THE RELATIVE PARTICIPATION OF FUNCTIONAL ROLES
IN THE INDUSTRIAL DECISION MAKING UNIT

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

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*** ***

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1985

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Daniel H. McQuiston
January, 1985
THE RELATIVE PARTICIPATION OF FUNCTIONAL ROLES
IN THE INDUSTRIAL DECISION MAKING UNIT

by

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The Ohio State University, 1985
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The purpose of this study was an attempt to determine if the Industrial Transaction attributes of novelty, complexity, and importance provide a plausible representation of the relative participation of four functional roles in the industrial decision making unit for a capital equipment purchase.

The reason for this research is found in the general inconsistency of previous findings regarding participation in industrial decision making. Between-informant consensus concerning participation is high when a dichotomous measure is used, but has low consensus when rating scales are used (Silk and Kalwani 1982). However, a dichotomous measure is of little use to marketing researchers and practitioners. It is more important to know how much each person participated relative to the other individuals in the decision making unit. Most studies studying participation have used the BUYGRID typology of Robinson, Faris, and Wind (1967) of new task, straight rebuy, and modified rebuy. Other researchers have hypothesized that this classification scheme is too narrow and factors several attributes of the purchase situation together (e.g., Johnston and
Bonoma 1981). Thus, if the attributes of novelty, complexity, and importance can be operationalized to the point where they provide a plausible representation of the relative participation of certain functional roles in the industrial decision making unit, then the first step towards a more encompassing definition of the purchase situation can be found.

The research was conducted using a survey of firms that had purchased a truck scale from the same vendor over a period of one and one-half years. Prospective respondents were prenotified by telephone of the purpose of the study and asked for their cooperation in it. The useable response rate was 62.6%.

Respondents were grouped into one of four functional categories: purchasing, management, engineering, or operations. Each respondent provided a score of his own participation and the participation of others in the decision making unit. These scores were then summed for each area to get a total company score, and totaled for the company to obtain the total company score. The relative score for each area was that area's proportion of the total. Each individual's participation scores were their areas' proportional score divided by the number of respondents in the DMU.

A structural equations model was then specified for each functional role, with the dependent variable being the relative participation of that role and the independent variables being the purchase situation attributes of novelty, complexity, and importance. A confirmatory analysis was done using the responses of the entire sample on the measured variables for novelty, complexity, and importance in order to ensure the construct validity for these variables. The results from this analysis were then used as the measurement model for the structural equations analysis.
Four separate models were tested: one for each functional role. Of the four models, the purchasing model provided a plausible representation, the operations and engineering models provided marginal representations, and the management model was non-convergent. A supplementary analysis was then done using only the self-report scores for the largest group (engineering). As with the entire model, a confirmatory factor analysis was first done. However, in this analysis only the responses from engineering to the novelty, complexity, and importance variables were used. These results were then used as the measurement model for the structural equations analysis.

Preliminary analysis here indicates that the operationalizations of novelty, complexity, and importance differ between functional roles, and that participation differs by stage of the process. The findings of this supplementary analysis are encouraging, indicating that the attributes of novelty, complexity, and importance can provide a more complete definition of the industrial purchase situation.
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Chapter I

INTRODUCTION

1.1 OVERVIEW

The purpose of this chapter is to provide an outline of the research project, indicate the reasons why this research is needed, present an overview of the methodology, and to suggest potential contributions of the research to the field of Organizational Buying Behavior (OBB).

The overall purpose of the research was an attempt to determine the relative participation of four functional areas (purchasing, management, engineering, and operations) in the industrial decision making unit (DMU) given certain attributes of the purchase situation. The reporting of the research will take place in the following manner:

1. The proposal of a conceptual model of functional role participation in the DMU in an industrial purchase decision by melding together three sub-models derived from theoretical concepts in the marketing, organizational behavior, and social psychology disciplines.
2. The proposal of the marketing submodel for the testing of relative participation of these roles.

3. A data collection procedure representing a combination of the most successful elements of past research.

4. A confirmatory factor analysis of the indicators of the latent constructs.

5. The testing of the marketing submodel for plausibility using a structural equations approach.

6. The reporting of these findings.

7. Some supplementary analysis based on these findings.

The research was carried out from the period of May, 1984 to October, 1984, and was a nationwide survey of business who had purchased truck scales from January, 1983 to August, 1984.

1.1.1 The Study of the Unit of Analysis

A large amount of the research that has been done in OB has focused on the unit of analysis — alternatively called the buying center or decision making unit. In general terms, the DMU can be considered to consist of all those individuals, inside or outside the firm, whose input receives some type of consideration, or who has some purposive involvement in the purchase process.
Throughout the development of OBB as a discipline, researchers have looked at the DMU in a number of different ways. Work started with Duncan (1940) who looked at the motives that a single individual, (the purchasing agent) had in his purchase of industrial goods. The unit of analysis gradually gravitated toward the buying center (Robinson, Paris, Wind 1967) and expanded the concept of the DMU to include other individuals in the organization who became involved in the purchase decision. In the study of the DMU, researchers have looked at many and varied aspects, such as the locus and basis of influence (Patchen 1974), the effect of environmental uncertainty (Spekman and Stern 1979), the involvement of certain individuals at certain stages of the decision process (Woodside, Doyle, and Mitchell 1979) and communication patterns (Johnston and Bonoma 1981).

However, other researchers have pointed out that the empirical results in the area of OBB have been disappointing (Horiarity 1983, Stern and Reve 1980). These findings have resulted in certain 'pockets' of findings rather than progressing towards an overall theoretical framework of OBB. Some researchers have felt that lack
of methodological rigor is the main reason behind these disappointing findings (Moriarity 1983). While this is certainly the case, other shortcomings exist in the conceptual framework that contribute to these shortcomings.

1.2 REASONS BEHIND THESE SHORTCOMINGS

The first reason is that most researchers to date have spent the vast majority of time studying the what when examining the unit of analysis -- what influences, what communications, what environmental certainty, and so forth. While this work is undoubtedly needed, a more fundamental purpose is noted by J.H. Fredrick:

The major objective of all marketing is to contact the man who actually brings about the purchase decision, regardless of his position or title ...

(Industrial Marketing, 1934).

Thus, before one can know what influences, what communication patterns, what uncertainty, and so forth, he must first know the who -- who participates in the purchase decision.

The major intent of this research was to make an initial attempt at solving this problem. This project will center around determining the relative participa-
tion of certain functional roles in the industrial decision making unit.

In other attempts to determine the participation of various individuals in the industrial decision process, several researchers (Jackson, et.al., 1983, Bellizzi and McVay 1983) have found that different functional roles within the organization have different levels of involvement in the purchase decision, depending on the type of purchase situation encountered. These findings, using the BUYSIDE typology (new task, modified rebuy, straight rebuy) have achieved conflicting results, suggesting a new purchase situation typology is in order.

These inconsistencies in determining participation have lead to a basic problem in industrial marketing research: if one is to study communication patterns, lacus and basis of influences, and other such factors, where should this study begin? Should it begin with the study of individuals or the functions they perform? Should new tasks, modified rebuys, or straight rebuys be considered?

Previous research findings have shown a general lack of consistency regarding participation when measures
other than a dichotomous one are used (Silk and Kalwani 1982). Other research (e.g., Jackson, Keith, and Bur- 
dick 1984, Bellizzi and McVay 1983) has shown that dif-
ferent functional roles have different levels of in-
volve ment depending on the type of purchase situation. 
Therefore, if some empirical research could determine 
different degrees of participation given different at-
tributes of the purchase situation, the groundwork to-
w ards the achievement of more consistent findings could 
be laid.

The first component towards this framework needs to 
be a more definitive measure of participation. A di-
chotomous measure is of little use to market research-
ers and strategic planners. To know whether or not a 
person participated is of little value. What would be 
of value would be to know how much participation each 
member of the DMU had; specifically, how much partici-
pation one member had relative to the other members of 
the DMU.

The second component centers around a more encom-
passing classification of the industrial purchase situ-
ation. Most researchers have used the BUYGRID typology 
when studying industrial purchases. However, this
classification has a major shortcoming in that it factors together several elements of the purchase situation. Merely to know if the purchase is a new, modified, or straight repurchase is an oversimplification of the complex industrial decision process. Other factors such as organizational experience, amount of information required, and perceived impact on the organization will affect the relative participation of members of the DMU as well. Thus, factors such as novelty of the purchase situation to the company, complexity of the product evaluation process, and financial and operational impact on the organization must be considered.

The basis of this research will center around these two components:

1. To develop a measure that determines one functional roles' participation relative to the other functional roles in the DMU, and

2. To propose and operationalize a more encompassing classification of the attributes of industrial purchase situations. Not only will knowledge of this information provide researchers with a base from which to conduct further research, but will provide practicing sales managers with a better indication of where to target their sales efforts.
Another shortcoming in the conceptual framework in the study of participation in the industrial DMU centers around the fact that several fundamental differences exist between consumer and organizational buying behavior that makes the organizational side substantially more complex and a much more difficult area for study. Many researchers gaining their research backgrounds in the consumer arena have undertaken the study of organizational buying behavior assuming the decision process is substantially the same as in consumer buying. There are several distinct differences, and only if these differences are explicitly recognized and accounted for can any research of OB/B expect to represent a true picture of the decision process.

The first difference centers around the fact that while the consumer decision process typically involves only one individual, at the organizational level more than one individual is involved. Each participant brings a different level of expectations and expertise into the
process, and the motives and expectations of all those involved will impact the decision process in both length and complexity.

The second reason is that the decision process of an organization is much more intricate and involved. Depending on how formalized this process is, decision making may require such things as Request for Proposals, sealed bids, and so forth. This greatly expands both the time and scope of the evaluative process, making for more individuals from various functional areas participating in the decision.

Third, the impact of an unsuccessful purchase decision poses much greater personal and organizational risks than does a consumer decision. If the chosen product does not accomplish its desired purpose, it can have a detrimental effect on the financial standing of the organization and on the individual that had primary responsibility for purchasing it.

Finally, an interdependency exists between the buyer and seller that does not exist in the consumer sector. For the vast majority of con-
sumer purchases, the consumer has a large choice of goods and the producer has a large amount of potential customers. However, such is not the case in the industrial sector. Research has found that most purchasers of industrial goods have only 2 or 3 suppliers, with this number often dropping to one in the case of a computerized purchase process (McQuiston, Johnston, Matthews 1983). Thus, the buyer is not only dependent on the seller for a continued source of raw materials, but the seller is also dependent on the buyer for a continued outlet for his finished goods. This interdependency is compounded by source loyalty and reciprocity, which makes for both tangible and intangible switching costs.

Another difference centers around the proper organizational framework from which to study the industrial purchase transaction. Alderson (1957, 1967) states that any marketing exchange is an exchange between two organized behavior systems. These organized behavior systems constantly interact with each other and are influ-
enced by environmental variables -- thus an open systems approach (Thompson 1967) is needed to more fully account for the dynamism of the environment. The majority of previous organizational buying research has assumed a closed system approach -- that the organization is a discreet entity, operating independently of any environmental factors. To use such an approach is atomistic and will achieve results that are only partially complete.

1.3 THE ANSWER

If we are to initiate a starting point towards a theoretical framework of Organizational Buying Behavior, we must orient our research towards the following purposes:

1. Examining relative participation in the OBB process,

2. Doing so within a framework that recognizes the distinctive characteristics of organizational buying behavior, and

3. Taking an open systems approach.

By taking these steps, accompanied by methodological rigor, this research should make a significant step towards the development of an overall conceptual framework for determining the unit of analysis in OBB.
This research will have managerial implications as well. The average cost of an industrial sales call is now estimated to be in the neighborhood of $200 (Industrial Marketing 1982). Other studies have shown that as many as 50% of the industrial sales calls made are on an individual that does not have the authority to make the purchase decision (Hutt and Speh 1984). Therefore, if this research can provide sales managers with some indication of which functional roles in an organization participate in the decision process under what purchase situations, the managers can better direct their sales efforts and thus institute substantial cost savings for their organization.

1.4 METHODOLOGY

While there have been several steps in the right direction both conceptually (Kirsch and Kutschker 1982, Achrol, Stern, and Reve 1983, Fraizier 1983) and empirically (Bender 1983), there still remains to be found a logical starting point for the research of the unit of analysis in the organizational purchase process. This research will attempt to provide such a starting point by proposing and testing a structural equations model.
Specifically, the research centered around the testing of a marketing submodel that examined the relative participation of four functional roles in the industrial decision making unit given the purchase situation attributes of novelty to the organization, complexity of the purchase decision, and perceived importance to the organization.

1.4.1 Data Collection

In order to ensure the external validity of the results of the study, it was necessary to obtain the opinions of industrial purchasers in actual purchase situations. Towards this end, cooperation was secured from the Toledo Scale Division of Reliance Electric to gain access to their company purchase records. Toledo Scale provided the names of firms who had purchased one of several items within the same product line (vehicle scales and their components) from January, 1983 to August, 1984. A questionnaire was designed and pretested (explained more fully in chapter 3). Toledo Scale sales representatives or distributor sales representatives who had sold the scales were contacted to provide the name of the key informant in the purchasing organi-
zation. These key informants were then sent a letter under the signature of the chairman of the Department of Marketing at Ohio State University informing them of the purpose of the study and asking their cooperation in it. The individuals were then contacted by telephone and a limited multistage snowballing technique was used to obtain the names of other individuals in the firm who had participated in the process. These individuals were then sent a questionnaire, and if they did not return the questionnaire within 21 days a follow-up questionnaire was sent. If this questionnaire was not returned, the individuals were once again contacted by telephone to request that they take the time to fill out the questionnaire and return it.

1.4.2 Data Analysis

Data was analyzed through the use of the LISREL VI computer program (Joreskog and Sorbom 1982). This is a confirmatory procedure that matches the covariance structure of the proposed model with that of the observed data. It is different from such procedures as ANOVA and regression in that it can study the entire model at the same time, while explicitly accounting for measurement error.
The questionnaire was pretested, and certain measured variables were hypothesized to load on certain latent constructs. In an attempt to maximize construct validity, a confirmatory factor analysis procedure was carried out prior to the actual testing of the structural equations model. The measured variables were forced to load on their hypothesized latent constructs, with modifications made as the procedure dictated. Every effort was made to make substantive changes and to avoid capitalizing on chance associations.

This method of data analysis must be used with great caution, however. Fornell (1983) has pointed out that two main concerns must be taken in the use of structural equations modeling:

1. That all latent and measured variables have a sound theoretical base, and

2. That other measures besides the chi-square goodness of fit test be used to test the model.

In accordance with these cautions, to the greatest extent possible the latent constructs specified in the model have been verified by empirical research or conceptual work in the marketing, organizational behavior, or social psychology literature, with the same being true of the measured variables. The confirmatory anal-
ysis mentioned above was first undertaken to ensure the construct validity of the latent factors. The results from this analysis served as the measurement model for the structural equation model. Four separate models were then tested for plausibility, one for each functional role. The dependent variable in each model was the relative participation of that role, with a combination of self observations and observations of others serving as a perfect indicator of that construct. To the extent that it was justified on a theoretical basis, the model was modified as warranted in an attempt to gain a better fit. Great care was taken to avoid capitalizing on chance associations.

1.5 METHODOLOGY AND RESULTS

It was expected that the testing of the marketing submodel would provide a plausible explanation of the relative functional role participation in the organizational buying process. The methodology is explained in chapter 3, with the results reported in chapter 4. One model (purchasing) provided a plausible representation, two models (engineering and operations) provided marginal representations, and one (management) did not converge on a solution.
These results were different than expected. An explanation for these differences is given in chapter 5, with some supplementary analysis given in chapter 6. Chapter 7 will provide conclusions and suggestions for future research.

1.6 SUMMARY

Several attempts have been made to study participation in the industrial decision making unit. However, these attempts have mainly used a dichotomous measure of participation versus non-participation (this is explained more fully in chapter 2). Merely to know if a person participated is of little value to both the researcher and the practicing manager. Rather, it needs to be known what functional role this individual has and what his participation is relative to the other functional roles involved. Efforts need to be concentrated on who participates before such aspects as locus and basis of influence, communication patterns, and the like can be studied.

Not only is it important to determine who participates, but under what circumstances of the purchase situation does this participation take place. If it
can be shown that different functional roles have different levels of participation given certain attributes of the purchase situation, the first step towards the development of a framework for the study of organizational buying behavior can be made. Researchers have a basis for future study, and marketing managers have a basis for targeting their sales efforts.

Chapter 2 will provide a review of the relevant literature in this area, and chapter 3 will outline the methodology. The results of the analysis will be reported in chapter 4, with a discussion in chapter 5. Chapter 6 will consist of some supplementary analysis, and chapter 7 will discuss this supplementary analysis, provide some conclusions, and end with some suggestions for future research.
Chapter II

REVIEW OF THE LITERATURE

2.1 OVERVIEW

The purpose of this chapter will be to review the literature relevant to this research project. The discussion will encompass the applicable areas of marketing, organizational behavior, and social psychology. The organization of the chapter will be as follows:

1. A review of the theoretical developments of OBB, centering around the four types of OBB models proposed,

2. A discussion of the various methods that have been used to study the unit of analysis;

3. A decision on which unit is the relevant unit to use,

4. The proposal of a conceptual framework which synthesizes streams of thought in the marketing, organizational behavior, and social psychology literature in a general model from which to study participation in the DMU;

5. The proposal of a marketing submodel as the initial attempt to test the overall conceptual model for plausibility.
2.2 THEORETICAL DEVELOPMENTS: MODELS OF OBB

The models of OBB that have been proposed over the past two decades capture the major conceptual developments in the field and provide an insight into its evolution. In addition, they also provide a look at the many and varied divergent approaches that have been the trademark of the discipline.

Webster and Wind (1972) propose that models of OBB come in four types:

1. Task-oriented -- those that emphasize a variable directly related to the task, such as price or source loyalty.

2. Non-task-oriented -- variables that do not have a direct bearing on the specific problem to be solved by the purchase but may be important determinants of the decision. Buyer's motives would be a non-task variable.

3. Decision-process -- these are more detailed than the above two, and model the series of steps or various processes that the organization goes through in its purchase decision.

4. Complex -- assimilate and synthesize the various dimensions of OBB, encompassing all of the above, into an attempt to further explain how organizations buy.
2.2.1 **Task-Oriented Models**

Task-oriented models have their foundations in economics and focus on specific variables associated with a particular purchase. These models are rather elementary in nature and do not attempt any type of comprehensive explanation of buying behavior; rather each one looks at a specific facet of the decision process. Although all of the task-oriented models have rather limited applicability, many of the concepts behind them (i.e., different classes of the buying situation) have proven useful in a more complete explanation of organizational buying.

Perhaps the most well-known task model is the **minimum price model** which is derived directly from microeconomic theory. The minimum price model assumes that the firm will attempt to minimize the price it pays in order to maximize its profits. As in micro economics, this model assumes perfect competition, perfect information, and perfect substitutability. As these conditions rarely if ever are true in the real world, this model has limited usefulness. Similar to this model is the **lowest total cost model** which expands the definition of lowest price to include such factors as costs
for delivery, poor product quality, reliability, and other non price variables. This model is subject to basically the same limitations as the minimum-price model.

The behavioral sciences have contributed a task-oriented model in proposing the rational buyer model. This model was first introduced by Copeland (1924) and assumes that the purchaser rationally assesses every alternative in the decision and the expected value of each one, and then chooses the one that will maximize the expected gain. For a long time many researchers used this assumption to differentiate industrial buying from consumer buying, with industrial buying being a totally rational process. However, it was first discovered by Duncan (1940) and subsequently by many others that emotional motives as well as rational ones enter into the industrial buying process.

Another task-oriented model has been proposed in the form of the source loyalty model which proposes that purchasers will maintain a certain loyalty to their previous suppliers. Webster and Wind (1972) propose a number of reasons for this source loyalty:

1. It recognizes that much organizational buying is routine decision making,
2. It is consistent with the observation that purchasing managers are busy people who will establish relationships with vendors that are easily maintained, and

3. It is consistent with the notion of satisficing rather than maximizing behavior in the purchasing decision.

This concept of source loyalty empirically has been shown to have some merit. Wind (1970) used discriminant analysis and multiple regression to demonstrate that source loyalty was a major factor in the purchasing of an electronics firm. Closely connected with the concept of source loyalty has been that of reciprocity—firms basically buying from each other. Many agreements of this type exist either formally or informally, even though they may be against the law in some cases.

Another concept related to source loyalty that has some empirical support is that of source credibility. Levitt (1965) found that the better a firm's reputation, the better were its chances of getting an initial inroad into the organization and getting early adoption of that product.

Perhaps the most well known of the task-oriented models is the Buyclass proposed by Robinson, Paris, and Wind (1967). This model identifies three types of buying situations: the new task, modified rebuy, and
straight rebuy. Each of these buying situations can be
differentiated along three dimensions: the newness of
the problem, the information requirements, and the con-
sideration of new alternatives. Of the three situ-
ations, the new task is the most complex and involves
the greatest degree of perceived risk for the buyer.
However, it was also hypothesized that most purchases
are modified rebuys, which would include such things as
a simple change in the credit terms to a major modifi-
cation of a product specification.

Since the introduction of the Buyclass, a number of
other researchers have proposed several modifications
that build upon it. Lehmann and O'Shaughnessy (1974)
proposed adding a product dimension to the Buyclass
with the following four categories:

1. Routine order,
2. Procedural problem,
3. Performance problem

Moriarity and Galper (1978) carried this one step fur-
ther by adding a two-dimensional buying classification
system, which added specific product categories to Buy-
class. This two dimensional system expanded the expla-
natory powers of Buyclass because they proposed the following factors can vary widely by product category:

1. Level of expenditure and financial risk to the buying organization,

2. Size and structure of the DMU,

3. Complexity and technical content of the decision-making process.

Another interesting aspect of the Buyclass is the aspect of dividing suppliers into two categories -- the in supplier and the out supplier. The in supplier is constantly attempting to provide positive reinforcement to the buyer in an attempt to keep the purchase decision for that product routine and therefore maintain or increase purchase levels. The out supplier is attempting to create some dissatisfaction with the current supplier and create a more favorable impression of himself, through such factors as better prices, better service, and so forth. Should they be successful, then they will adopt the strategy of the in supplier, and try to withstand the pressures of the other out suppliers.
2.2.2 Non-Task Models

Non-task-oriented models focus on non-economic determinants of buying behavior and draw their major premises from social psychology and the behavioral sciences. These models tend to be a bit more abstract than the task oriented, and as a result are a bit more complicated.

Perhaps the best-known non-task model is the perceived risk model which is the reverse of the minimum price model. This model postulates that instead of being motivated to maximize any potential payoff, the buyer is instead motivated to reduce his perceived risk when buying. The perceived risk model has as its foundations the major premises first proposed by Bauer (1960): uncertainty about the outcome and the consequences of the decision.

In organizational buying, the concept of perceived risk is a part of several models. Sheth (1973) sees this as being applicable by summarizing the strategies that an industrial buyer uses to minimize his risk:

1. Reliance on supplier reputation,
2. Development of strong source loyalty,
3. Search for information
4. Reliance on credible sources such as personal friends and experts, and

5. Greater deliberation, thinking, and planning in high-risk situations.

In an empirical study, Sweeney, Mathews, and Wilson (1973) postulated the following generic categories for risk reduction:

1. External uncertainty reduction (i.e., a visit to a suppliers plant),

2. Internal uncertainty reduction (i.e., a consultation with others involved in the buying decision),

3. External consequence reduction (i.e., multiple sourcing), and

4. Internal consequence reduction (i.e., consultation with the top management of the company).

Webster and Wind (1972) developed a more concise classification of risk reduction:

1. Information acquisition and processing,

2. Goal reduction,

3. Loyalty, and

4. Investment reduction.

In examining the locus and basis of influences in the purchasing decision of an organization, Patchen (1974) outlined a conceptual approach to studying interpersonal influences. He
found that as a person's stake in the purchase increases, so does his influence, although the influence patterns did not fit neatly into the categories outlined by French and Raven (1959).

These studies, particularly the one by Patchen, indicate that the concept of perceived risk can indeed have an impact in the organizational buying process, and should be included in any further explanations.

While the perceived risk model looks at the behavior and motivations of single individuals or firms, the diffusion-of-innovations model looks at the behavior of an entire group of firms in the market. First proposed by Rogers and Shoemaker (1971), the classical diffusion of innovations model consists of four primary elements:

1. The innovation: an idea, practice, or object perceived as new by an individual or other relevant unit,
2. The channels through which the innovation is communicated,
3. The time required for this communication, and
4. The social system in which the communication occurs.
Carrying this concept over to the field of industrial marketing, Moriarity (1983) proposes that the diffusion of innovations model attempts to deal with three different aspects of buying:

1. Organizational, cultural, legal, environmental, or social factors that may retard or facilitate diffusion or a new product or service.

2. Characteristics that encourage or dissuade innovative industrial buying behavior. The concept of risk might also be incorporated here in future developments.

3. The extent to which particular attributes of a new product or service are more prone to diffusion than others.

As with several other concepts, the diffusion-of-innovations model has been borrowed from fields outside that of marketing. Although this model can help industrial marketers better understand the buying process, its usefulness is limited to the adoption of new products.

2.2.3 Decision Process Models

Whereas the above mentioned models were derived from various economic or behavioral concepts, decision process models have investigated the total buying process
empirically. Perhaps the first major attempt to look at the decision process an organization goes through was an exploration of the assumption that the process in an organization was a totally rational one done by Cyert, Simon, and Trow (1956). Over a two and one-half year period, the researchers documented the activities of the firm related to the purchase decision. On the basis of these observations, they came up with three aspects of the decision process:

1. Routine purchases that recur within the organization at various stages in the decision,

2. Communication processes, which represent the information flow within the organization, and

3. Problem-solving processes, which attempt to locate solutions to the buying problem.

The authors also made the first attempt to distinguish between various kinds of purchase decisions based on their complexity. A continuum of purchase decisions was proposed, ranging from highly programmed decisions that dealt with repetitive, well defined problems to nonprogrammed decisions dealing with vague and unique ones. This early research provided the foundations for the later work of industrial marketing researchers who proposed different classes of a buying decision and the concept of a buying process.
In one of the first attempts to model the industrial buying process, Webster (1965) proposed four major stages of the industrial purchase process:

1. Problem recognition,
2. Organizational assignment of buying responsibility and authority,
3. Search process for identifying product offerings and for establishing selection criteria, and

In addition to the Buyclass model mentioned earlier, Robinson, Faris, and Wind also proposed the Buyphase which outlined eight steps of the purchase process:

1. Anticipation or recognition of a problem and a general solution,
2. Determination of characteristics and quality of needed item,
3. Description of characteristics and quantity of needed item,
4. Search for and qualification of potential sources,
5. Requisition and analysis of proposals,
6. Evaluation of proposals and selection of supplier(s),
7. Selection of an order routine, and
8. Performance feedback and evaluation.
Shortly thereafter, Ozanne and Churchill (1968) expanded on this general approach and brought together the elements of the basic buying process approach with the diffusion of innovations model to propose the industrial adoption-process model for new products. The model has five stages: awareness, interest, evaluation, trial, and adoption. Ozanne and Churchill used this model to investigate the functions of various information sources at different stages of the adoption process. They found that mass media has their largest impact in the interest stage, but also have an effect throughout the process. In the evaluation stage, technical, impersonal sources, such as price quotations and proposals, are the most significant. As the buying process progresses from awareness to adoption, the purchasers need for all kinds of information increases.

Moriarity and Galper (1978) have combined the Industrial Adoption Process model and the Buyphase model into a single model — the purchase decision-process model. One or two of the Buyphase classifications are combined with the corresponding elements in the Industrial Adoption to model the purchase decision process.
In 1975, Hillier identified four stages of the decision process and classified them by the nature of the decision task: precipitating decisions, product decisions, supplier decisions, and commitment-procurement decisions. Saleh et al. (1971) also identified four stages: problem recognition, search processes, choice processes, and postchoice evaluation. McMillian (1973) identified five stages: recognition and definition of the problem, definition of alternatives, information search, development of decision criteria, and choice of vendors. Backhaus and Gunter (1976) proposed a rather complex model of the decision process, which consists of 12 stages and is similar to a critical path method model of production management. Choffray (1977) felt that each specific product has its own unique number of stages in the purchase process. However, if this is true, then it is also possible that each firm has a different number of unique stages through which it passes because of a characteristic inherent in its organizational structure.

Other decision process models have been proposed by Crow et al. (1980) who used protocol analysis to develop a simulation model of the decision process the indi-
individual buyers use in requesting quotations and selection of a supplier. The results here suggest the industrial buyers frequently employ multistage decision models involving conjunctive decision processes. Johnston (1979) also used protocol analysis to construct communication networks in the purchase of capital equipment. He found that although certain tasks appeared frequently in the buying process, there was no clear order chronologically in which they occurred. Gronhaug (1975) conducted research into the search process and developed a model in which he hypothesized that perceived product risk, the time pressure for a solution, and the ability to handle new information were the major factors in the determining the amount of search. He also found a significant relationship for the amount of search and the perceived risk and information handling ability. Corey (1982) looking at the decision process from the procurement side, proposes four elements of a procurement strategy:

1. Procurement scope,
2. Supplier selection,
3. Price-quality determination, and
Thus, while there is no one set of decision steps that a purchasing firm goes through, the work in this area clearly indicates that they do go through some series of stages in their decision process. A useful concept here is that the decision process is a multistage one, and one that occurs over a period of time. If the researcher could find some aspect of the purchase situation that would further explain the decision process the firm goes through, then the understanding of the field would be greatly enhanced.

2.2.4 Complex Models

The proposing of the complex models represent an attempt by OBB researchers to combine the earlier attempts of task, non task, and decision process models into models that capture more completely the multidimensional aspects of organizational buying behavior. While many models have been proposed, the empirical validation of most has not been attempted, leaving the validity of the model to rest with the clarity in which the variables are operationalized. Many complex models have been proposed:

1. The BUYGRID (Robinson, Faris, and Wind 1967)
2. Competence-Activity (COMPACT) (Robinson and Stidsem 1967)

3. Information Processing (Howard and Morgenroth 1968)

4. Simulation Models (Wind and Robinson 1968)

5. Organizational Buying Model (Webster and Wind 1972)

6. Industrial Buying Behavior Model (Sheth 1973)

7. Organizational Interaction (Hakansson and Ostberg 1975)


9. Structural Role Analysis (Calder 1977)

10. Industrial Buying Task Group Model (Spekman 1977)

11. Industrial Market Response Model (Choffray and Lilien 1978)

12. The Likelihood of Involvement Model (Lilien and Wong 1984)

13. The Decision System Approach (Johnston and Spekman 1982)

14. The Industrial Conversion Framework (Bender 1983)

15. The Socioeconomic Transactional Model (Kirsch and Kutschker 1982)

Most of these complex models view the organizational buying process as an intricate one that takes place over a period of time and includes the involvement of many individuals. Each of these models has contributed
in its own way to an understanding of the organizational buying process. Several of the more well developed will be examined here: the Cyert and March Behavioral Theory of the Firm (1963), Robinson, Faris, and Wind's BUYGRID (1967), Webster and Wind's Organizational Buying Behavior Model (1972), the Sheth Industrial Buyer Behavior Model (1973), the Choffray and Lilien Industrial Market Response Model (1978), the Buying Task Group Model (Spekman 1977), the Structural Role Analysis Model (Calder 1977), The Industrial Conversion Framework Bender (1983), The Decision System Approach (Johnson and Spekman 1982), and The Socioeconomic Model (Kirsch and Kutschker 1982).

2.2.5 The Behavioral Theory of the Firm

Perhaps the first attempt to provide a theoretical foundation for the complex decision process of the firm was that by Cyert and March (1963). In their work they propose four basic concepts that form the basis of organizational decision making:

1. Quasi-Resolution of Conflict. Latent conflicts exist among organizational members when they make decisions, and the members will resort to three mechanisms so as to reduce conflict:

   a) local rationality — complex problems are broken down into subproblems and are handled by subunits of organizations,
b) acceptable level decision rules -- rather than seeking optimal decisions, the organizational members search for solutions that are acceptable within the organizational constraints, and

c) sequential attention to goals -- conflicting goals within the subunits of the organization are treated by handling them one at a time.

2. **Uncertainty Avoidance.** Members within a firm are motivated by a strong desire to reduce uncertainty. This leads to a negotiated environment in which decision makers will focus on shorter range problems that offer immediate alleviation from this problem rather than concentrating on long range solutions.

3. **Problemistic Search.** The members of the organization will define a problem and then organize their search for information in accordance with solving that problem. The search path will proceed from the most familiar to the least familiar, and will be biased so as to reflect both the past experience and the expectations of the people conducting the search.

4. **Organizational Learning.** Over time, according to the success or failure of past experiences, the organization will exhibit adaptive behavior of three types:

   a) adaptation of goals -- goals are shifted up or down to reflect success or failure in reaching goals in previous periods.

   b) adaptation in attention rules -- organizations will selectively pay attention to some factors in the environment while ignoring others.

   c) adaptation in search rules -- search rules will be adjusted to reflect previous successes and failures.
These propositions have received attention whenever organizational decision making is examined, lending credence to their existence. However, going further than that, these concepts have been borne out by subsequent research.

2.2.6 The BUYGRID

Mentioned previously in this chapter, the BUYGRID (Robinson, Paris, and Wind 1967) was developed in a descriptive study of three organizations and a large number of purchasing situations that they actually went through. The three types of buying situations were combined with the eight stages of the decision process to in effect form the 'grid' of all possible purchase situations.

The BUYGRID model has been immensely popular by both academics and researchers alike, due in large part to its simplicity. However while providing an applicable two-dimensional taxonomy of the organizational buying process, as Webster and Wind state, "... it is virtually devoid of predictive ability, and offers little insight into the nature of the complex interplay between task and non task variables" (Webster and Wind 1972, pp
24-25). Also, as Johnston (1981) has pointed out, the model confounds three separate dimensions of the purchase situation. As later research has shown, not only does the novelty (new task, etc.) of the buying situation affect the process, but so does the complexity of the evaluation process and the importance both organizationally and financially to the organization. Hence, the novelty of the purchase situation is aptly represented, but other variables that impact the decision process are not. According to this model, a firm that is buying an electric pencil sharpener for the first time, would, according to the BUYGRID, have a longer and more involved decision process than would the same firm making a second purchase of a mainframe computer (modified rebuy). What is needed is a typology that more aptly encompasses the purchase situation attributes.

2.2.7 The Organizational Buying Behavior Model

The Organizational Buying Behavior Model developed by Webster and Wind (1972) represents an attempt to integrate a large number individual, interpersonal, interorganizational, and environmental variables into one
conceptual framework. This model asserts that all organizations -- profit, non profit, public and private -- all purchase in a similar manner. The purpose of the model is threefold:

1. To identify the major sets of variables affecting the organizational buying decision,

2. To highlight the current state of knowledge with respect to the various relationships among the key variables in the buying system, and

3. To provide guidelines for future research in the area of industrial buying behavior.

Organizational buying is seen as a decision process being carried out by individuals in interactions with others in the context of a formal organization. The organization is influenced by a number of factors in the environment: economic, political, legal, cultural, and social interactions and forces. These determinants act as constraints on the organization and must be considered in the overall strategies of the firm. The organization is also seen as a source of influence on the buying process, namely on the buying center defined as the set of all individuals who participate in the purchase decision making process, who in turn are motivated and directed by the organizational and human resources of the firm. The third source of influence
in the model is the network of interpersonal relationships among organizational members, and, more specifically, among those within the buying center. Each individual has a "role set" -- defined as the expectations, actual behavior, and relationships with others -- and an awareness of each individuals' role set is necessary to understand the nature of the participation in the buying process. Given these differences in role sets, individuals often have different responsibilities and may play different roles. Finally, organizational behavior is reducible to individual behavior, and thus the individual is at the center of the decision process. Because of this, the individual, not the organization as a whole, needs to be the target of the industrial marketers strategy.

This model is purely conceptual in nature, and thus offers no testable propositions. Even so, if offers valuable insight into the environmental and organizational factors that impact upon the individual during the organizational decision process.
2.2.8 The Industrial Buyer Behavior Model

The Industrial Buyer Behavior Model, developed by Sheth (1973), is in essence a scaled-down version of the well known Howard-Sheth model of consumer buying. In this model, a large number of variables are woven together into a complex stimulus-response model of the industrial buying process. The model can be broken down into four basic components:

1. The expectations of the individual participants in the decision,

2. The industrial buying process,

3. The decision-making process, and


The model deals with each of these four components according to the level of empirical justification existing for them. At the center of the model are the individuals involved in the buying process, with considerable interaction seen to take place between these individuals, and differences between the respective role sets. The expectations of the individuals involved in the process is a function of four factors: the individual's background, information sources and the results of an active search, perceptual distortion, and satisfaction with past purchases. The deci-
sion process is divided in individual decision making and joint decision making, with persuasive bargaining and politicking mentioned as two methods of conflict resolution in joint decision making. The model also distinguishes several factors which are either product specific, such as the repetitive character of the purchase, or company specific, such as its organizational structure and managerial philosophy.

While the Sheth model also provides no testable propositions, it does provide a better understanding of the complexity of the organizational buying process, a better explanation of the more important explanatory variables is a more concise manner, and assimilates a wide variety of theories, concepts, and empirical research.

2.2.9 The Industrial Market Response Model

The Industrial Market Response Model (Choffray and Lilien 1978) represents the initial attempt to propose a complex model that is capable of empirical validation. The model is divided into three major components: controllable variables, which consist of the marketing support given to the product and its design
characteristics, the decision process, and external measures. The decision process is broken down into four submodels -- the awareness model, the acceptance model, the individual evaluation model, and the group decision model. External measures of interest are the communication consumption for each participant in the purchasing process, environmental constraints, organizational requirements, individual perceptions and evaluation criteria, and group process variables.

The model is built on two critical assumptions:

1. That decision participants who belong to the same category share the same set of evaluation criteria and information sources, and

2. Within a buying organization, the composition of the buying center can be characterized by the function of the participants in the purchase process.

The first assumption is questionable in that it allows for no functional role differences that have been previously proposed by other individuals. Each participant's motives differ substantially as well as goals changing over a period of time. Thus, proceeding with this shortcoming renders the decision matrix questionnaire of questionable use. While this model is useful in that it provides a means to operationalize the buying center and provides good insight into the decision
process of an industrial organization in new product purchases, the findings must be tempered somewhat due to the shortcoming in this assumption.

2.2.10 The Industrial Buying Task Group

The Industrial Buying Task Group, proposed by Spekman (1977) was an attempt to capture the dynamic interactions among those organizational members who share in the purchase process. As the buying center reaches across many functional role boundaries, Spekman used a contingency approach to conceive of the buying center as a decision unit, the structural properties of which can be determined by analyzing data about the relations of each buying center member to the other members of the unit. This patterning of behavior and communication form the structure of the buying center rather than the formal organizational structure.

Spekman used the properties of organizational structure (centralization, formalization, complexity, participation in decision making, size) to position an organization along one of several continua. Examination of the various sociometric and informal interactions that take place during the organizational buying pro-
cess, coupled with the organizational structure, can then give a more complete picture of how the organizational communication network is established.

2.2.11 **Structural Role Analysis**

By using functional role theory, Calder (1977) provided a conceptual framework for connecting individuals in the organizational purchase process. Basic to the concept of role theory is the premise that any group of individuals is connected by the various tasks and the subsequent communication patterns that result in order to accomplish those tasks. The communication pattern that emerges will establish specific role expectations for each member of the group. Therefore, depending on the situational aspects of the purchase decision, the communication patterns will involve different members of the group in different task relationships. A second fundamental element of role theory is the concept of positions; that is, by examining the different tasks in the purchasing process, a certain task may always be the responsibility of a certain formal role. Calder uses a directional graph (digraph) to illustrate how in one firm the set of tasks, positions and persons were inter-related in structural role analysis.
Using this structural role analysis therefore allows the researcher to:

1. establish the formal relationships among buying center members,
2. represent the functional role assigned to a certain task, and
3. indicate what influence each functional role exerts on the particular buying task.

Therefore, the concept of position not only identifies the location of an individual on an organization chart, but specifies the nature of the formal interactions with other members of the organization. Calder uses the digraph technique to define a pattern of relationships among the formal relationships among the members of the buying center. These series of graphs consist of a P-graph, which depicts formal relationships among the members of the buying center, the T-graph, which details the sequence of purchasing related tasks, and the H-graph, which outlines the informal relationships.

While structural role analysis has not reached its full conceptual development, it nevertheless provides a useful conceptual framework from which to examine the relationships among the relationships of the various individuals who become involved in the purchase process. By looking at a digraph, a researcher can more
easily discern the sequence of purchasing related events and the various positions sharing in these activities.

2.2.12 The Decision System Approach

The decision system approach to organizational decision making proposed by Johnston and Spekman (1982) uses the metasystem approach (Kickert and van Gijch 1979) to model the organizational decision process. In this model, they propose that the organizational decision process is made up of three phases:

1. subsystems -- individuals, groups, functional departments, strategic business units.

2. aspect systems -- issues, topics, tasks, decisions, and

3. phase systems -- time phases of the decision process.

They then link the three systems together in a 3 x 3 matrix format, with each system crosstabulated against the other systems. The decisions within each cell of the matrix are then classified.

In addition, Johnston and Spekman advocate the use of the methodological triangulation approach to the study of organizational behavior. Denzin (1978) broadly defines the triangulation approach as the combina-
tion of methodologies in the study of the same phenomenon. The authors feel that by using such methods in a quantitative and qualitative explanation of the buying center concept, a more complete picture of the process might be obtained. However, they do state that triangulation is not an end in itself, but rather, "... afford(s) us an opportunity to break from tradition to build research paradigms that encourage a more creative approach to our problems" (1982, p. 144).

2.2.13. The Industrial Conversion Framework

Such an approach at this triangulation method as suggested above is the Industrial Conversion Framework (ICF) as proposed by Bender (1983). This has as its main purpose to explore how industrial organizations procure material to produce products of their own, which they in turn market to various consumer segments. The framework further shows how technology and expertise is a constraining factor is the firms' ability to provide benefits to customers, and how organizations continually generate transactions (both intraorganizationally and interorganizationally) through physical and communication exchanges. The ICF uses major bodies
of literature in organizational theory and marketing to establish a communications paradigm of information processing within and between functional units, expands it to the buyer-seller dyad, and ultimately to the consumption chain. All of this attempts to explain how each firms' capabilities results in the ability to provide benefits to the consumer segments.

The ICP goes beyond models the models previously discussed in that instead of only examining procurement orientations within the purchasing firm, it has several other distinguishing features:

1. It uses a holistic approach (Bagozzi and Phillips 1982) to capture the evolution of products from the procurement process through the production process to the purchase process at the household level; thus it encompasses the entire consumption chain.

2. It explicitly models technological factors -- the conversion of inputs by the firm into products through manufacturing and then into benefits for customers the the marketing function.

3. The use of standardization in information exchanges between firms using scientific, technical, and accounting languages.

4. Provides a systematic integration of previous research by specifying relationships among technical, economic, service and social variables.

While Bender has made a significant contribution to the field, his research is not without its criticisms.
He has examined the entire consumption process, and as such has been forced to do so in a macro context. While providing a realistic viewpoint of the entire system, there is little specification at the micro level. Another point of controversy centers around the use of structural equation modeling into the holistic approach. Using this method of analysis means dealing with latent constructs that cannot be directly measured, scores on variables that are not determinant, and indicators that are not perfect -- creating a situation which some researchers are not comfortable with.

However, the model by Bender, as well as those by Spekman and Calder, represent a major and necessary shift in the emphasis placed on the organizational buying process. By including factors external to the firm, they are viewing the organizational buying process from an open systems perspective -- which shifts the nature of the research from a focus on the individual level to one that proposes that an organization is a subsystem composed of numerous subsystems, and is also a subsystem within a broader context of a complex economic and cultural system. This is a viewpoint set forth in the Webster and Wind (1972) conceptual model
but one that has only recently been used in the empirical research. Later in this review, it will be further elaborated upon as to why this is the correct viewpoint from which to examine the organizational buying process.

2.3 THE UNIT OF ANALYSIS IN ORB

This section will review the relevant work that has studied the unit of analysis in organizational buying behavior. Many researchers have stated that the composition of the decision group should be a major priority (Nicosia and Wind 1977, Wind 1978, Johnston and Spekman 1982), and several others have looked at the composition of the decision group (Bradley 1978, Lilien and Wong 1984, Spekman and Stern 1979). This section will trace the historical development of the study of the unit of analysis, first looking at the purchasing agent, then at others in the firm, and finally others outside the firm that make up the decision making unit.
2.3.1 The Purchasing Agent as the Unit of Analysis

Traditionally, the most common level of analysis in organizational buying has been the purchasing agent—the individual in the firm who holds the head position in the purchasing department. A large number of questionnaires and surveys have been conducted using these individuals, with many being of a psychological nature and dealing with such factors as motives, perceptions, and the learning processes of the purchasing manager.

Duncan (1940) appears to have been the first to examine the decision process of the PA. He found that while rational motives predominate, non-rational motives also impact the outcome. Non-rational motives would include such factors as habit, emotional stress, caution, and confidence of price levels. An interesting additional finding at the time was that in purchases of heavy equipment and raw materials, sometimes more than one executive influenced the purchase decision.

Other researchers discovered a tendency toward risk reduction in the industrial purchase decision. An additional finding of the Sweeney, Mathews, and Wilson (1973) study was that the greater the need for cognitive clarity on the part of the industrial purchasers,
the greater the risk reduction desired. Peters and Venkatesan (1973) found the perceived risk and self confidence were related to the adoption of a small computer system. Wilson (1971) identified three decision making styles of industrial buyers and found that an individuals' need for certainty appears to be an important factor upon choice under conditions of uncertainty. Wilson, Mathews, and Sweeney (1971) found two main patterns of industrial buyer behavior and two major decision styles. Buyers were found to be either rational or non rational and made decisions in a normative or conservative manner. Lazo (1960) found that an early motivating factor of the purchasing agent was thought to be fear -- fear of losing status, of displeasing the boss, of making the wrong decision, even of losing one's job.

2.3.2 Perceptual Processes of the Industrial Buyer

Other researchers have examined the perceptual processes that the industrial buyers go through. Parket (1972, 1973) examined the effects of product perceptions on the buying process and found that for products that were perceived as highly similar, the price, specifica-
tions, and delivery were important attributes. For generic product classes, certain company specific features could also help in making the sale -- a broad product line, close geographic location, cooperation on unusual orders, ease of placing orders reputation, previous performance, and the particular salesman involved. Hahn and Vana (1973) found that demographics and values, both terminal and instrumental, provided a basis for differences in the buying behavior of purchasing agents. Hankansson and Wootz (1975) found that purchasing managers generally perceived price to be more important than quality. Other factors that were important were the location of a vendor, particularly in an international purchase situation.

In studies examining the information processing of the industrial purchasing agent, Schroder, et al. (1967) suggested that the individuals information processing system has a large number of programs and rules for combining the information from product vendor attributes. The level of information processing is a function of the complexity of the task, the reward structure associated with the task, and the individuals conceptual complexity. Webster and Wind (1972) suggest
that whenever an organizational buyer makes a product
or vendor selection, or indeed any type of buying deci-
sion, he faces problem of multivariate attributes.
They hypothesized that organizational buyers might uti-
ilize a conjunctive, disjunctive, lexicographic, or com-
pensatory decision model either implicitly or explicit-
ly, depending on the complexity of the purchase
situation. Stiles (1973) showed that industrial buyers
exhibited different levels of information processing as
a function of:

1. the amount of structural complexity in the spe-
cific purchasing task,

2. the individual differences in conceptual capaci-
ty,

3. total work load,

4. quality of communication with the product users
   served, and

5. the number of participants in the decision pro-
cess.

Monoky, et al., (1975) found that the Buyclasi variables
are differentiated by the magnitude of uncertainty
associated with each situation, and that this in
turn dictated information source preferences. Uncer-
tainty is greatest in the new task and lowest in the
straight rebuy, and the sources preferences will vary
accordingly. In another study (1973), Monoy found that in the new task and modified rebuy situations, buyers had a greater preference for personal information sources. Hanssens and Weitz (1980) examined the relationships between industrial advertisement characteristics and recall, readership, and inquiry generation. Their findings indicated the recall and readerships were strongly related to the format and content characteristics of the industrial advertisements, with a somewhat weaker (but still significant) relationship between the ad characteristics and inquiry generation.

2.3.3 Shortcomings of the Unit Paradigm

Because all of the above studies focused solely on the purchasing agent, they can be classified as the unit paradigm approach. Bonoma, Zaltman, and Johnston (1977) define the unit paradigm as "... the behavior of actions of single actors (or aggregates of actors) or the properties or characteristics of these actors" (1977, p. 19). They go on to point out that the subject matter in the unit paradigm is limited to an aspect of a solitary entity or aggregates of solitary entities. The unit paradigm focuses primarily on the
classical S-R model or modifications of this to explain variation in the paradigm.

When using the unit paradigm to examine the purchasing agent, researchers are subject to the shortcomings that Bonoma, et.al., have pointed out:

1. It is mechanistic; individuals taking part in the industrial purchasing system are not.

2. It takes a naïve and unidirectional view of social causation in industrial buying behavior as "moving" from the stimulus to the response. It is not acknowledged that responses can influence their stimuli.

3. The paradigm has a classic problem of reductionism, of forcing a transactional sort of behavior into an individualistic model (Bonoma, Baggozi, Zaltman 1975).

However, perhaps the most obvious shortcoming is that the unit paradigm ignores the social character of OBB. Purchases are not made in response to a given stimuli; rather, the purchase process is a transactional one, taking place over a period of time. It is a negotiated settlement between the industrial purchasers, their past experience, and the current purchasing situation. Purchases are made in a public setting, with influences from organizational and environmental characteristics (e.g., the open system), not in a private setting.
2.3.4 Other Individuals Involved in the Purchasing Task

While the preceding section focused on the purchasing agent, the current viewpoint is that purchasing in an industrial organization generally involves more than one individual and that the effects of interpersonal influence, interests, and actions need to be taken into account of the organizational purchase decision.

The Cyert, Simon, and Trow (1956) and the Duncan (1940) research gave mention to this fact. Another early finding was one by Buzzell (1964) in a casebook which contained a descriptive study of the purchase of an air compressor in which he noted that 14 individuals within the firm at one time or another became involved in the purchase decision. Perhaps the first publication that addressed this issue directly was Weigand (1968) in an article entitled "Why Studying the Purchasing Agent Is Not Enough". Weigand showed that the industrial buying process is substantially more complex than it appears initially, and that it involved many people at all levels of the firm who have vastly different goals, interests, and viewpoints. Purchasing was often a protracted activity and could be influenced by many factors that were largely unrelated to the
price of the product. He also examined the varying use expectancies of individuals, the purchase time span, the responsibilities of various individuals, and the existence of outside influences.

Wind (1971) concluded that buying decisions typically involved a number of people within the firm, and that the person responsible for the purchase was generally not the only user of the product and that the researcher had to consider the interests and reactions of others. Therefore, the OBB process could be viewed in light of the buying center or decision making unit concept, and the focus should be on the roles of the individuals involved. Witt and Bruce (1972) found that brand choice congruence in a group can be partially explained in terms of the group structure and the symbolic involvement of products in the interpersonal situation in which they are purchased and used.

In other studies that looked at the involvement of multiple individuals in the industrial purchase decision, Brand (1972) examined the involvement of individuals of 43 individuals in the purchasing process. He looked at the participation of key departments and individuals in the different stages for new task, modi-
fied rebuys, and straight rebuys. His findings showed that general management and technical personnel were perceived as equal or more important than purchasing management in most of the purchases. Bradley, in a study of state sponsored industries in Ireland (1978) found that four distinct "centers" become involved in the purchase process:

1. General management -- company hierarchy
2. Technical -- production, design and development, maintenance
3. Commercial -- purchasing, finance, marketing
4. Outsiders -- suppliers, consultants, advisors

Each of the above centers becomes involved in the purchase decision to some extent. He did not, however, identify any distinct purchase tasks nor make any attempt to determine the extent to which the above do get involved. Woodside, Doyle, and Mitchell (1979) studied 14 British industries by conducting interviews with senior marketing managers to examine purchase situation behavior in new task, modified rebuy, and straight rebuy. They found that the buying center was composed of a smaller number of individuals (2 or 3) in a straight rebuy and increased (3 to 6) in modified rebuy or new task situation. They also found that the actual buying
center fluctuated through the decision stages for all three classes, with engineers, production managers, users and/or others involved with the purchasing agent in evaluating alternative products in all cases or in straight rebuys. The purchasing agent, engineer, and production manager acted as a buying center for the final decision in six of the seven straight rebuy situations. In all cases of the straight rebuy, the purchasing agent was the one person to be a member in nearly all buying phases. Top management, production, engineering, the board of directors, and purchasing agents were reported most often as members of the buying center for the modified rebuy and new task buying situations. An interesting sidelight is that the purchasing agent was a member of the buying center in three of the seven modified rebuy and straight rebuy situations, but was a member of the final decision in only one of the seven new task situations.

2.3.5 Frequency of Involvement of Different Functions

Several researchers have made attempts to study the involvement of different organizational functions in the purchase decision. Buckner (1967) found that the
purchasing decision is a joint process involving three groups of up to eight people:

1. for capital goods and equipment -- top management, operating management, and production engineers.

2. for materials and components -- the purchasing department, production engineers, and operating management.

*Scientific American* (1969) in a survey entitled "How Industry Buys" surveyed a large cross section of industrial firms, and aggregate frequencies of involvement were computed on a product or category basis. This study made an attempt to group and systematically investigate the characteristics of organizations and their pattern of involvement during the purchase process. Erickson and Gross (1980) conducted a replication of the *Scientific American* study using the paper and chemical industries. They found that the purchasing department dominates when it comes to taking advantage of price differentials, choosing suppliers from whom to invite bids, and deciding which supplier gets the order. The research department is the dominant factor when it comes to the exploitation of newly developed material, the determining characteristics to be met by the material, and evaluating the material for accordance with
specifications. Other departments that play a role in the process are administration, design, and production.

Wind and Robertson (1982) used the linking-pin role in organizations to study the composition of the buying center in a hospital. In an examination of the adoption of new radiology equipment, they found that the buying center was composed of two major groups:

1. a financially oriented group — controller, chief of staff, purchasing agent, and

2. an administrative professional group — the radiologists on the staff.

2.3.6 The Influence of Various Individuals

Another group of studies has examined the influence that certain individuals or subunits within the organization have had on the purchase process. In an oft-quoted study, Patchen (1974) examined the locus and basis of influence and outlined a conceptual approach to studying interpersonal influences. He found that the data concerning the locus and basis of influence did not fit into the categories as prescribed by French and Raven (1959); rather, he found that a person’s stake in the decision was a major determining factor in determining who had the most influence. Crow and Lindquist
(1982) showed that industrial buyers can be classified into decision model categories. One of their findings was that marketers must consider the risk factor to the organization in the purchase decision. The researcher must realize that each person has a 'stake' in the purchase decision, and will exhibit influence accordingly. If there is no stake, the influence is the same. Another one of their findings was that different industrial buyers have different levels of focus in the purchase decision.

Wiegand (1966) surveyed different members of the firm in an attempt to find who was the most influential in the purchase process. He found that purchasing managers tended to rate their concern with different responsibilities in the purchasing process than other individuals did. This study provided the first indication that purchasing may rate themselves as having more influence than the other members of the decision making unit. Grashof and Thomas (1976) found that there was a wide variance between self and other perceptions of influence in the purchasing process. They also found that the variance of perception was relatively small across the several stages of the purchase process.
Cooley, et al. (1977) analyzed the perceptions of the relative power of various functional groups in a modified rebuy situation. He found that perceptions of power differed significantly between the supplier selection decision and the product selection decision. The size of the firm, type of product, and type of manufacturer each affected the perceived power of the various participants. Rijke (1978) found that purchasing and non-purchasing members of the firm had divergent views about their respective roles in the purchasing process, and thought that perhaps the best way to increase convergence between self and others' perception of influence was to break the question down from a more global question into a more specific response. Silk and Kalwani (1982) computed a coefficient of agreement in an attempt to solve the problem of perceived influence. The results were inconclusive in that they showed a lack of consensus with the perceived influence ratings among roles but not with stages in the decision process. Bellizzi and Walter (1980) in a survey of the influence of purchasing agents in the construction industry found that while the purchasing function is heavily involved in some stages of the decision process
(i.e., the selection of an order routing) they may not be as heavily involved in other stages, such as post performance feedback. Naumann (1981) found that the purchasing department was more heavily relied upon than other organizational members in modified rebuy and straight rebuy situations. In new buy situations, the other organizational departments were more heavily relied upon by other members of the buying center to share, gather, and process information. Among the other trends noticed were:

1. **The relative influence of purchasing and production increased as the situation changed from new task to modified rebuy.**

2. **The relative influence of research and development and engineering decreased as the situation changed from new task to modified rebuy.**

3. **The relative influence of marketing and quality control were about the same regardless of the purchase situation.**

Jackson, Keith, and Burdick (1983) looked at differences in purchasing across three different dimensions: across product type, across decision type, and among buying center members. In a summary of their findings, they discovered:

1. In the decision of which product to buy and which supplier to choose from, the relative influence of engineering was greater than the relative influence of all other members for component parts.
2. The influence of purchasing was greater in the supplier decision than the product decision for all product types.

3. The relative influence of manufacturing and engineering was greater in the product decision than in the supplier decision.

4. The relative influence of manufacturing was greater that the relative influence of top management for minor capital, materials, component parts, and supplies.

2.3.7 Summary of Participation and Influence

Thus, many of the studies that have examined participation have had mixed results. A general finding has been that consensus of participation is high for measurements that pertain to specific stages of the decision process which required dichotomous judgments of participation versus non-participation (Silk and Kalwani 1982). However, in studies that used rating scales to measure participation, a low consensus was obtained (Spekman 1977, Wiegand 1966). An exception to this was the study by Silk and Kalwani (1982) -- however, their sample size was only 25 and they used only three stages of the decision process. A logical question to be asked here is if the same findings would result if the study was done on a larger scale.
A possible explanation for the inconsistency of these findings is the differences in the purchase situation. Virtually all of the above studies have used the Buyclass classification, which has criticisms that are noted above. However, another confounding factor could be the operationalization of the participation construct. Merely to ask "who participated" seems an insufficient way to measure this construct. What constitutes participation to one individual may mean influence to another.

Under the definitions that have been used previously, an individual who has one conversation with another member of the DMU is considered the same as one who has contact with the vendors, does some outside research on the product, and who has conversations with every other member of the DMU. Therefore, a more definitive operationalization of participation past the "yes-no" classification is required. The more a member of the DMU participates, the more information he has to offer other members of the DMU. Thus, the vendor sales representatives know who to call upon, and researchers know who survey.
A person participates through communicating his opinions or ideas in either written or verbal form to other members of the DMU. Without this communication, the other members of the DMU have no idea whether this person participated in the decision process or not. Therefore, a logical method of measuring participation would be accomplished by determining whether or not verbal or written communication occurred between himself and other members of the DMU.

For this study, then, participation is defined as the extent to which written or verbal communication (formal or informal) was offered by that specific individual for consideration to other members of the decision making unit at each stage of the decision process.

2.4 General Summarization of the Current Literature

Trying to draw some type of overall conclusions regarding influence of different functional roles or departments in the industrial purchasing process using the literature to date would be a difficult, if not impossible, task. The results of the above empirical studies are confusing, often indicating different re-
sults depending on the purchase situation or the indus-
try chosen.

The vast majority of the above studies used the Buy-
class variables -- new task, modified rebuy, and
straight rebuy. However, although many have used this
typology, it is not without its critics.

The Buyclass typology has been questioned both con-
states that, "The problem with this purchase typology
is that it seems to confound at least three separate
dimensions of the purchase situation. The importance of
the purchase, the novelty of the product or service to
the organization, and the complexity or difficulty of
evaluating the purchase alternatives all seem to be
factored together" (1981, p. 83). An additional criti-
cism of the model comes from Webster and Wind (1972),
when they state, "... it is virtually devoid of pre-
dictive ability, and offers little insight into the na-
ture of the complex interplay between task and non task
variables" (1972, pp. 24-25).

On the empirical side, Ferguson (1979) in his study
of a public warehouse could find no support for the
Buyclass variables as a general purpose model of indus-
trial buyer behavior. All of hypotheses of the Buy-
class as indicators of purchase situation attributes
were consistently insignificant at the 90% level. Bel-
lizzi and McVay (1983) in a survey of general contrac-
tors varied both the Buyclass variables and the product
type. Differences in the product type were the purpose
served in the construction process. Through the use of
a multivariate regression technique they assessed the
relationship between an independent variable and a de-
pendent variable set. Their findings indicated that
the influence of top managers increases as the purchas-
es move from the buying of inexpensive operating sup-
plies to expensive capital goods. The influence of ar-
chitects and consulting engineers is greater in the
purchase of accessory equipment, major material and op-
erating supplies, and becomes progressively less as the
purchase moves toward capital goods. Overall, they
found that the total buying influence exerted by the
six buying center participants was not significantly
related to the buyclass of the product to be purchased.
They even go on to suggest that the role of the buy-
class variable may have been overemphasized in the mar-
keting literature. Thus, even though the Buyclass is
the most popular typology in research, its usefulness is open to question.

2.5 **THE DYADIC PARADIGM AS THE UNIT OF ANALYSIS**

The dyadic paradigm was proposed as the unit of analysis in the industrial context by Bonoma, Zaltman, and Johnston (1977). This proposal states that the smallest analyzable unit of human behavior is the interaction between two entities -- two persons, two groups, or two organizations. In doing so, it avoids the classic and unresolved controversy of the unit paradigm and allow more complex social behavior to be explained in simpler social concepts.

The major defining characteristic of the dyadic interaction is the social relationship between the two actors as shown by the connections, shared experiences, interdependencies or alliances between actors. The unit paradigm postulates stimuli and responses; the dyadic paradigm specifies the realtionships between the two entities. Thus, the industrial buying process can be characterized as an exchange between two parties using the dyadic paradigm.
Evans (1963) used the dyadic paradigm as the basis for a model from which to study the interaction between insurance salesmen and their customers. Kiser, et al. (1975) found that both the buyer and seller had the most to gain when their relationship was viewed as one of mutual benefit rather than conflict. It is then up to the marketer to decide which one of its broad range of marketing strategies can best be used to consummate a transaction with the buyer. Hakansson and Ostberg (1975) proposed that dyadic interactions between buying and selling firms result in relationships of mutual dependence involving commitment to each other. Their approach saw the purchase transaction as a social exchange between the buyers and sellers of the market, an exchange that posited three types of interactions of different types of products -- completely standardized, somewhat complicated, and complex.

Stern and Reve (1980) use the dyadic paradigm to set forth a political economy approach which "...view(s) a social system as comprising interacting sets of major economic and sociopolitical forces which affect collective behavior and performance" (p.53). This approach is specified in order to gain a deeper understanding
of the internal functioning of the distribution channel. They propose that a marketing channel dyad can be analyzed in terms of its:

1. internal economy — the internal economic structure and processes, and

2. the internal polity — consisting of the internal sociopolitical structure and process.

This political economy approach is further expanded by Achrol, Reve, and Stern (1983) by coupling the internal interactions with the environmental framework within which the economy operates. This piece, as does the preceding one, adopts the perspective that the fundamental activity in marketing is the transaction, and that the proper unit of analysis is the buyer/seller dyad. The authors propose that the environment of a marketing channel is composed of three distinct environments:

1. the primary task environment, consisting of the immediate suppliers and customers of the dyad;

2. the secondary task environment, consisting of the suppliers to the immediate environment, customers to the immediate customers, regulatory agents, and direct and potential competitors to the dyad; and

3. the macro environment, comprised of general social, economic, political, and technological forces which will affect the activities of the dyad members.
This environment is further expanded into input, output, competitive and regulatory sectors. Where the Stern and Reve (1980) article concentrates mainly on the participants in the primary environment participating in direct exchanges, this framework expands to include the external forces that are generated by non-exchange factors.

The dyadic paradigm expands the unit of analysis to comprise the exchange behavior on both sides of the buyer/seller dyad. As will be pointed out shortly, this approach will make conceptual as well as intuitive sense when applied to the organizational buying process.

2.5.1 The Systems Approach

A further attempt to explain the OBB process has been the systems approach. This goes more in depth than the dyadic concept in that it assumes that the researcher will hypothesize and model the various social interactions that occur in the environment. Driver and Stenfert (1966) proposed a model of information processing in systems of all types. This was called a ‘phasic model’ and assumed that at least two subsystems existed in each information processing system:
1. The perceptual subsystem -- concerned with data search and intake, and then transmits information into the

2. executive subsystem -- which translates input into decisions, actions, and strategy.

Shaw (1964) identified two concepts of group patterns of communication: independence, the degree to which one individual is under the information control of another individual, and saturation, the total amount of information the individual has to deal with. Shaw goes further in proposing that performance and satisfaction in a group was a function of independence and saturation.

Schroder, et.al., (1967) suggested that not all output in an information processing system is the result of the complexity of the input. They proposed that output was only related to the "integrative complexity":

1. the differentiation or the number of parts at work, and

2. the integrative complexity the amount of interconnection among the parts.

Choffray (1977) discovered that different companies exhibited different vector involvement in the purchase of cooling systems. The vector involvement was a list of departments in the firm with a dichotomous response to
whether or not they were involved in the purchase decision. Choffray, however, had difficulty in relating this vector involvement with any type of measured variables.

Hillier (1975) developed a 'decision atom' model of the industrial purchasing process. He classified the industrial purchase decision situations into four typologies:

1. services -- production, advisory, ancillary
2. production facilities, primary equipment, operational equipment, ancillary equipment
3. product constituents, and
4. product transformers.

In the center of the 'atom' was the project team, the first level was the group of individuals who exhibited primary constraints, at the second level was the significant others, and the third level was a level of those individuals outside the firm. Hillier proposed that the model was based on the complexity of the negotiation, the behavioral complexity of the human interaction, and the characteristics of the product.

Johnston and Bonoma (1981) used dyadic communication links to develop the structural dimensions of the organizational buying center. They proposed five dimen-
sions of the buying center (vertical involvement, lateral involvement, extensivity, connectedness, centrality of purchasing agent) and then tested them against the organizational structure variables (size, centralization, formalization, complexity) and purchase situation attributes (novelty, complexity, importance). They found that both the structure of the organization and the purchase situation attributes affect the structure of the buying center, with the importance of the purchase situation and the degree of organizational formalization having the most significant effects.

Kirsch and Kutschker (1982) employ what they define to be the "multiorganizational interaction approach" to study organizational decision making. The main thrust of this approach is that the interaction process takes place in a socioeconomic field that extends over many different organizations. This socioeconomic field is the sum of all social factors (both isolated effects and interactions with one another) that must be considered when attempting to explain why a certain industrial market exchange has been realized under certain conditions.
The industrial exchange takes place in the form of a 'transaction episode' which comprises all activities and interactions connected with the preparation, arrangement, and realization of the transaction in question. In order to get an accurate picture of the transaction episode in the relevant socioeconomic field, the level of analysis must be macroscopic in nature.

The authors also stress that complex transactions are simply too intricate to be treated by a single collective decision. Rather, it is more productive to handle such complex events as a sequence of partially parallel and loosely connected decision processes, each of a different nature and each referring to a different aspect of the transaction episode. They go on to propose and test a model based on these premises, and by so doing define the complexity of a purchase situation using the following terms:

1. the number of relevant contexts,
2. the dissimilarity of the contexts,
3. the lack of correspondence of the contexts, and
4. the variability of the dimensions.
They also found that the three determining factors that were especially influential with respect to the complexity of the purchase situation were:

1. the relative value of the investment,
2. the novelty of the relevant activities, and
3. the degree of organizational change caused by the investment object.

2.5.2 **Which Unit of Analysis Do We Use?**

A crucial decision that must be made at this point is which unit of analysis do we use. Each has their strengths and weaknesses. The unit paradigm allows for more careful scrutinization of the purchase situation on a single individual in a controlled environment, yet ignores the transactional nature of the organizational purchase process. The dyadic paradigm takes into account the interaction between the two parties, yet does not account for the many environmental and competitive effects that may impact the transaction. The systems approach does so, but, as Bonoma, Bagozzi, and Zaltman point out, "At this state of its development, systems 'theory' is primarily a descriptive tool (e.g., the flow chart) which does not admit rigorous hypothesis formulation, testing, or theory formulation" (1978, p.
Thus, the researcher is in somewhat of a quandary as to which typology to use. In order to solve this quandary, we will examine some basic marketing theory in an attempt to determine just what activities are taking place in the industrial purchase transaction. Once this is known, perhaps then we will have a clearer picture of which unit of analysis to choose.

2.6 Marketing Exchange Theory

Alderson (1957, 1967) states that marketing brings about the necessary transformations in products desired by heterogeneous parties through the process of sorting. These heterogeneous parties meet in market transactions, each having tentatively identified the other as an answer to an assortment problem. To understand the nature of the transaction, a closer look must be taken at the nature of the participants — thus realizing the existence of an organized behavior system of which each representative is a part.

Alderson hypothesizes that all market behavior is primarily group behavior; that is, individual action in the marketplace is action on behalf of some group in which the individual holds membership. Thus, the or-
organized behavior system is a broad concept including the more tightly organized groups acting in the market (i.e., business firms and households) and the more loosely connected (trade center and marketing channel).

Therefore, no market transaction can be looked at in isolation; rather, it must be examined in light of the organizational influences that impact the individuals in the decision process. This organized behavior system is easily applied to the industrial market transaction. In simplest terms, the two parties in the exchange consist of the purchasing agent representing the buying organization on the one hand, and on the other hand is a salesperson representing the selling organization. Each partakes in the negotiation process directed by the rules of organization of which they are a part.

In discussing marketing as the concept of exchange, Bagozzi (1975) states that in reality marketing exchanges are often indirect, may involve intangible and symbolic aspects, and that more than two parties may participate. He defines three types of exchanges -- restricted, generalized, and complex. Most industrial transactions could be classified as complex exchanges,
with a series of mutual relationships among the parties involved (A -> B -> C). As the diagram depicts, each party is tied to the others by a series of interactive transactions that indicate an interdependence of the parties involved.

Achrol, Reve, and Stern (1983) take as a given that the fundamental activity in the marketing channel is the transaction -- the act of exchange between two parties. Transactions come about in order to allow the marketing channel to carry out its desired activities. They assert that in order to effectively look at the nature of organizational interactions, one needs to understand the exchange between the two parties by understanding and applying the dyadic interaction between the two.

2.6.1 The Resource Dependency Perspective

Another concept having an impact in the study of the unit of analysis is the resource dependency perspective (Pfeffer and Salancik 1979). This perspective gives the interdependent exchange system further insight by proposing that the organization is a structure of coordinated behaviors whose ultimate aim is to garner the
necessary environmental support necessary for its survival. The survival of an organization ultimately depends on its ability to obtain resources and support from its external coalitions, that those internal coalitions that secure those resources most needed by other members of the organization come to have more influence and control over the organization. Anderson (1982) takes this resource dependent perspective one step further in that the various functional areas in the organization will bargain with the others in order to determine which ones will interact with the environment in order to obtain the necessary resources. The role of marketing therefore is to identify the long-term positions that will assure customer satisfaction, develop strategies to capture these positions, and negotiate with other functional areas to implement these strategies.

2.6.2 Exchange, Resource Dependency, and The Unit of Analysis

The organization, if it is to survive, must carry on negotiations with the external environmental coalitions that provide the resources necessary for its survival. These negotiations result in a transaction between two
organized behavior systems, with the individual parties that consummate the transaction being controlled by the organized behavior system which they represent. These negotiations and transactions take place in a dynamic environment consisting of social, political, legal, economic, and competitive factors, with any and all of them capable of affecting the transaction process.

Thus, if one is to study the organizational buying process, he must do so in a manner that accounts for these various factors. Going back to the unit of analysis quandry, then, it can be seen that all units previously discussed enter into the transaction process. The unit paradigm enters in when the representatives of two organized behavior systems get together to negotiate, with each member of the buying center and selling organization subject to the psychological properties previously studied. The dyadic paradigm enters in when the two organized behavior systems interact to negotiate the exchange of necessary resources. One of the fundamental differences between consumer buying behavior and organizational buying behavior is an interdependence between the parties involved. The resource dependency perspective supports this. Not only is the
buyer dependent on the seller for the resources necessary for its survival (raw materials, etc.) but the seller is dependent on the buyer for the resources necessary for its survival (financial payment for the goods supplied). The systems paradigm enters in when it is realized that these transactions take place in an environment where macro variables in the suprasystem will impact the transaction. To ignore the presence of these variables and their affect on the industrial transaction would be to achieve an incomplete picture of the process.

2.7 Methodological Considerations

Studies that made any methodological contributions were relatively few until that by Moriarity (1983). For his doctoral dissertation he endeavored to determine the composition of the decision-making unit (DMU) in the purchase of non-intelligent computer terminals. However, the main focus of the study centered around the proposal of a more rigorous and comprehensive methodological framework which future industrial marketers could use in their empirical studies.
The main thrust of this work and a subsequent piece by Moriaty and Bateson (1982) was to determine whether a single stage or exhaustive snowballing technique was more effective in determining the composition of the DMU. In research previous to this, only 17 studies were identified in which more than a single participant was surveyed in the industrial purchase decision. Of these, only 8 attempted to survey the whole DMU, with 2 using the exhaustive technique. Membership in the DMU was defined as "purposive involvement in the process" (Spekman and Stern 1979). The research encompassed "new buy" situations -- the purchase of three or more "dumb" terminals that were not used to expand an existing system. Focus groups and clinical studies were used prior to the actual study to make some initial determinations of the purchase process.

In this study, Moriaty asks several questions regarding the determination of membership in the DMU:

1. Does exhaustive snowballing provide any advantage over single stage snowballing?

2. Who should be the primary respondent?

3. How far should the snowballing process go?

4. Should all stages of the process be considered, or should the researcher focus on a single stage?
5. Should membership in the DMU be limited only to members in the buying organization?

6. How should the members be classified -- according to the roles in the purchase process, job functions, or managerial position?

7. How does the researcher confront the probable discrepancy in perceived influence between self evaluation and evaluation by others?

Respondents in the study were chosen using a stratified random sample of firms listed in Dun & Bradstreet. Five different SIC codes were used, with roughly the same number of firms within each classification. Determination of eligibility was determined by telephone -- the person "in charge of data processing" was contacted by telephone in an attempt to determine eligibility for the study. Of the almost 6100 firms initially contacted, 75.9% did not meet the eligibility requirements. A major problem was that in more than half of the ineligible companies, a suitable primary respondent could not be found. In reviewing the data, no systematic bias occurred for either non-contacts or refusals.

When a primary respondent was contacted and eligible, s/he was asked to identify other respondents in an initial screening over the telephone. In interviews preceeding the survey, a concern was that the primary
respondent would not identify the secondary respondents. However, this proved not to be the case in the actual study, mainly because the primary respondents name was mentioned as a referral. Single stage snowballing increased the number of participants by 238%, and multiple stage snowballing increased the number of participants by 91% over single stage. The average size of the DMU went from 3.5 to 6.5.

Variations in product evaluation criteria were also determined for different functional roles and different managerial levels. For functional roles, 33 different attributes were compared across five different functional areas, for a total number of 165 evaluations. The five functional roles (finance, sales, production/operations, administration, and general management) were compared using a mean determinancy method with the evaluations of the data processing department. (data processing was used as that had the highest number of decision participants) In these comparisons, 51 were significantly different at the 95% level, and 18 were different at the 90% level. However, when upper-middle management was compared against four other levels (top management, middle management, first line, senior
staff), only 8 differences at the 95% level and 17 at the 90% level were noted, indicating that functional roles differ in their judgements with much more regularity than managerial levels.

Moriarity has made a significant methodological contribution in this study through painstakingly making his way through the various phases. Several factors contributed to the success of his study:

1. the funding by a large corporation that allowed him to be so comprehensive and precise,
2. the hiring and training of high quality executive interviewers,
3. referring to the primary respondent made the other respondents more responsive,
4. explaining the purpose and origin of the study up front added credibility and helped build a bridge between the interviewer and the potential respondent,
5. making at least four attempts to contact each person.

Moriarity had an overall response rate of 39.7%, which was attained by using such factors as:

1. an attractive questionnaire, printed in two colors,
2. each cover letter being personally addressed,
3. each envelope being personally addressed,
4. each questionnaire being mailed with a commemorative stamp,
5. offering an executive summary of the results as an incentive to fill out the mail questionnaire,

6. sending out a second questionnaire if the first was not returned in 14 days, which increased the response rate from 25% to almost 40%.

While Moriarity has indeed made a major contribution to the use of certain methodologies, there is one weakness in his study. He used only "new buy" situations, and as such does not capture any of the composition of the DMU's in any other types of purchase situations. As mentioned previously, using the Buygrid typology factors several important variables together, pointing to the need for the proposal of a more complete purchase situation typology.

2.7.1 A Combined Approach

If one is to study the organizational buying behavior process and account for all the factors that impact the process he must do so in a way that encompasses the unit, dyadic, and systems paradigms. In order to do so, two critical factors must be accomplished:

1. The proposal of a framework from which to launch the research that will include the necessary elements of the unit, dyadic, and systems paradigms, and

2. A methodological approach that will allow the study of all these factors simultaneously to show the effect they have upon each other.
The main purpose of this research was an attempt to combine these two factors to study the relative participation of four functional roles in the industrial decision making unit. The rest of this chapter will be devoted to setting up the proper framework for the study of the industrial transaction. The next chapter will explore the methodology with which it will be carried out.

2.8 A FRAMEWORK FOR THE STUDY OF OBB

The proposal of this framework will begin with the applicable macro environmental variables, go through the organizational variables, and finally to the individual ones. Using this open systems approach (Thompson 1967, Ford and Solcum 1967), a considerable amount of research in this area suggests that the predominant direction of influence is from macro variables in the suprasystem (organizational size, the state of technological advancement, and environmental uncertainty) to organizational structure (differentiation, centralization, formalization) to employee behavior (Thompson 1967, Lawrence and Lorsch 1967, Pugh et al. 1969, Duncan 1972, Jelinek 1977). Using this direction of in-
fluences combined with the variables will encompass the necessary elements of the systems, dyadic, and unit paradigms.

2.8.1 The Macro External Variables

A considerable amount of research has attempted to identify the causal texture of the major sources that have an influence on organizational structure (Ford and Solcun 1977, Child 1972, Webster and Wind 1972). The results of this research has identified basically three factors: technology, environmental uncertainty, and size. Other research (Hickson, Pugh, and Pheysey 1969, Freeman 1973, Blau et.al., 1976) has suggested that interactive effects between these variables do exist, and that these variables do in turn affect organizational structure. The properties of each of these macro variables will be considered individually.

2.8.1.1 Technology

The initial study of technology was carried out by Woodward (1965). In a review piece, Fry (1982) notes that at least five different conceptualizations of technology have been used:

1. Technical complexity
2. Operations technology and variability
3. Interdependence
4. Routineness/non-routineness of tasks

Pry also found that by removing the studies that used an operations technology conceptualization that 68.8% of the remaining studies supported a technology/structure relationship. Therefore, by excluding the operations-technology consideration, most research suggests that technology is one determinant of organizational structure (Ford & Slocum 1977).

2.8.1.2 Environmental Uncertainty

The vast majority of research in this area has focused on environmental uncertainty and its effect on organizational structure (Burns and Stalker 1961, Duncan 1973, Megandhi and Reimann 1973, Pfeffer and Leblebici 1974). In the OBB literature, Spekman and Stern (1979) specifically examined the effect that environmental uncertainty has on the structure of the decision making unit. While some of the findings between organizational structure and environmental uncertainty proved to be insignificant, there were several inter-
esting ones. As the information needs of the buying groups were shown to increase in response to higher environmental uncertainty, the tasks between these groups became less routine and less differentiated. Thus, the resultant increase in shared single stage snowballing increased the number of decision participants responsibility and contributes to a more flexible organizational design, which in turn permits members of the DMU to react more quickly to the environmental uncertainties. Also, this greater participation in decision making points to the emergence of additional communication networks, which in turn facilitate the acquisition of additional information related to the purchase decision.

2.8.1.3 Size

In the organizational behavior literature, several studies indicate that a significant relationship exists between size and organizational structure. Of the many definitions used, perhaps the most applicable one used is the number of employees. As Child (1973) notes, because it is people who are organized, it therefore stands to reason that their numbers will have a closer
relationship to structure than other aspects of size. However, since size has also been shown to be related to centralization, it also becomes important to consider the number of employees at that particular site of operation, rather than company wide (Child 1973, Spekman 1977). Other definitions used are total assets, number of locations, total sales, and market share (Pugh et al., 1969, Khandwalla 1974, Aldrich 1972).

In the OB literature, much of the literature concerning size centers on the individual and the small firm. Therefore, the size of the firm should be a determining variable, and only firms with a certain number of employees, certain assets, and locations should be used (McMillian 1980). Bellizzi (1981) also showed that size was an important element in predicting certain aspects of employee behavior. Presidents, Vice-Presidents, and owners influence declines with increases in corporate size, while the influence of other participants (i.e., purchasing) increases as organizational size increases. This may result in delegation of authority. Also, Bellizzi found that the decreasing influence of some individuals may be due to increased influences of individuals outside the company --architects, engineers, etc.
2.8.1.4 Time Pressure

Another external factor shown to impact decision making in organizations is the effect of time pressure to make the decision. Frye and Strich (1964) found that as time pressure increases group members tend to acquire more in order to achieve group consensus. Hermann (1972) found that time pressure tended to restrict participation in decision making to relatively few members. Pruitt and Drews (1969) found that time pressure caused various group members to be less demanding and more conciliatory in bargaining situations. Isenberg (1981) found that time pressure is likely to increase role differentiation and an increased gap between the most and least communicative members of a small decision making group. These and other studies (e.g., Hamblin 1958, Lanzetta 1955, Torrence 1961) all suggest that time pressure will cause predictable changes in group structure.

2.8.2 Summary of Macro Variables

While some controversy exists over which aspect of the external environment has the most impact on organizational structure (Reimann 1977), this is really a
needless distinction. The fact remains that environmental uncertainty, technology, and size have an impact on organizational structure. Each of these three factors has multiple dimensions, and failure to incorporate this multidimensionality into the study of organizational buying behavior could severely limit the generalizability and validity of any results. Thus, the correct perspective to take is to start with these macro variables, work through these variables to organizational structure, and finally to any individual actions. Any other attempts will achieve incomplete results. The next section will focus on organizational structure and its effect on individual behavior.

2.8.3 Organizational Structure

Organizational structure is defined as "... the enduring system of consistent relationships among positions within an organization " (Scott, et al., 1981, p.160). Organizational structure is important because these 'consistent relationships' focus on expectations about certain functional roles, the grouping configuration of positions, and the degree of decision making authority allocated to those positions. Studies on or-
ganizational structure started with that of the Aston Group (Pugh, et.al., 1969) and has since settled around three major dimensions of structure: differentiation, centralization, and formalization (Pugh, et.al., 1969, Hall 1972, Child 1974).

2.8.3.1 Differentiation

Differentiation is the degree of specialization or separation of tasks within the organization (Price 1972) and may be vertical, horizontal, spatial, or personal in nature (Hall 1972). A high degree of differentiation would be indicated by many specialized roles or subunits within the organization. Research in the study of differentiation has used the vertical number of levels, the number of departments of functions, the number of operating sites, or the degree of personal expertise (Blau and Shoeherr 1971, Hage and Aiken 1969, Hall 1962, Harvey 1968, Van de Ven and Delbecq 1974).

2.8.3.2 Centralization

Centralization determines the distribution of formal control and power within an organization. It includes
such factors as hierarchy of authority, autonomy, the
location of decision making authority, and the extent
of participative decision making. Organizations with a
high degree of centralization would be typified by a
concentration of power and control among a relatively
few members of the organization, probably at high lev-
els (Child 1972, Child and Mansfield 1972, Hall 1962,
Harvey 1968).

2.8.3.3 Formalization

Formalization represents the degree to which organi-
zational policies, rules, and regulations are clearly
stated and obeyed by individuals. Basically, formaliz-
ation sets forth the amount of acceptable variation in
the behavior of individuals in the organization. A
high degree of formalization would result in many poli-
cies, procedures, and rules that would facilitate a
high level of consistence in decision making. Con-
versely, a low level of formalization would result in
relatively few rules and procedures and policies (Child
1973, Hall 1968, Hall et.al., 1967, Pugh, et.al.,
1968).
2.8.4 Summary of Organizational Structure

These variables all have fairly clear-cut definitions, and have been shown to have an impact on employee behavior. Thus, just as any study of the OBB process should begin with an examination of the macro variables, it must further be shown how these macro variables affect organizational structure. The next section will examine the composition of a decision group, and then attempt to tie this framework into a typology for study.

2.9 The Composition of a Group

Jewell and Reitz (1981) propose that a group is formed to accomplish some designated task, that each member of the group has certain assets and liabilities relative to the group's purpose. However, some members may not be aware of what their assets are or by the same token realize their liabilities.

Maier (1967) points out that the group assets are:

1. Greater sum total of knowledge and information.
2. Greater number of approaches to the problem.
3. Participation in problem-solving increases acceptance.
4. Better comprehension of the decision.
Conversely, there are several liabilities:

1. social pressure to accept the majority opinion and the absence of minority opinions,

2. the number of positive and negative comments about each position are summed, with nothing done to reflect the valence of each statement,

3. individual domination often occurs, and

4. in some cases of disagreement, the goal becomes that of winning the argument rather than achieving the best solution.

2.9.1 The Creation of a Group

Very little literature in the social sciences exists on just how decision making groups are formed. Two researchers in the area noted:

In the development of this program (creation of small groups) we have (attempted) to draw from studies in small group theory related to member characteristics that are viewed as influencing group effectiveness ... we are far from satisfied with the material located ... many of the studies that have been done in this area pertain to effectiveness in completing some discrete task, rather than focusing on the development of a group that is effective in bringing about change in the problematic social functioning of individual members ... (Bertcher and Maple 1977, p.7).

This view is supported by Kell and Corte (1975), who found that there were many studies on group decision making, intergroup influences, and group dynamics, but virtually no information on group creation.
The research that has been done on the composition of the decision group has focused on the homogeneity/heterogeneity issue -- differences versus similarities of the members in the decision group. Heterogeneous groups have been shown to outperform homogeneous groups, whatever the trait being studied. When a group is composed of a mixture of capable individuals confronting a multiple part problem that lends itself to division of labor and communication with the group allows for utilization of the different opinions, approaches, and pieces of information possessed by the members, groups are likely to produce a better decision than any one member (Jewell and Reitz 1981). Also, different members of the group may define the problem differently, and some common ground must be found to allow the individuals to look at the problem from as close to the same perspective as possible.

Thus, the social psychology literature offers little assistance and guidance in the study of how groups are formed. Many of the limitations listed above have also been found in the OB literature. Virtually all of the studies that have shown the composition of the DMU have had other purposes as their central focus, and all have
focused on a particular decision, rather than attempting to elicit some general type of findings. What is needed, therefore, is that 'common ground' from which to study the composition of the DMU. The next section will propose what that common ground can be.

2.10 **Towards a Common Ground**

Looking at the findings of organizational behavior collectively, one aspect of the purchase decision has shown up several times. The *complexity* of the decision was first noted by Cyert, Simon and Trow (1956) and has been noted by several researchers since then. Further examination of the various dimensions that compose the complexity of the purchase situation will provide the theoretical underpinnings for the common ground needed.

Several researchers have studied what they have termed the "complexity" of the purchase decision. Gronhaug (1977) studied the purchase of a computer by small businesses in Norway, choosing the computer because of the assumed complexity of the purchase transaction, and because the use of this product is not restricted to certain production technologies. He does not, however, define precisely what 'assumed complexi-
ty' is merely that it existed in this type of purchase situation. Using the snowball technique, he looked at the gradual versus sudden perception of the need for the product. He found that this complexity of the product made the sudden perception more prevalent in small organizations. His other findings showed that in non-market organizations the purchase decision was related to budgets and whether or not the organization had money in the budget for such purchases. In the market organizations, the exchange was based on the need for the product. In the majority of cases, the initiative to purchase and the deciders were found at the top level of the organization. Also, different evaluation criteria was stressed by different members of the buying center, and this proved to be a valid source of conflict within the organization.

Reve and Johanson (1982) based on extensive interviews with individuals in the off-shore drilling industry proposed a conceptual model based around three general components:

1. the complexity of the purchase transaction (high, low),

2. the salient criteria of evaluation (organization, product, operations, market variables), and
3. The key participants in the organizational decision making process (top management, engineers, operations, purchasing).

Their study was an attempt to determine three factors: who participates in the decision process, what is their degree of influence, and under what conditions is this influence exerted?

Their findings indicated that what determined the pattern of participants actively involved in the organizational buying process were:

1. Technological complexity,
2. Importance, and
3. The novelty of the purchase situation.

All of these variables were then combined together to form the complexity of the purchase transaction, with the authors proposing:

A buying transaction is complex when it is relatively large and important for the organization, when analyzibility is low and the technical complexity is high, and when the transaction is novel and infrequently bought by the organization...

(1982 p.279). Low complexity transactions were largely handled by boundary units such as the purchasing departments and focused on market variables and feedback for the actual users of the organization. High complexity transactions involved high influence depart-
ments that were able to untangle the uncertainties associated with complex transactions.

In one of the more comprehensive and conceptually interesting articles on OBB, Kirsch and Kutschker (1982) employ what they term the 'multiorganizational interaction approach' to study organizational decision making. As previously mentioned, this approach stresses that the interaction process takes place in a socioeconomic field that extends over many different organizations. The industrial exchange takes place in the form of a transaction episode which comprises all activities and interactions connected with the preparation, arrangement, and realization of the transaction in question.

The authors go on to say that problems arising with most industrial goods transactions are generally complex in nature — with complexity being a positive function of:

1. the number of different relevant contexts, and the number of interested parties concerned,

2. the difference between these contexts, and

3. the difficulty of transferring statements from one context to the other (the degree to which they correspond).
In order to get an accurate picture of the transaction episode in the socioeconomic field, the level of analysis needs to be macroscopic in nature. Therefore, a theory of industrial goods marketing should provide a bridge between microscopic and macroscopic analysis in order to take advantage of both.

However, complex transactions are simply too intricate to be treated by a single collective decision process. Rather, it is generally more effective to handle such complex events as a sequence of partially parallel and loosely connected decision processes, each of a collective nature and each referring to different aspects of the transaction episode.

Transaction episodes can be divided into five classes:

1. transactions and transformation of physical objects,
2. the generation and distribution of evidence (perception, explanation, intelligence),
3. the building, exercising, and securing of power,
4. development of consensus, and
5. the securing of commitments.

In interviews with representatives of German manufacturing firms, they discovered that the three deter-
mining factors especially influential with respect to the complexity of the purchase situation were:

1. the relative value of the investment,

2. the novelty (innovativeness) of the relevant activities, and

3. the degree of organizational change caused by the investment object.

Johnston (1979) also proposed three purchase situation attributes: novelty, complexity, and importance. While not providing operationalizations of these variables, he brings out the important point that use of the BUYGRID typology factors several important variables together, and as such could lead to somewhat unreasonable findings in certain purchase situations.

2.11 SUMMARY OF THE CURRENT LITERATURE

Looking at the organizational buying behavior literature over the past two decades can lead one to several conclusions:

1. While there has been a fair amount of conceptual work, empirical research has for the most part generally not been all that conclusive and certainly not all that cohesive.

2. Studies on the unit of analysis, although many in number, have made few advances towards the proposition of an overall theoretical framework.

3. The research has for the most part not embraced totally the major differences between consumer
and organizational decision making, and therefore has achieved disappointing results.

4. While several allusions have been made to exchange theory, precious few attempts have been made to implement it.

2.12 **TOWARDS A NEW APPROACH**

The way then, seems clear. Researchers studying organizational buying behavior need to develop a conceptual framework which recognizes several key tenets:

1. That the transaction is the basic unit of exchange and exchange theory pervades the entire process;

2. That the transaction takes place over several different organizations;

3. Because the industrial purchase transaction encompasses individuals making decisions in interdependent organizations existing within a macro environment, a paradigm must be proposed that embraces the effect of all of these on the purchase transaction;

4. That the effect that the macro environmental variables and organizational structure has on the transaction process necessitates the use of an open systems approach; and

5. That all of this happens simultaneously and therefore must be measured simultaneously.

Many researchers (Johnston 1981, Zaltman and Bonoma 1977, Wind and Nicosia 1977) call for a better re-conceptualization of the process of OBB before attempting any new research on the subject. However, what remains
to be determined is just what form this reconceptualization is to take. Previous attempts have researched individual actions or processes and for the most part have provided inconclusive results. Therefore, this reconceptualization needs to take more of a macro approach, to examine the effects of several processes and variables not only intraorganizationally but interorganizationally, and to do so simultaneously.

A major step toward this reconceptualization was accomplished with the proposal and testing of the Industrial Conversion Framework (ICF) by Bender (1983). The ICF pursues both an open and closed system methodology to establish a communications paradigm of information processing in the industrial purchase decision which begins within the organizational subunit, expands to the buyer/seller dyad and ultimately to the entire consumption chain. Within this framework are "spaces"—procurement, product, and benefits, which are connected and influenced by two heuristics, manufacturing and marketing. Bender then breaks the framework down into what in effect are submodels and tests them for plausibility using the holistic approach (Bagozzi and Phillips 1982).
Using this structural equations approach, Bender tests the model for the process of the consumption of soybeans. Two models of the ICF were tested, one for the growers of soybeans and another for the dealers of soybeans. In both cases, using the holistic approach provided a plausible representation of the data.

Another empirical attempt to model the organizational purchase processes using more of a macro approach was done by Kirsch and Kutschker (1982), who use a multiorganizational interaction approach to study organizational buying. Using an open systems approach, they showed that an industrial exchange takes place in the form of a transaction episode that takes place over several different organizations. This transaction episode is too complex to be treated by a single collective decision; rather, the entire process is connected by a series of partially parallel and loosely connected decision processes, each referring to a different aspect of the transaction episode. The coefficients of the path analysis model specified were all greater than .10, the standard cutoff point for the relevance of causality effects. Thus, their model as well provides a plausible representation of the data.
2.13 PURPOSE OF THIS RESEARCH

The purpose of this research will be an attempt to draw together the relevant constructs in the marketing, organizational, and social psychology disciplines into a conceptual model of purposive participation in the industrial purchase decision (figure 1). Drawing on these three disciplines, the model will in effect be composed of three submodels, all of which contribute some variance to the participation construct. Incorporated in this model will be the necessary elements earlier deemed necessary for a more complete explanation of the organizational buying process:

1. To examine functional role participation in the OBB process,

2. To do so within a framework that recognizes the distinct characteristics of OBB,

3. To combine the unit, dyadic, and systems approaches into one paradigm for the unit of analysis, and

4. To take an open systems approach in the analysis.

The purpose of structural equation modeling as with all models involving latent constructs, is to attempt to achieve as parsimonious a model as possible. As mentioned above, this conceptual model draws together latent constructs from three different disciplines.
Without some type of empirical test of the causal structure, it would be impossible to determine if indeed the model is plausible. In order to obtain as parsimonious a model as possible, the testing should be done in stages, with the testing of the submodel with the most hypothesized variance being done first, with the others (or parts thereof) being added in a stepwise fashion. Therefore, it remains to be determined which submodel should be chosen first.

Research that has gone beyond the BUYGRID typology and has defined the industrial transaction has achieved some promising results. Using these results as a point of departure, this research will concentrate on the testing of the marketing submodel. The key latent constructs in this submodel are: novelty, complexity, importance, functional role participation, own opinion of participation, other opinion of participation, sales effort of vendor company, and sales effort of the major competing company. The next chapter will provide a further operationalization of these variables.
Chapter III
RESEARCH METHODOLOGY

3.1 OVERVIEW

The purpose of this chapter is to provide a discussion of the research methodology to be used in this project. The theoretical model mentioned in the previous chapter will be reiterated, and the various submodels proposed. Next will follow a general hypothesis of the research, and why the marketing submodel is proposed for testing first. Then will come a more detailed discussion of the marketing submodel, followed by a brief discussion of the holistic approach along with cautions about using the approach. The method of data collection will be outlined and the instrument used to survey the respondents discussed. Finally will come a reporting of the response rate of the survey.
3.2 **THE CONCEPTUAL MODEL**

The previous chapter mentioned the propositions of an overall theoretical model of purposive participation in the industrial decision making unit. This model is found in figure 1, with an operationalization of the latent constructs and the measured variables found in appendix A. The latent constructs for this model have been drawn from three disciplines -- marketing, organizational behavior, and social psychology, and contain the following constructs:

1. **marketing** -- the attributes of the transaction (novelty, complexity, importance), activities of the selling firm, activities of competing selling firms, and opinions of participation in the decision process.

2. **organizational behavior** -- environmental uncertainty, size, technology, organizational structure, differentiation, centralization, formalization.

3. **social psychology** -- time pressure, personal stake in the decision, individual differences.

However, a test of the entire theoretical model will not be the subject of this research. Not only would a test of the model be fraught with methodological difficulties, but theoretical ones as well. First, LISREL VI will be used to test the model for plausibility, and the program is simply not designed to handle that much
data (15 latent constructs, 86 measured variables). Second, it would be impossible to determine the amount of variance that was accounted for by each of the submodels -- only the total variance would be known. Since the main purpose of structural equation modeling is to find a parsimonious explanation for the data, to take such an approach would go against this stated purpose. Thus, the research will begin with the submodel that is proposed to account for the greatest amount of variance, with future research adding other submodels (or parts thereof) in a stepwise fashion.
FIGURE 1
CONCEPTUAL MODEL OF PARTICIPATION IN THE INDUSTRIAL DECISION MAKING UNIT
3.2.1 Which Submodel to Use?

Thus, we are faced with the question of which submodel to start with. Previous research, for the most part using the BUYGRID typology, has shown that what is bought affects how it is bought (e.g., Morarity 1983, Johnston 1981, Jackson et al. 1983). In these and other studies, the purchase situation was viewed in different ways by different organizational participants. This difference in perception affected all the other elements of the purchase situation -- influence patterns, communications, involvements, etc. The previous two chapters discussed the importance of determining who participates in the decision process before other factors of the process can be studied. Therefore, if some common factors of the purchase situation could be operationalized to the point where they provided a plausible representation of the relative participation in the industrial decision making unit, a major step toward an overall framework could be achieved.

Much of the previous empirical research has been carried out using the BUYGRID typology. However, the criticisms of this approach have been outlined above. Newer conceptualizations of the industrial purchase

It is the general hypothesis of this research that these industrial transaction attributes -- novelty, complexity, and importance -- will provide a plausible explanation for a portion of the variance that exists in the functional role participation in an industrial purchase decision. Since previous research has shown that other aspects of the decision process are largely affected by how the purchase situation is perceived by the participants, if the purchase situation can be more fully defined and operationalized the groundwork is laid for a better explanation of the purchase process. Also, as stated above, a logical starting point for research in the industrial decision process is to attempt to determine who actually participates in the decision process. To determine who is involved under certain attributes of the decision process would provide a basis from which future research could be conducted.

Functional role participation has been chosen for study based on conceptual work and empirical findings.
Organizational sociologists have proposed that the significant unit of social structure in an organization is not the person but the role the person plays, and that organizational functions are defined in terms of role expectations (Parsons 1970, Katz and Kahn 1966). Bonoma, Zaltman, and Johnston (1977) propose that to gain an understanding of the industrial purchase process, one must understand the different functional roles that become involved in the process. Empirically, Moriarity (1983) found more significant differences in evaluative criteria for suppliers in functional roles than in managerial levels. Therefore, functional role participation was chosen for study.

The next question to be resolved is in two parts:

1. how will participation be operationalized, and
2. how exactly will it be measured.

Previous empirical findings have shown that there is normally general agreement on whether a person participated in the decision using a dichotomous measure (e.g., Choffray 1977, Gronhaug 1977, Kelly 1974). However, a dichotomous measure is of little value to industrial marketers. Merely to know if a person participated in the purchase decision is not sufficient
enough for a targeting of the marketing effort. The marketer must also know how much each individual participated relative to the others in the decision making unit. Once this relative participation of each functional role is determined for different attributes of the purchase situation then subsequent research can explore such aspects as locus of influence, communication patterns, and the like.

A more distinctive operationalization of participation therefore needs to be determined. An individual's participation in the decision process is perceived by others as the amount of input this individual has during the process. This input is in the form of written or verbal communication of a formal or informal nature. Only if one person in the decision making unit communicates with others in the unit can he be perceived by that person as having any participation. Therefore, participation will be defined as the amount of written or verbal communication (formal or informal) that this particular individual offered to others for consideration at each stage of the decision process, as well as an overall measure for the entire process.
Measuring participation is a somewhat more intricate matter. As mentioned above, merely to determine whether or not a person participated using a dichotomous measure is of little use to researchers and practitioners. What is of use is the amount of participation the particular functional role had; specifically the amount of participation relative to the other functional areas. Researchers have had respondents rank order participation (i.e., Grashof & Thomas 1976) or assign a participation score as a percentage of the whole (i.e., Nor- iarity 1983). However, these measures do little to determine the participation of each functional role relative to the others in the decision-making unit. If the relative participation of each functional role can be determined when the attributes of the purchase situation differ, then a first step is made towards a cohesive framework for studying the industrial decision making unit. Once relative participation of different functional roles for different purchase situations is determined, then further research can be conducted in such areas as influences, communication patterns, and the like.
There are several ways to measure participation in the industrial decision process. The first would be raw absolute scores at the aggregate level. This would be accomplished by summing each functional roles' participation across all purchase situations. However, to do so would be invalid for two reasons. The first is that there is no way of telling how much each functional role participated relative to the others in the decision making unit. The second is that each observation would have an unequal weight relative to other companies. For example, if one company had only two participants and another one had eight, then the latter company would have 4 times the number of observations as the former, and due to differences in organizational structure, could bias the results.

A second method would be to sum total participation across each company, and then take each functional roles' relative participation as a proportion of that total. This would determine the relative participation of each role; yet, the company bias would still remain.

A third method would be to take each roles' participation relative to the total, and then weight these proportions by the number of participants in each company. For example, in the previous case the
2-participant company would have the scores multiplied by 1/2, while the 8-participant company would have each score multiplied by 1/8. To do so validates the purchase process on two fronts. First, an implicit part of the marketing submodel is that it is affected by elements in the organizational behavior submodel. To weight the scores in this manner would neutralize the specific effects of organizational structure that each company would have. Secondly, the relative participation of each functional role is preserved for each purchase situation. It is this approach that will be used in the analysis.

If it was found that the proposed industrial transaction attributes did indeed provide a plausible explanation of relative participation in the industrial transaction, a significant step would be made both theoretically and managerially. From a theoretical standpoint, researchers would have a more comprehensive base from which to propose further research. From a managerial standpoint, sales managers would have a base from which to better direct their sales efforts. If it could be determined what functional roles within the purchasing organization participated under what attri-
butes of a purchase situation, then the sales person in the field would have a clearer idea of who to target his sales efforts to. Given that the average price of an industrial sales call is in the neighborhood of $180 (Industrial Marketing, 1982), and sometimes as many as 50-70% of sales calls are misdirected (Hutt and Speh 1984), the potential cost savings are significant.

3.3 THE MARKETING SUBMODEL

The Industrial Transaction Attributes (ITA) -- novelty, complexity, importance -- have been proposed in previous research (Johnston 1979, 1981, Johnston and Bonoma 1981). However, they have not been operationalized sufficiently enough to be used in empirical research. In order to use a structural equations technique and to ensure a high degree of construct validity, a more complete operationalization is necessary.

The ITA will be operationalized as follows:

1. novelty -- to what extent does this represent a 'new' purchase to the organization; i.e., how much experience do they have with a purchase situation of this type.

2. complexity -- what is the degree of difficulty in generating and evaluating alternatives, and the degree of difficulty in making organizational adjustments to accommodate this product (physical facilities, special training, etc.)
3. importance -- What is the perceived organizational and financial impact of the purchase.

Other aspects of the marketing submodel include sales effort expended by both the selling and competing firms and relative participation of the selected functional role in the decision process. Sales effort is included because it is hypothesized that the salesperson can have an effect on who participates in the purchase decision merely by whom he chooses to call upon. The same holds true for competitive effort; also, the sales effort of either party may be affected by efforts of the other. Participation is included because it directly relates to the procurement process, which is implicitly assumed to be part of the marketing process. While novelty is related to complexity and complexity is related to importance, novelty is hypothesized not to be related to importance. The experience the firm has can easily be seen to be related to the degree of difficulty in generating and evaluating product alternatives. In the same vein, the difficulty in generating and evaluating alternatives is related to the perceived organizational and financial impact of the purchase. However, the link between the experience with the product and the perceived financial and organ--
izational impact is much less clear. How new the purchase decision process is really should have very little to do with the perceived impact on the organization. Therefore, the covariance between these two is hypothesized to be non-significant. A pictoral representation of the marketing submodel is seen in figure 2.
FIGURE 2
THE MARKETING SUBMODEL
3.3.1 **Functional Role Testing**

The eight functional roles identified on the questionnaire were collapsed into four categories based on similarities of organizational tasks:

1. purchasing -- purchasing respondents.
2. management -- plant managers, owner/operators.
3. engineering -- plant engineers and corporate engineers.
4. operations -- operations management, transportation/traffic, and finance.

These four groups were used as the basis for all data analysis.

Four separate models will be analyzed, one for each functional role. The latent construct will be the relative participation of that particular role, with the relative participation score being a perfect indicator of that construct. For example, the first model would be relative participation of purchasing, with the weighted relative participation score being used as the perfect indicator for that construct.
3.3.2 Hypothesis

The general hypothesis of the research is the Industrial Transaction Attributes will provide a plausible representation of functional role participation in the industrial decision making unit. This will be tested by running a structural equation model for each of the four functional areas and examining the results for plausibility.

These are not nested models because they are using different data (the dependent variables are different); therefore it is not possible to do a statistical comparison of the models or their elements. However, it is possible to make a subjective comparison of the models and their elements by making comparisons of such things as gamma weights, ksi values, and the coefficient of determination for the structural equation model. Based on these subjective comparisons, the other hypothesis of the research would be:

H1: The coefficient of determination for structural equations will be highest for engineering and lowest for operations.

This is based on the fact that the purchase of a truck scale is often a first-time purchase for most compa-
nies. Due to the increased technical nature of the purchase with electronic load cells, computer interfaces, and the like, the technical function of engineering is most often called upon to participate in these situations, and would have more participation relative to the other groups. Operations would be lowest due to the fact that they are concerned with the day-to-day operations of the scale, and have little input into the actual decision to purchase it.

H2: Engineering will have higher gamma weights in complexity and importance than the other three areas.

The reasons behind this are the same as those above; due to the complex technical nature that most firms attach to the purchase of a truck scale, engineering will have a greater participation.

H3: Purchasing will have the highest gamma weight in novelty.

At first glance this may seem contradictory to the reasons given for engineering above. However, when there is more novelty in a situation there is more information to be gathered and evaluated. In the majority of cases the purchasing acts as a gatekeeper in contacting vendors, sending out and collecting requests for proposals, and collecting the quotes from the vendors. The
purchasing agent must then disperse this information to the other participating functions to use in their evaluative procedures. This collecting and dispersing of information results in more communication originating with the purchasing agent; thus, his participation will be increased.

A general hypothesis of the research is that the Industrial Transaction Attributes will provide a plausible representation of relative functional role participation in the industrial decision making unit. This will involve the testing of elements of the marketing submodel as shown in figure 3. Four different submodels will be tested, one for each functional role. It is not possible to test the model using all four functional roles as indicators of the latent constructs of participation. This is due to the fact that all four participation scores sum to one which in turn results in a non-positive definite input matrix. Such a matrix cannot be analyzed.
3.4 CAUTIONS IN USING STRUCTURAL EQUATIONS

As mentioned above, the data will be analyzed using structural equation modeling. However, some precautions need to be taken before using this method of analysis. Fornell (1983) has proposed several cautions to observe when using the structural equations approach:

1. **Identification** -- a crucial point in the proposal of any structural equation model is that the model must be overidentified, meaning a unique solution exists for all parameter estimates.

2. **Reversal of the research hypothesis** -- with the use of the chi-square statistic in structural equations, the purpose is to reject the statistic, which is a reversal of traditional hypothesis testing. The problem with this is that the power to reject the research hypothesis is not known, and it leaves the door open for type I error in hypothesis testing.

3. **Goodness of fit and relationships among unobserved variables** -- most theories postulate relationships between variables or unobservable constructs. However, the chi-square test refers to the comparison between two covariance matrices; it does not support conclusions about the significance of the variable relationships in the model.

4. **Goodness of fit and relationships among observed variables** -- if the correlations are low enough to start with, there is an increased chance that an incorrect model will be retained.

5. **Sample size** -- several researchers point out that small samples are not compatible with the maximum likelihood estimation of covariance structure models. Boomsma (1982) says that the sample size should not be less than 100, and a
size of at least 200 should be used depending on the expected covariance structure in the population. Bearden, et al. (1982) found that for a four factor model with a sample size of 100 or less, the likelihood ratio statistic is not chi-square distributed. Joreskog (1981) recommends a minimum sample of 400 for accurate estimation of standard errors, and 500 or more is discrete variables are involved. Thus, the gist of this is that small samples tend to produce unstable results. However, the chi-square statistic is also sensitive to sample size. As the sample size increases, so does the statistical power, and the chance of accepting the null increases.

6. trivial fits — as with all unobserved variable structure and its fitting to an observed structure, some of the parameters may be fitted trivially.

7. indeterminacy — since the factor loadings between the variables can be rotated in a number of ways, the solution can be said to be non-unique. Therefore, this indeterminacy allows for an infinite number of factor scores to be consistent with the same loadings.

8. improper solutions — sometimes the only way to obtain an acceptable fit is to assign a negative sign to certain variances and to have correlations greater than one. To alleviate this problem, variances are often fixed at zero, which is not correct either, it being unlikely that empirical data is perfectly free from error or specific variance. Thus the best solution is to find the cause and eliminate it.

Fornell goes on to suggest two basic concepts to follow when using structural equations modeling:

1. a grounding in proper theory, both substantive and measurement, is necessary to ensure for the interpretative validity of the model, and

2. that the chi-square goodness of fit test be supplemented by other statistics.
Both of these cautions have been explicitly accounted for in this research. From a theoretical standpoint, the latent constructs have been grounded in conceptual work in the marketing, organizational behavior, and social psychology. To the greatest extent possible measured variables have been chosen that have been used in previous empirical studies. Measured variables were also chosen on the basis of the pre-tests.

The chi-square test was supplemented by other statistics. Due to the large sample size, the chi-square statistic had such a high level of statistical power that an insignificant value was achieved in only one model. However, the supplementary statistics used were the rho test (Bentler and Bonnett 1980) which compares the proposed model versus a null model of no relationship, the goodness of fit index, the adjusted goodness of fit index, and the root mean residual.
3.5 OVERVIEW OF DATA COLLECTION

Data was collected under the sponsorship of the Toledo Scale division of Reliance Electric. Toledo Scale has made all types of weighing scales for over 100 years, including everything from small ones to weigh supermarket produce to large ones used to weigh motor vehicles. Toledo Scale provided the names of the companies that had purchased one of three model numbers of truck scales since January, 1983. It was decided to go back only as far as this date because it covered a period of roughly 18 months, and it was felt that purchases which occurred longer ago than this would not be remembered sufficiently enough by the participants. All government purchases were excluded.

In total there were 129 potential purchase situations. Because this is research it was decided to reflect a theory-centered approach (Krulanski, 1975), a random sample is not necessary. Also, given the financial constraints, the cost of obtaining a random sample would have been prohibitive.
3.6 **THE QUESTIONNAIRE**

The questionnaire (appendix C) was the final result of extensive pretesting and revision. The original questionnaire (appendix A) which covered the entire conceptual model was judged to be too lengthy to elicit a sufficient response. Therefore, only questions pertaining to the marketing submodel (and some other selected items) items were included. The questions to be included in the first draft of the questionnaire were determined in a general session involving the researcher, the marketing research director of Toledo Scale, and two product managers of Toledo Scale. The questionnaire was then tested for question clarity and understanding using five individuals in the Columbus area who had been involved in an actual purchase of a truck scale, and two sales representatives who had been involved in selling them. The suggestions gained from these pretests were then included in a revised version of the questionnaire, which was then pretested on five different truck-scale purchasers. The problems that had been found in the first pretest were resolved sufficiently in the revision such that the second group of pretests found no major clarity or understanding prob-
lems. All individuals stated that the length of the questionnaire was short enough so that they would in all likelihood respond to it. It was therefore decided to go with the second revision.

The questions are scaled on a 1 to 5 Likert scale (strongly disagree, disagree, neutral, agree, strongly agree) due to the fact that in the pretests the respondents found this an easier scale to use and understand than a 1 to 6 or a 1 to 7 scale. It was determined to have a midpoint to allow for inclusion of a truly neutral response. It was felt that if an individual was truly neutral to a question then he should have a response to allow him to express that neutrality. To force him to make a choice one way or the other could bias the results.

The questionnaires were then typeset on high-quality paper, back-to-back. Screens were placed on alternate questions. Questions were divided into sections, and each new section was placed in its own box to aid the respondents in answering the questions.
3.7 **DATA COLLECTION**

Truck scale sales are made by either a sales representative who is employed directly by Toledo Scale or one of their authorized distributors. A letter under the signature of the director of marketing research was sent to both company and distributor sales people who had been involved in the sale of a truck scale during the chosen time. The letter explained the nature of the research project and asked their cooperation in providing the names of the key informant within each purchasing organization. Shortly after these letters were mailed, the salespeople were contacted by telephone to ask for the name of the key informant. A concern here was that the sales representative might not be willing to provide the names in order to preserve the confidentiality of the client relationship. This concern proved to be unfounded. In the few cases where a salesperson did hesitate in providing the name of the key contact, it was explained that this was purely an academic study, and that no proprietary would be requested from the customers or given to Toledo Scale for evaluation. There were a few cases where the salesperson did not wish the buying organization to be contact-
ed, due mainly to problems with installation, payment, or the like. These companies were dropped from the sample and no attempt was made to contact them.

The key contact was then sent a letter under signature of the Chairman of the Department of Marketing at The Ohio State University (appendix D). The letter explained the general nature of the project and asked for the individual's cooperation in the study. In most cases the individual was contacted within five working days after the letter was mailed to ascertain three things:

1. to verify that they did participate in the purchase decision,

2. to ask their cooperation in the study, and

3. to provide the names of other individuals in the organization that participated in the purchase decision.

It was originally hoped that the telephone interviewing would be conducted by Ohio State University women who had been selected and trained by the researcher. These women did complete a few calls; however, they did not complete anywhere near the amount expected, and the ones they did complete were usually done in
an unsatisfactory manner (a source of great consterna-
tion to the researcher). Therefore, the vast majority of
calls were completed by the researcher.

This method of collection closely parallels that
done by Moriarity (1983). However, one of the major
problems that Moriarity had was in identifying an eli-
gible organization (due to his use of a random sampling
approach). In his study 76.9% of the companies that
were contacted were not eligible to participate in his
study. In this study, by having Toledo Scale supply
the name of the company and the sales representative
supplying the name of the key informant, the problem of
finding an eligible company was virtually eliminated.

3.7.1 Multistage Snowballing

Multistage snowballing has shown to be an effective
tool in determining participants in an industrial pur-
chase decision (Gronhauq 1975, Spekman and Stern 1979,
Moriarity 1983). For example, Moriarity found that
single stage snowballing increased the number of deci-
sion participants by 238% over the number obtained by
asking the key informant, and multiple stage snowball-
ing increased the number of participants by 91% over
single stage, with the average size of the decision making unit being increased from 3.5 to 6.5.

Multistage snowballing was chosen for this study over exhaustive snowballing because the cost of exhaustive snowballing is often not worth the incremental amount of respondents contacted (Moriarity, 1983). In this study, once the key informant had judged to be qualified to be included in the sample, a multistage snowballing effort was undertaken to attempt to obtain the names of others in the organization who had had some type of purposive involvement in the purchase decision. It was initially difficult to get the respondents to give the names of others involved in the process. Merely to ask, "What are the names and titles of others involved in the process?" caused some respondents to balk at the prospect of mentioning others in the organization. This problem was alleviated by using the statement, "Now, I would also like to send a questionnaire to anyone else at (name of company) who you might have had contact with or who otherwise might have been involved in the purchase decision. Is there anyone there that I should send a questionnaire to?" Phrasing the question in this way elicited a much more
favorable response from the key informant -- they were then much more willing to provide the names of others in the organization who had participated.

If the informant hesitated in giving the names of any other respondents, s/he was prompted by asking such questions as, "Was anyone in the (purchasing, engineering, etc.) department involved?" Also, "How about your boss or anyone who would actually use the scale?". When the respondents did give a name, they were also asked for that individual's title. These individuals were then contacted and the same questions asked. In the vast majority of cases, there were no new names obtained from the secondary respondents. If a new name was obtained, the individual was contacted and questioned in the same manner.

Morarity (1983) made four attempts to contact each individual. However, because it was deemed crucial to get in touch with the key informant, it was determined to use as many calls as necessary to get ahold of this individual. This was usually accomplished by the third call; however, in several cases it took more than that (the maximum number was 18). Four calls were then used to reach the secondary respondent.
Once the individual was contacted and agreed to participate in the study, s/he was then sent a questionnaire. Each questionnaire was individually prepared to include the names and titles of anyone else in the company who had been mentioned by someone in that company as having participated in the purchase decision. The individual was also sent a short cover letter (appendix E) as well as a postage-paid response envelope. The return envelope was yellow because the pretest determined that this color would be more likely to remind the respondent to send back the questionnaire when it was sitting on his desk. The cover letter was personally addressed, as was the envelope. The envelope had 'PERSONAL' typed on the outside, and was mailed with a stamp rather than using a postage meter. If the individual was not contacted by telephone, the process was the same, except they were sent a different cover letter which explained the purpose of the study and asked their cooperation in it (appendix F). All letters and envelopes were of high-quality bond-type paper and were printed on the letterhead of The Ohio State University Department of Marketing.
The individual was given 21 days to respond to the first questionnaire. If they did not respond in that time, they were sent a second questionnaire with a reminder cover letter (appendix G). If the questionnaire was still not received in another 21 days, the individual then received a telephone call asking them to please return the questionnaire. One attempt was made to contact each individual. If the desired person was not contacted, a message was left with the person who answered the phone.

3.8 RESPONSE RATE

Of the 129 eligible companies, 12 either did not wish to participate or were asked not to be contacted by the sales representative. The remaining 117 companies identified a total of 273 respondents, for an average participation of 2.33 individuals. The number of participants per company ranged from one to seven. All of the 273 were mailed a questionnaire and received the follow-up procedure where necessary. Of the 273 mailed out, 274 were returned for an overall response rate of 78.3%. Of these 274, 14 were unusable and 11 arrived too late to be included in the keypunching, making for
189 useable responses (69.2%). Eighteen of these were single respondent companies and were dropped from the analysis; this left a total of 171 respondents (62.6%) representing a total of 77 purchase situations (an average of 2.2 respondents per purchase situation).

Each respondent made at least two observations of participation; one of his own and one for each individual in his company that was also mentioned as participating. For example, if a total of three individuals in a company were mentioned as participating in the purchase process, each respondent would have a potential of 4 observations of participation: one of his own and one for each of the other three participants. These numbers indicate that each respondent evaluated the participation of a total of 2.03 other in the process. This number being lower in magnitude reflects the fact that some of the respondents did not evaluate the participation of each person in their company who participated. How these data were analyzed will be the subject of the next chapter.
Chapter IV

ANALYSIS OF THE DATA

4.1 CHAPTER OVERVIEW

This chapter will provide an overview of the data analysis procedure that was used in the research project. First will be reported some overall descriptive statistics of the sample. Next will come an explanation of the participation scores chosen, and how the weighted relative participation scores for each functional role were determined. A t-test between self evaluation scores and evaluation scores by others will then be undertaken, followed by a brief overview of the assessment of fit procedure in structural equation modeling.

A confirmatory factor analysis was done on the measured variables to increase the construct validity for the latent constructs. This analysis resulted in a revised version of the marketing submodel. This revised version was then used as the basis for the testing of the full model with the weighted relative par-
ticipation score of each of the four functional roles used as the dependent variable. The results of the tests for these four models will conclude the chapter.

4.2 DESCRIPTIVE STATISTICS OF THE SAMPLE

The data was collected from May to October, 1984. Two hundred and seventy-three questionnaires were sent out, of which 171 were considered useable for this research (a response rate of 62.6%). Of these 171 respondents, 58% considered themselves to be in a headquarters operation, while 42% did not.

In regards to the level of expenditure allowed without authorization from corporate headquarters, the following results were reported:

<table>
<thead>
<tr>
<th>Payment Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not apply</td>
<td>18.7%</td>
</tr>
<tr>
<td>Under $10,000</td>
<td>17.5%</td>
</tr>
<tr>
<td>$10,000-$19,999</td>
<td>4.0%</td>
</tr>
<tr>
<td>$20,000-$29,999</td>
<td>1.1%</td>
</tr>
<tr>
<td>$30,000-$39,999</td>
<td>1.1%</td>
</tr>
<tr>
<td>$40,000-$49,999</td>
<td>1.7%</td>
</tr>
<tr>
<td>Over $50,000</td>
<td>14.6%</td>
</tr>
<tr>
<td>No report</td>
<td>40.1%</td>
</tr>
</tbody>
</table>

Regarding the major reason for purchasing the scale, 61.74% reported the major reason to be control on incoming and outgoing shipments, 17.6% saw it as a replacement for an existing scale, 3.5% bought the truck scale to satisfy government regulation, 1.8% did so in
response to a directive from corporate headquarters, and 15.2% cited other reasons. In an individual indicated that the scale was purchased for "other reasons", a space was provided on the questionnaire for them to state what those reasons were. The major reason listed here was that the purchase was part of a larger construction project.

The mean number of vendors considered was 2.86—not surprising given the nature of the vehicle scale industry. Frost and Sullivan, a national management consulting firm, estimates that the top three producers of vehicle scales (Fairbanks, Toledo, and Cardinal) account for almost 80% of the sales in static truck scales (static refers to the trucks being weighed while not moving). The technology of the modern-day truck scale has progressed from the weight being determined by a mechanical lever to the more sophisticated strain gauge load cells and their associated instrumentation. Virtually every truck scale purchased today has these features, and these three top firms have pioneered this technology. Very little tangible product differentiation exists in the minds of the truck scale purchaser. Thus, the sale of the scale often comes down to the
perceived product and service quality and the availability of the product (Frost and Sullivan 1982).

The importance of product quality and service capability is borne out by the evaluative criteria that the respondents of the study indicated is important to them in their purchase of a truck scale. The respondents provided the following answers in response to the question, "Please give us your opinion of how important each of the following factors is to you in your purchase of a truck scale". The factors are listed in order of the highest to lowest overall mean (n=171, 5 is the highest value on the scale).

1. Overall quality of service 4.518
2. Vendors reputation for quality 4.497
3. Competence of service technician 4.400
4. Ease of scale maintenance 4.380
5. Construction costs 4.238
6. Product Warranty 4.224
7. Installation time 4.065
8. Delivery (lead time) 4.053
9. Vendor's financial stability 3.988
10. Salesperson competence 3.922
11. Options available 3.880
12. Compatability with facility 3.810
13. "Turnkey" installation available 3.617
14. Computer interface ability 3.608
15. Recommendation of other purchasers 3.593
16. Offering a broad product line 3.356
17. Willingness to negotiate price 3.500
18. Scales are lowest price 3.343

These findings are similar to those found in several other studies (e.g. Webster 1978, Parasuraman 1981), and again point to the importance of product quality, service capability, and product availability are important factors to the industrial purchaser, and that having the lowest price is considered the least important factor.

For purposes of this study, company size was determined to be the number of employees at all locations of the company. All locations were considered because larger firms have a tendency towards more centralized purchasing. This centralization could affect the participation of individuals at locations other than the corporate office. Number of employees was also chosen over such other size indicators as annual sales or total assets because the pretest indicated that most respondents would know the number of employees the firm
had, but probably would not know the sales or assets
figures. The breakdown in company size was as follows:

<table>
<thead>
<tr>
<th>Size</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 25</td>
<td>4.0%</td>
</tr>
<tr>
<td>25-99</td>
<td>20.4%</td>
</tr>
<tr>
<td>100-250</td>
<td>10.5%</td>
</tr>
<tr>
<td>over 250</td>
<td>64.9%</td>
</tr>
</tbody>
</table>

In purchaser dealings with salespeople, 55.4% stated
that the majority of their dealings were with a dis-
tributor representative, and 43.3% stated that they
were with a Toledo Scale company representative.

Regarding the functional roles of the respondents,
after collapsing them into four categories, the respon-
dents broke down this way:

<table>
<thead>
<tr>
<th>Functional Role</th>
<th>Number of Respondents</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>Management</td>
<td>34</td>
<td>94</td>
</tr>
<tr>
<td>Engineering</td>
<td>55</td>
<td>115</td>
</tr>
<tr>
<td>Operations</td>
<td>47</td>
<td>69</td>
</tr>
</tbody>
</table>

4.3 Determination of Weighted Relative Participation Scores

4.3.1 T-Test between self and others participation scores

A common finding throughout the organizational buy-
ing behavior literature is that individuals in the de-
cision making unit tend to rate their own participation and influence higher than others rate them. Because it was desired to use both self and other ratings in this research, and to combine them into the same category, the task was two-fold. First, it was necessary to determine if there was indeed a significant difference between self and other observations, and if a significant difference did exist, to make an adjustment to bring the higher scores to the same level as the lower scores.

Individuals gave self and other ratings of participation at six different stages of the decision process, plus an overall rating. The six stages were determined as a result of the previously mentioned session at Toledo Scale with the director of marketing research and the product managers, plus the results obtained in the pretests. It was decided to use only the overall participation score for two reasons. First, the proper method to combine the scores for the six stages could not be determined. A decision could not be made to simply sum the scores, or, if one or more stages were shown to be more important to the overall process, if the scores of these stages should be weighted be a cer-
tain factor. The pretest showed that the respondents became confused when asked to rate the importance of a particular stage to the success of the overall decision. Comments such as "... No one stage is most important -- it's the overall result that's important..." were common. Secondly, if a value was missing for one stage, the risk of the entire case being deleted was present. Thus, it was decided to use the overall participation score. The results of the t-test are as follows:
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>x</th>
<th>T-Statistic</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PURCHASING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self evaluations</td>
<td>31</td>
<td>3.65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other evaluations</td>
<td>55</td>
<td>2.93</td>
<td>3.05</td>
<td>84</td>
<td>p &gt; .005</td>
</tr>
<tr>
<td><strong>MANAGEMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self evaluations</td>
<td>33</td>
<td>3.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other evaluations</td>
<td>62</td>
<td>3.37</td>
<td>2.32</td>
<td>94</td>
<td>p &gt; .01</td>
</tr>
<tr>
<td><strong>ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self evaluations</td>
<td>51</td>
<td>3.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other evaluations</td>
<td>74</td>
<td>3.32</td>
<td>2.15</td>
<td>123</td>
<td>p &gt; .025</td>
</tr>
<tr>
<td><strong>OPERATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self evaluations</td>
<td>38</td>
<td>3.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other evaluations</td>
<td>45</td>
<td>3.02</td>
<td>.905</td>
<td>88</td>
<td>NS</td>
</tr>
</tbody>
</table>
As can be seen, significant differences exist in the purchasing, management, and engineering functions. Thus, the self scores in these areas need to be adjusted to bring them in line with the other scores.

To make this adjustment, a reduction factor was applied to the self scores for purchasing, management, and engineering. This factor was a simple ratio of the other scores to the self scores. For the three affected areas, the factors were as follows:

\[
\begin{array}{lcl}
\text{Purchasing} & 2.93/3.65 = .80 \\
\text{Management} & 3.37/3.90 = .86 \\
\text{Engineering} & 3.32/3.71 = .89 \\
\end{array}
\]

Each of the self evaluation scores in the three affected areas was multiplied by its respective factor to reduce it to a level comparable with the mean of the other evaluation scores. It is interesting that the largest difference between self and other scores was in purchasing, with the smallest in engineering. Many of the key informants given by the sales representatives were in purchasing; yet, when these individuals were contacted, they often referred the researcher to another person (normally engineering) to gain the desired information. This reflects a clear division of responsibilities in the industrial decision making unit and a
difference in perception of how those responsibilities affects the perception of participation. For most of the purchase situations, the purchasing agent acted as a gatekeeper, controlling the flow of information to others. This is evidenced by the salesman regarding the purchasing agent as the key contact. Yet, in the majority of cases the purchasing agent did not often have a clear picture of who else besides the engineer was involved in the process. Purchasing was responsible for sending out requests for proposals, and then processing the paperwork after the decision was made, having virtually no participation in the actual decision to purchase the product. Yet, they considered these clerical tasks as purposive participation in the process. Others, however, did not concur. The purchasing agent considered his processing of paperwork as having formal or informal communication in the purchase process, while the other three roles apparently did share the same viewpoint. This provides an interesting contrast in perceptions which provides a basis for future research.
4.3.2 Determination of the Relative Participation Scores

After the reduction factor was applied to the self scores, the result was a participation score for each respondent. The respondents were grouped by company, and the scores for each of the four functional areas were summed to get a total score for that area. These four area scores were then summed to get a total company score. Relative scores were determined by taking each functional area's total score as a proportion of the total company score. These relative scores were then multiplied by a factor which was the reciprocal of the number of total company participants. For example, if there were three participants, each relative score was multiplied by 1/3; if there were four, the scores were multiplied by 1/4, and so forth. This was done to preserve the equality of each observation discussed in the previous chapter. Table 4-2 gives an example of how these relative participation scores were determined.
TABLE 4-2

RELATIVE PARTICIPATION EXAMPLE

COMPANY - #18
TOTAL PARTICIPANTS - 4
TOTAL PARTICIPATION = 98.59

<table>
<thead>
<tr>
<th></th>
<th>SCORE</th>
<th>% OF TOTAL</th>
<th>WEIGHTED RELATIVE SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PURCHASING</td>
<td>8.15</td>
<td>8.2</td>
<td>.0205</td>
</tr>
<tr>
<td>MANAGEMENT</td>
<td>44.02</td>
<td>44.6</td>
<td>.220</td>
</tr>
<tr>
<td>ENGINEERING</td>
<td>21.74</td>
<td>22.0</td>
<td>.055</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>24.63</td>
<td>24.9</td>
<td>.062</td>
</tr>
</tbody>
</table>
4.4 **Assessment of Fit in Structural Equation Modeling**

In assessing the fit of a structural equations model, two types of criteria are used. One concerns the fit of the overall model, or overall measures. The second concerns the fit of individual components of the model, or detailed measures. Both of these will be discussed briefly.

4.4.1 **Overall Measures of Fit**

Overall measures assess the fit of the entire model. The best known of these measures is the chi square goodness of fit test. This statistic tests the null hypothesis that a given model provides an acceptable fit of the data. It compares the observed covariance (or correlation) matrix S with the covariance (or correlation) matrix sigma that is estimated by the model. Sigma will not be a perfect reproduction of S due to the fact that the values sigma can assume are limited by the constraints placed on certain parameters of the model (starting values of 1, fixing parameters at 0, etc.). The chi square goodness of fit test compares this fit to the alternative hypothesis that sigma is any covariance matrix. The larger the difference, the
larger the chi square. The objective, therefore, is to obtain a non-significant chi square at the .05 level or higher. The degrees of freedom are determined by the difference of the number of independent parameters under the null hypothesis from the number of independent parameters under the alternative hypothesis.

It should be emphasized at this point that chi square is not the definitive statistic for overall fit of a model. A non-significant chi square only means that the model is a plausible representation of the data. This statistic is highly sensitive to sample size. As sample size increases, the statistical power increases as well. Also, the null will never be exactly true due to the constraints imposed. Therefore, the null will always be a little bit false, and a large sample size may actually lead to a rejection of the model. However, too small a sample can lead to statistically invalid results. As mentioned in the previous chapter, most researchers suggest a sample size such that N minus the degrees of freedom is greater than 50, while others state that a sample size of less than 200 should not be considered (Bearden, Sharma, and Teel 1982).
A second problem with this statistic is that it is sensitive to departures of multivariate normality of the observed variables. Joreskog and Sorbom (1982) point out that the chi square is a valid statistic only if:

1. all observed variables have a multivariate normal distribution,

2. the analysis is based on a sample covariance matrix, with standardization not permitted, and

3. the sample size is fairly large.

Instead, the chi square should only be regarded as a measure of the goodness or badness of fit, with smaller chi square values indicating a better fit.

Another measure of the overall goodness of fit is the rho test, suggested by Bentler and Bonnett (1980). This is a descriptive measure that is a ratio of the chi square to the degrees of freedom in a 'worst case' scenario, where there are no relationships in the model. \( Q_0 \) is obtained by taking the chi square divided by the degrees of freedom for the null model. \( Q_1 \) is obtained by taking the chi square divided by the degrees of freedom for the model being tested. The rho statistic is \( Q_0 - Q_1/Q_0 - 1 \), with the 1 in the denominator representing the 'perfect' case where the observed matrix is ex-
actly reproduced by the model. A rho statistic of .95 or higher indicates a good overall measure of the fit.

Another descriptive measure is the goodness of fit index (GFI), which is given as part of the computer output of LISREL. This measure is very similar to a ratio of the sums of squares. The actual statistic is computed by dividing the sums of squares accounted for by the model by the total sums of squares. This will yield a number between 0 and 1 -- the closer to 1, the better the fit.

The adjusted goodness of fit index (AGFI) is also part of the computer output and is computed by dividing the mean square error by the total sums of squares. As with the goodness of fit, the more the value is closer to 1, the better the fit.

The root mean residual (RMR) is a measure of the average of the residuals, and is also part of the computer output. Given the use of a correlation matrix, a RMR of .05 or less is considered an acceptable fit.

Unlike the chi square, the GFI and AGFI are independent of sample size and are relatively robust against departures from normality. However, their statistical distributions are not known, so there is no standard to compare them with (Joreskog & Sorbom 1982).
4.4.2 Detailed measures of fit

Detailed measures of fit consider the impact of individual parameters on the model. These detailed measures include the t-values, the squared multiple correlations (SMC), and the coefficient of determination for the individual parameters.

The t-test for an individual parameter is part of the computer output and is a test of the null hypothesis that the parameter is equal to zero. The t-value is computed by the parameter estimate divided by the standard error. If an absolute value greater than 2 is achieved, this is considered a rejection of the null. Small t-values mean that error accounts for a larger portion of the variance, and large t-values mean that error accounts for a smaller portion of the variance.

The SMC gives the strength of the relationship for the various components of the model. For each measurement variable, the SMC is a proportion of the variance accounted for by the latent variable. For each structural equation, the SMC is the proportion of variance in each dependent variable that is accounted for by other latent variables in the equation. The coefficient of determination measures the overall strength in
the relationship in various parts of the model. If this value is high, it indicates that the overall model is good in that there is a strong overall relationship among the components. The ksi estimates are in essence the SMC of the latent construct, being the proportion of variance that is accounted for by the construct.

4.5 **Confirmatory Factor Analysis**

Because the model is an explanatory one, an attempt must first be made to determine the construct validity of the latent variables before an explanation as to the plausibility of the model can be made. Rather than attempting to assess the validity of the entire model, a confirmatory factor analysis for the measured variables of the latent constructs of novelty, complexity, and importance as well as for the sales effort variables in the marketing submodel was undertaken. This was carried out to determine to the greatest extent possible the reliability of each latent construct and the reliability of each individual parameter.

Because the ITA of novelty, complexity, and importance were not hypothesized to be related to the sales effort variables, two separate confirmatory analyses
were run using measured variables for each of the latent constructs. An initial confirmatory analysis was done with all the measured variables, forcing each variable to load on its hypothesized latent factor. Modifications were then made using both the overall and detailed measures of fit described earlier. The initial model and each modification of that model will be briefly described here, with the reporting of the overall and detailed measures of fit found in appendix H.

For this analysis, a correlation matrix was generated using the total of 171 observations. The matrix was 32 by 32 and correlated all the measured variables with each other. The applicable variables were then selected out for each analysis. This entire correlation matrix is found in appendix K.

4.5.1 Novelty, Complexity, and Importance Constructs

The measured variables for novelty, complexity, and importance are identified by having an N, C, or I and a number assigned to them. For example, N1 is the first indicator for novelty, C4 is the fourth indicator for complexity, and so forth. The measured variables for each of the constructs are as follows:
1. N1 -- Before this purchase, some people in the organization had experience in purchasing truck scales.

2. N2 -- We have made other capital equipment purchases in the last five years.

3. N3 -- We did not have much information from past purchases when we were defining the product specifications for the truck scale.

4. N4 -- Few people in the organization had much technical knowledge about truck scales before we purchased this one.

5. N5 -- The truck scale purchase was unlike any previous capital equipment expenditure that we have made.

6. C1 -- Because of the complex nature of the truck scale, we had to involve more people than we usually do for capital equipment purchases.

7. C2 -- The scale operator required special training in order to use the truck scale properly.

8. C3 -- The purchase of a truck scale required a change in our office procedures.

9. C4 -- We had to gather more information before purchasing this truck scale than we usually do for capital equipment purchases.

10. I1 -- The purchase of this truck scale represented a major financial commitment for a firm with our sales volume.

11. I2 -- The purchase was necessary to better monitor the weight of inbound and outbound shipments.

12. I3 -- The purchase of the scale was necessary to ensure compliance with road weight regulations.

13. I4 -- We anticipated that this purchase would make a significant improvement in our operations.
14. I5 -- The purchase was important to our overall company profitability.

4.5.2 Initial Model

The initial model had 14 indicators -- 5 for novelty, 4 for complexity, and 5 for importance. Not surprisingly, this model had a non-significant chi square (134.27 with 74 DF), a GFI of .904, an AGFI of .864, a RMR of .083 and a coefficient of determination for the X variables of .972. Examining the t-values and SMC, it was decided to drop out N2 and I2. This was based on low SMC's (.008 & .275 respectively) and low t-values (1.11 & 1.03). Because the addition or subtraction of a measured variable can affect the other measured variables in that construct, only one indicator per construct was dropped per modification.

4.5.3 First Modification

The model now has 12 indicators -- 4 for each construct. The overall fit improved marginally -- chi square (CS) of 111.21 with 51 degrees of freedom (DF), GFI of .907, AGFI of .857, a RMR of .088, and a coefficient of determination for the X variables of .972. Upon examining the detailed measures, it was decided to
drop I1 (SMC=.116) and C2 (SMC=.340). From this point forward it became necessary to rely on the estimates of SMC, as many of the t-values were significant.

In this and subsequent modifications, measured variables were eliminated mainly on the basis of statistical conclusions. However, if will shortly be seen that there are theoretical reasons for dropping these variables as well.

4.5.4 **Second Modification**

The model now has 10 indicators -- 4 for novelty, 3 for complexity, and 3 for importance. Dropping out I1 and C2 improved the overall fit considerably. The CS was 66.6 with 32 DF (p=.002), the GFI was .933, the AGFI was .884, and the RMR was .064. Because this represented such an improvement in fit, more detailed measures were considered from here on out; specifically, the ksi estimates and the coefficient of determination. The coefficient of determination has been explained earlier; the ksi estimates are the proportion of variance that is explained by the particular construct. For this model, ksi 1 was .392, ksi 2 was .613, and ksi 3 was .070. The coefficient of determi-
nation for the X variables was .979. At this stage, it was decided to drop I3 (SMC=.070).

4.5.5 Third Modification

After dropping I3, the model has 9 indicators -- 4 for novelty, 3 for complexity, and 2 for importance. This model resulted in non-convergence, meaning that the model is either misspecified or that the model is inconsistent with the data. The specification was correct; therefore the problem lies in the data.

It was at this point in the analysis that a pattern began to develop in the complexity and importance constructs. It appears that the data are indicating that these constructs may have more than one dimension; thus, some indicators are loading more highly on the dimension that is represented by that particular construct in the model. Recall that complexity was operationalized as complexity in evaluating product alternatives and the perceived increase in the complexity of company operations. It appears that these may be two distinct constructs, possibly the result of a second order construct having a causal effect on the first order constructs. The same appears to hold true for the
importance construct. Importance was operationalized as perceived importance of the purchase on company operations and perceived financial impact upon the company. These also appear to be the two distinct constructs, which also could be the result of a second order factor.

These suppositions begin to make theoretical sense when we examine the indicators initially hypothesized to load on each construct and the ones that have been dropped from the analysis so far. For complexity in evaluating product alternatives, indicators C1 and C4 would be measured variables of this construct. For complexity in operations, variables C2 and C3 would be indicators. Modifications to this point have dropped C2, and the SMC for C3 is low (.346), indicating that error is accounting for more of the variance in the indicator than the construct is. It therefore appears that the measured variables indicating the complexity in evaluating product alternatives have higher loadings on this construct. This would in turn indicate that this operationalization fits the model better. Since the overall purpose of this stage of the analysis is to attempt to determine the validity the measures, the
complexity construct will be reoperationalized to be complexity of evaluating product alternatives.

The same pattern appears to be emerging in the importance construct. Importance was originally operationalized as the perceived importance on company operations and the perceived financial impact on the financial standing of the firm. Variables I1 and I5 would be indicators of the financial impact, while I2, I3, and I4 would be indicators of the operational importance. The first modification dropped out I1, and in the second model I5 has a marginal SMC (.510). It therefore appears that the perceived importance to company operations fits the model better than the perceived impact of financial operations. Thus this construct will be reoperationalized to the importance to organizational operations. Any further modifications will proceed with the attempt to keep the indicators of both of these constructs. Reasons behind why these constructs emerged will be explored in the next chapter.
4.5.6 Fourth Modification

The model now has 9 indicators. N1, N3, N4, and N5 load on novelty, C1, C3, and C4 now load on complexity, and I3 and I4 load on importance. The overall fit did improve. The CS was 44.51 with 24 DF (p=.007), the GFI was .945, the AGFI was .896, and the RMR was .056. The coefficient of the K variables was .963. However, the estimates of the ksi variables remain largely unchanged. Ksi 1 was .390 compared with .392 in the previous model; ksi 2 was .622 compared with .613 previously; and ksi 3 was .058, compared with a value of .070 previously. Based on these results and the new operationalizations of the constructs, it was decided to drop N1 (SMC=.390), C3 (SMC=.344) and I3 (SMC=.048).

Dropping I3 now makes I4 a perfect indicator of the importance of organizational operations construct. Even though I3 (ensuring compliance with road weight regulations) was originally hypothesized to load on this construct, the low SMC indicated that a large portion of this variance was due to error. In all likelihood this is due to the difference in perceptions between the functional roles. Operations and management may consider compliance with road weight regulations
important where engineering and purchasing may not. Because all of the respondents are grouped together for this analysis, it appears that any positive covariance between this construct and this indicator is offset by some negative covariance or even lack of covariance. This points to an interesting methodological question: should all functional roles be considered as one group, or should the group be divided into the four roles and separate analysis be done on each group? This is an interesting question which will be more fully explored in chapter 5.

With I4 now the perfect indicator, it means that no further statistical tests can be done on the importance to company operations construct, and that all the variance will be accounted for by a single variable in the latent construct. Given the global nature of I4 ("we anticipated that this purchase would make a significant improvement in our operations"), this appears to be a statement that all functional can understand and relate to. The same is not true for ensuring compliance with road weight regulations; this may not be important at all to some of the functional roles. This points to the fact that different functional areas may have dif-
ferent operationalizations of novelty, complexity, and importance, a point that will be expanded on in the next chapter. C3 was dropped because of its low SMC and due to the fact that it is an indicator of complexity in operations than complexity in the purchase decision. N1 was dropped because even though it appears to be a direct indicator of the construct, its loading did not indicate that it was, and it may have run into the same perceptual differences in functional roles that I3 did.

4.5.7 Fifth Modification

The model now has six indicators. N3, N4, and N5 load on novelty, C1 and C4 now load on complexity, and I4 is a perfect indicator of importance. The overall fit did improve. The CS was 25.58 with 7 DF (p=.001), the GFI was .954, the AGFI was .861, and the RMR was .056. The most dramatic improvement was in the ksi variables; ksi 1 is .797, ksi 2 is .718, with ksi 3 being 1.0 due to the perfect indicator. By allowing only the indicators of the new operationalizations to load on these three factors has improved the ksi values greatly. This would indicate that there indeed does
appear to be more than one dimension to these constructs, and that the indicators chosen are good indicators for the new operationalizations.

Until this point, modifications had been made based solely on the SMC and t-values. However, another method for assessing measures of fit is the modification index given by the program. This index gives the minimum reduction in CS that will result by freeing one parameter. The program will list these modification indices, and print the one with the highest value. A caution here is capitalization on chance associations; if indeed the parameter is to be relaxed, it must make substantive and theoretical sense to do so.

For this model, the program indicated that the maximum modification index would be allowing N5 ("The truck scale purchase was unlike any previous capital equipment expenditure that we have made") to load on the complexity construct. Remembering that the complexity construct now represents complexity in the purchase decision, it would indeed appear that this indicator could load on both the novelty and complexity constructs. Therefore, it was decided to free that parameter and allow N5 to be an indicator of both novelty
and complexity (The modification index was 9.79. Because freeing a parameter loses one degree of freedom to the model, the index must be greater than 3.84 (CS with 1 DF) to make a significant contribution to the model).

4.5.8 Sixth Modification

The model still has six variables, but W5 is now an indicator of both novelty and complexity. The overall fit improved to a CS of 15.58 with 6 DF (p=.014), the GFI was .970, the AGFI was .894 and the RMR was .033. KSI 1 improved to .850, KSI 2 decreased slightly to .663, and KSI 3 remained at 1.00 (with a t-value of 9.22). Even though the estimate of KSI 2 decreased slightly, the overall fit did improve to the point that it was decided to allow W5 to be the dual indicator.

At this point, it was determined that no further modifications could be justified theoretically. The model has a reasonably good overall fit (the chi-square is affected by the sample size), and the modification index does not indicate a substantive change. (The maximum modification index was 4.29 for allowing W4 to load on complexity, which does not make substan-
tive sense). It was therefore decided to conclude the confirmatory analysis at this point for the ITA. Table 4-3 reiterates the modifications made and the measures of fit obtained.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>NS Dur</th>
<th>C3, I3</th>
<th>drop NT</th>
<th>replace I3</th>
<th>drop I5</th>
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<tbody>
<tr>
<td>15.58</td>
<td>6.014</td>
<td>0.14</td>
<td>970</td>
<td>0.84</td>
<td>0.033</td>
</tr>
<tr>
<td>1.000</td>
<td>9.77</td>
<td>0.061</td>
<td>9.69</td>
<td>0.956</td>
<td>0.063</td>
</tr>
<tr>
<td>2.792</td>
<td>0.622</td>
<td>0.058</td>
<td>3.90</td>
<td>0.945</td>
<td>0.007</td>
</tr>
<tr>
<td>4.451</td>
<td>0.24</td>
<td>1.24</td>
<td>4.007</td>
<td>0.945</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Non-convergent model

<table>
<thead>
<tr>
<th>drop</th>
<th>11.51</th>
<th>6.02</th>
<th>9.27</th>
<th>0.88</th>
<th>0.000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.070</td>
<td>6.13</td>
<td>0.392</td>
<td>0.879</td>
<td>0.979</td>
<td>0.000</td>
</tr>
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MODIFICATION OF CPA FOR NOVELTY, COMPLEXITY, IMPORTANCE

TABLE 4-3
4.6 **CONFIRMATORY ANALYSIS OF SALES EFFORT ATTRIBUTES**

A confirmatory factor analysis was then undertaken for the latent constructs of the Toledo Scale representative and competitive representative sales efforts. Each construct had nine indicators, and except for relating the question to either Toledo Scale or the competition, the questions were exactly the same. The indicators were labeled T1 through T9 for the Toledo Sales effort, and from OTH1 to OTH9 for the competitive sales effort. The indicators were as follows:

1. **T1, OTH1** — Sales literature and technical information was readily available when we wanted it.

2. **T2, OTH2** — The quotes were complete and easy to understand.

3. **T3, OTH3** — The quotes were on time.

4. **T4, OTH4** — The representative talked to all the key people who had an input into the purchase decision.

5. **T5, OTH5** — The representative helped in writing the product specifications.

6. **T6, OTH6** — The representative worked harder for the sale than did the representatives from the competing firms.

7. **T7, OTH7** — The representative was readily accessible.

8. **T8, OTH8** — The representative was technically competent.
9. T9, OTH9 -- We considered (company) because their product represented a better value than the competition.

4.6.1 Initial Model

The initial model with the sales effort construct had nine indicators for each latent variable. As with the novelty, complexity, and importance analysis, a general description will be presented here, with a more detailed description of the results found in appendix I. Not surprisingly, the initial model had very poor overall measures of fit. The CS was 666.44 with 134 DF (p=.000), the GFI was .685, the AGFI was .598, and the RMR was .144. KSI 1 (Toledo Scale) was .375 and KSI 2 was .607. The covariance between the two constructs was .059.

Upon examining the detailed measures of fit for each parameter, it was decided to drop T5 (SMC=.137) and OTH9 (SMC=.025).

4.6.2 First Modification

The model now has eight indicators for each construct. The overall measures were a CS of 525.26 with 103 DF (p=.000), GFI of .704, an AGFI of .609, and an RMR of
.142. The coefficient of determination for the X variables was .658. ksi 1 was .388 and ksi 2 was .609, with the covariance between them .069.

Looking at the detailed measures of fit, it was decided to drop T9 (SMC=.232) and OTH5 (SMC=.119). Notice that the corresponding indicators were dropped for in the previous model.

4.6.3 Second Modification

The model now has 7 indicators for each variable. The overall measures were a CS of 463.58 with 76 DF (p=.000), a GFI of .697, an AGFI of .581, and an RM of .151. ksi 1 was .409, ksi 2 was .613, and the covariance between them was .079. All of these indicate an increasingly better fit.

Looking at the detailed measures of fit, the lowest SMC's are for T6 (.200) and OTH6 (.193). This is a bit surprising, given that this variable is "the salesman worked harder for the sale", which should be a direct indicator of sales effort. A possible explanation for this is that the construct is multidimensional and should be broken down, or that sales effort is not the proper construct and that a construct with another op-
rationalization is actually the cause. At this stage, we will drop T6 and OTH6 and continue to examine the possibility of a second order construct or a different construct altogether.

4.6.4 Third Modification

The fit continued to improve in the third model, which had six indicators of each construct. Overall measures were a CS of 343.66 with 53 DF (p=.000), a GFI of .727, and AGFI of .599, and an RMR of .113. The coefficient of X variables was .839. ksi 1 was .499, ksi 2 was .635, and the covariance between the two was a value of .168.

In examining the detailed measures, the lowest SMC's were found in T4 (.280) and OTH4 (.347) — "the salesman talked to all the key people". As with the previous model, having low reliability of these estimates indicates that perhaps the construct should not be operationalized as sales effort. Further modifications should bear this out.
4.6.5 Fourth Modification

The fourth model has five indicators for each construct. The overall measures of fit were virtually unchanged from the previous model -- a CS of 239.0 with 34 DF (p=.000), a GFI of .731, and AGFI of .565 and a RMR of .132. However, the real difference is in the estimates of the ksi variables. Ksi 1 is .378, down from .499 in the previous model, and ksi 2 is .662, up only slightly from the previous model. Thus, taking out T4 and OTH4 appeared to have mixed effects on the model. The overall CS dropped, but the ksi value for the first construct was reduced.

Looking at the detailed measures, the lowest SMC's are in T2 (.231) and OTH2 (.486) -- "the quotes were easy to understand". The decision was made at this point to drop T2 and OTH2 from the model, and if the fit did not improve over this and the previous modification, to add T4 and OTH4 back in.

4.6.6 Fifth Modification

The model now has four indicators for each construct. The overall fit does improve over the previous models. The CS is 105.96 with 19 DF (p=.000), the GFI
is .859, the AGFI is .733, and the RMR is .101. The coefficient of \( x \) variables is .967 up from .943 in the previous model. These indicate a better overall fit than in the previous two models.

However, the same is not true of the estimates of the ksi parameters. Ksi 1 has a value of .310 and ksi 2 has a value of .586, down from the estimates in the previous two models. Looking at each of the four indicators, two of them have low SMC's -- indicator 1, "sales literature was technically available", and indicator 3, "the quotes were on time". Higher SMC's are noticed in the seventh indicator -- "the sales representative was readily accessible" and the eighth indicator -- "the sales representative was technically competent". Given these differences, it appears that the construct should now be changed from 'sales effort' to 'sales expertise' because the indicators with the higher loadings have more to do with perceived expertise than with effort. The next modification will drop T3 and O3, "the quotes were on time" and see if the overall and detailed estimates improve.
4.6.7 **Sixth Modification**

The sixth model now has three indicators for each construct. The overall fit improves to a CS of 26.38 with 8 DF (p=.001), the GFI is .954, the AGFI is .878, and the RMR is .053. The coefficient of determination for the X variables is .975, again indicating a stronger overall relationship.

However, the estimates for the individual parameters are not as high. ksi 1 drops to .285 and ksi 2 to .475, and the covariance between them drops to .071. At this point, there are two paths we could choose. We could drop T1 and OTH1 because of their low SMC's (.285 and .475) and rename the constructs 'sales expertise', or go back and make several more modifications. Given that the measured variables that should have been direct indicators of sales effort had very low SMC's, the latter path would not appear to be a very productive one. Thus, it was decided to drop T1 and OTH1 and see if the construct should indeed be sales expertise rather than sales effort.
4.6.8 **Seventh Modification**

The seventh model has two indicators per construct, and the fits improved dramatically. The CS was .03 with 1 DF (p=.873), the GFI was 1.000, the AGFI was .999, and the RMR was .002. The coefficient of determination for the $X$ variables was 1.000. In the detailed measures, ksi 1 jumped to .709, while ksi 2 dropped to .324. This is not surprising in that all of these were successful sales for Toledo; naturally the expertise of the Toledo sales representative would be high for the expertise of the competing sales representative would be lower.

A problem here is that an out-of-bounds estimate was obtained for OTH8. The normal method of dealing with this is to drop it from the model or fix its error variance at zero, neither of which is an acceptable solution. To drop it from the model would leave OTH7 as a perfect indicator of competitor sales expertise. However, to drop out that indicator would be to decrease an already low estimate for ksi 2. Because the construct is now named sales expertise, it is questionable whether or not the sales expertise of the firm that did not get the sale would contribute to the relative par-
ticipation of each of the four functional roles. It was therefore decided to drop the competitive effort altogether and only include the construct of Toledo Scale sales expertise in the overall model. Whether or not it improves the fit will remain to be seen. A reiteration of the modifications and the overall measures obtained are found in table 4-4.
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**Modification Taken**

**REITERATION OF CPA FOR SALES EFFORT**

**Table 4-a**
4.7 **STRUCTURAL EQUATIONS MODELS WITH THE FOUR FUNCTIONAL ROLES**

Based on the results of the confirmatory factor analysis, the final model in figure 3 was used as the basis for the testing of the functional role participation in the industrial decision making unit.
FIGURE 3
THE STRUCTURAL EQUATION MODEL TESTED
Notice that M5 is considered an indicator of both the novelty and complexity constructs, and the sales effort variable has been changed to Toledo sales expertise as a result of the confirmatory analysis. Testing of the models for each of the four functional roles will be reported separately, with an overall section of the results concluding the chapter.

For this stage of the analysis, a different correlation matrix was used. The one used for the confirmatory factor analysis had only the 171 observations, one for each individual. However, each individual made at least two observations: one of himself and one of each person in the decision making unit. As mentioned previously, the total number of observations of participation was 348. Of these, however, is one observation for each functional role that participated in that company's purchase decision.

4.7.1 The Purchasing Model

The first purchasing model was tested using the model in figure 3. The correlation matrix used for the model is found in table 4-5. This model proved to be
non convergent, indicating that the model is either misspecified or that the model does not fit the data. Since the model is specified correctly, the problem is obviously with the data fitting the model.
It is questionable whether Toledo sales expertise would impact on the participation of the purchasing agent. While sales expertise could conceivably influence the relative participation of purchasing, it must be remembered that the indicator "talked to all the key people in the decision" was dropped relatively early in the confirmatory analysis. The remaining indicators of being readily accessible and technically competent have more to do with the perception of the sales representative's ability than his influencing the relative participation of purchasing. It was therefore decided to drop Toledo sales expertise from the purchasing model.

After dropping the sales expertise from the overall model, a good overall fit was obtained. The CS was 10.11 with 10 DF (p=.431), a GFI of .960, an AGFI of .887 and an RMR of .053. The rho statistic (this model against a null model) was .997, also indicating a good fit. The estimate of novelty (ksi1) was .804, and the estimate of the complexity (ksi 2) was .424.

In the full model we also need to consider the gamma weights as they are part of the hypothesis stated in chapter 3 (the gamma weight is similar to a regression weight in that it is a measure of the association of
the change in the dependent variable from an increase or decrease in the independent variable). In the purchasing model, gamma 1 (novelty) was -.157, gamma 2 (complexity) was .052, and gamma 3 (importance) was -.103. The coefficient of determinations for structural equations was .026.

The gamma weight for novelty is in the opposite direction from what was hypothesized, indicating that the relative participation of purchasing decreases as novelty increases. H3 stated that the gamma weight would be highest for purchasing and would have a positive sign. This was not the case as table 4-9 shows. The reasons behind this and the results of the subsequent models will be explored more fully in the next chapter.

4.7.2 Operations Model

The initial operations model was tested using the model in figure 3. The correlation matrix in table 4-6 was used. As with the purchasing model, non-convergence was also achieved here. For the same reasons as in the purchasing model, the Toledo sales expertise was dropped.
As with the purchasing, the model without the sales expertise achieved convergence. However, the goodness-of-fit was not as high here as with the purchasing model. The CS was 21.73 with 10 DF (p = .017), with a GFI of .948 and an AGFI of .853. The RMR was .062, and the rho statistic was .749. Kσ1 was .761 (novelty) and Kσ2 was .397 (complexity). An interesting and non-expected finding here was the gamma weights of the operations model. Gamma 1 had a value .213, gamma 2 was .047, and gamma 3 was -.057. Comparing these weights with those for purchasing and engineering found in table 4-8 shows that operations had the highest weights in novelty and importance, with the second highest coefficient of determination for structural equations (.048). This was a rather unexpected finding, but makes sense when the overall purpose behind the purchase of a truck scale is examined. These reasons will be examined in the next chapter.
4.7.3 Engineering Model

The engineering model was tested using the same model in figure 2, while using the correlation matrix in table 4-7. As with the first two models, the initial engineering model did not converge. The sales expertise variable was also dropped out, which did achieve convergence. The CS was 20.08 with 10 DF (p=0.29), with a GFI of 0.951 and an AGFI of 0.863. The RMR was 0.066, with the rho statistic being 0.769. Gamma 1 is -0.135, gamma 2 is -0.286, and gamma 3 is -0.084. Ksi 1 is 0.790 and ksi 2 is 0.705. The coefficient of determination for the structural equations model is 0.113. This is the highest coefficient of determination and supports H1. However, engineering had the lowest gamma weight for the complexity construct. As with the other models, the reasons behind these findings will examined more fully in the next chapter.
4.7.4 Management Model

The management model started with the correlation matrix in table 4-8. Unlike the first three models, the management model did converge on the initial model. However, it did have an out-of-bounds estimate in the form of an SMC of T8 of greater than one. Ignoring this for the moment, the CS with 19 DF is 32.67 (p=.02), with a GFI of .931 and an AGFI of .836. The RMR was .075, and the rho statistic was .885. All of these indicate a reasonable measure of fit if the out-of-bounds estimate can be alleviated.

In an effort to get rid of this estimate T8 was dropped from the model. The resulting model did not converge. Dropping the sales expertise altogether from the model also resulted in non-convergence.

This points to an interesting finding that will be explored further in chapter 5. The fact that the management model came so close to fitting with the sales expertise variable included points to the fact that the relative participation of different functional roles is affected differently by the different latent constructs. What may also be the case is that these constructs may have different indicators, depending on the
functional role involved and perhaps even on the stage of the decision process. This indicates a direction for future research that will be explored more fully in the next chapter.
4.8 OVERALL FINDINGS

Table 4-9 provides the findings of the four structural equation models. The results are rather surprising: operations has the highest gamma weights in two of the three categories, and engineering has the lowest gamma weight in complexity; engineering also has the highest ksi values. One of the three hypotheses, H1, was supported. However, when the measurement issue of combining all the observations together for the confirmatory analysis is coupled with what appears to be differences of relative participation between the constructs, a more definitive explanation can be offered. The next chapter will commence with that explanation.
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**Comparison of the Three Structural Equations Models**

Table 4-9
Chapter V
DISCUSSION OF THE RESULTS

5.1 OVERVIEW

This chapter will first outline the results of the analysis discussed in the previous chapter, and then attempt an explanation of the observed results. Next will be a discussion of the methodology and its accomplishments. A discussion of some suggestions for future research will follow, along with an outline of some supplementary analysis (to be reported in the next chapter) that will put some of these suggestions to the test. The final section will draw some conclusions from the research.

5.2 DISCUSSION OF THE RESULTS

The Industrial Transaction Attributes of novelty, complexity, and importance did provide a plausible representation of the relative participation of the purchasing role, and a marginal representation of the engineering and operations roles. This in itself
represents a step forward in organizational buying behavior research. However, future research should concentrate on the attainment of more definitive operationalizations of these constructs across all types of organizational purchase situations.

The results were disappointing in that only one of the three proposed hypotheses was supported. H1 stated that engineering would have the highest coefficient of determination for the structural equations; and this hypothesis was supported. However, H2 (engineering will have higher gamma weights in complexity and importance than the other roles, and these weights will be positive) and H3 (purchasing will have the highest gamma weight in novelty, and it will be positive) were not supported. Only three of the four functional role models achieved convergence, and of these only the purchasing model achieved an acceptable fit.

The ksi estimates for novelty were above .5 for all three convergent models, meaning that the construct accounted for a larger portion of the variance than error did. However, only in the engineering model was the estimate for complexity over .5. Because of the perfect indicator, the ksi value for importance was 1.00;
yet in the modification in the confirmatory analysis before 13 was dropped the kσi value for importance was only .058, indicating that error accounted for a major portion of the variance. Overall, the indicators have good reliability for novelty, fair reliability for complexity, and poor reliability for importance.

These high values for novelty indicate that the perception of novelty is relatively consistent across the three functional roles, which makes intuitive sense. Novelty was operationalized as the amount of experience the organization had in a purchase of this type. This is a straightforward, unidimensional construct, which was able to achieve kσi estimates of .804 for purchasing, .761 for operations, and .890 for engineering. The unidimensionality accounts for the consistency of perceptions across these functional roles.

However, the same was not true for the complexity and importance measures. It became evident during the course of the analysis that these constructs are in fact multidimensional, probably influenced by a second order construct. The multidimensionality in turn leads to different perceptions of the constructs by different functional roles. These differences are a function of
such factors as job specialization, organizational structure, individual expertise — many of the factors mentioned in the original model.

These findings point to an obvious need for more reliable indicators of the complexity and importance constructs. A way to solve this problem could be done similar to that proposed by Burnkrant and Page (1982). In some initial exploratory research of the Fishbein model, a group of respondents was asked to give their opinions to 83 questions about the donation of blood. An item analysis was performed, and the 20 most discriminating questions were then employed as Likert scale items in the final research.

Ideally, the same scenario could have been followed in this research. A pretest could have been done on an initial set of questions in the novelty, complexity, and importance areas, with the most discriminating ones being kept for the final project.

Such an approach would be acceptable if specific items relating to specific constructs were set beforehand. It must be remembered that a confirmatory approach is what is desired. To follow the procedure as was done by Burnkrant and Page is exploratory in na-
ture, going against one of the fundamental principles of structural equation modeling. However, realistically such an approach was not possible. Even though the project was funded by Toledo Scale, to carry out such a pretest would have increased both the financial and time costs considerably. Secondly, just where the respondents would have come from would have posed a problem. In similar research Moriarity (1983) found an average of 6.5 individuals participated in a capital equipment purchase; Spekman and Stern (1979) found an average of 5.5. Given the 123 purchase situations chosen for study here, it was initially thought that at least 600 potential respondents would be identified. However, only 273 respondents were identified, and of these there were 171 useable responses (an average of 2.2 participants). To conduct a pretest of the type just described would have to be carried out using actual purchasers of the product to have the desired external validity, which would have cut severely into the final sample.
5.3 DISCUSSION OF THE METHODOLOGY

When compared with results of similar studies in the industrial sector, the methodology employed in this research was much more successful. Of the 213 questionnaires sent out, eventually 214 were returned for an overall response rate of 78.4%. This is in contrast to an average response rate of 20-30% in most industrial surveys.

The success achieved here has its foundation in three basic principles: personalization, prenotification, and perseverance. Personalization refers to knowing the correct person(s) in the buying firm to survey. This is accomplished initially by identifying the key informant, and then using a multistage snowball technique to reach the other individuals inside (or outside) the firm who had some purposive participation in the process. The sponsorship of an organization or association who gives the researcher access to company purchase records provides immeasurable assistance in identifying the key informant in the purchasing organization. Once this person is identified by name, all correspondence should be done using letters individually prepared and addressed to this specific person. To
send a letter with the salutation "Dear Purchasing Executive" virtually insures a home in the circular file.

A personally addressed envelope with "Personal" on the outside increases the chances the questionnaire will find its way into the desired person's hands. This same form of personalization should be applied to other individuals in the decision making unit who are identified by the multistage snowballing technique. All correspondence to these individuals should be individually prepared and personalized as well.

Prenotification is perhaps the most important of the three. When an individual is contacted before the questionnaire is sent, asked for this opinion of the process (people will almost always give their opinion; they will not always answer questions), and convinced that his input is crucial to the success of the study, the chance of a response is increased dramatically. When at all possible, this prenotification should take place by telephone. Given the use of articulate, professional-sounding interviewers working from a prepared script, calls can be completed in short order. Cost, however, is a limiting factor here. In this study, Toledo Scale paid for the cost of the telephone calls and
the vast majority of the calls were completed by the researcher; thus costs were held to a minimum. If the research is to be conducted on a larger scale, these costs can increase dramatically, making the sponsorship of an organization or association even more crucial.

The industrial marketing researcher must also exhibit the trait of persistence if he desires to bring his project to a successful completion. To gain corporate sponsorship, proposals must be written, meetings must be held, and old-fashioned sales techniques applied to convince the prospective organization that the benefits gained from the research will outweigh any potential costs. In the prenotification stage, the interviewers must finesse their way around secretaries and receptionists, endure long periods of being put on "hold", and keep calling back until the desired person is contacted. In the snowballing stage he must explain the purpose of the research quickly and concisely to the person on the other end, and continue to probe for information even when that person has lost interest or has become uncooperative. In the follow-up stage, copious records must be kept of who was sent a questionnaire, when it was returned, and when should the second mailing be sent.
5.4 THE DIFFERENCE IN FUNCTIONAL ROLE PERCEPTION

Even though an initial discriminant analysis would help to solve the low reliability of the constructs, the low reliability was not the major reason for the results of the study. The confirmatory factor analysis was done using the entire sample, with responses for all four functional areas being combined and analyzed as one group. However, different functional roles will have different perceptions of the novelty, complexity, and importance, depending on their expertise, level of specialization, and so forth. This was alluded to in the modification of the importance construct. Ensuring compliance with road weight regulations, may be important to some groups but not to others. This would result in a large covariance between one group and this indicator being neutralized by a small or absent covariance between this indicator and the other groups. Thus, the only indicators that could hope to load on these constructs were of a global nature, which all the functional roles could agree with. This is evident by the indicators kept from the confirmatory analysis:

1. Novelty -- we did not have much information from past purchases when we were defining the product specifications for the truck scale (N3). Few people in the organization had much technical knowledge about truck scales before we purchased
this one (N4). The truck scale purchase was unlike any previous capital equipment expenditure that we have made (N5).

2. **Complexity** -- Because of the complex nature of the truck scale, we had to involve more people than we usually do for capital equipment purchases (C1). We had to gather more information before purchasing this truck scale than we normally do for capital equipment purchases (C4).

3. **Importance** -- We anticipated that this purchase would make a significant improvement in our operations (I4).

These loadings of these indicators in essence represent an "average" of the indicators across all four functional roles. When these indicators determined by the entire sample are then forced into a model for a specific functional role, the perceptions of participation for one particular group are not necessarily those for the entire sample. An example here would be the initial management model. This model included the expertise of the Toledo Scale sales representative, and achieved convergence with one out-of-bounds estimate.

Given that the management functional role was made up of plant managers and owner/operators, the covariance between the relative participation of these individuals and Toledo Sales expertise was significant enough to be included in the original model. This is just one example of the difference in covariance across functional
roles that could not be accounted for given the way in which these models were determined. These indicators had sufficient covariance with the relative participation of purchasing to achieve a good fit; however, such was not the case with engineering, management, or operations. This difference in covariance between different functional roles is the underlying reason why the models did not achieve a good fit. Forcing these aggregate perception measures into a model explaining a particular functional role's behavior resulted in a measurement specificity mismatch. Respondents will have individual perceptions of the purchase that will underlie the observations they make. The participation of a particular group must be matched with the perceptions of that group, not the entire sample.

5.5 SUGGESTIONS FOR FUTURE RESEARCH

Given the exploratory nature of this and subsequent research, it would be beneficial to conduct some initial confirmatory analysis to validate the constructs. However, instead of using the entire sample, the data should be broken down into one group for each functional area, with a separate functional analysis done for
each area. In all likelihood, the indicators of the constructs for each functional area will be different, which in turn may change the operationalizations of complexity and importance that emerged from this research as well.

An analysis of this type will be the subject of some supplementary analysis in chapter 6. This analysis will take the self report scores of the largest group of respondents (engineering) and apply a confirmatory factor analysis followed by a structural equations model in an attempt to determine if the results differ from those achieved from the sample as a whole.

5.5.1 Other Suggestions for Future Research

The coefficient of determination for structural equations was low across the three convergent models, and the average number of participants (22) was lower than expected. This floor effect of little variation being explained by less than the expected participation is due to the nature of the product. Truck scales are a largely undifferentiated product, with the three major vendors offering basically the same product. Thus, product differentiation exists more in the untangible
factors -- competence and availability of service, product warranty, and so forth. Thus, any future research should take the nature of the product they are studying into account.

The nature of the product in this industry affected the low number of respondents in the study. Moriarity (1983) studied the purchase of "dumb" computer terminals -- a product which has many vendors and is perceived as being different across producers. This accounts for his finding of an average of 6.5 people participating in the decision. Truck scales on the other hand have relatively few producers and are perceived as being largely undifferentiated; thus the average number of vendors considered being 2.86 and the average company participation being 2.2. To consider the nature of the industry would in all likelihood increase the coefficient of determination for the model. Future research should explore this possibility.

Another area for consideration should be the overall purpose of the decision. The purchase of a truck scale is straightforward -- to make the plant more productive in its operations. The respondents in this study were for the most part purchasing agents, plant engineers,
plant managers, and production people — all who are concerned with the day-to-day operations of the plant. This was the reason that the financial impact variables did not load on the importance construct. The respondents in this study were only concerned about the short term productivity and not the long term financial picture.

The overall purpose of the purchase decision is in all likelihood the reason that the operations model achieved the results that it did. Because the major reason for a truck scale purchase is to make the plant more productive in its operations, the relative participation of operations personnel is going to increase along with the increases in novelty and complexity.

More exploratory research needs to be conducted into just what constitutes participation and influence in the industrial decision making unit. In this study, the purchasing agent considered his participation to include sending out the requests for proposals and the processing of the paperwork for the order. Others in the decision making unit apparently did not view this as participation. However, a reason for the difference in the self and other participation scores is that one
functional role only has limited information into what another functional role did in the decision process. Obtaining proposals may well constitute purposive participation on the part of the purchasing agent. The engineer, on the other hand, may be unaware of the work involved in obtaining these proposals and therefore not perceive this as participation. Future research should examine just how accurate an assessment one functional role can make of the tasks performed by another functional role, and whether or not all these tasks should be considered purposive participation.

5.6 CONCLUSIONS

This research project had two overall purposes. The first was to provide industrial marketing researchers with a more broadly defined operationalization of the attributes of the purchase situation, and to attempt to determine whether these attributes could provide a plausible representation of the relative participation of certain functional roles. The second was to provide practicing managers with additional information which they could use to design and target their sales efforts. How well each of these objectives was met will be discussed below.
The first objective was accomplished to a certain degree. Even though the results were not as definitive as had been hoped, some positive findings did result. The model did provide a plausible representation of the purchasing role, and a marginal fit in both the engineering and operations functions. Regarding the operationalizations of the constructs, novelty had high reliability; complexity and importance, however, were low. This was due mainly to the multidimensionality of the constructs and differences in perceptions across functional roles. Given the fact that there was little empirical evidence to guide the researcher in the operationalizations of these constructs, this is an important finding in and of itself in that it provides future researchers with a point of departure for their study of the attributes of the purchase situation. This research was exploratory in nature; future research can expand upon these findings, and, with clearer operationalizations, dividing up the functional roles, and employing similar methodology can hopefully achieve more definitive results.

Practicing managers have benefited as well from this study. They now know that the novelty, complexity, and
importance can impact the relative participation of certain functional roles. The results here indicate that as purchase situations increase in novelty, the relative participation of operations increases as well. Dividing up the functional roles as mentioned above may provide even more of an indication as to the relative participation of other roles.

The evaluative criteria provides sales managers with a checklist of product attributes to include in their sales presentations. Given the undifferentiated nature of this market, other vendors of products in similar markets will also know now to emphasize the intangible benefits of service competence and availability, product warranty, and their overall reputation for quality. This will in turn create some form of product differentiation in the minds of the purchaser, and therefore increase the chances for a successful sale.

Above all, this study shows the need for continued empirical work in this area. The findings of this project represent a new and exciting direction in organizational buying behavior. Researchers can now expand upon this base to more clearly define the attributes of the purchase situation. This is a direction which can and should be pursued in the future.
Chapter VI

SUPPLEMENTARY ANALYSIS

6.1 OVERVIEW

In the previous chapter it was hypothesized that different functional roles in the industrial decision making unit could have different perceptions of the Industrial Transaction Attributes. These differences could occur at each stage of the process or across the entire process as a whole. This in turn could result in both a different measurement model and structural equation model for each functional role and perhaps even for each stage. Consistent with this proposition, this chapter will undertake a supplementary analysis in an endeavor to discover if such differences exist.

For this analysis, we will select out the self responses of the largest group, which is engineering. A correlation matrix will be calculated using these responses, correlating the measured variables of novelty, complexity, and importance with each other. An initial confirmatory factor analysis will then be performed,
forcing each indicator to load on its indicated construct. The results of this analysis will then be used as a basis for a structural equations model. This model will consider the self report scores of participation at the three stages of the decision process where the engineering respondents had the highest mean. This score will serve as the perfect indicator of the relative participation of purchasing at that particular stage.

A word of caution is necessary here. The sample size here is small (N=54). Thus, the results must be interpreted with the cautions about the use of a small sample size in structural equation modeling that was discussed in chapter 3. However, even though the sample size is small, an indication as to whether there are differences between functional roles and stages of the decision process can be gained.

The analysis will be undertaken with the same format as in chapter 4. The confirmatory analysis will list the modifications done at each stage of the process, with a table reiterating the results. The results of the structural equations models will also be presented, and a table with those results presented as well.
6.2 CONFIRMATORY FACTOR ANALYSIS

A confirmatory factor analysis was undertaken using the correlation matrix found in table 6-3, using only the indicators for novelty, complexity, and importance. Modifications were carried out in the same fashion as chapter 4, mainly examining the SMC's and t-values. The general results are reiterated in table 6-1, with the more detailed results found in appendix J.
TABLE 6-3
ENGINEERING CORRELATION MATRIX

<table>
<thead>
<tr>
<th></th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
<th>N4</th>
<th>N5</th>
<th>L1</th>
<th>L2</th>
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CORRELATION MATRIX TO BE ANALYZED

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<th>G4</th>
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CORRELATION MATRIX TO BE ANALYZED

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<tr>
<td>L5</td>
<td>0.346</td>
<td>1.000</td>
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</table>

DETERMINANT = 0.7121338D-02
6.2.1 Initial Model

The initial model had all 14 indicators and the 3 latent factors. The difference in the overall measures of fit between this analysis and the confirmatory analysis using the entire sample was noticed immediately. The CS was 102.5 with 74 DF (p=.016), the GFI was .808, the AGFI was .727 with an RMR of .114. Again, these measures of overall fit, particularly the chi square, must be tempered somewhat. Due to the chi square being sensitive to departures from normality, the importance of this should be lessened somewhat and more attention paid to the other measures of overall fit. The coefficient of determination for the X variables was .992, and the ksi estimates were ksi 1 of .319, ksi 2 of .584 and ksi 3 of .342. The differences between this model and the overall model noted here are fairly consistent throughout the confirmatory analysis. The reliability of novelty was lower, but those for complexity and importance were higher than those achieved for the overall model.

Looking at the SMC values and the t-values, it was decided to drop M2 (SMC=.000), C4 (SMC=.233) and I3 (SMC=.159). Notice that C4, which was kept all the way
through the analysis of the overall sample, had a low SMC here and was dropped in the initial modification.

6.2.2 **First Modification**

The dropping of C4, however, evidently caused some problems. The resulting model had 4 indicators for novelty, 3 for complexity, and 4 for importance. The model was non-convergent. It was decided to put C4 back in the model. This was due mainly to its being an indicator of the complexity of the purchase decision, which was the reoperationization of the construct in the overall sample. However, it must be considered if such a reoperationization makes sense for the engineering function. Engineers are still more concerned with the complexity of the purchase situation rather than complexity in operations; therefore, C4 was put back in.

6.2.3 **Second Modification**

The model now has four indicators for each construct. This also achieved a non-convergent model. Looking back at the results obtained from the initial model, it was noted that I5 also had a low SMC.
This is an indicator of the importance of the purchase to the financial standing of the firm -- a factor that was not included in the overall analysis. Therefore, based on the assumption that the financial impact of the purchase of the firm will have little covariance with the participation of engineering, I5 was dropped.

6.2.4 Third Modification

The model now has 11 indicators -- 4 for novelty, 4 for complexity, and 3 for importance. A convergent model with a better overall fit than the initial model was achieved. The CS was 44.0 with 41 DF (p= .346), the GFI was .874, the AGFI was .797, and the RMR was .095. The coefficient of determination for the X variables was .930. However, the detailed measures of fit can still be improved. KSI 1 was .313, KSI 2 was .552, and KSI 3 was .003. There was also an out-of-bounds theta delta estimate for N3 in the form of a negative unique error variance.

Here, a decision has to be made in light of the particular functional role we are evaluating. In the confirmatory model for the entire sample, N1 (some people in the organization had experience purchasing truck
scales) was dropped and N3 (not having much information from past purchases when determining the product specifications for the scale) was kept. Initially the thought would be that the engineering function would be concerned about having specifications from past purchases, and that this might covary with the other factors. However, the purchase of a truck scale is a "one-of-a-kind" type of purchase. Past specifications do not mean too much because the engineer will draw up his own to fit the requirements and restrictions of the task at hand. Therefore, N3 was dropped from the model. I1 was also dropped (SMC=.003).

6.2.5 Fourth Modification

The model now has 9 indicators: N1, N4, and N5 for novelty, C1, C2, C3, and C4 for complexity, and I2 and I4 for importance. The overall fit continued to improve. The CS was 21.77 with 24 DF (p=.593), a GFI of .917, an AGFI of .884, and an RMR of .082. The coefficient of determination for the X variables was .955. Examining the SMC estimates C2 has an SMC of .346 and C4 has one of .219. However, given the earlier problems in non-convergence that were encountered when C4
was dropped, and being as how C2 is an indicator of operational complexity, C2 was dropped. I2 also has a low SMC (.144), but the ksi value for importance is higher (.134). As we are endeavoring to achieve a comparison between this model and the overall sample model, it was decided only to drop C2 and to leave I2 in. N1 had a low SMC (.310), and because it was dropped from the original model, it was dropped here as well.

6.2.6 Fifth Modification

The model now has 2 indicators of novelty, 3 of complexity, and 2 of importance. The overall measures of fit improved, but the detailed measures, particularly the ksi values did not. The CS was 12.37 with 17 DF (p=.777), the GFI was .946, the AGFI was .886, the RMR was .057. The coefficient of determination for the X variables was .946.

In the detailed measures, ksi 1 was .242, down from .317 when N1 was included as an indicator. Ksi 2 as .590, compared with .530 in the previous model, and ksi 3 was .113 compared with .117 in in the previous model. The overall measures were satisfactory in the previous model, and the detailed measures were better. There-
fore, it was decided to conclude the confirmatory analysis with the model achieved in the fourth modification.

6.2.7 The Resulting Model

FIGURE 4
THE ENGINEERING RELATIVE PARTICIPATION MODEL

The resulting model is seen in figure 4. This differs significantly from the confirmatory model achieved from the overall sample. Novelty has the three indicators of N1, N4 and N5, where the other model also had three indicators with N3 replacing N1. Complexity in this model has all four indicators, where the overall model had only C1 and C4. In the previous model, N5 was also allowed to load on the complexity factor. In this model, N5 also had the highest modification index, but the value was 3.46, below the significant value of 3.85. In the importance construct, this model has I2 and I4, where the original model had only I4.

The ksi estimates differ as well. This model has ksi 1 (NOV) of .310 compared with .850 in the overall ksi 2 (COM) of .546 compared with .663 in the overall, and ksi 3 (IMP) of .134, which is 3 times the estimate of ksi 3 in the previous analysis before I4 was made a perfect indicator of the construct. Thus, the differences are evident: the novelty score is lower, complexity is somewhat lower, and importance is higher. There are also more indicators for the novelty and complexity constructs. This model was used as the measurement model for the structural equations analysis.
By having a different measurement model that the overall sample achieved, the latent constructs in the engineering model have a different interpretation than the overall model. In the novelty construct, "overall experience in purchasing truck scales" (N1) replaced "having information from past purchases when defining the product specifications" (N3). This is still experience with the purchase situation, but indicates the uniqueness of the engineering function. Engineering has low loadings on N3 due to the fact that this normally is a one-of-a-kind purchase decision. Engineering will generally draw up their own specifications especially for this particular project, and will not rely on any past information to do so. Other functional roles, not knowing this, may perceive past specifications as being important; thus, in the overall model this indicator came out with a higher loading. N1 has a high loading for the engineer because while he may have to draw up the specs, he still has to rely on others in the organization for other information in aspects of the purchase situation they are not familiar with.
Another difference from the overall sample to note is the lower values for ksi 1. This is the proportion of variance that the construct accounts for. The low value here (.310 as compared with .850 in the overall model) indicates that engineering is not as concerned with the overall experience that the organization has in making a purchase of this type. Again, this is due to the uniqueness of the purchase situation and engineering's involvement in it. Company experience is not as important to the engineer because he will design the specifications as if it were a totally new task, and he will rely little on any previous information the company may have.

Regarding the complexity construct, this is different from the complexity of product evaluation that emerged from the overall sample. This construct has all four indicators, and its ksi value is only slightly lower than the overall model. This indicates that engineering is concerned both with the complexity of the product evaluation and the complexity to operations.

This is a result of being close to both aspects in the complexity construct. Engineering is actively involved in designing the product specifications and in
the evaluation of the proposals; this accounts for the product evaluation aspect. However, they are also concerned with the day-to-day workings of the scale as well. If the scale did not operate as well as they had planned, then engineering in all likelihood would have to take the responsibility as they were mainly responsible for the specific scale that was installed. This would account for the complexity of operations aspect.

Importance to engineering appears to still be importance to operations, the same as in the overall model. As with the complexity construct, engineering is still concerned with the successful operation of the scale on a daily basis. Engineering, being close to the production process, has as its main objective the smooth operation of the scale. As with the overall sample, long-term financial impact is not important to the engineers.

6.3 THE STRUCTURAL EQUATION MODELS

The results of the confirmatory factor analysis were used as the measurement model for the structural equations model for engineering. It was suggested earlier that the gamma weights for novelty, complexity, and im-
Importance might vary by stage as well as by functional role. The supplementary analysis also tested this. An examination was made of the means of the self-reported participation scores (table 6-4), and the stages with the three highest self participation means were chosen. For engineering, these were stage 3 (determining product specifications and cost information), stage 5 (evaluating proposals), and stage 7 (overall for the entire process). Three different structural equation models were tested, using the self reported participation of the engineers at these three stages as a perfect indicator of the dependent variable.

This was carried out in hopes of achieving two results:

1. That the model is a plausible representation of the data, and

2. The gamma weights will differ significantly between stages.

A comparison of the models, along with the results obtained in the overall model is found in table 6-2. Figure 4 is a pictorial representation of the structural equation model that was tested in this analysis.
### TABLE 6-4

**MEANS OF SELF REPORTED SCORES**

**PARTICIPATION**

<table>
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<tr>
<th>STAGE</th>
<th><strong>Purchasing</strong></th>
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<th><strong>Engineering</strong></th>
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<td></td>
<td>X SD</td>
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<td>3.87 0.99</td>
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<td>3.66 .99</td>
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**INFLUENCE**

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<td>3.59 1.18</td>
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</table>
6.3.1 First Model -- Stage 3

It is not surprising that engineering would have a high self-report mean score for the stage where product specifications were determined. In all likelihood, the engineer had primary responsibility for designing the specifications. The overall fit of the model was good; a CS of 24.52 with 31 DF (p=.789) a GFI of .917 and an AGFI of .852. The RMR was .082 and the coefficient of determination for the X variables was .949. Kxi 1 was .308, Kxi 2 was .534, and ksi 3 was a value of .150. Gamma 1 (novelty) is -.183, gamma 2 (complexity) is .001, and gamma 3 (importance) was .026. For a comparison of this model with the other 2 models, see table 6-2.

These findings indicate that as the overall novelty of the decision increases, the participation of engineering in determining the specs and cost information would decrease. As the complexity and importance increase, engineering participation will increase slightly.

As novelty increases, the organizational experience decreases. Thus, more preliminary product and cost information must be gathered -- not a step that the engi-
neering function would be involved in. Rather, it appears that the engineering function relies on other functions (probably purchasing) to collect this information, and engineers would get involved later in the process — such as evaluating proposals.

6.3.2 **Second Model — Stage 5**

Stage 5 refers to the evaluation of proposals stage — again one in which engineers should have high self-report participation scores. The CS was 23.96 with 31 df \( (p = .812) \), the GFI was .919, the AGFI was .857, and the RMR was .081, indicating a slightly better overall fit than the Stage 3 model. The coefficient of \( X \) variables was .953. Ksi 1 was .292, ksi 2 was .545, and ksi 3 was .156. The gamma weights are -.100 for novelty, .225 with complexity, and .323 with importance — again, all significantly different from the overall model. For a comparison of this model with the other two models, see table 6-2.

The negative coefficient for novelty indicates the decreasing participation of engineers where the company has less experience, probably for the same reasons as stated earlier. What appears to be happening is that
the information gathering related to the experience of the purchase situation is passed on by the engineers to other functional roles, while the positive weights for complexity and importance indicate that as each of these increases for the purchase situation, the participation of engineers increases.

This is a result of the engineers being concerned with the day-to-day operations of the firm, as well as being connected with product evaluation.

6.3.3 **Third Model — Overall Participation**

This model is perhaps the best comparison of the engineering self report with that of the overall model as the scores come from the same stage. The CS is 28.68 with 31 DF (p=.586), with a GFI of a value of .908, a AGFI of .837, and RMR of .086, and a coefficient of determination for the X variables of .968 — all indicating a slightly worse fit than in the stage 5 model. Ksi 1 .270, ksi 2 is .533, and ksi 3 is .140, again slightly lower than the previous model. However, the major difference is noticed in the gamma weights. Gamma 1 has a value of -.154, gamma 2 is .136 and gamma 3 has .567. These compare with values of -.135, -.286,
and -.084 respectively in the overall model. Two of the three weights are in a different direction, which may provide support for the hypotheses originally proposed.

This again reflects the lower participation of engineering when the novelty of the situation increases, but increased participation when the complexity and importance increase. However, it must be remembered that these were self-reported measurements of participation. While the engineering function may not see their participation as relating to overall experience, others in the decision-making unit may see it as such. This could come out when the self-ratings are combined with the other ratings.
<table>
<thead>
<tr>
<th>Stage</th>
<th>SEM</th>
<th>GFI</th>
<th>GFI</th>
<th>RHO</th>
<th>KSI(N)</th>
<th>KSI(C)</th>
</tr>
</thead>
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<tr>
<td>Stage 3</td>
<td>2.17</td>
<td>31.78</td>
<td>0.01</td>
<td>0.08</td>
<td>0.85</td>
<td>0.01</td>
</tr>
<tr>
<td>Stage 5</td>
<td>2.97</td>
<td>31.81</td>
<td>0.07</td>
<td>0.87</td>
<td>0.01</td>
<td>0.01</td>
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<tr>
<td>Stage 7</td>
<td>28.68</td>
<td>31.63</td>
<td>0.08</td>
<td>0.89</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Overall</td>
<td>20.08</td>
<td>10.029</td>
<td>1.13</td>
<td>0.86</td>
<td>0.06</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Comparison with overall engineering model in structural equation models.
6.4 Supplementary Analysis with Sales Effort

Due to the differences seen in the participation of engineering at different stages of the process, it was thought that the same might be the case for the sales effort variables. The initial management model did achieve convergence with one out-of-bounds estimate, indicating that perceptions of sales effort (or expertise) may indeed differ across functional roles by stages of the process.

In order to test for this difference, certain a priori decisions about which sample to use and which stages of the process to compare it with were made. Due to the level of gamma weights of the operations function in the overall model it was decided to use this group as the basis for the analysis. Table 6-4 indicated (and the personal opinion of the researcher) indicated that the engineering function had the most participation throughout the process in the form of interpreting proposals, setting specifications, and the like.

In technical aspects of the purchase decision, the non-technical roles (purchasing, management, operations) would have to rely on someone with technical ex-
pertise to interpret this information for them. This expertise could come from either the engineer, in the DMU or the sales representative of the vendor firm. Thus, if the operations people indicated that engineering participation was lower at certain stages where the sales effort could in effect "substitute" for the expertise provided by the engineer, this would indicate that sales effort could impact the relative participation of a functional role. This sales effort should result in a lower or negative value for the participation of engineering at that particular stage.

It was decided to choose the following sales effort variables for study. The effect tested for was the impact of these variables on operations perceptions of engineering participation at the indicated stages.

1. TPER2 -- The quotes from Toledo were complete and easy to understand.

2. TPER4 -- The Toledo Scale sales representative talked to all the key people who had an input into the purchase decision.

3. TPER5 -- The Toledo Scale representative helped in writing the product specifications.

4. TPER7 -- The Toledo Scale sales representative was readily accessible. TPER8 -- The Toledo Scale representative was technically competent.
It was decided that these sales effort variables should affect the participation of the engineers at the following stages:

1. Stage 3 -- Determining product specifications and cost information.
2. Stage 5 -- Evaluating proposals.
3. Stage 6 -- Selecting final supplier.

However, the sample size was small (N=35, operations observations of engineering participation), so all results must be considered with this in mind.

6.4.1 Analysis and Results

A univariate analysis was run relating each sales effort variable individually with each stage, and a multivariate analysis was run with all the effort variables for each stage. No significant differences were found in the multivariate analysis. In the univariate analysis, three differences were found at the .05 level: TPER4 with stage 3, TPER2 with stage 5, and TPER2 with stage 6. However, due to the small sample size, this level should be much more conservative than .05 (i.e., .003). As none of these differences reached this level, there are really no statistically significant differences. Table 6-5 provides the correlation matrix that was used for this analysis.
Note: E3,E4,E5,E6,E7,E8,E9,E10, and E11 were all empty cells.

<table>
<thead>
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<th>PER8</th>
<th>4865.2705</th>
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<th>0.0000</th>
<th>0.3295</th>
<th>0.3295</th>
<th>0.2378</th>
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<td>0.7737</td>
<td>0.2132</td>
<td>0.6001</td>
<td>2.2012</td>
<td>2.2136</td>
<td>2.8022</td>
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<tr>
<td>PER6</td>
<td>3420.2501</td>
<td>0.5773</td>
<td>0.7737</td>
<td>0.2132</td>
<td>0.6001</td>
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</tr>
<tr>
<td>PER5</td>
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<td>0.7737</td>
<td>0.2132</td>
<td>0.6001</td>
<td>2.2012</td>
<td>2.2136</td>
<td>2.8022</td>
</tr>
<tr>
<td>PER4</td>
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<td>0.0000</td>
<td>0.3573</td>
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<td>0.7472</td>
<td>0.5940</td>
<td>0.5940</td>
</tr>
</tbody>
</table>

**CORRELATION MATRIX FOR SALES EFFORT**

**TABLE 6-5**
This same analysis was done combining the competitive sales effort variables with the Toledo sales effort variables. The effort variables were added together for each stage and considered as independent variables. The same analysis was done. Here, there was also no significant differences at the multivariate level, and only one significant difference at the univariate level -- TPER2 with stage 6. This was also found to be significant (at the .05 level) for the Toledo effort. This relates "quotes were easy to understand" with selection of final supplier. However, the engineering participation scores were in the opposite direction of what they would have been had the effort of the sales representative come into play. Perhaps the explanation here is that the participation of the engineer (through his understanding of specifications and ability to interpret them to the rest of the decision making unit) actually increased his participation in the eyes of the operations role when a final supplier was being chosen.

It therefore appears that, given this rather limited analysis, that effort of the sales representative does not affect the participation of functional roles in the
decision making unit. However, this must be taken with the same caveat as in the novelty, complexity, and importance variables. Activities of the sales representative that the researcher thinks should effect the participation of certain should be pretested in an initial confirmatory-type analysis. Also, the analysis should use the different functional roles at different stages. Should all of these also turn up to be non-significant, it could be hypothesized that effort on the part of the sales representative does not impact the participation of the various functional roles.

A possible explanation for this non-significance of sales expertise relates back to the nature of the product and of the truck scale industry. The average number of vendors contacted, plus having many conversations with purchasers, indicates that missionary selling is of little use in the truck scale market. Purchasers know the vendors and the product they offer, and there is little need for a pioneer selling effort. The evaluative criteria indicates that product quality and service capabilities are more important to the purchasers than the expertise of the sales representative. Also, all of these purchase situations were ones where
a Toledo Scale had been sold. Toledo Scale is a well known name in the truck scale industry with an excellent reputation for producing a quality product. The purchase of a Toledo Scale represents a "risk-free" purchase, and thus the expertise of the sales representative has little impact. The sale of the product was based on these other factors.

6.5 DISCUSSION OF THE FINDINGS

Going back to the engineering self report scores, table 6-2 indicates that differences do indeed exist between the different stages and even between the overall scores. In the overall model, engineering had a high ksi value in the novelty construct, here it was much lower. Complexity was about the same, and importance was much higher than the model before 14 was made the perfect indicator.

A major difference is in the gamma weights. The original overall model stated that the relative participation of engineering would decrease as novelty, complexity, and importance increased. These three models all state that self reported participation will decrease with increases in novelty of the purchase deci-
sion for stages 3 and 5 and overall. However, self participation will increase slightly at the determination of product specification stage for an increase in complexity of the purchase decision, will increase much more at the evaluating of proposals stage for complexity, and increase overall for increases in the complexity. Participation will increase for stages 3, 5 and overall for increases in importance to company operations, with the largest increase being overall.

Two caveats are in order here. The first is that the sample size is small—too small to make any definitive statistical conclusions. However, the direction of these findings appear to indicate that by breaking the respondents into distinct functional roles, the results will differ not only between roles but between stages of the decision process. Secondly, it must be remembered that this model only provides a plausible representation of the data. Future research should concentrate on replicating these findings using the same or similar operationalizations of the constructs. However, even with these cautions, the findings are much more realistic than those achieved by the overall sample. Having worked with the truck scale purchase
process for some time, it was evident to the researcher that the engineering function should indeed have more participation as the complexity and importance of the purchase situation increased. The results here are much more in line with what was expected, and are certainly a much more factual picture than the results from the entire sample obtained.

6.6 CONCLUSION

Dividing the sample into the four functional areas and doing a confirmatory factor analysis on one of the groups provided a significantly different measurement model than that obtained by taking the overall sample. Using this model as a basis for the structural equations model, the differences between the overall model and these three models were rather dramatic. Even though the sample size was small enough so that the findings open to questions of statistical validity, the direction is clear: different functional roles have different perceptions of participation across stages of the decision process.

This is truly an exciting finding. By showing that differences exist between functional roles and even be-
between stages of the decision process, the stage is now set for future analysis. This analysis should break down the functional roles into four separate groups. Both the self and other scores of participation should be used, with the dependent variable of relative participation used in the structural equations model. This analysis would provide a much truer picture of the relative participation of different functional roles at different stages of the decision process, and could indeed improve the framework that researchers could use, as well as assisting marketing managers to better target their marketing efforts. The process could be broken down into stages, with models run for each stage. Gamma weights achieved by each group at each stage would be an indication of relative participation of the group at that stage. Groups with the highest gamma weights at each stage could be targeted for study by researchers, and for marketing efforts by marketing managers.

This supplementary analysis gives a much clearer indication as to the significance of the novelty, complexity, and importance constructs on the relative participation of functional roles in the industrial
decision making unit. This research represents what could be the initial step in a reconceptualization of a framework for the study of organizational buying behavior. Expanding on these findings, researchers can find new and productive avenues for their efforts. The results of this research can then be used by marketing managers as a basis for targeting their marketing efforts, and as such can make the entire process more productive.
Chapter VII

CONTRIBUTIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This concluding chapter will be in three sections. The first will examine the contributions of the research. The second will discuss directions for future research that this project has provided. The third will be some concluding remarks.

7.1 CONTRIBUTIONS

Several contributions to the field were made as a result of this research. This research has provided an initial empirical step towards an expanded operationalization of the attributes of the industrial purchase situation. The BUYGRID model made this step initially in providing a classification scheme for industrial purchase situations. However, as was noted above, empirical studies using this classification scheme have often resulted in conflicting results. This research allows for a more comprehensive definition of the industrial purchase situation. The attributes of novel-
tivity, complexity, and importance were expanded into novelty, complexity of the evaluative procedure, complexity to company operations, importance to company operations, and importance to company financial standings. The initial analysis showed that these constructs provided a plausible explanation for the purchasing function, with marginally plausible explanations for the engineering and operations function. The supplementary analysis showed that not only will the operationalizations of these constructs change between functional roles, but that participation will differ even between stages. Future research can use these findings as a basis from which to further study participation in the industrial decision process, and then expand their work into such aspects in locus and basis of influence, communication patterns, the effect of organizational structure, and many other aspects.

The methodology employed in this study represented a combination of the most successful elements of previous work, plus some additional elements provided by the researcher. The response rate was truly remarkable for an industrial study; an overall response rate of 78.3%, with a useable response rate of 62.6%. This is in com-
parison with other studies that have only achieved responses in the 20-30% range. All of this points to the importance of gaining corporate or organizational sponsorship, and coupling this with the factors of personalization, prenotification, and perseverance. Using a multistage snowballing technique, given the undifferentiated nature of this product, was an efficient and effective method of gaining the names of those individuals who did participate in the process.

A third contribution of this research was the finding that the nature of the product can affect the perceived impact of the sales representative. In the truck scale market, the product is relatively undifferentiated, with the majority of purchasers being familiar with the vendors and the products they offer. The evaluative criteria that these purchasers have when choosing a truck scale indicates the importance of the intangible factors such as overall quality of service, vendors' reputation for quality, and the competence of the service technician, while downplaying the importance of a broad product line and having the lowest price. Marketing managers can use these findings not only in targeting their sales efforts to cer-
tain individuals at certain stages of the process, but in choosing which of these elements to include in their sales presentations.

7.2 SUGGESTIONS FOR FUTURE RESEARCH

The findings resulting from this study give a broad range of directions which industrial marketing researchers can pursue in the future. Perhaps the most interesting study would be one in which the entire sample was broken down into four groups consisting of the four functional areas. Confirmatory analysis could be run on each group to see if the same operationalizations of the latent constructs differ, and if they do differ, what the cause of this difference is. As with this project, this confirmatory procedure could serve as the basis for a test of the structural equations model. Models could be run for each functional role at each stage of the process. The gamma weights and ksi values would provide a clear indication of the relative participation of each role at each stage of the process, and how this participation differs between stages.
The research in this project used the weighted relative participation score as the dependent variable in the structural equation model. This is a measurement which heretofore has not been used in the literature. An interesting study would be to calculate the participation scores differently to determine if the results differ. Participation scores could be determined from the raw absolute score, the unweighted relative participation score, the weighted relative participation score, and the average participation score.

Another possible avenue for research would be to examine the relationship between participation and influence during the decision process. It makes intuitive sense that a person's participation would be related to his influence. However, participation is defined as the amount of formal or informal communication that a particular person offered to others in the decision making unit for consideration. An interesting possibility would be the case where the person offered a large amount of communication (high participation) but had a low influence on the other members of the DMU. This research could be undertaken as above, breaking the sample down into four groups and testing each group
at each stage. The analysis could then be done to determine if the attributes of the purchase situation had an impact on the participation and influence of certain functional roles at different stages of the process.

Patchen (1974) found that an individual's personal stake in the decision affected his influence in the process. Carrying this one step further, future research could examine if perceived stakes in the process differ by functional role at different stages of the process. Also, an analysis could be undertaken to see if the attributes of the purchase situation affect the perceived stake in the decision process, and if it does, for which functional role at which stage.

A common finding throughout the organizational buying behavior literature is that members of the decision making unit estimate their own participation and influence higher than other members of the decision making unit do. It has been implicitly assumed that these individuals inflate their participation in order to appear more important to the success of the overall decision. However, these differences may be the result of a general lack of knowledge of what the other functional role does. For example in this study, purchasing
had the largest difference between self and other evaluation of participation. However, purchasing is the function that generally examines the available literature for possible vendors, sends out requests for proposals, collects the bids, and handles the paperwork for the purchase. In this study, the purchasing respondents evidently considered these tasks as participation in the process; however, the other functions did not. Whether this was due to a simple overinflation of own participation or a general lack of knowledge of purchasing activities is an interesting question that future studies should endeavor to answer.

One of the reasons for a lower than anticipated number of participants in the decision process was the undifferentiated nature of the product. The purchasers had a good idea of who the vendors were and what they had to offer. This is evidenced by the average number of vendors considered (2.86) and the average number of participants per decision (2.2). This is in contrast to the "dumb" terminal market, which has many vendors and offers a highly differentiated product. This was responsible for Morarity achieving an average participation of 6.5, with the most notable difference from this study being in the financial area.
Thus, another direction for study could be an attempt to determine if participation and influence changes not only according to the attributes of the purchase situation, but according to the nature of the product as well. The same questions could be used for products with low differentiation (i.e., fuel oil), moderate differentiation (i.e., office furniture) and high differentiation (i.e., personal computers). The results could then be compared across functional roles by stages of the process to see if they differ, and if they do, by what magnitude.

As can be seen, the findings of this study offer a wide range of directions that future researchers can pursue. The ones listed above represent only a small sample of the potential in this area. However, no matter which direction the industrial marketing researcher chooses, he stands to make a contribution to the ever-increasing base of empirical findings in this area.
7.3 CONCLUSION

This research project had two overall objectives:

1. To provide industrial marketing researchers with a more comprehensive operationalization of the attributes of the industrial purchase situation, and

2. To provide practicing sales managers with information on which functional roles have the greater participation at which stages of the decision process to increase the productivity of their sales effort.

Both of these have been achieved to a certain degree. The findings of the overall model and the supplementary analysis indicated that the purchase situation attributes of novelty, complexity, and importance provided a plausible representation of the relative participation of functional roles in the industrial purchase decision process. The supplementary analysis showed that participation differed not only by functional role, but by stage of the process as well. It must be remembered that structural equation modeling provides only a plausible representation of the data; an unequivocal statement that novelty, complexity, and importance impact the functional role participation is still a long way off. However, these findings do provide industrial marketing researchers with a basis from which further research can build upon in their study of different products and industries.
Marketing managers can benefit from these findings as well. The supplementary analysis showed that engineering had higher participation at the proposal evaluation stage as the purchase situation increased in complexity and importance. This can be used to target the efforts of field sales representatives. Once a representative knows where the prospective company is in the purchase process, he can then focus his efforts on the particular functional role that has greater participation at that stage.

The evaluative criteria that purchasers use is of value as well to the practicing manager. Past empirical work has shown that the aspects of product quality, availability, and service are important to industrial purchasers. The findings here echo these facts, with an important addition. Given the undifferentiated nature of the product, certain intangibles such as overall quality of service and the vendors' reputation for quality enter into the decision. Managers can take these findings, and not only target the specific individual to make the presentation to, but will also know what attributes of the product and company to emphasize in his presentation.
Above all, these findings indicate the dynamic and diverse nature of organizational buying behavior. The gradual evolution of a theoretical framework has been seen through the works of Fredrick, Duncan, Wiegand, Robinson, Paris, and Wind, Webster and Wind, Bonoma, Zaltman, and Johnston, Spekman and Stern, and Moriarity, to name but a few. This research, when expanded and added to the conceptual and empirical work of the above individuals, does indeed have the potential to place several more bricks in the foundation of a theoretical framework of organizational buying behavior.
Appendix A

APPENDIX A -- LATENT VARIABLES AND THEIR INDICATORS

(indicators are also the questions on the questionnaire)

NOVELTY -- to what extent does this represent a 'new' purchase to the organization; i.e., how much experience does the firm have in a purchase of this type?

1. We are experienced in purchasing products like truck scales.

2. When we were defining the product specifications, we did not have much information from past purchases that helped us.

3. A product of this nature has solved problems for us in the past.

4. We used a different type of decision process for this purchase than for other purchases.

5. Few people in the organization had much technical knowledge about truck scales before we purchased this one.

COMPLEXITY -- the degree of difficulty in generating and evaluating alternatives, and the degree of difficulty in making organizational adjustments to accommodate this product (i.e., physical facilities, special training).

1. We had to get the opinions of more company personnel than we normally do for typical capital
equipment purchases because of the complex nature of this truck scale.

2. The number of product options available made the purchase seem more complex than typical capital equipment purchases we make.

3. The scale operator required special training in order to use the truck scale properly.

4. For the truck scale purchase, we gathered information from more vendors than we normally would for a capital equipment purchase.

5. The number of different vendors we seriously considered was _____.

IMPORTANCE -- what is the perceived financial and organizational impact of the purchase.

1. This purchase will improve the productivity of our weighing operations.

2. The purchase of this product did not represent much of a financial commitment for a firm with our sales volume.

3. The purchase of this truck scale was necessary to ensure adequate cost control in certain areas (road weight, equipment wear, accuracy of shipments).

4. Top management was involved directly in the decision to purchase this truck scale.

5. It was anticipated that this purchase would make a significant improvement in our operations.

FUNCTIONAL ROLE PARTICIPATION -- to what extent did this particular functional role's input written or verbal, constitute some purposive participation in the
purchase decision? (Each of the following will be grouped and tested according to the stage of the process)

OWN PARTICIPATION -- what was the extent to which my input, written or verbal, constituted some purposive involvement at each stage of the decision process.

1. The degree to which my input received consideration in the problem recognition stage was:

2. The degree to which my input received consideration in the determination of specifications stage was:

3. The degree to which my input received consideration in the search for vendors stage was:

4. The degree to which my input received consideration in the acquisition and analysis of proposals stage was:

5. The degree to which my input received consideration in the selection of a supplier stage was:

6. The degree to which my input received consideration in the evaluating the performance of the product was:

7. When you consider the six stages of the decision process, I participated most at stage ____ of the process.

OTHER PARTICIPATION to what extent did the input of others receive consideration at various stages of the purchase decision.

(This will be repeated for as many individuals as participated in the decision process)

1. The extent to which his/her input received consideration in the problem recognition stage was:
2. The extent to which his/her input received consideration in the determination of specifications stage was:

3. The degree to which his/her input received consideration in the search for vendors stage was:

4. The degree to which his/her input received consideration in the acquisition and analysis of proposals stage was:

5. The degree to which his/her input received consideration in the selection of a supplier stage was:

6. The degree to which his/her input received consideration in the evaluating the performance of the product was:

7. This person participated most at stage ______ of the decision process.

8. The person who participated most throughout the entire decision process was ______ (name) ______ (title).

SALES REP OPINION OF PARTICIPATION -- who did the sales representative see as participating in the purchase decision (salesperson will name buying center participants).

(to be completed for as many individuals as participated in the process)

1. The extent to which his/her input received consideration in the problem recognition stage was:

2. The extent to which his/her input received consideration in the determination of specifications stage was:

3. The extent to which his/her input received consideration in the search for vendors stage was:
4. The extent to which his/her input received consideration in the acquisition and analysis of proposals stage was:

5. The extent to which his/her input received consideration in the selection of a supplier stage was:

6. The extent to which his/her input received consideration in the evaluating the performance of the product was:

7. This individual participated most at stage ____ of the process.

COMPETITIVE SALES EFFORT — what was the amount of effort expended by the non-supplier sales representative:

1. We received more sales literature from Toledo Scale than we did from the competing sales representatives.

2. Other sales representatives made more sales calls than did the one(s) from Toledo Scale.

3. The sales representatives from competing companies generally made called on more individuals within our firm than did the one from Toledo Scale.

4. I personally think that the sales representative from Toledo Scale put forth more effort than did the ones from the other companies we considered.

5. The sales representatives from the other companies were better prepared to deal with our problem than was the one from Toledo Scale.

6. The Toledo Scale sales representative talked to a majority of the people who had an input into the purchase decision.
7. We considered Toledo Scale because of their acknowledged expertise with truck scales.

8. We considered Toledo Scale mainly as a price competitor.

INDIVIDUAL SALES EFFORT -- what was the sales representatives degree of effort in making the sale.

1. I sent more sales literature to the prospective buyer(s) than I normally would in a sale of this type.

2. I made more sales calls with this organization than I normally would for this product.

3. I spent more time preparing for sales calls with this customer than for other customers who buy the same product.

4. I contacted more individuals in this buying organization than I usually do for a purchase of this product.

5. In comparison with other companies who have purchased this product, I had to put forth a greater effort than normal to make this sale.

6. I knew the following were involved in the purchase decision but just couldn't reach them (list).

7. I was called upon for expert advice.
8. I was given the chance to sell all the features of my product.

The following questions constitute the organizational behavior model

**Differentiation** -- what is the degree of specialized operations in the organization

1. In our company each distinct organizational operation has its own separate department.

2. Individuals have a specific level of expertise in their own departments.

3. We have a lot of job specialization in our company.

4. The majority of people in our organization have a specific job description for their position.

**Centralization** -- where is the locus of control/power in the organization

1. Important decisions in the firm are made by a relatively small number of people.

2. Employees in our company have a say in the decisions that will affect them directly
3. Most of our major decisions are made centrally at corporate headquarters.

4. There is a limit on the amount of money we can spend on a purchase without getting approval from corporate headquarters.

**FORMALIZATION** -- the presence of distinct operating procedures and the degree to which they are followed.

1. We have clear-cut guidelines and regulations for most activities in our company.

2. Employees usually act within the operating guidelines set forth by the company.

3. Most purchase decisions are made within the standard purchasing guidelines set forth by the company.

4. There is a lot of bureaucratic red tape in our company.

5. There are strict limits on the authorization of funds for purchases.

**ENVIRONMENTAL UNCERTAINTY** -- To what degree do we know the effect the environment will have on our operations

1. We always have the necessary information on hand for making a purchasing related decision.

2. It is hard to keep up with the changes that are occurring in our industry in the equipment we buy.
3. We are certain about the best procedures for dealing with company purchasing problems that arise.

4. It is often difficult for us to know if the purchase decision we made was the best one.

5. It is often difficult for us to know if the purchase decision we made is even a satisfactory one.

TECHNOLOGY -- What is the 'state of the art' as far as our firm is concerned

1. Changes in general technology often affect the purchase decisions decisions of our firm.

2. There is a great amount of interdependence among the operating units of our firm.

3. We would consider ourselves up-to-date as far as the willingness to adopt new technological advances.

4. There is a great deal of change in general technology that is affecting the way our firm operates.

SIZE how large is the company

1. The number of operating units within the company.
2. The number of employees at that operating site.

3. Yearly sales.

4. Total assets.

5. Our market share is large in relation to the other firms in our industry.

THE FOLLOWING CONSTITUTES THE SOCIAL PSYCHOLOGY PART OF THE MODEL

TIME PRESSURE -- Did the members of the decision-making unit perceive any pressure to make the purchase decision within a certain period of time?

1. It was understood that we had to make the purchase decision within a limited period of time.

2. All the individuals in the decision-making unit were aware that the decision had to be made within a limited period of time.

3. Because of the time pressure to make the decision, it did not take us as long to reach a decision as it normally does.

4. Because of the time pressure to make a decision, we did not gather information from as many vendors as we usually do.
PERSONAL STAKE IN THE DECISION if a person has a "stake" in the decision, does it increase his participation?

1. We did not at any stage decide that one person would take responsibility for the decision.

2. The person who would take responsibility if the purchase was good or bad had the most input into the decision.

3. If the product did not work as it was supposed to, the person who was responsible would be blamed.

4. If the product did not work as it was supposed to, then the responsible person's status in the organization would fall.

5. If the product worked well, then the responsible person would receive most of the credit.

INDIVIDUAL DIFFERENCES -- is the group heterogeneous enough to allow for enough diversification in the decision-making process?

1. The individuals in the decision-making unit pretty much came from the same department.

2. The members of the decision-making unit represented a wide variety of opinions and functional areas.

3. Each of the members of the decision-making unit had expertise in a different area.
4. After the input of all of the individuals in the decision-making unit was considered, we felt all the important topics were covered.

(The remaining questions are not part of the overall theoretical model, but will be used for further research)

EVALUATIVE CRITERIA

What was the importance to you of:

1. Vendor offers a broad line of scales
2. Many options available (printers, displays)
3. Cost of options
4. Ease of maintenance designed into scale
5. Competence of service technician
6. Service availability
7. Overall quality of service
8. Product warranty
9. Delivery (lead time)
10. Construction Costs
11. Time to install in plant
12. Scales are lowest price
13. Vendor's willingness to negotiate price
14. Offers large discounts
15. Financial stability of vendor
16. Vendor's reputation for quality
17. Amount of operator training required
18. Salesperson competence
19. Compatibility with existing facility
20. Ability to interface with computer
21. "Turnkey" installation available
22. Availability of pitless foundation

EVALUATION OF TOLEDO SCALE
-- In your opinion, how strong was Toledo Scale on each of the following items?

1. Vendor offers a broad line of scales
2. Many options available (printers, displays)
3. Cost of options
4. Ease of maintenance designed into scale
5. Competence of service technician
6. Service availability
7. Overall quality of service
8. Product warranty
9. Delivery (lead time)
10. Construction Costs
11. Time to install in plant
12. Scales are lowest price
13. Vendor's willingness to negotiate price
14. Offers large discounts
15. Financial stability of vendor
16. Vendor's reputation for quality
17. Amount of operator training required
18. Salesperson competence
19. Compatibility with existing facility
20. Ability to interface with computer
21. "Turnkey" installation available
22. Availability of pitless foundation
Appendix B

APPENDIX B — THE HOLISTIC CONSTRUAL

Theoretical and methodological concerns guide research in organizations (Bagozzi and Phillips 1982). However, a theory is really not rendered useful until it is empirically testable (Hunt 1976), and methodological problems have plagued past researchers in industrial marketing (Stern and Beve 1980, Moriarity 1983). By the same token, empirical research provides the greatest contribution when it is founded in theoretically sound concepts. Therefore, both are essential if the research is truly to make a contribution to the discipline.

Unfortunately, much of the research carried out (see Bender 1983 for an exception) in organizational buying behavior to this point has been to formulate a theory in rather abstract terms and then to test its propositions using objective variables. Sometimes, the procedure is vice versa -- the data is collected, and then the theory is proposed. In much research:
Although there are well-developed criteria to guide the formulation of theory, and statistical and observational standards can be found to direct empirical analysis, the linkages between theoretical concepts and their measurements are often left unspecified or else are stipulated in loose, unverifiable ways...

(Bagozzi and Phillips 1982, p. 459). Much previous research has used a variety of methods to assess the validity of various constructs and to test hypotheses. Popular methods have included the multitrait multimethod matrix (Campbell and Fiske 1959), regression theory, factor analysis, and analysis of variance. These methods have serious shortcomings as they provide only limited information as to measurement and method error, make naive assumptions as to the meaning of concepts, and examine only rudimentary aspects of construct validity (Bagozzi and Phillips 1982, Bagozzi 1983). Construct validation procedures typically establish the presence of a degree of measurement error; yet testing procedures that are currently used do not account for it. In a causal model where a sequence of relationships are hypothesized to occur, a failure to control for systematic and random errors can lead to a biased and inconsistent estimate of the parameters. This in turn could confirm a relationship where none
exists, or fail to recognize a relationship that does exist. Even if a relationship is found, the magnitude of the relationship can be overstated or understated, depending on the circumstances (Bagozzi and Phillips 1982). Thus it seems relatively clear that if one is to propose a causal model, as this research does, he must use a method that allows for a definitive testing of a theory as well as one that controls for random and systematic measurement error. Then and only then can the method provide an adequate test of the proposed theory.

The holistic construal (Bentler 1980, Bagozzi and Phillips 1982, Bagozzi 1983, Bender 1983) provides a method for the linking of the construction of a theory by explicit representation of latent variables, measured variables, and correspondence rules. This construal has its foundations in the physical and social sciences and is in essence a conglomeration of the ideas of several researchers and scholars. It shares the features of several approaches, yet is flexible enough to allow the researcher to select certain aspects of several approaches, basically the triangulation approach suggested by Johnston and Spekman (1982). The approach is
neither rigidly deductive or purely explanatory. Rather, subsumes a process by which theories and hypotheses are tenatively formulated deductively and then are tested on data, and later are reformulated and tested until a meaningful outcome emerges...

(Bagozzi and Phillips 1982, p. 460). Thus, the formulation of the theory is proposed by the researcher based on past research, with the whole concept having as its main purpose to encompass the aspects of theory construction and theory testing.
APPENDIX C

THE QUESTIONNAIRE

THE OHIO STATE UNIVERSITY
COLLEGE OF ADMINISTRATIVE SCIENCE
STUDY OF ORGANIZATIONAL DECISION MAKING

On the telephone we talked about your involvement in the purchase of a truck scale from Toledo Scale that has occurred since January, 1983. This questionnaire refers directly to that purchase. It is divided into sections, with each section referring to a particular phase of the decision to purchase the truck scale.

First, we would like to get some general information about your company and why you bought the truck scale.

1. Are you a headquarters operation? 1. Yes 2. No (4)

2. If no to #1, what is the level of expenditures that you are allowed to make without authorization from headquarters?
   0. Does not apply 4. $30,000-$39,999
   1. Under $10,000 5. $40,000-$49,999
   2. $10,000-$19,999 6. $50,000 and over (6)
   3. $20,000-$29,999

3. What was the major reason you purchased the truck scale?
   1. Control on incoming and outgoing shipments
   2. Replacement for existing scale
   3. Satisfy government regulation
   4. Directive from corporate headquarters
   5. Other (specify): (6)

4. How many truck scale vendors did you seriously consider?
   1. 1 2. 2-3 3. 4-5 4. Over 5 (7)

5. How many people are employed by your company at all facilities?
   1. Under 25
   2. 25-99
   3. 100-250
   4. Over 250 (6)

6. Who were the majority of your dealings with when you bought the truck scale? (9)
   1. Distributor representative
   2. Toledo Scale company representative

7. Which of the following most closely describes your job function?
   1. Purchasing
   2. Plant management
   3. Plant engineering
   4. Operations management
   5. Other (specify): (10)
   6. Transportation/Traffic
   7. Owner Operator
   8. Corporate Engineering

Now we would like to give you your opinions on certain aspects of the decision process that your company went through in your purchase of the truck scale.

The responses are rated from 1, Strongly disagree, to 5, Strongly agree. For each statement please circle the number under the response that most closely indicates your opinion.

<table>
<thead>
<tr>
<th>Statement</th>
<th>STRONGLY DISAGREE</th>
<th>DISAGREE</th>
<th>NEUTRAL</th>
<th>AGREE</th>
<th>STRONGLY AGREE</th>
<th>DON'T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the purchase, some people in the organization had experience in purchasing truck scales.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>We have made other capital equipment purchases in the past five years.</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>We did not have much information from past purchase when we were defining the product specifications for the truck scale.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Your management expected that the equipment would improve our performance.</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>The truck scale purchase was unique in any previous capital equipment expenditure that we have made.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

(Please continue to next page)
APPENDIX C, cont.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Because of the complex nature of the truck scale we had to involve more people that we usually go for capital equipment purchases.

1 2 3 4 5 0

The scale operator required special training in order to use the truck scale properly.

1 2 3 4 5 0

The purchase of the truck scale required a change in our office procedures.

1 2 3 4 5 0

We had to gather more information before purchasing the truck scale than we usually do for capital equipment purchases.

1 2 3 4 5 0

The purchase of the truck scale represented a major financial commitment for a firm with our sales volume.

1 2 3 4 5 0

The purchase was necessary to better monitor the weight of inbound and outbound shipments.

1 2 3 4 5 0

The purchase of the scale was necessary to ensure compliance with road weight regulations.

1 2 3 4 5 0

We anticipated that this purchase would make a significant improvement in our operations.

1 2 3 4 5 0

This purchase was important to our overall company profitability.

1 2 3 4 5 0

We did not at any stage decide that one person would take sole responsibility for the decision.

1 2 3 4 5 0

The person who had the most influence for the purchase had the most influence in the decision.

1 2 3 4 5 0

If the truck scale did not work as well as it was supposed to, I would be blamed.

1 2 3 4 5 0

If the truck scale did not work as well as it was supposed to, my status in the organization would fall.

1 2 3 4 5 0

If the truck scale worked well, then I would receive most of the credit.

1 2 3 4 5 0

(34)

Please give us your opinion on how important each of the following factors is to you in your purchase of a truck scale.

<table>
<thead>
<tr>
<th>Very Important</th>
<th>Unimportant</th>
<th>Neutral</th>
<th>Very Important</th>
<th>Unimportant</th>
<th>Important</th>
<th>Important</th>
<th>No Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor offers a broad line of scales</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>(30)</td>
</tr>
<tr>
<td>Many options available (prices, displays, etc.)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ease of maintenance designed into scale</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Competence of service technician</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Overall quality of service</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Product warranty</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Delivery lead time</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Convenience costs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Time to install on plant</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Service is lowest price</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Vendor willingness to negotiate price</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Financial stability of vendor</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Vendor's reputation for quality</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Salesperson competence</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Compatibility with existing facility</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ability to interface with controller</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Turnkey installation available</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Recommendations from other companies that have purchased a truck scale</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>(47)</td>
</tr>
</tbody>
</table>

(PLEASE CONTINUE TO NEXT PAGE)
### APPENDIX C, cont.

New, how would you rate Toledo Scale on each of the above criteria in regards to this purchase?  (48)

<table>
<thead>
<tr>
<th></th>
<th>Very Poor</th>
<th>Poor</th>
<th>Neither Good Nor Poor</th>
<th>Good</th>
<th>Excellent</th>
<th>No Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offers a broad line of scales</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Many options available</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Ease of maintenance designed to scale</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Competence of service technician</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Overall quality of service</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Product warranty</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Delivery (lead time)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Construction costs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Time to install in plant</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Scales are lowest price</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Willingness to negotiate price</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Financial stability</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Reputation for quality</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Salesperson competence</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Compatibility with existing facility</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Ability to interface with computer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>'Truck' installation available</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Recommendations from other companies that have purchased a Toledo truck scale.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

Now we would like you to rate the performance of the Toledo Scale representative (or distributor representative) and the performance of the representatives that were competing with Toledo Scale. Please circle the number under the response that most closely indicates your opinion.

<table>
<thead>
<tr>
<th>PERFORMANCE OF TOLEDO SCALE REPRESENTATIVE</th>
<th>STRONGLY DISAGREE</th>
<th>DISAGREE</th>
<th>NEITHER AGREE</th>
<th>AGREE</th>
<th>STRONGLY AGREE</th>
<th>DON'T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales literature and technical information was readily available from Toledo Scale when we wanted it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>The quotes from Toledo Scale were complete and easy to understand</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>The Toledo Scale representative talked to all the key people who had an input into the purchase decision.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>The Toledo Scale representative helped in writing the product specifications</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>The Toledo Scale representative worked harder for the sale than did the representatives from competing firms.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>The Toledo Scale representative was readily accessible</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>The Toledo Scale representative was technically competent</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>We considered Toledo Scale because their product represented a better value than the competition.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

(Please continue to next page)
APPENDIX C, cont.

Please rate the performance of the one major competitor with Toledo Scale for the purchase:

<table>
<thead>
<tr>
<th>PERFORMANCE OF COMPETING REPRESENTATIVE</th>
<th>STRONGLY DISAGREE</th>
<th>NEUTRAL/NOR DISAGREE</th>
<th>AGREE</th>
<th>STRONGLY AGREE</th>
<th>DON'T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales literature and technical information was readily available from the competitors when we wanted it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The competitor’s quote was complete and easy to understand.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The competitor’s quote was on time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The competing salesman talked to all the key people who had an input into the purchase decision</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The competing salesman helped in writing the product specifications.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The competing salesman worked harder for the sale than did the one from Toledo Scale.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The competing salesman was readily accessible.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The competing salesman was technically competent.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>We considered the competitor’s product because it represented a better value than Toledo Scale.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Please give us your opinion of the amount of participation and influence you had at each stage of the decision to purchase the truck scale. For each stage listed, please circle the number under the category that indicates your participation and influence, using the following definitions:

**PARTICIPATION**: The total amount of written or verbal communication both formal and informal you offered to others for consideration.

**INFLUENCE**: The extent to which the communication influenced the overall decision outcome.

<table>
<thead>
<tr>
<th>Stage of Decision Process</th>
<th>Late or None</th>
<th>Some</th>
<th>Quite a Bit</th>
<th>A Great Deal</th>
<th>A Very Great Deal</th>
<th>Don't Know</th>
<th>LATE or None</th>
<th>SOME</th>
<th>QUITE A BIT</th>
<th>A GREAT DEAL</th>
<th>A VERY GREAT DEAL</th>
<th>DON'T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
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<td>3</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<td>0</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
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<tr>
<td>Determining product specifications and cost information</td>
<td>1</td>
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<td>3</td>
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<tr>
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<td>1</td>
<td>2</td>
<td>3</td>
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<td>4</td>
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</table>

(PLEASE CONTINUE TO NEXT PAGE)
APPENDIX C, cont.

Now we would like you to give your opinion of the participation and influence of others in the decision process. For each person listed, please indicate his/her participation and influence using the same definitions as on the previous page. If a person is not listed that should be, please write his name & title on the insert and rate him.

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<tr>
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<th>INFLUENCE</th>
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<td>Selecting Final Supplier</td>
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(Please continue to next page)
### APPENDIX C, cont.

#### PARTICIPATION OF OTHERS (CONTINUED)

**#3**

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<th>Some</th>
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<th>A Great Deal</th>
<th>A Very Great Deal</th>
<th>Don't Know</th>
<th>Little or None</th>
<th>Some</th>
<th>Quite A Bit</th>
<th>A Great Deal</th>
<th>A Very Great Deal</th>
<th>Don't Know</th>
</tr>
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### PARTICIPATION (continued)

**#4**

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<th>Don't Know</th>
<th>Little or None</th>
<th>Some</th>
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<th>A Great Deal</th>
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<td>4</td>
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<td>0</td>
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<tr>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0 (68)</td>
</tr>
</tbody>
</table>

---

*Again, please be assured that your responses will only be analyzed in the aggregate. Your or your company’s identity will not be disclosed. The only use of the code number on this questionnaire is to connect your responses with those you gave us over the telephone.*

*Thank you very much for your participation. By completing this questionnaire, you have helped us at Ohio State gain a better understanding of the organizational purchase process. If you do wish to receive a summary of the results of this study, please send us your business card when you return this questionnaire in the enclosed envelope and we will be happy to send it to you.*

*Code # _____________________________ (Card 1 1-3)*
APPENDIX D

INITIAL PRENOTIFICATION LETTER

The Ohio State University  Academic Faculty of Marketing

1775 College Road
Columbus, Ohio 43210-1399
Phone 614-222-8808

September 7, 1984

Mr. John Doe
XYZ Company

Dear Sir:

I am writing to ask for your assistance in a research project that is being undertaken here at Ohio State. One of our doctoral candidates in marketing, Daniel McQuiston, is writing his doctoral dissertation on participation and influences in an industrial purchase decision. OSU has built a solid reputation with many firms in the business community over the years, and from time to time these firms assist us in our academic endeavors. Toledo Scale is one of these firms. For this research, Dan is collecting information from recent purchasers of a truck scale from Toledo Scale. Your name was mentioned by a Toledo Scale representative as playing a major role in this purchase.

A student working for Dan will be contacting you by telephone shortly to ask for your cooperation in this study. Conducting academic research in the industrial sector is very difficult because management time is often considered too valuable to permit participation in these studies. However, we are hopeful that you can take between 5 and 10 minutes to fill out a short mail questionnaire that will not only assist Dan in his research, but will assist marketing managers in the targeting of their sales calls. To thank you for your participation, we will be happy to send you an executive summary of the findings of this study. Of course, all of your responses will be held in strictest confidence.

Thank you for your time.

Best wishes,

W.W. Talczzyk
Chairman and Professor of Marketing

WWT:11p
APPENDIX E

COVER LETTER TO RESPONDENTS

OSU

The Ohio State University

September 26, 1984

Mr. John Doe
XYZ Company

Dear Sir:

Thank you for agreeing to participate in the research project concerning the purchase of a truck scale from Toledo Scale that we discussed over the telephone with you. Your and your company's participation will greatly assist me in the completion of my doctoral dissertation. Of course, all of your answers will be held in strictest confidence. All the responses will be analyzed as a group rather than as individuals, and Toledo Scale will not have access to this information.

As was mentioned over the telephone, we would be happy to provide you with an executive summary of the results of this project. If you would like to receive this summary, just enclose your business card when you return this questionnaire and we will be happy to send you a copy.

Because we want to obtain your own personal opinion of the purchase decision, please complete the entire questionnaire by yourself.

Once again, thank you very much for your participation.

Sincerely,

Daniel H. McQuiston
Doctoral Candidate

DHM:1lp
enclosure
APPENDIX F

COVER LETTER TO NON-CONTACTED RESPONDENTS

OSU

The Ohio State University

September 26, 1984

Mr. John Doe
XYZ Company

Dear Sir:

I am a doctoral student at Ohio State University in the dissertation stage of my program. For my dissertation, I am attempting to determine what individuals in an organization have some input into the purchase decision for a piece of capital equipment, and the type of input they have. The piece of equipment that I have chosen is a truck scale from Toledo Scale, and - mentioned you as being involved in the purchase of this scale.

We made several attempts to contact you by telephone but were unable to reach you. Since it is crucial to the success of this study that I get the opinions of all who participated in the purchase of this scale, could I prevail upon you to take a few minutes to give me your opinions of the purchase on the enclosed questionnaire? Because we want to obtain your own opinion of the purchase decision, please complete the entire questionnaire by yourself. Of course, all of your responses will be held in strict confidence, and in return for your participation we would be happy to send you an executive summary of the results of the study. If you would like to receive this summary, just include your business card when you return the questionnaire in the enclosed envelope.

Thank you very much for your participation.

Sincerely,

Daniel H. McQuiston
Doctoral Candidate

DHM:Ilp
evaclosure
September 7, 1984

Mr. John Doe
XYZ Company

Dear Mr. Doe:

Approximately 3 weeks ago I sent you a questionnaire asking your opinions on your company's recent purchase of a truck scale from Toledo Scale. To date, I have not received your questionnaire back. I know that you are very busy, but could I prevail upon you to take a few minutes of your time to fill out and return the enclosed questionnaire?

Of course, all of your responses will be held in strictest confidence, with the results only used to help me complete my doctoral dissertation. If you would like a copy of the executive summary of the study, please enclose your business card when you return the questionnaire and we will mail you a copy.

Thank you very much for your help.

Very truly yours,

Daniel H. McQuiston
Doctoral Candidate
APPENDIX H

CONFIRMATORY ANALYSIS FOR
NOVELTY, COMPLEXITY, AND IMPORTANCE

Initial Model

<table>
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<th>SMC</th>
<th>t-Values</th>
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<td>-</td>
</tr>
<tr>
<td>N2</td>
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<td>1.115</td>
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</tr>
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<td>-</td>
</tr>
<tr>
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<tr>
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<td>6.657</td>
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<td>.444</td>
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</tr>
<tr>
<td>I1</td>
<td>.012</td>
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</table>

\[ \chi^2 \] 134.27 df 74 (p=.000)  
GFI = .904  
AGFI = .864  
RMR = .083

Coefficient of Determination  
for x variables (CD) .972
**APPENDIX H, (continued)**

**FIRST MODIFICATION - DROP N2, I2**

**LISREL ESTIMATES**

<table>
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</table>

\[ x^2 \text{ 51 df 111.21 (p=.000)} \]

- GFI = .907
- AGFI = .857
- RMR = .088
- CD = .972

- KSI 1 = .393
- KSI 2 = .591
- KSI 3 = .016
APPENDIX H, (continued)
SECOND MODIFICATION - DROP I1, C2

LISREL ESTIMATES

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\[ x^2 = 66.6 \text{ 32 df (p=.002)} \]

GFI = .933  
AGFI = .884  
RMR = .064  
CD = .979

KSI 1 = .392  
KSI 2 = .613  
KSI 3 = .070
APPENDIX H, (continued)

THIRD MODIFICATION - DROPPED I3
GOT NON-CONVERGENT MODEL

FOURTH MODIFICATION - PUT BACK I3, DROP I5

LISREL ESTIMATES

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</table>

\[\chi^2\] 44.51, 24 df \(p=.007\)

GFI = .945
AGFI = .896
RMR = .056
CD = .963

KSI 1 = .390
KSI 2 = .622
KSI 3 = .058
APPENDIX H, (continued)

FIFTH MODIFICATION - DROP N1, C3, I3

LISREL ESTIMATES

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<tr>
<td>I4</td>
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χ² 25.58 7 df (p=.001)

GFI = .954
AGFI = .861
RMR = .056
CD = 1.000

KSI 1 = .797
KSI 2 = .718
KSI 3 = 1.000
APPENDIX H, (continued)

SIXTH MODIFICATION - FREE N5

LISREL ESTIMATES

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\[ x^2 \text{ 15.58, 6 df (p=.014)} \]
GFI = 9.70
AGFI = .894
RMR = .033

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APPENDIX I
MODIFICATION OF SALES EFFORT VARIABLES - INITIAL MODEL

LISREL ESTIMATES

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$X^2 = 660.44, \ 134 \text{ df} \ (p=.000)$

GFI = .685
AGFI = .598
RMR = .144
CD = .276

KSI 1 .375
KSI 2 .607
APPENDIX I, (continued)

FIRST MODIFICATION - DROP T5, OTH9

**LISREL ESTIMATES**

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\[ \chi^2 = 526.26, 103 \text{ df } p = 0.003 \]

GFI = 7.04
AGFI = .609
RMR = .142
CD = .658

KSI 1 = .388
KSI 2 = .609
APPENDIX I, (continued)

SECOND MODIFICATION - DROP T9, OTH5

**LISREL ESTIMATES**

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\[ \chi^2 \quad 463.58, \quad 76 \text{ df } (p=.000) \]

GFI = .697
AGFI = .581
RMR = .151
CD = .746

KSI 1 = .409
KSI 2 = .613
APPENDIX  I, (continued)

THIRD MODIFICATION - DROP T6, OTH6

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\[ \chi^2 \] 343.66, 53 df \( p = (.000) \)

\[ \text{GFI} = .727 \]
\[ \text{AGFI} = .599 \]
\[ \text{RMR} = .113 \]
\[ \text{CD} = .839 \]

\[ \text{KSI 1} = .499 \]
\[ \text{KSI 2} = .635 \]
APPENDIX I, (continued)

FOURTH MODIFICATION - DROP T4, OTH4

LISREL ESTIMATES

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\[ x^2 \text{ 239.00, 34 df (p=.000)} \]

GFI = .731
AGFI = .565
RMR = .132
CD = .929

KSI 1 = .378
KSI 2 = .662
APPENDIX I, (continued)

FIFTH MODIFICATION - DROP T2, OTH2, PUT BACK T4, OTH4

**LISREL ESTIMATES**

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\[X^2 = 207.31, 34 \text{ df (p} = .000)\]

- GFI = .810
- AGFI = .692
- RMR = .117
- CD = .943

KSI 1 = .322
KSI 2 = .570
APPENDIX I, (continued)
SIXTH MODIFICATION - DROP T4, OTH4

LISREL ESTIMATES

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\[ x^2 \] 105.96, 14 df (p=.000)

GFI = .859
AGFI = .733
RMR = .101
CD = .967

KSI 1 = .310
KSI 2 = .586
APPENDIX 1, (continued)

SEVENTH MODIFICATION - DROP T3, OTH3

**LISREL ESTIMATES**

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\[ x^2 \text{ 26.38, 8 df (p=.001)} \]

GFI = .954
AGFI = .878
RMR = .053
CD = .975

KSI 1 = .285
KSI 2 = .475
APPENDIX I, (continued)

EIGHTH MODIFICATION - DROP T3, OTH3

**LISREL ESTIMATES**

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\[ x^2 \quad .03, 1 \text{ df (p=.873)} \]

GFI = 1.000
AGFI = .999
RMR = .002
CD = 1.000

KSI 1 = .709
KSI 2 = .324

*Out-of-bounds estimate.*
APPENDIX J
ENGINEERING CONFIRMATORY - FACTOR ANALYSIS

**LISREL ESTIMATES**

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\[ x^2 \text{ 102.50, 74 df (p=.016)} \]

GFI = .808
AGFI = .727
RMR = .114
CD = .992

KSI 1 = .319
KSI 2 = .584
KSI 3 = .042
APPENDIX J, (continued)

FIRST MODIFICATION - DROP N2, C4, I3

ACHIEVED NON CONVERGENCE
APPENDIX J, (continued)

SECOND MODIFICATION - ADD BACK C4

ACHIEVED NON CONVERGENCE
APPENDIX J, (continued)

THIRD MODIFICATION - DROP I5

**LISREL ESTIMATES**

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\[X^2 = 41, 44 \text{ df (p=.346)}\]

GFI = .874
AGFI = .797
RMR = .095

KSI 1 = .313
KSI 2 = .552
KSI 3 = .003
APPENDIX  J, (continued)

FOURTH MODIFICATION - DROP N1, I1

**LISREL ESTIMATES**

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<tr>
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<td>-</td>
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<tr>
<td>C2</td>
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<td>3.562</td>
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<tr>
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\[x^2 \text{ 21.77, 24 df (p=.593)}\]

- GFI = .917
- AGFI = .844
- RMR = .082

- KSI 1 = .310
- KSI 2 = .546
- KSI 3 = .134
APPENDIX J, (continued)

FIFTH MODIFICATION - DROP N1, C2

**LISREL ESTIMATES**

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\[ x^2 \ 12.37, \ 17 \ df \ (p=0.777) \]

- GFI = .946
- AGFI = .886
- RMR = .057
- CD = .942

- KSI 1 = .242
- KSI 2 = .590
- KSI 3 = .113
## APPENDIX K

### CORRELATION MATRIX FOR CFA

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<th>E4</th>
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### CORRELATION MATRIX TO BE ANALYZED

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### CORRELATION MATRIX TO BE ANALYZED

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**Determinant = 0.2585920-01**
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