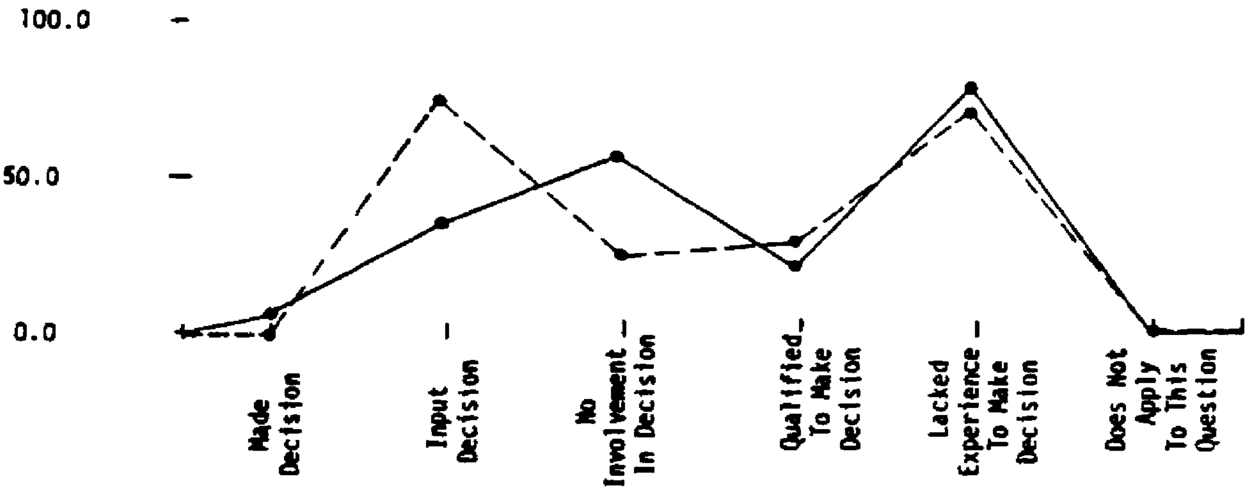

Figure 24I. Determining the circulation patterns within the building.

Project architects involved in construction management projects indicated a higher level of perceived participation on the part of their board members than did project architects involved in traditional construction projects. However, the project architects involved in traditional construction projects indicated that they perceived the board members as being more qualified to make the decision than did project architects involved in construction management projects (see Figure 24J).

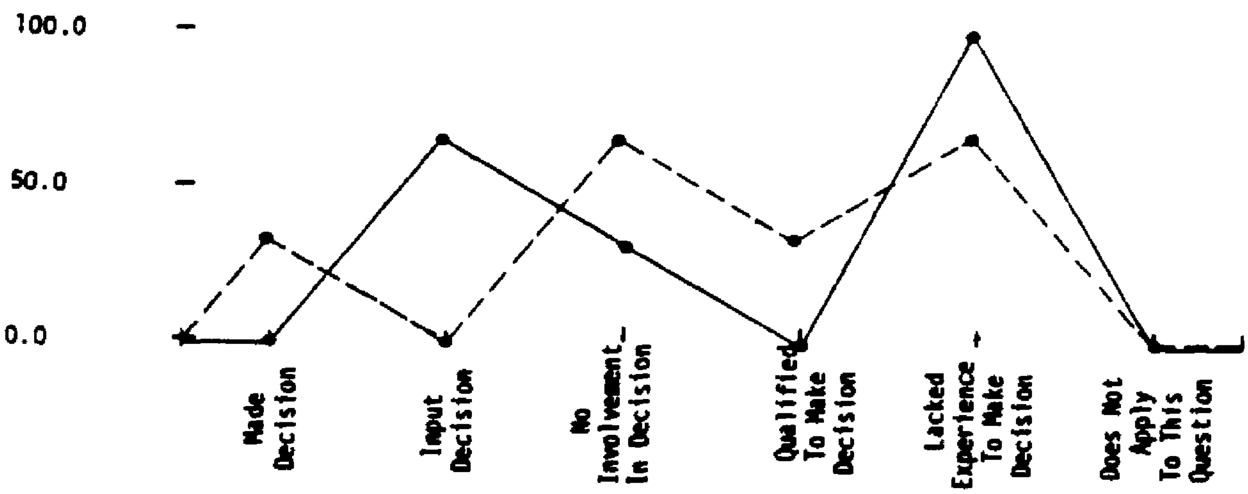

Figure 24J. Determining the circulation patterns within the building.

The analysis of this portion of the question would indicate that board members involved in traditional construction projects were perceived to be slightly more involved in the decision than were board members involved in the construction management projects. It would also indicate that they were perceived to be slightly more qualified to make the decision than were board members involved in the construction management projects.

Decision # 25 - Determining the Heating and Cooling Requirements for the Building

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives agreed on their level of participation in the decision while the board representatives involved in the traditional construction projects felt more qualified to make the decision than did the board representatives involved in construction management projects (see Figure 25E).

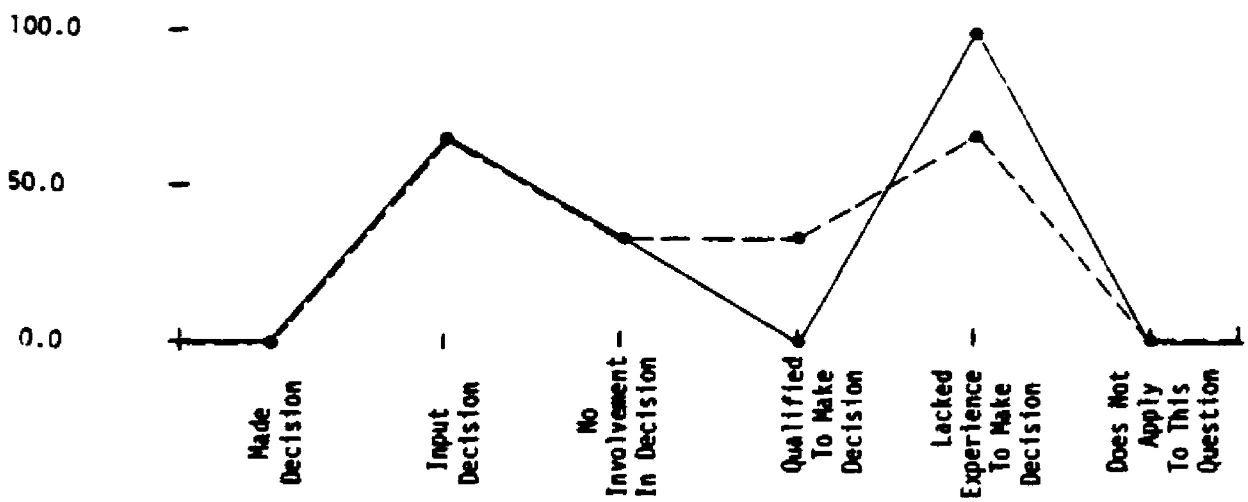

Figure 25E. Determining the heating and cooling requirements for the building.

There is very little difference in the perceptions of both sets of board members, with the board members involved in traditional construction projects indicating their board representatives participated at a slightly higher level than did the board members involved in construction management projects. They also indicated that their board representatives were slightly more qualified to make the decision than did the board members involved in a construction management project (see Figure 25F).

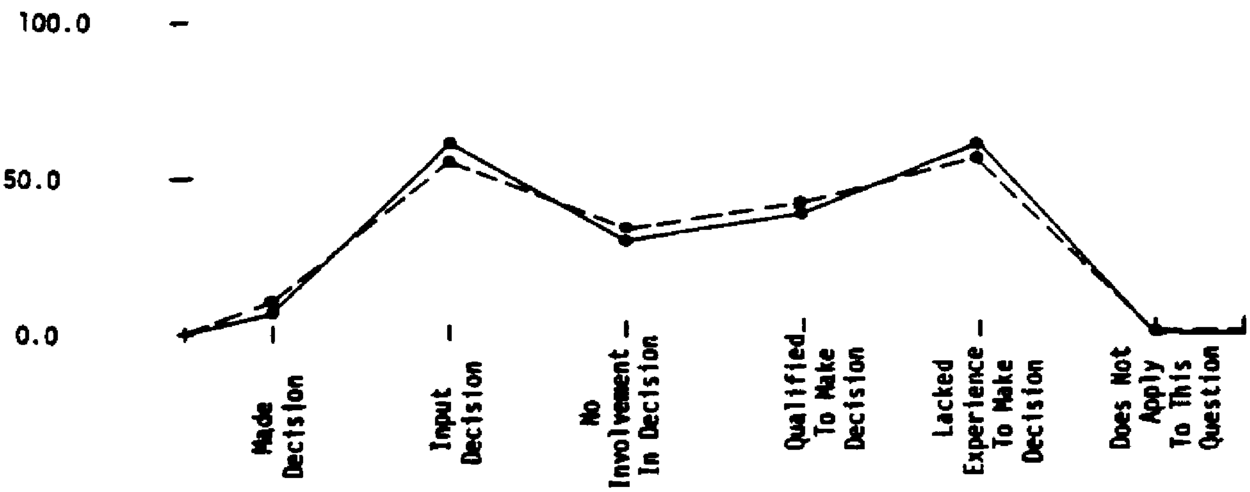

Figure 25F. Determining the heating and cooling requirements for the building.

Both sets of project architects agreed on the perceived level of involvement of the board representatives and indicated that they were qualified at the same level to make the decision (see Figure 25G).

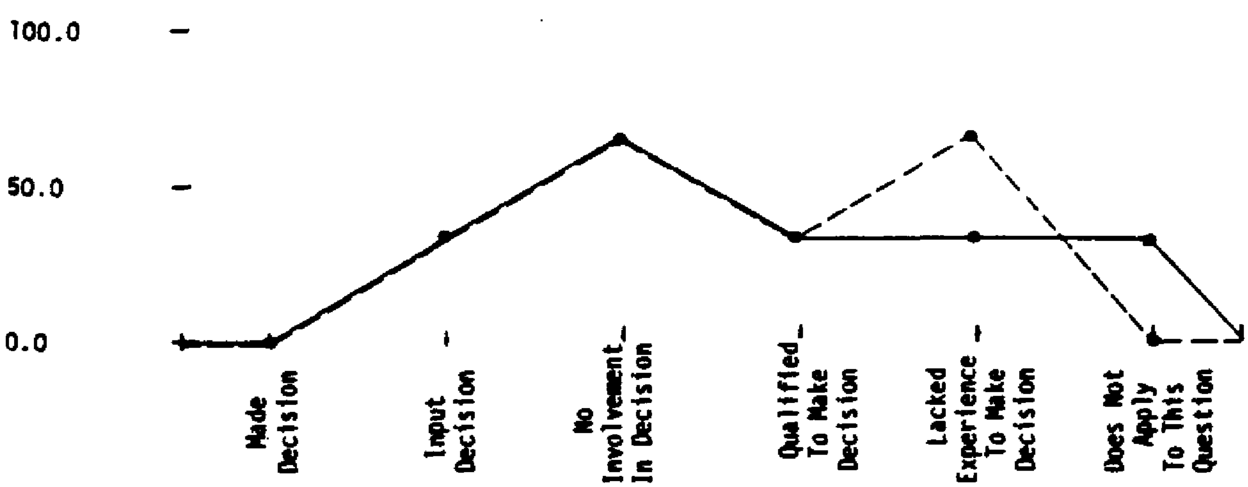

Figure 25G. Determining the heating and cooling requirements for the building.

The analysis of this portion of the question is extremely difficult with no clear indication as to whether the board representatives involved in the traditional construction projects or the board representatives involved in construction management projects had a higher level of involvement. However, there is an indication that the board representatives involved in traditional construction projects are slightly more qualified to make the decision than are the board representatives involved in the construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in construction management projects indicated that their board members participated at a higher level than did the board representatives involved in traditional construction projects. Both sets of board representatives indicated that their board members were not qualified to make the decision (see Figure 25H).

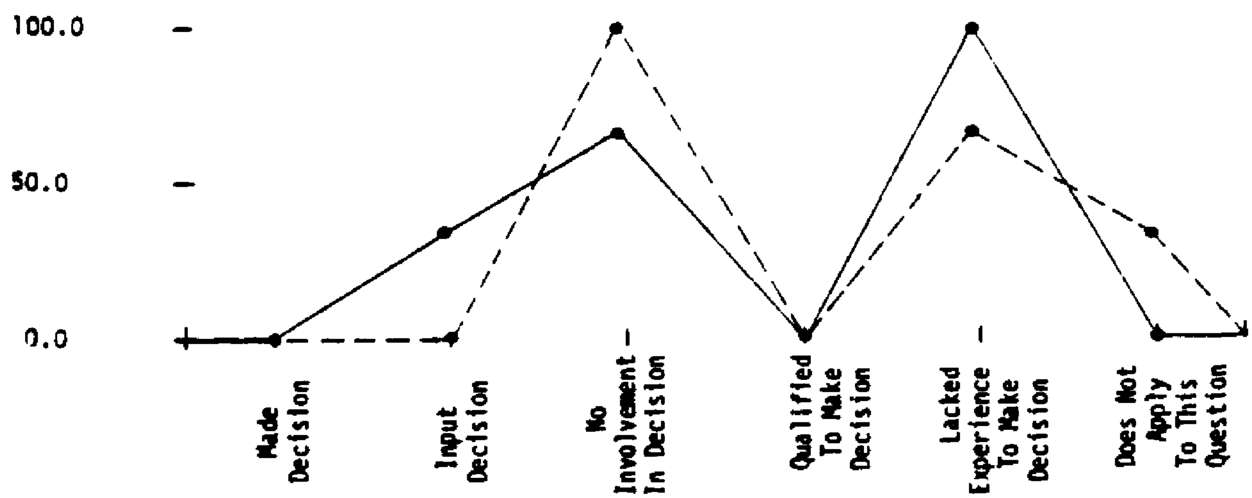

Figure 25H. Determining the heating and cooling requirements for the building.

Board members involved in construction management projects indicated that they were slightly more involved in the decision than did board members participating in traditional construction projects. However, the board members participating in traditional construction projects felt slightly more qualified to make the decision than did the board members participating in construction management projects (see Figure 25I).

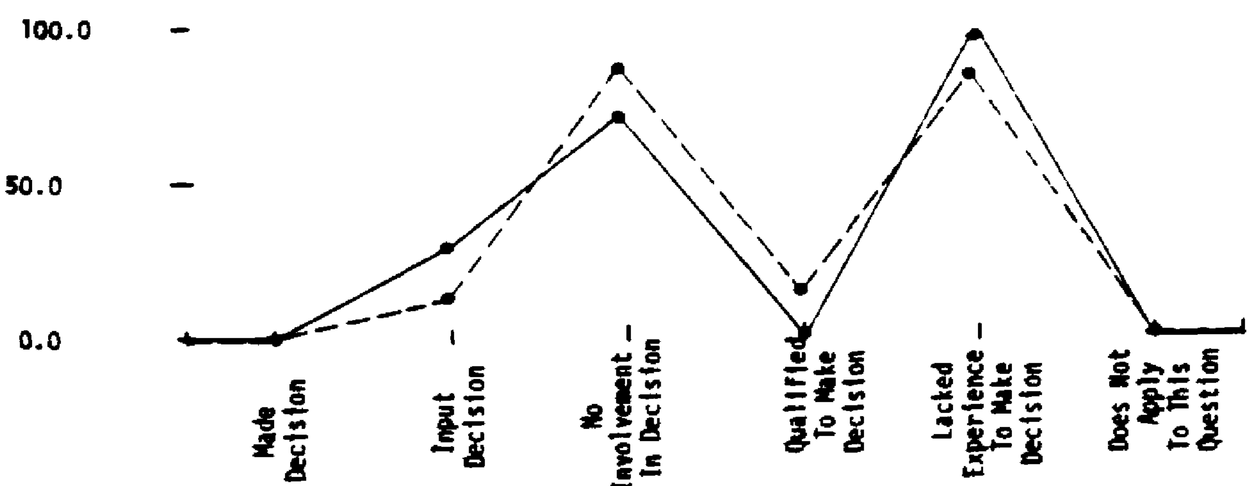

Figure 25I. Determining the heating and cooling requirements for the building.

Project architects participating in traditional construction projects indicated that the board members were perceived as having a higher level of involvement in the decision than did the project architects involved in the construction management project. Both sets of project architects indicated that the board members were qualified at the same level to make the decision (see Figure 25J).

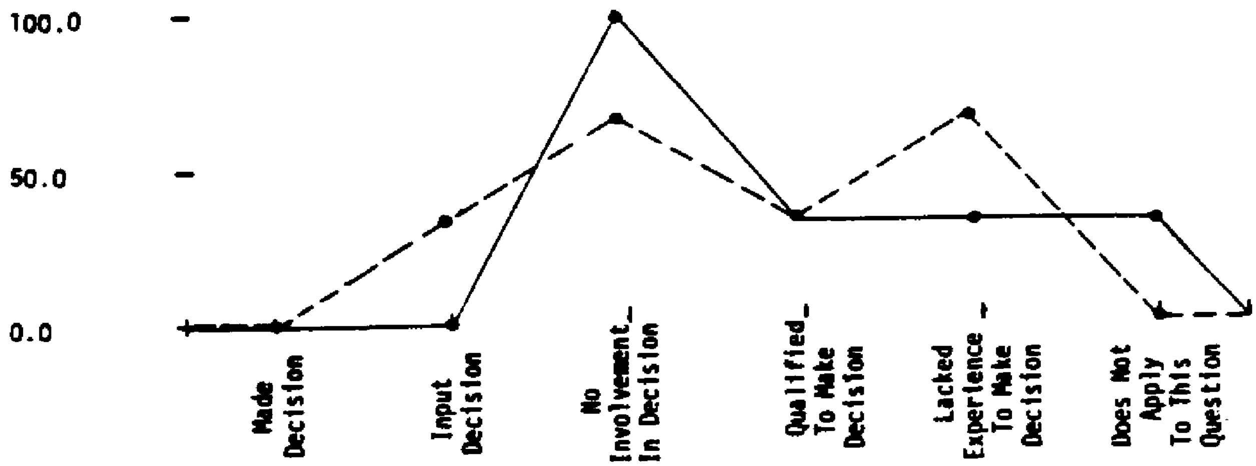

Figure 25J. Determining the heating and cooling requirements for the building.

The analysis of this portion of the question would indicate that board members involved in construction management projects are perceived to have a higher level of participation in the decision than board members involved in traditional construction projects. However, the board members involved in traditional construction projects are perceived to have a slightly higher level of competence in making the decision than are the board members involved in construction management projects.

Decision # 26 - Determining the Type of Heating, Cooling and Ventilating Systems to be Used

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in construction management projects perceived themselves as having a higher level of involvement in the decision than did the board representatives involved in traditional construction projects. Both sets of board representatives indicated that they were not qualified to make the decision (see Figure 26E).

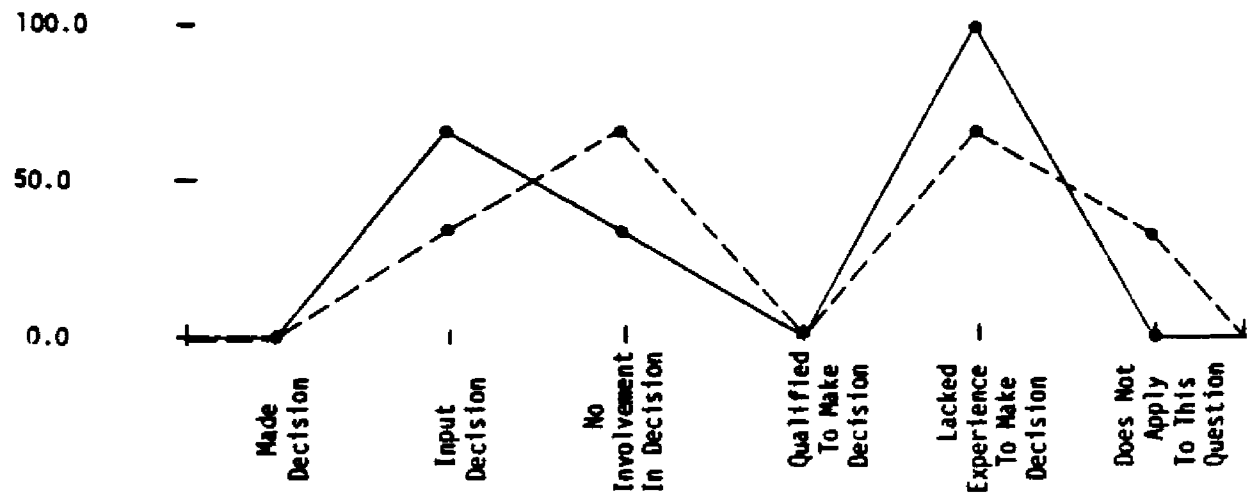

Figure 26E. Determining the type of heating, cooling and ventilating systems to be used.

The board members involved in construction management projects indicated that they perceived their board representatives as having a higher level of involvement in the decision than did the board members involved in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than did board members involved in traditional construction projects (see Figure 26F).

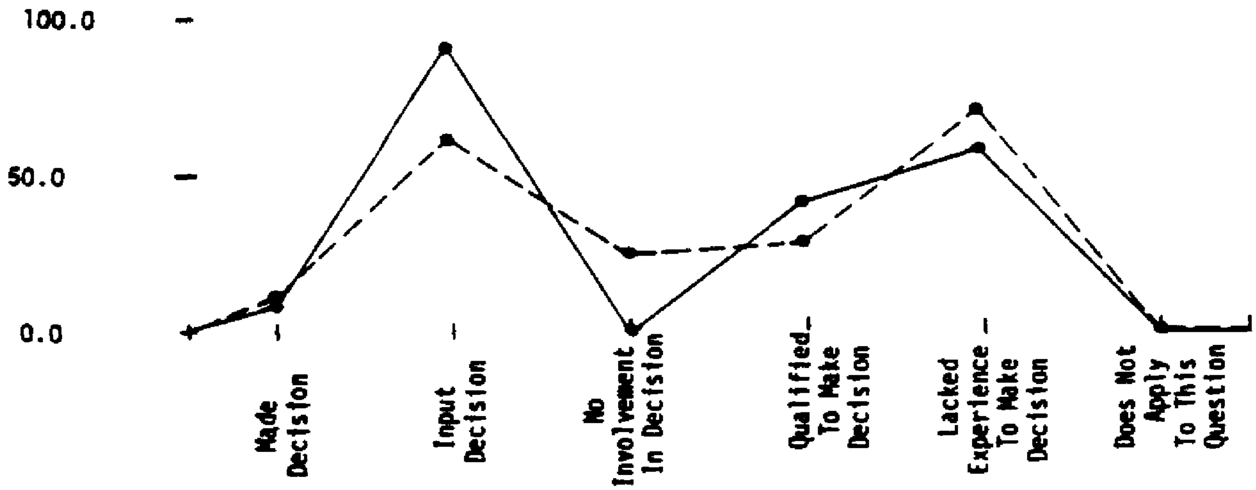

Figure 26F. Determining the type of heating, cooling and ventilating systems to be used.

Both sets of project architects agreed on the level of involvement that was perceived on the part of the board representatives. They also agreed that the board representatives were not qualified to make the decision (see Figure 26G).

Figure 26G. Determining the type of heating, cooling and ventilating systems to be used.

The analysis of this portion of the question would indicate that the board representatives involved in construction management projects are perceived to have a higher level of involvement in the decision than are the board representatives involved in traditional construction projects. The board representatives involved in construction maange-ment projects are perceived to have a slightly higher level of competence in the decision area than are board representatives involved in the traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Board representatives involved in traditional construction projects perceived their board members as having a higher level of involvement in the decision than did the board representatives involved in construction management projects. They also indicated that their board members were more qualified to make the decision than did the board representatives involved in construction management projects (see Figure 26H).

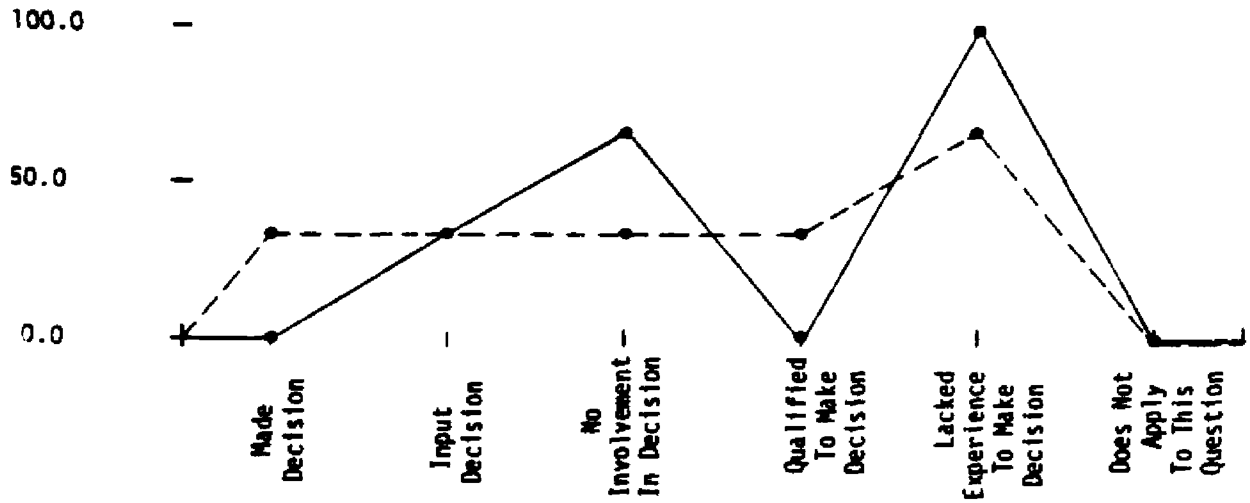

Figure 26H. Determining the type of heating, cooling and ventilating systems to be used.

Board members involved in traditional construction projects indicated that they had a higher level of involvement in the decision than did board members involved in construction management projects. However, the board members involved in the construction management projects felt that they were more qualified to make the decision than did the board members involved in the traditional construction projects (see Figure 26I).

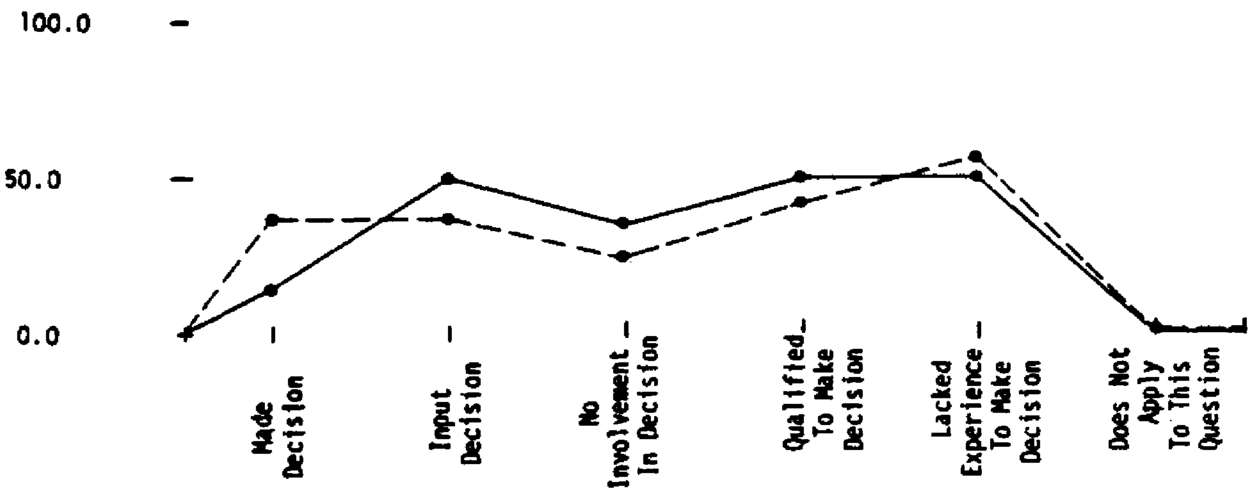

Figure 26I. Determining the type of heating, cooling and ventilating systems to be used.

Both sets of project architects concurred on all points thus indicating that the board members had a moderate level of involvement in the decision; however, they were not qualified to make the decision (see Figure 26J).

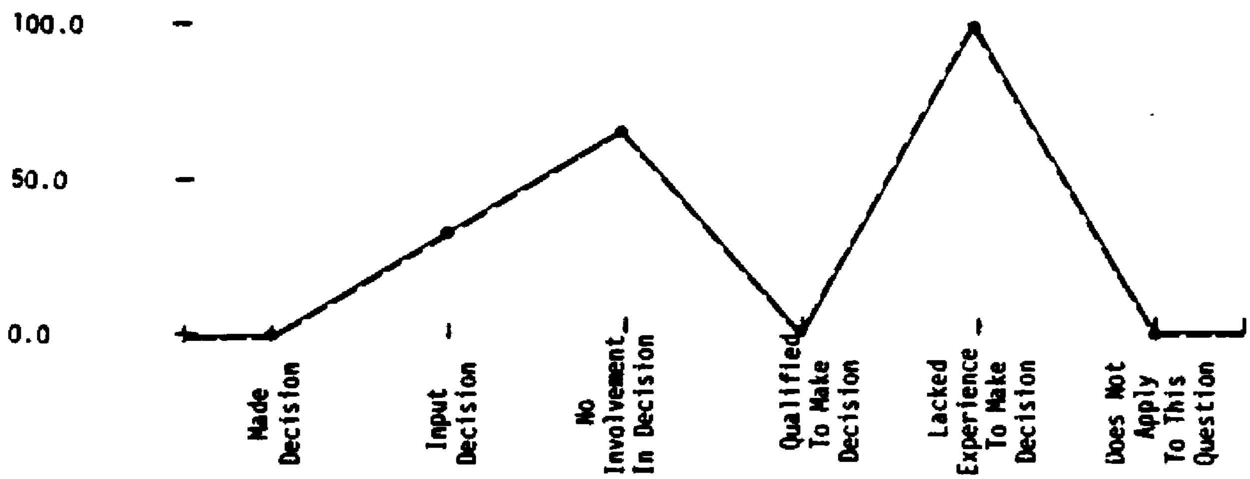

Figure 26J. Determining the type of heating, cooling and ventilating systems to be used.

The analysis of this portion of the question would indicate that board members involved in traditional construction projects are perceived to have a higher level of participation in the decision than are board members involved in construction management projects. They are also perceived to be slightly more qualified to make the decision than are the board members involved in construction management projects.

Decision # 27 - Determining the Design Production Schedule

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives agreed on the level of involvement in the decision and both sets of board representatives indicated that they were not qualified to make the decision (see Figure 27E).

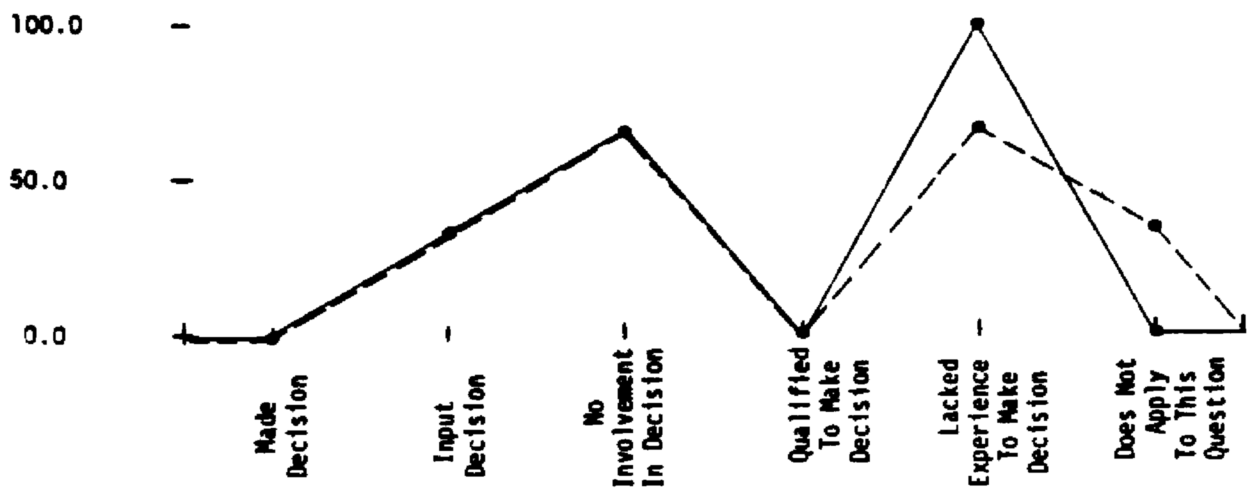

Figure 27E. Determining the design production schedule.

For all practical purposes both sets of board members perceived their board representatives as participating at the same level of involvement while the board members involved in construction management projects indicated their board representatives were more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 27F).

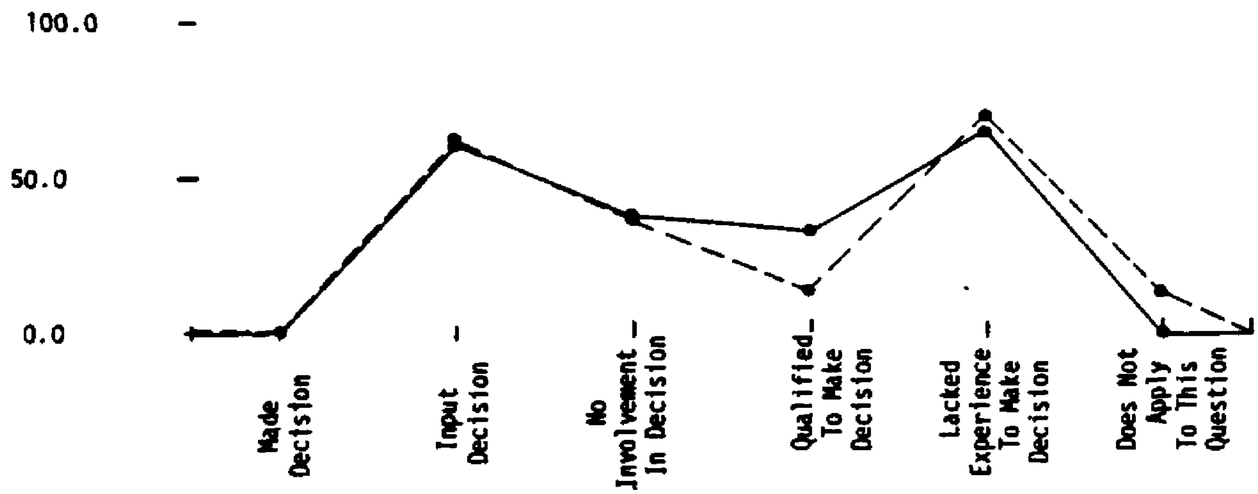

Figure 27F. Determining the design production schedule.

Project architects involved in traditional construction projects indicate that the board representatives are involved at a higher level in the decision than do project architects involved in construction management projects. Both sets of project architects indicate that board representatives are not qualified to make this decision (see Figure 27G).

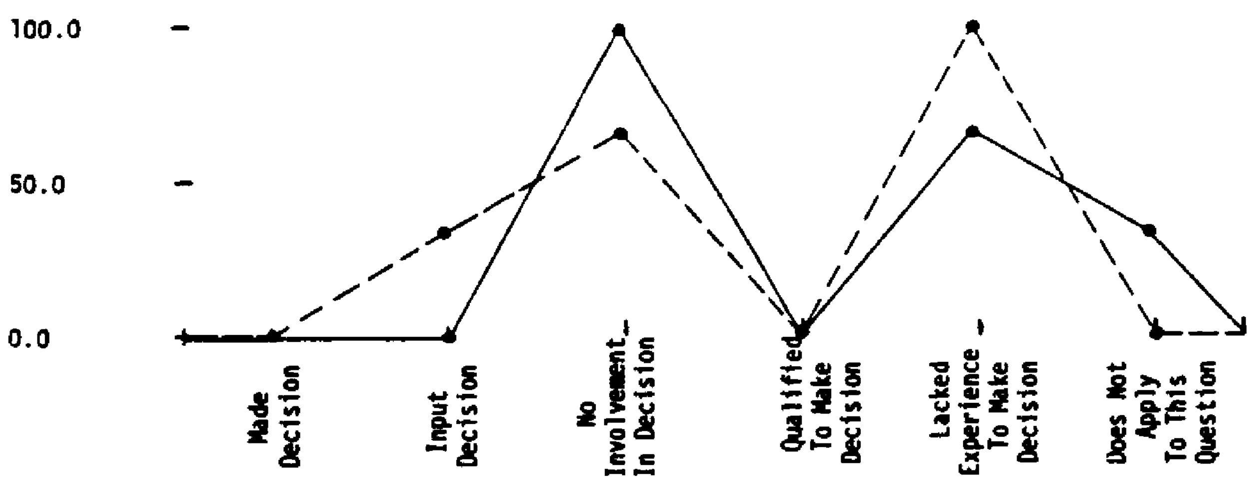

Figure 27G. Determining the design production schedule.

The analysis of this portion of the question would indicate that board representatives involved in traditional construction projects are perceived to be more involved in the decision than are board representatives involved in construction management projects. However, the board representatives involved in the construction management projects are perceived to be slightly more qualified to make the decision than are board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects perceived their board members as having a higher level of participation in the decision than did the board representatives involved in construction management projects. They also indicated that their board members were more qualified to make this decision than did the board representatives involved in construction management projects (see Figure 27H).

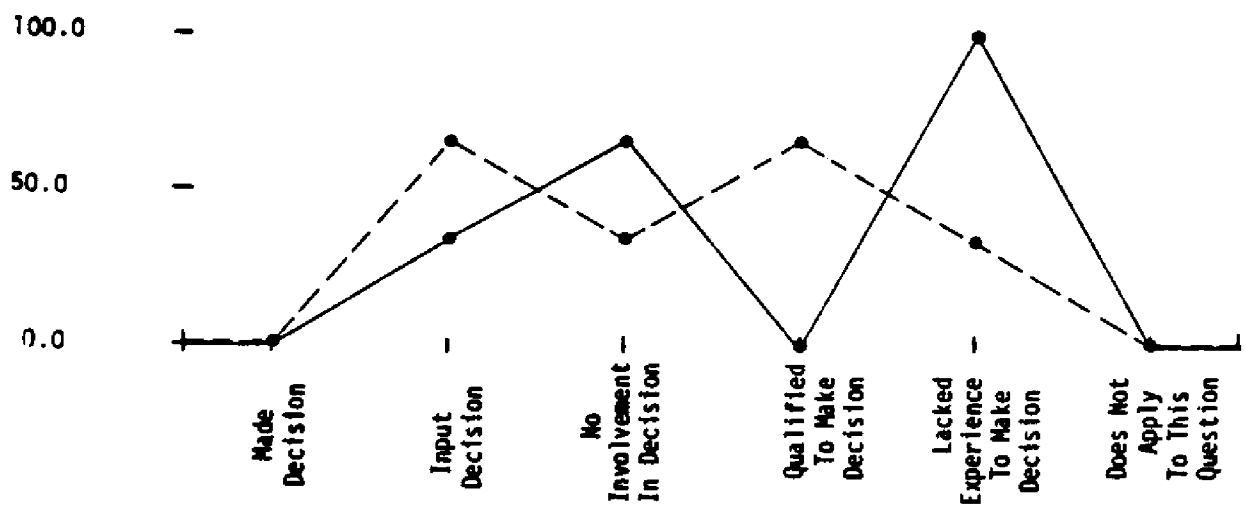

Figure 27H. Determining the design production schedule.

The board members involved in construction management projects indicated that they participated at a higher level of involvement in the decision than did board members involved in traditional construction projects. They also indicated that they were more qualified to make the decision than did board members involved in traditional construction projects (see Figure 27I).

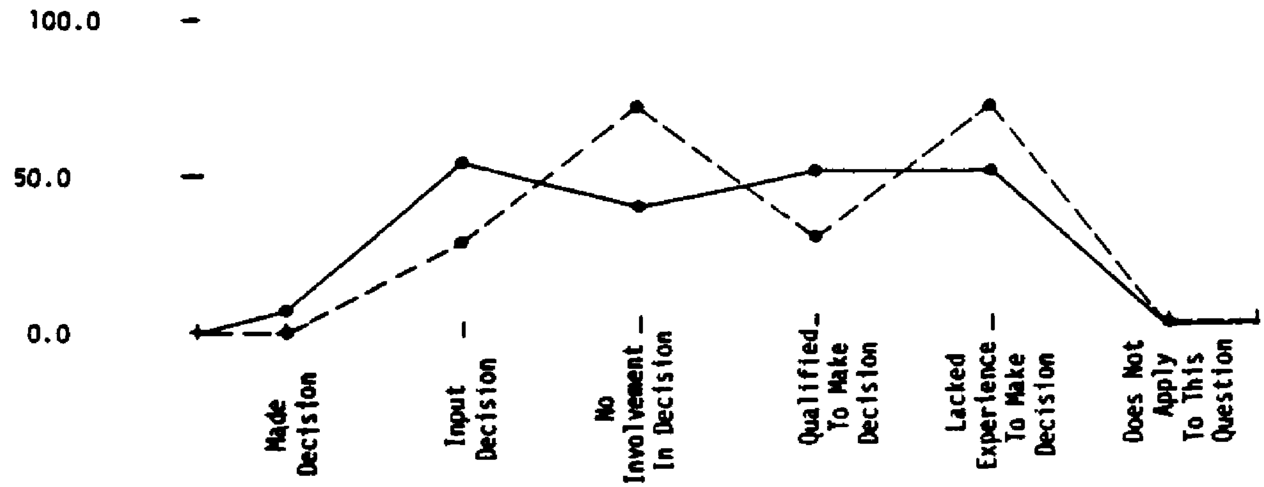

Figure 27I. Determining the design production schedule.

Both sets of project architects agreed on all points indicating that they perceived the board members to have a moderate level of involvement in this decision but they lacked the experience necessary to make the decision (see Figure 27J).

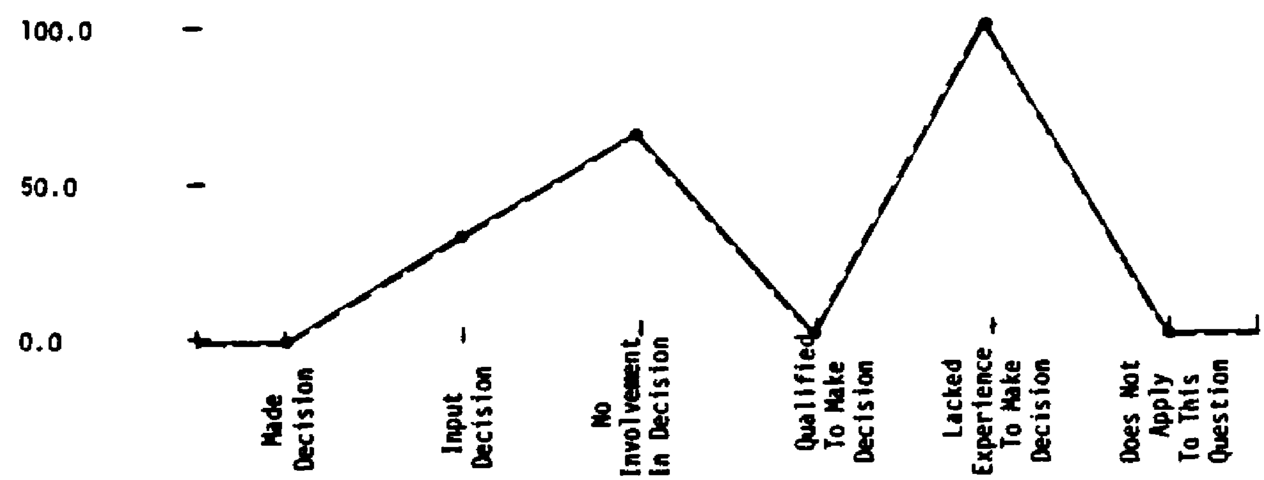

Figure 27J. Determining the design production schedule.

The analysis of this portion of the question would indicate that the board members involved in construction maangement projects are perceived to have a slightly higher level of participation in the decision than are the board members involved in traditional construction projects. However, the board members involved in traditional construction projects are perceived to be more qualified to make the decision than are the board members involved in construction management projects.

Decision # 28 - Determining Both the Arrangement and Spacial Requirements for the Mechanical Equipment

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives perceived themselves to be involved in this decision at the same level; however, both sets also indicate that they are not qualified to make that decision (see Figure 28E).

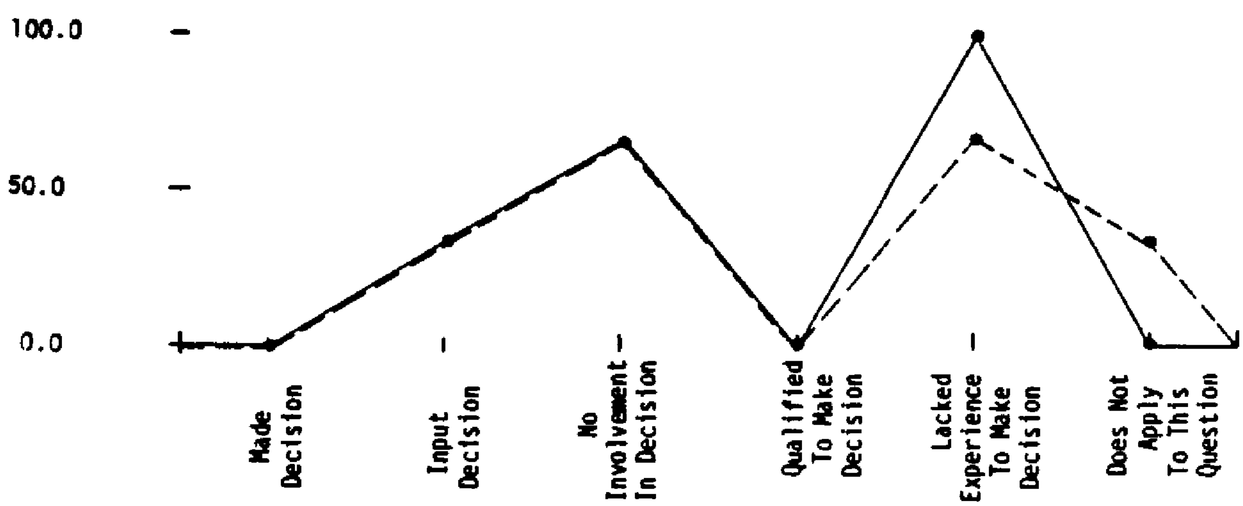

Figure 28E. Determining both the arrangement and spacial requirements for the mechanical equipment.

Board members involved in construction management projects perceived their representatives as participating at a higher level in the decision than did board members involved in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 28F).

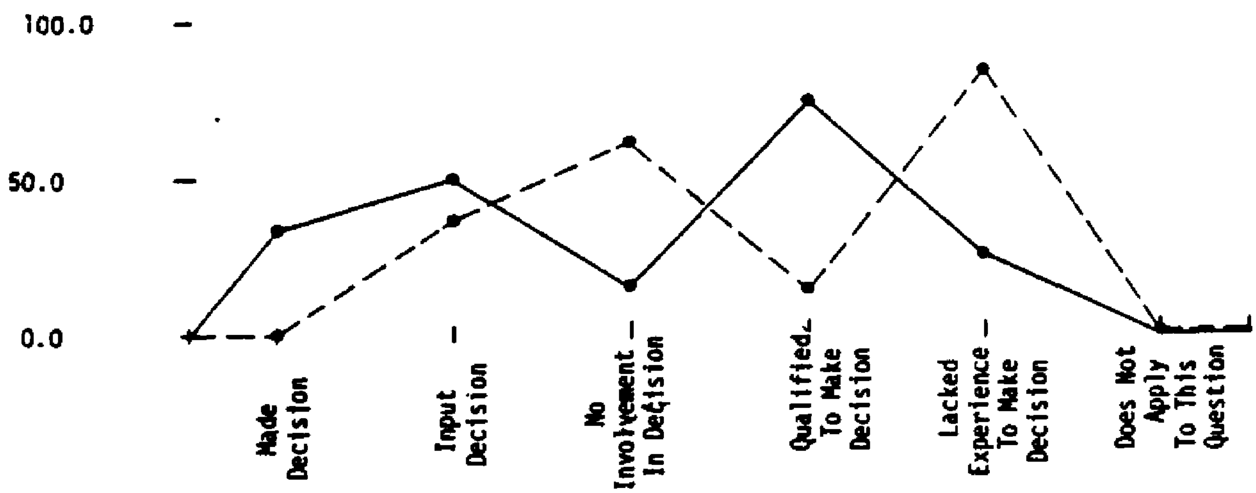

Figure 28F. Determining both the arrangement and spacial requirements for the mechanical equipment.

The project architects involved in construction management projects indicated that they perceived the board representatives participating at a higher level in the decision than did the project architects involved in traditional construction projects. However, both sets of project architects agreed that the board representatives were not qualified to make the decision (see Figure 28G).

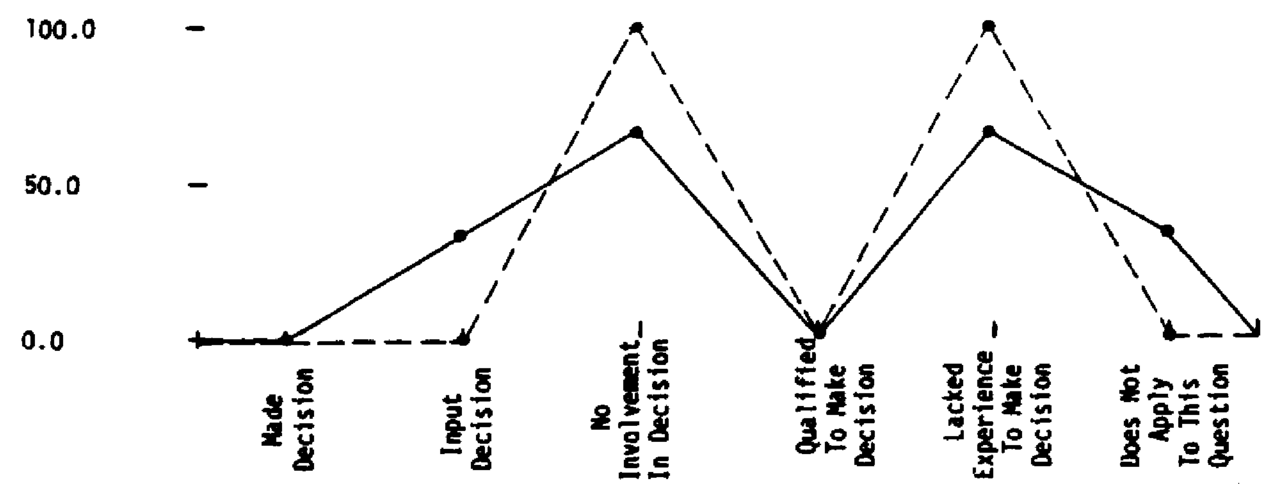

Figure 28G. Determining both the arrangement and spacial requirements for the mechanical equipment.

The analysis of this portion of the question would indicate that the board representatives involved in construction management projects are perceived as having a higher level of participation in the decision than are the board representatives involved in traditional construction projects. It is also indicated that they are more qualified to make the decision than are the board representatives involved in traditional construction projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

Both sets of board representatives perceived that their respective board members were not involved in this decision and further were not qualified to make the decision (see Figure 28H).

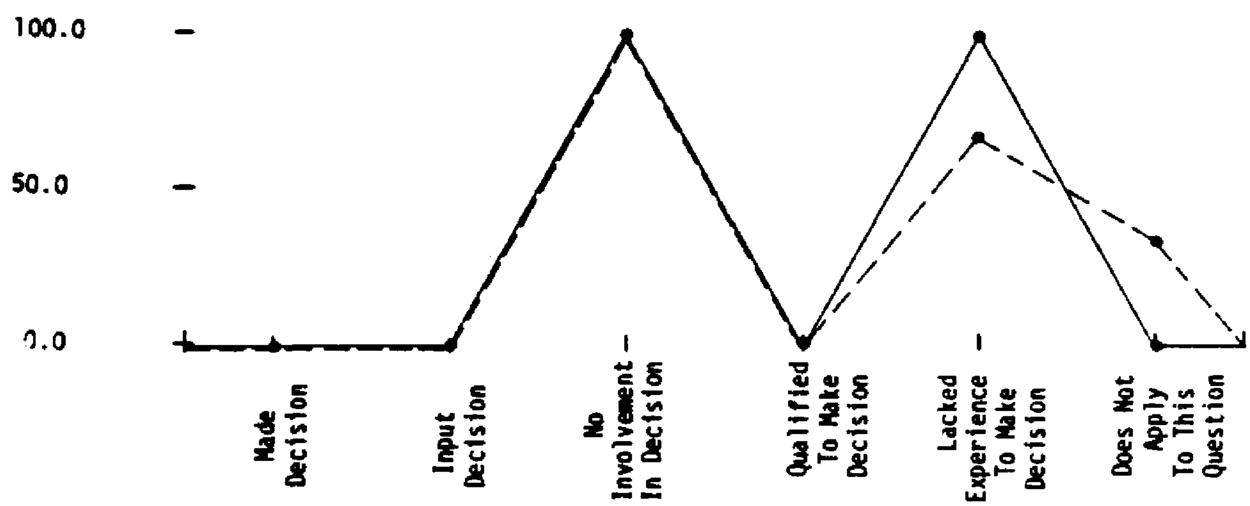

Figure 28H. Determining both the arrangement and spacial requirements for the mechanical equipment.

Board members involved in construction management projects indicated that they had a higher level of participation in the decision than did board members involved in the traditional construction projects. Both sets of board members agreed upon their level of competence in making the decision (see Figure 28I).

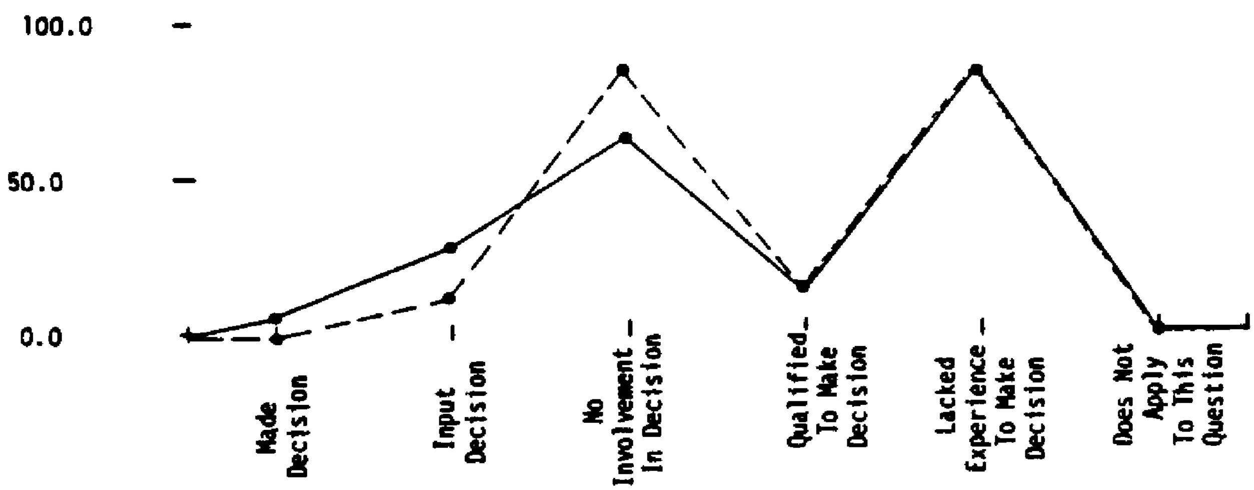

Figure 28I. Determining both the arrangement and spacial requirements for the mechanical equipment.

Both sets of project architects perceived that the respective board members were not involved in the decision and further indicated that they were not qualified to make the decision (see Figure 28J).

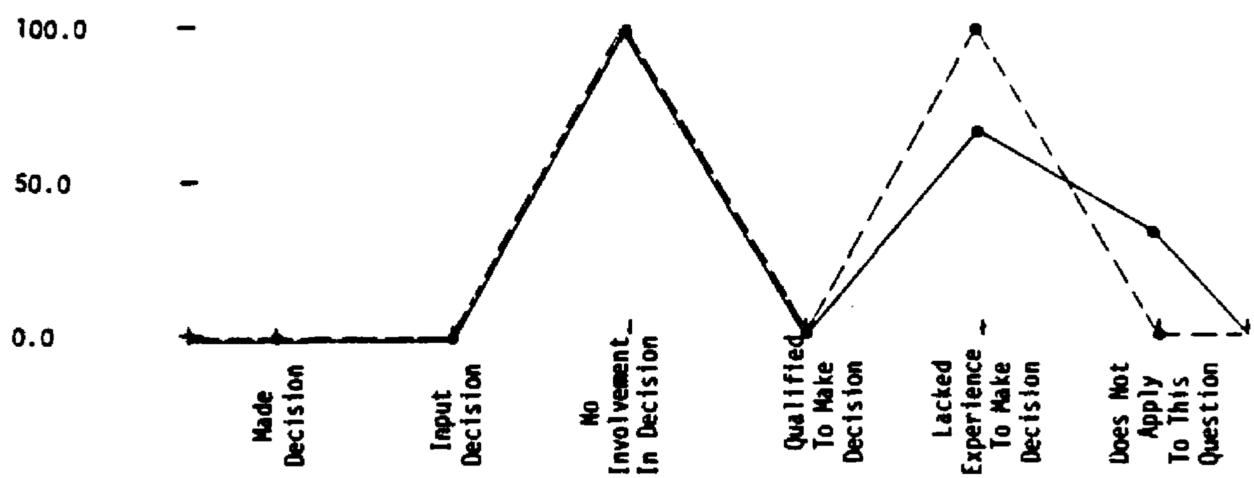

Figure 28J. Determining both the arrangement and spacial requirements for the mechanical equipment.

The analysis of this question would indicate that board members involved in construction management projects are perceived to have a higher level of participation in this decision than board members involved in traditional construction projects. However, there is no perceived difference in their level of competence in making the decision.

Decision # 29 - Determining the Outlined Specification for the Architectural Portion of the Building Design

--Comparative perceptions of the board representatives' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in construction management projects indicated a higher level of involvement in the decision than did the board representatives involved in traditional construction projects. Both sets of board representatives agreed on their level of competence in the decision area (see Figure 29E).

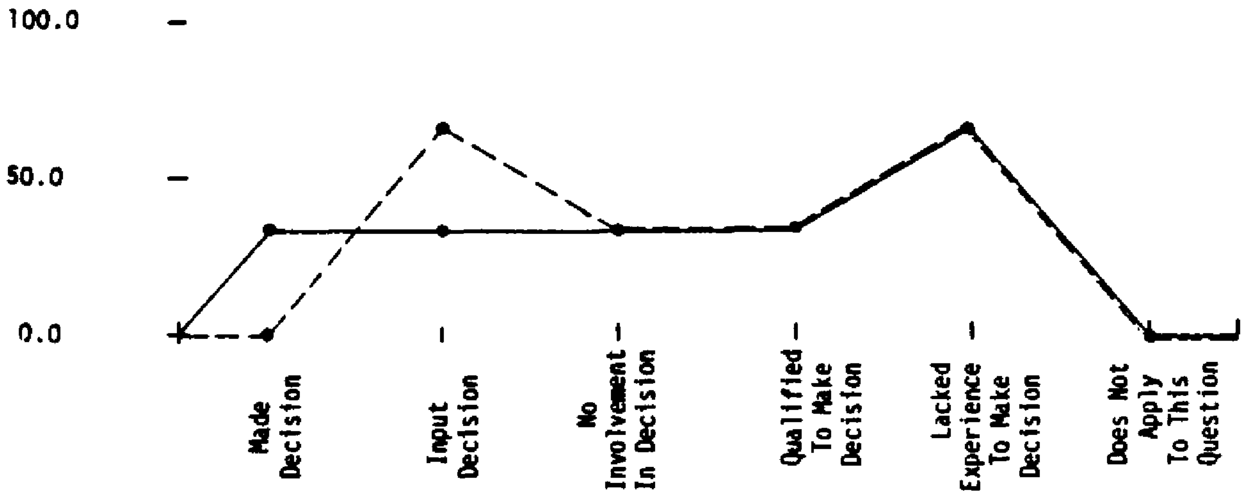

Figure 29E. Determining the outlined specification for the architectural portion of the building design.

Board members involved in construction management projects perceived their board representatives as participating at a higher level in the decision than did board representatives involved in traditional construction projects. They also indicated that their board representatives were more qualified to make the decision than did the board members involved in traditional construction projects (see Figure 29F).

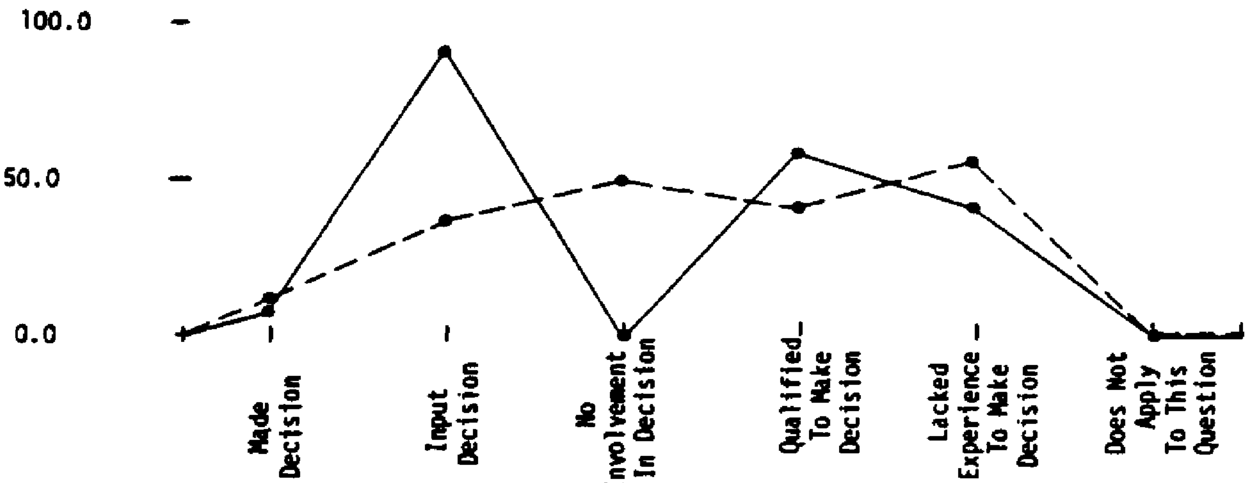

Figure 29F. Determining the outlined specification for the architectural portion of the building design.

The project architects involved in construction management projects indicated that the board representatives participated at a higher level in the decision than did the project architects involved in traditional construction projects. However, the project architects involved in traditional construction projects indicated that their board representatives were more qualified to make the decision than did the project architects involved in construction management projects (see Figure 29G).

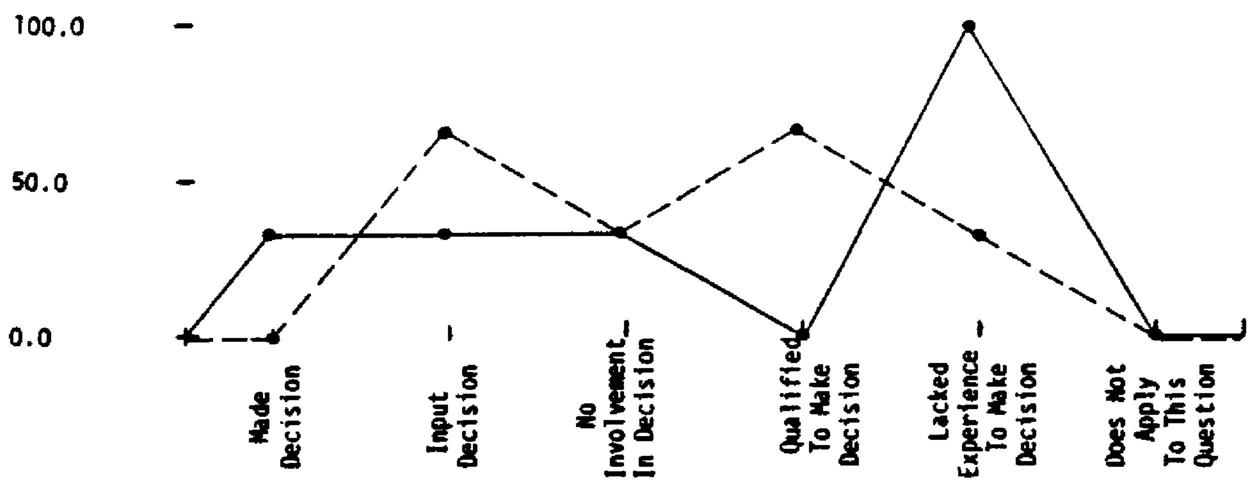

Figure 29G. Determining the outlined specification for the architectural portion of the building design.

The analysis of this portion of the question would indicate that the board representatives involved in construction management projects are perceived to have a higher level of participation in the decision than are the board representatives involved in traditional construction projects. However, the board representatives involved in traditional construction projects are perceived to be slightly more qualified in the decision area than are the board representatives involved in construction management projects.

--Comparative perceptions of the board members' level of involvement and competence in making the decision in construction management projects versus traditional construction projects

The board representatives involved in traditional construction projects perceived their board members as participating at a higher level in the decision than did the board representatives involved in the construction management projects. They also indicated that their board members were more qualified to make the decision (see Figure 29H).

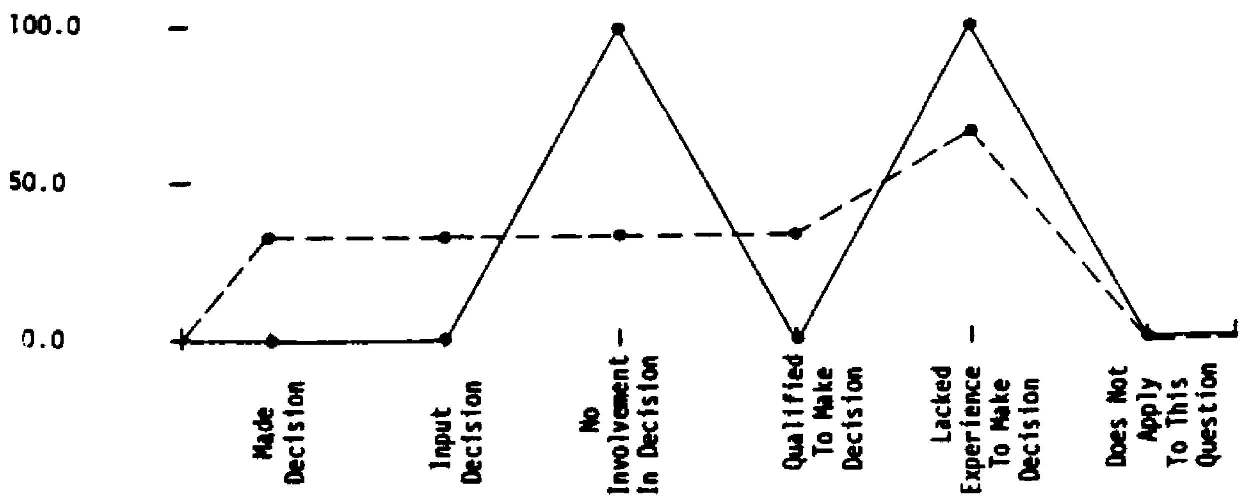

Figure 29H. Determining the outlined specification for the architectural portion of the building design.

Board members involved in construction management projects indicated that they were involved at a higher level in the decision than did board members involved in traditional construction projects.

However, the board members involved in traditional construction projects indicated that they were more qualified to make the decision than did the board members involved in construction management projects (see Figure 29I).

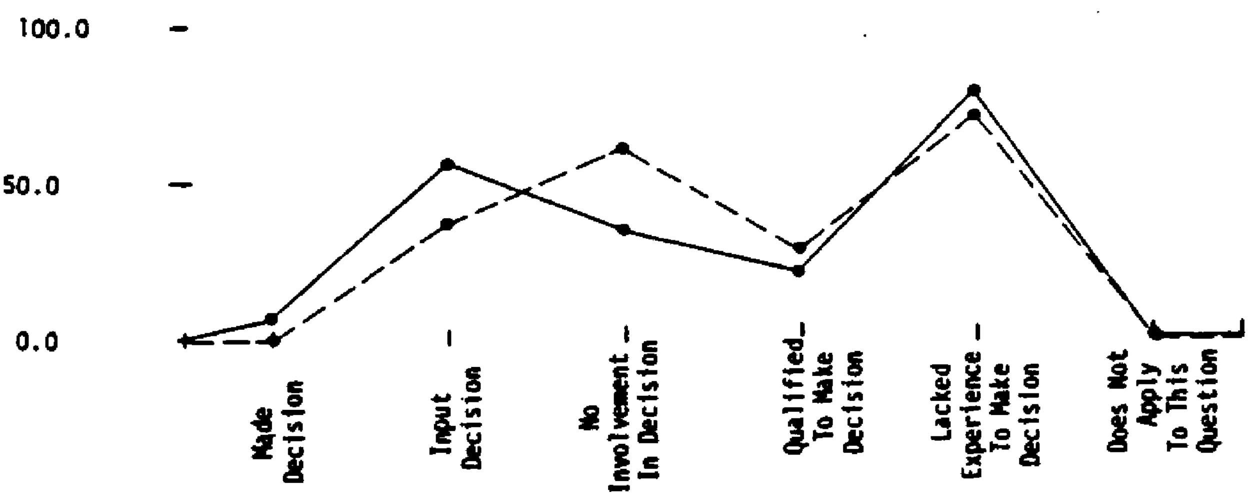

Figure 29I. Determining the outlined specification for the architectural portion of the building design.

The project architects involved in traditional construction projects perceived the board members as participating at a higher level in the decision than did the project architects involved in the construction management projects. They also indicated that the board members were more qualified to make the decision than did the project architects participating in the construction management projects (see Figure 29J).

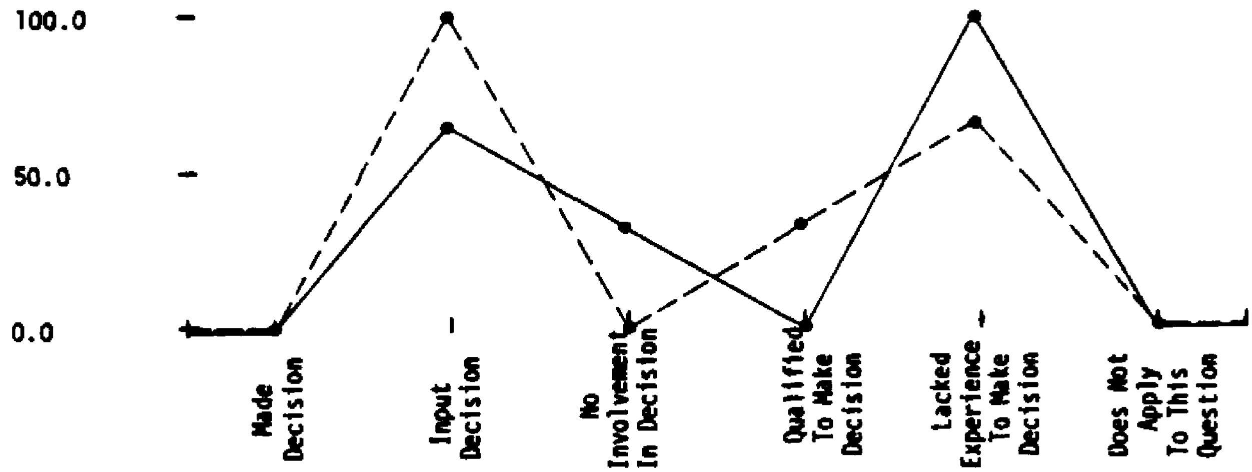

Figure 29J. Determining the outlined specification for the architectural portion of the building design.

The analysis of this portion of the question would indicate that the board members involved in traditional construction projects are perceived to have a higher level of participation in the decision and to be more qualified to make the decision.

CHAPTER 5

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

This chapter is designed to review the purpose of the study, summarize the information that was collected as a result of the study, present the major conclusions of the study, make recommendations for further action and present implications of the study.

Summary

As indicated in Chapter 1, the need for this study was generated as a result of the increasing application of the construction management approach to the design and construction of intermediate school district owned secondary area vocational centers. This need was further supported by a position paper which was approved by the Michigan State Board of Education on June 3, 1975, in which the recommendation was made to establish 50 intermediate school district based area vocational centers during the six years between 1974-75 and 1979-80. An effort of this magnitude would benefit greatly from the improved cost-quality ratio and the time savings which can be accrued through the use of the construction management technique. The implementation of this technique requires a basic shift in the role which the owner plays during design and construction of the project. This shift can have a direct and potentially traumatic impact on administrators and board members of intermediate school districts. As a result of the projected activity in the State of Michigan, the need for both inservice and preservice programs designed to prepare the owner and the owner's representative to assume their role on the design team was a potential.

The problem which existed then was to examine in depth the role of the board members and the board representatives during the design phase of the construction management project to determine if there was, in fact, a change in the responsibility which they assumed when compared to similar roles in a traditional construction project.

A review of literature was conducted to determine if data were available from a rigorously controlled study which compares the level of involvement of the board members and the board representatives in making the decision during the design phase of a construction management project to the level of involvement of the board members and board representatives in making the decision during the design phase of a traditional construction project. While the result of this review indicated that no such studies had been conducted, the literature in the field of construction management supported the fact that the approach has many benefits which are perceived as desirable by the owner.

Research was then conducted which was designed to address the problem that had been identified. Perceptions of both the level of involvement and the competence which board members and board representatives demonstrated in making decisions were obtained from the board members, the board representatives and the project architects who were involved in construction management projects and traditional construction projects. When all of the data had been collected, a question by question analysis was conducted to determine those areas in which board members and board representatives were in need of inservice training and to determine if, in fact, there was an increase in the level of involvement on the part of those board members and board representatives who were involved in construction management projects.

Comparative Level of Involvement

The overall analysis of the comparative levels of involvement indicated that the board representatives participating in the traditional construction projects were perceived to have a higher level of involvement in the design phase than were board representatives participating in construction management projects. This is supported by responses which indicated that board representatives participating in the traditional construction projects had a higher level of involvement than board representatives participating in construction management projects in 53.6 percent of the design decisions. Board representatives participating in the construction management projects had a higher level of involvement than board representatives participating in traditional construction projects in 46.4 percent of the design decisions.

The overall analysis of board members participating in construction management projects showed a marked increase in the level of involvement when compared to the level of involvement of board members participating in traditional construction projects. Supporting this are responses indicating that board members participating in construction management projects were involved at a higher level than board members participating in traditional construction projects in 65.5 percent of the design decisions. Conversely, board members involved in traditional construction projects participated at a higher level than board members involved in construction management projects in only 34.5 percent of the design decisions.

An interesting shift occurs when the design decisions are placed in rank order, most important to least important and the top fifteen decisions are examined. The percentage of those design decisions in which board representatives involved in construction management projects had a higher level of input than board representatives involved in traditional construction projects increases from 46.4 percent to 60 percent. The percentage of design decisions in which the board representatives participating in traditional construction projects had a higher level of involvement decreased from 53.6 percent to 40 percent. There was only a slight change in the level of involvement of board members participating in construction management projects and traditional construction projects. The board members involved in construction management projects indicated an increase from 65.5 percent to 66.7 percent in the percentage of design decisions in which they had a higher level of participation. The board members involved in traditional construction projects indicated a decrease from 34.5 percent to 33.3 percent of the design decisions in which they had a higher level of participation.

Overall Competence

Board representatives and board members involved in the traditional construction projects were perceived to have a much higher level of competence than board representatives and board members involved in construction management projects. The board representatives (71.4%) involved in traditional construction projects were perceived to be more competent in making the design decisions than were board representatives involved in construction management projects. Similarly, 75 percent of the board members involved in traditional construction projects were perceived to be more competent in making the design decisions than were board members participating in construction management projects. This trend continued when the top fifteen design decisions were evaluated with board representatives involved in the traditional construction projects being perceived as more competent than board representatives participating in construction management projects in 60 percent of the design decisions. The board members involved in the traditional construction projects were perceived as being more competent than board members participating in construction management projects in 66.7 percent of the design decisions. The board representatives involved in construction management projects were perceived as being more competent in 40 percent of the design decisions and board members involved in construction management projects were perceived as being more competent in 33.3 percent of the design decisions.

Another interesting pattern emerges when the level of involvement in the design decisions were based on the categories architectural and mechanical/electrical. Under this structure the board representatives involved in traditional construction projects indicated a higher level of involvement than board representatives participating in construction management projects in 60 percent of the design decisions which fall in the architectural category. The board representatives involved in construction management projects were perceived to have a higher level of involvement than board representatives participating in traditional construction projects in 40 percent of the design decisions in this category.

Board members involved in construction management were perceived to have a higher level of involvement than board members participating in traditional construction projects in 60.9 percent of the design decisions in this category. Board members involved in a traditional construction project were perceived to have a higher level of participation in 39.1 percent of the design decisions in the architectural category.

Both the board representatives and the board members involved in construction management projects are perceived to have a higher level of involvement in the category mechanical/electrical than were board representatives and board members participating in traditional construction projects. This is supported with responses indicating that the board representatives involved in construction management projects were perceived to have a higher level of involvement in 80 percent of the design decisions in this area than were board representatives participating in traditional construction projects. Board members involved in construction management projects are perceived to have a higher level of involvement in 83.3 percent of the design decisions in this area than were board members participating in traditional construction projects. Board representatives involved in traditional construction projects have a higher level of involvement in only 20 percent of the design decisions while board members involved in traditional construction projects participate at a higher level in only 16.7 percent of the decisions in the mechanical/electrical category.

In the overall analysis of the response to the questionnaires, board representatives involved in construction management projects and board representatives involved in construction management projects were perceived as having the same level of involvement in 3.4 percent of the design decisions and they have the same level of competence in 3.4 percent of the design decisions. Board members involved in traditional construction projects and construction management projects were perceived to have the same level of competence in 3.4 percent of the design decisions. It should be noted here, however, that there were no relationships between those decisions in which the level of competence was the same as those decisions in which the level of involvement was the same.

Need for Inservice Program

A portion of the problem as stated was to identify those areas in which the board representatives and the board members involved in construction management projects needed preservice and inservice programs to increase their ability to participate as a member of the design team. The analysis which was conducted on the data obtained indicated that while the need for preservice and inservice of board members and board representatives involved in construction management projects was greater than the need identified for board members and board representatives participating in traditional construction projects, there were considerable needs for both populations.

Conclusions

The data which has been collected and analyzed as a result of this study establishes a base from which the following conclusions are drawn:

1. Based on the overall response to the 29 design decisions which were identified for the purpose of this study, the level of involvement of board representatives participating in construction management projects reflects a decrease when compared to the level of involvement of board representatives participating in traditional construction projects.
2. Based on the overall response to the 29 design decisions which were identified for the purpose of this study, the level of involvement of board members participating in construction management projects reflects an increase when compared to the level of involvement of board members participating in traditional construction projects.
3. There is a positive relationship between the importance of the decisions and the level of involvement of board representatives involved in the construction management projects. This relationship is such that it causes an increase from 46.4 percent to 60 percent with respect to the number of design decisions in which these representatives were perceived to have the higher level of involvement.
4. There is no relationship between the importance of the design decision and the level of involvement of board members participating in construction management projects. This is supported by the fact that the overall perceptions of board

members participating in construction management projects were that these board members had a higher level of involvement than board members involved in traditional construction projects in 65.5 percent of the design decisions. When the same perceptions were compared for the top fifteen design decisions, the board members involved in construction management projects were viewed as having a higher level of involvement than board members involved in traditional construction projects in 66.7 percent of the design decisions thus indicating an increase in only 1.2 percent.

5. Board representatives involved in construction management projects had a higher level of involvement than board representatives participating in traditional construction projects in 80 percent of the design decisions which impacted the mechanical/electrical design.
6. Board members participating in construction management projects had a higher perceived level of involvement than board members participating in traditional construction projects in 83.3 percent of the design decisions which impacted the mechanical/electrical design.
7. The study tends to support the implications which exist in current literature relative to the increased level of involvement of the owner participating in the design phase of a construction management project.
8. Board representatives participating in traditional construction projects were perceived as having a higher level of competence in decision making than were board representatives involved in construction management projects.

9. Board members involved in traditional construction projects were perceived to have a higher level of competence in decision making than were board members involved in construction management projects.
10. Because the board representatives' involved in construction management projects level of participation increases as the level of importance of the decision increases, and because the board representatives involved in construction management projects are perceived to have a lower level of competence than the board members involved in traditional construction projects, the need to provide both preservice and inservice programs to increase their skills is evident.
11. Because board members involved in construction management projects are perceived to participate at a higher level in more design decisions and because these board members are also perceived to be less competent than board members involved in traditional construction projects, the need for both preservice and inservice programs to increase their skills is indicated.
12. Even though the board representatives involved in traditional constrcution projects are perceived as being more competent than board representatives involved in construction management projects, there is need for both preservice and inservice programs for these individuals.
13. Even though the board members involved in traditional construction projects are perceived to be more competent than the board members involved in construction management projects,

there remains identifiable need for both preservice and inservice programs for these individuals.

Recommendations

Based on the conclusions which were drawn from the data collected and analyzed in this study, the following recommendations are made.

1. That statewide preservice and inservice education programs be developed for those board representatives who anticipate becoming involved in projects in which the construction management technique will be used. These programs should be designed to promote competencies and are presented in rank order.
    a. Determining the actual building location
    b. Determining a site master plan for the purpose of future growth
    c. Determining the final building cost estimates based on value engineering
    d. Determining the exterior treatment and fenestration of the building
    e. Determining the structural system
    f. Establishing access to the building (staff, students and public)
    g. Establishing the project development schedule
    h. Determining the circulation patterns within the building
    i. Determining the major entrances
    j. Establishing the heating and cooling requirements for the building

k. Establishing the preliminary building costs through value engineering

l. Developing mechanical trade budget

m. Determining the type of heating, cooling and ventilation systems to be used

n. Determining the instructional equipment layouts for both movable and fixed equipment

o. Determining the contouring for purposes of landscaping and storm drainage

p. Determining the space relationships in flow diagrams

q. Determining both the arrangement and spacial requirements for mechanical equipment

r. Determining the outline specification for the architectural portion of the building design

s. Establishing drives and entrances off major streets

t. Determining the characteristics of the exterior envelope

u. Determining considerations for future expansion

v. Establishing the orientation of the building taking into consideration the sun, wind and noise

w. Determining bus and pedestrian traffic to the site

x. Determining the interface between the electrical and mechanical systems.

2. That statewide inservice education programs be developed for those board members who anticipate becoming involved in projects in which the construction management technique will be used. These programs should be designed to promote competencies in the following rank ordered areas:

a. Selecting a site

b. Determining the actual building location

c. Determining a site master plan for purposes of future growth

d. Determining a final building cost estimate based on value engineering

e. Determining the structural system

f. Establishing access to the building (staff, students, public, etc.)

g. Establishing the project development schedule

h. Determining the circulation patterns within the building

i. Determining the major entrances

j. Establishing preliminary building costs through value engineering

k. Determiming the type of heating, cooling and ventilation systems to be used

l. Determining the design production schedule

m. Determining instructional layouts for both movable and fixed equipment

n. Determining space relationship in flow diagrams

o. Determining the outline specifications for the architectural portion of the building design

p. Establishing drives and entrances off the major streets

q. Determining the characteristics of the exterior envelope

r. Determining considerations for future expansion

s. Establishing the "U" factor for exterior walls

t. Determining other site uses: games, storage, community uses, program uses, etc.

u. Determining bus and pedestrian traffic to the site.

3. While it was not the original intent of the study to identify preservice or inservice needs for those board representatives involved in traditional construction projects, the results which were accrued through the effort indicates that there is a need in this area. Therefore, establishment of preservice and inservice education programs to address the following rank ordered areas are recommended for board representatives involved in traditional construction projects:

   a. Determining the actual building location

   b. Determining the exterior treatment and fenestration of the building

   c. Establishing the project development schedule

   d. Determining the heating and cooling requirements for the building

   e. Establishing a preliminary building cost through value engineering

   f. Determining the type of heating, cooling and ventilation systems to be used

   g. Determining the design production schedule

   h. Determining the contouring for purposes of landscape and storm drainage

   i. Determining the integration of architectural and mechanical systems

   j. Establishing the orientation of the building taking into consideration wind, sun and noise

k. Determining the interface between the electrical/ mechanical systems.

4. While the original scope of the study did not include identifying inservice education needs for board members involved in traditional construction projects,because of the implications inherent in the outcome, inservice education programs are recommended for board members in the following areas:

   a. Determining the actual building location
   b. Determining the final building cost estimate based on value engineering
   c. Determining the exterior and fenestration of the building
   d. Determining the circulation patterns within the building
   f. Determining major entrances
   g. Establishing preliminary building costs through value engineering
   h. Determining the type of cooling, heating and ventilating systems to be used
   i. Determining the instructional layouts for both movable and fixed equipment
   j. Determining space relationships in flow diagrams
   k. Determining the outline specification for the architectural portion of the building design
   l. Establishing drives and entrances off major streets
   m. Determining the characteristics of the exterior envelope
   n. Determining considerations for future expansion
   o. Establishing the "U" factor for exterior walls.

Recommendations for Further Study

It is further recommended that:

1. A study which is similar in design to the one which has been conducted be undertaken to determine the level of involvement and competence of both the board representatives and the board members involved in the construction phase of a construction management project when compared to the board representatives and board members involved in similar activities in a traditional construction project.
2. When a sufficient number of projects have been completed using the construction management approach, a statistical study be conducted which tests the level of significance of the implications which were generated as a result of this study.
3. That a similar statistical study be conducted which tests the level of significance of a similar study which has been recommended for the portion of the construction management project which deals primarily with the involvement and competence of the board members and board representatives in the construction phase of a construction management project.

Implications

As a result of the study, in addition to the need to improve the ability of the board members and board representatives to participate as members of the design team, other implications surfaced. While the research procedures were not designed to address these implications, it is appropriate to present them at this time.

Construction management is a complex process. The decision-making deficiencies which appear to exist in the design team should not be considered as the sole determinant when selecting an approach to a construction project. In the interim, before any education programs can be established to address the preservice and inservice needs of boards and board representatives, construction management may still offer a better method for delivering an educational facility. There are actions that an owner can udnertake which will contribute positively to the construction management effort. It is in this light that the following project control techniques are suggested.

Project Control Techniques

The project control techniques which are suggested result from the combination of approaches that were implied in the reviewed literature and the experiences of the researcher in dealing with construction management projects. They should be acted upon prior to interviewing and hiring an architect or engineer. The following implications resulted:

1. Educational specification development - Educational specifications which identify the number of students, the types of acticities, the circulation needs and the equipment to be housed should be developed consistent with the administrative and operational philosophy. This should be accomplished with as little architectural involvement as possible, the objective being to eliminate architectural bias from the educational program.

2. Establish gross square footage parameter - Based on the educational specifications which identify the curricular approach to be employed in the various types of educational programs housed in the facility, the net instructional space for the building can be determined. To this amount, add space for ancillary services and circulation. The sum total of this effort will establish the gross square footage parameter. Note: The net instruction space should constitute approximately 75 percent of the building.
3. Establish the cost parameters - Use information available from various state agencies in conjunction with the gross square footage parameters which have been determined to establish basic building costs. To this amount, add allowances for site acquisition and development plus equipment and furnishings. By establishing the cost parameter early in the effort, the proper tone is set for the entire project.
4. Employment of the construction manager - Once the overall program, educational specification, the gross square footage parameter and the cost parameter have been established, several (at least three) construction management firms should be interviewed. The firm which demonstrates the greatest potential should be hired on a fixed fee basis. This encourages performance since the construction manager's greatest expenditure is incurred during the construction phase. If he does not complete the project on schedule, the overburden is his.

5. Obtain site data - Part of the construction manager's contract should include assisting the owner in obtaining appropriate site data, soil borings, sanitary sewer, water, etc.
6. Determine project schedule - The construction manager working with the owner should determine the desirable occupancy date based on the program need and cash flow. Once this has been established, the amount of time which can be allotted to design can be determined and a design CPM developed.
7. Employment of design professionals - All design professionals, project architects, electrical engineers, mechanical engineers and speciality consultants should be hired under separate contract. This facilitates design accountability and increases owner control of the project.
8. Hiring of professionals - All professionals should be hired on a fixed fee basis to eliminate the conflict in interest which can arise if the project has the potential of coming in under the budget. In addition, the professional is not unjustly rewarded if the project should come in over the budget.
9. Submission of proposals - All architects and engineers submitting proposals should be required to obtain a set of educational specifications and to familiarize themselves with the contents. A deposit should be made by each firm checking out a set of specifications.

The aforementioned suggestions, if utilized, appear to clarify the building program for interested architects and engineers prior to the time they enter into a contractural arrangement with the owner. This should establish an environment in which the project can move forward smoothly and quickly saving the owner money and eliminating many frustrations.

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APPENDICES

APPENDIX A

STATE OF MICHIGAN

DEPARTMENT OF EDUCATION

Lansing, Michigan 48902

JOHN W. PORTER
Superintendent of
Public Instruction

Dear

During the past two years, six out of seven of the area vocational centers which have been constructed have employed the services of a construction management firm. The process requires the establishment of a designed team composed of the architect, the owner and the construction manager.

Because of both the newness and uniqueness of this approach, the Vocational-Technical Education Service is interested in examining the role which the owner plays as a member of this team during the designed process.

In order to initiate this study, it is first essencial that the decisions which are typically made during the design process be identified. In a recent telephone conversation you indicated a willingness to serve on a panel of judges composed of five architects registered in the State of Michgian for the purpose of identifying the above mentioned. This panel will not meet formally but will be asked to react individually to the format which is attached. I am anticipating completing this phase of the project by March 31st.

Your assistance in this matter is deeply appreciated. Hopefully, your contribution will provide a basis for improving the role which the owner plays during the design phase of a construction project.

Sincerely,

Robert J. Paullin
Occupational Specialist
Planning Unit

RJP/pam
Enclosure

MICHIGAN The Great Lake State

DESIGN DECISION

FORMAT NO. 1

The following is a format designed to collect information about the decisions which are normally made during the design phase of an educational facility project. It is important that your decisions be categorized as indicated on the attached sheets. If a particular decision should impact one or more categories directly, list the decision in each category. Please be specific; do not lump your decisions into generalized groups. If you have any questions about this format, please call Robert Paullin at (517) 373-0402.

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APPENDIX B

STATE OF MICHIGAN
DEPARTMENT OF EDUCATION
Vocational-Technical Education Service
Box 30009 Lansing, Michigan 48909

JOHN W. PORTER
Superintendent of
Public Instruction

Dear

During the past two years, six out of seven of the area vocational centers which have been constructed have employed the services of a construction management firm. The process requires the establishment of a design team composed of the architect, the owner, and the construction manager.

Because of both the newness and uniqueness of this approach, the Vocational-Technical Education Service is interested in examining the role which the owner plays as a member of this team during the design process.

In order to initiate this study, a team of five architects was identified and charged with the responsibility of identifying the decisions that are typically made during the design phase of the project. In order to determine the relative importance of each one of these decisions, architects across the State of Michigan who are familiar with school work are being contacted and asked to rate the decisions which have been identified by the above-mentioned panel. Because of the knowledge and experience you have in the area of school design, I feel it is most desirable that you have an opportunity to input this study.

If your schedule will allow you approximately twenty minutes to assist us in this matter, please respond in the affirmative and I will forward to you a questionnaire upon which you can act.

Thank you very much for your consideration.

Sincerely,

Robert J. Paullin
Occupational Specialist
Planning Unit

RJP/pam

STATE OF MICHIGAN

DEPARTMENT OF EDUCATION

Vocational-Technical Education Service

Box 30008 Lansing, Michigan 48909

JOHN W. PORTER
Superintendent of
Public Instruction

INSTRUCTIONS:

The purpose of this questionnaire is to obtain your perception of the importance of the design decisions which have been identified. Since all of these decisions impact the design process in varying degrees, it is necessary to determine the relative importance of each decision. The more building sub-systems a particular decision impacts, the more critical that decision becomes. Please examine each of the items shown herein and classify it according to its relative importance to the design process. A mark (x) should be placed in the column that most nearly indicates your opinion. The categories are weighted as follows:

Critical	5 pts
Extremely Important	4 pts
Very Important	3 pts
Important	2 pts
Somewhat Important	1 pt

Note: Since the weight you assign each design decision will be used in combination with the responses generated by the other participants to establish a rank order of the importance of each design decisions, it is essential that you consider each item carefully.

Please write directly on these sheets.

After you have completed the rating of this questionnaire, place it in the enclosed self-addressed stamped envelope and mail it to the sender.

Thank you.

R.J. Paullin

Date ____________

Name Of Person Reporting ________________________________

______ Check Here If You Would Like A Copy Of The Results

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISIONS	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
1. Determining the electrical distribution system.					
2. Establishing the temperature requirements.					
3. Determining space relationships in flow diagrams.					
4. Determining colors and textures for aesthetic reasons.					
5. Selecting a site.					
6. Selecting building materials: hard, soft, wet or dry.					
7. Determining major entrances.					
8. Establishing requirements for temperature control.					
9. Determining the communication system: telephone, public address system, CATV, computer, etc.					
10. Determining the types of plantings: shrubs, trees, flowers, etc.					
11. Determining interior finishes, integral or applied.					
12. Establishing drives and entrances off major streets.					
13. Determining the layouts for interior lighting.					
14. Determining considerations for future expansion.					

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISIONS	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
15. Determining the integration of architectural and mechanical systems.					
16. Determining the interface between electrical and architectural systems.					
17. Identifying equipment manufacturers with competitive mechanical equipment.					
18. Determining the location of mechanical equipment locations (roof, grade or below grade)					
19. Determining the integration of lighting fixtures and the electrical devices.					
20. Determining the structural system.					
21. Determining the design of the interior elevations.					
22. Establishing access to the building (staff, students, public).					
23. Determining instructional layouts both movable and fixed.					
24. Determining the characteristics of the roof: shaped, pitched, dead level, etc.					
25. Determining roof top equipment concealment techniques.					
26. Selecting furnishings.					
27. Determining the emergency lighting system type.					

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISIONS	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
28. Establishing the project development schedule.					
29. Developing the mechanical trades budget.					
30. Determining the actual building location.					
31. Identifying the low abrasion area for purposes of selecting interior finishes (high walls, ceilings, etc.)					
32. Determining the contouring for purposes of landscape, storm drainage.					
33. Determining the final building costs estimates based on value engineering.					
34. Determining a typical wall section.					
35. Determining the amount and location of parking to be provided.					
36. Determining the characteristics of the exterior envelope.					
37. Establishing the type and number of plumbing fixtures.					
38. Determining the optimum electrical loads and capacity.					
39. Determining the exterior treatment and fenestration of the building.					
40. Determining the room finish schedules.					

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISIONS	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
41. Establishing type of electrical service to be provided (primary or secondary)					
42. Determining the site budget for the project.					
43. Determining the architectural integration of mechanical devices.					
44. Determining a site master plan for the purposes of future growth.					
45. Establishing the appropriate life cycle costs of the mechanical system.					
46. Determining the characteristics of the exterior walls, opaque, transparent, translucent.					
47. Establishing the "U" factor for the exterior walls.					
48. Selecting materials and control system for the purposes of maintaining the appropriate acoustical levels.					
49. Determining the type and amount of hardware.					
50. Establishing the type of security system to be employed within the building.					
51. Identifying any special construction and equipment.					
52. Determining the size of the site (acres).					
53. Determining exterior electrical requirements: lighting, snow melting, signage					

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISION	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
54. Establishing preliminary building costs through value engineering.					
55. Determining the types of electrical conductors to be used in the building.					
56. Establishing the orientation of the building taking into consideration sun, wind and noise.					
57. Determining high abrasion areas for the purposes of selecting materials for the floors, corridors, walls, toilets, etc.					
58. Establishing the thermal qualities of the building.					
59. Determining bus, pedestrian traffic to the site.					
60. Establishing the type of mechanical protection for the electrical system.					
61. Determining the utility locations in relationship to the building and parking.					
62. Developing cost estimates for site work through value engineering.					
63. Determining the HVAC for special requirements: kitchen equipment, auto spray booth, computer room, etc.					
64. Determining the appropriate interface between the electrical and mechanical system.					

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISIONS	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
65. Determining other site uses: storage, games, community uses, program uses, etc.					
66. Determining the type of electrical feed to the building: underground or overhead.					
67. Determining the exterior elevations.					
68. Determining mechanical details schedules.					
69. Determining the circulation patterns within the building.					
70. Determining the heating and cooling requirements for the building.					
71. Projecting future parking needs.					
72. Establishing the mechanical requirements for site utilities.					
73. Determining ground cover types: hard, pavings, soft, grasses, gravel, etc.					
74. Determining the type of heating, cooling and ventilation systems to be used					
75. Determining the design production schedule.					
76. Determining the electrical requirements for vaults, transformers, sub-stations and metering.					
77. Determining the piping requirements and locations for the HVAC systems, hot water system, radiation,					

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISIONS	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
temperature controls, refrigeration, fuel domestic hot water and cold water, storm sanitary systems and the fire protection system.					
78. Determining the light switching systems and locations.					
79. Determining the electrical requirements such as chases, riser diagrams and clearances.					
80. Determining the cross and longitudinal building sections.					
81. Determining the specification outlines for the mechanical system.					
82. Establishing the cost parameters for the electrical systems.					
83. Determining both the arrangement and spacial requirements for the mechanical equipment.					
84. Determininq the types of electrical insulators to be used in the project.					
85. Determining the outline specifications for architectural portion of the building design.					
86. Establishing the lighting requirements for the building.					
87. Determining the zoning of a mass area required for the HVAC system.					

DESIGN DECISION
FORMAT II

DESIGN DECISIONS RATE THE IMPORTANCE OF THE FOLLOWING DESIGN DECISIONS	Critical 5	Extremely Important 4	Very Important 3	Important 2	Somewhat Important 1
88. Determining the method of fire protection.					
89. Determining type of lighting fixtures required.					
90. Determining the layout for the communication system.					
91. Determining ventilation requirements: exhaust, air make-up and humidity.					
92. Determining the electrical characteristics of the mechanical equipment.					
93. Developing riser diagrams.					

APPENDIX C

MADE DECISION	INPUT DECISION	NO INVOLVEMENT IN DECISION	DESIGN DECISION a. What was your level of involvement in the following decisions? b. How qualified were you to make the decisions?	QUALIFIED TO MAKE DECISION	LACKED EXPERIENCE NECESSARY TO MAKE DECISION	DOES NOT APPLY TO THIS QUESTION
			1. Determining space relationships in flow diagrams.			
			2. Selecting a site.			
			3. Determining major entrances.			
			4. Establishing drives and entrances off major streets.			
			5. Determining considerations for future expansion.			
			6. Determining the integration of architectural and mechanical systems.			
			7. Determining the interface between electrical and mechanical systems.			
			8. Determining the structural system.			
			9. Establishing access to the building (staff, students, public).			
			10. Determining instructional layouts both movable and fixed.			
			11. Establishing the project development schedule.			
			12. Developing the mechanical trades budget.			
			13. Determining the actual building location.			
			14. Determining the contouring for purposes of landscape, storm drainage.			

MADE DECISION	INPUT DECISION	NO INVOLVEMENT IN DECISION	**DESIGN DECISION** a. What was your level of involvement in the following decisions? b. How qualified were you to make the decisions?	QUALIFIED TO MAKE DECISION	LACKED EXPERIENCE NECESSARY TO MAKE DECISION	DOES NOT APPLY TO THIS
			15. Determining the final building costs, estimates based on value engineering.			
			16. Determining the characteristics of the exterior envelope.			
			17. Determining the exterior treatment and fenestration of the building.			
			18. Determining a site master plan for the purposes of future growth.			
			19. Establishing the "U" factor for the exterior walls.			
			20. Establishing preliminary building costs through value engineering.			
			21. Establishing the orientation of the building taking into consideration sun, wind and noise.			
			22. Determining bus and pedestrian traffic to the site.			
			23. Determining other site uses: games, storage, community uses, program uses, etc.			
			24. Determining the circulation patterns within the building.			
			25. Determining the heating and cooling requirements for the building.			

MADE DECISION	INPUT DECISION	NO INVOLVEMENT IN DECISION	**DESIGN DECISION** a. What was your level of involvement in the following decisions? b. How qualified were you to make the decisions?	QUALIFIED TO MAKE DECISION	LACKED EXPER-IENCE NECESSARY TO MAKE DECISION	DOES NOT APPLY TO THIS
			26. Determining the type of heating, cooling and ventilation systems to be used.			
			27. Determining the design production schedule.			
			28. Determining both the arrangement and spacial requirements for the mechanical equipment.			
			29. Determining the outline specifications for the architectural portion of the building design.			

APPENDIX D

STATE OF MICHIGAN
DEPARTMENT OF EDUCATION
Vocational-Technical Education Service
Box 30009 Lansing, Michigan 48909

JOHN W. PORTER
Superintendent of Public Instruction

INSTRUCTIONS

The Vocational-Technical Education Service is interested in examining the roles the owner plays as a member of the design team during the establishment of an area vocational center.

A questionnaire has been developed with the assistance of a group of architects to obtain perceptions of the members of the board relative to the roles which they played in this process. As a member of the board of Branch Intermediate School District, please examine each item shown on the yellow questionnaire. A mark ('X') should be placed in one of the columns on the left hand side of the questionnaire which most clearly indicates your administrator's involvement. A mark ('X') should be placed in one of the columns on the right hand side of the page in whose category most nearly indicates his ability to make the decision.

Please write directly on the questionnaire. After you have completed your responses, place the questionnaire in the envelope provided and seal it. All responses will be kept confidential.

Thank you very much for your assistance in this matter.

Sincerely,

Robert J. Paullin
Occupational Specialist
Planning Unit

RJP/pam

STATE OF MICHIGAN

DEPARTMENT OF EDUCATION

Vocational-Technical Education Service

Box 30009 Lansing, Michigan 48909

JOHN W. PORTER
Superintendent of
Public Instruction

Dear

In August, you kindly agreed to assist the Vocational-Technical Education Service with its study to determine the role of the owner and the owner's representative in the design phase of a construction project. To date, we have completed responses from the architect and administrator involved in your project. However, we have received no responses from your board. If this situation remains unchanged, it will present a significant problem for us in attempting to complete our study. Therefore, we must impose upon your board one more time in the hope of getting this data collected.

To assist you in this task, I am enclosing three (3) copies of the data collection instrument in the event that some members of your board have either misplaced or inadvertently discarded the set which was initially issued.

Please indicate to those board members who have not responded that it is very important that they respond to both the blue questionnaire and the yellow questionnaire and that the columns on both the right hand and left hand side of the pages of each questionnaire should be filled in. If it is possible to administer the questionnaires either immediately before or immediately after your next board meeting so that you could collect them and forward them to this office, the response level will be considerably higher.

We are hoping to have this study completed by the first of the year in order to plan inservice sessions based on its outcome in late Spring. Therefore, anything you could do to expedite the completion of this data collection would be deeply appreciated.

Thank you for your time and consideration.

Sincerely,

Robert J. Paullin
Occupational Specialist
Planning Unit

RJP/pam

Enclosures