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# The construction of theory in MIS research

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## ABSTRACT

*As a relatively new academic discipline, MIS has gone through processes of initiation, expansion, and consolidation. During the past two decades, MIS researchers have examined the state of their discipline and have found it "wanting" at times in the area of theory building and development. One important criticism of early MIS research was that it lacked strong theory of its own, and that it was often weakly grounded in theory, if at all. This paper examines the process and significance of theory building with an emphasis on some of the most well known MIS research streams. This paper demonstrates that MIS researchers have begun to develop strong theory and apply it successfully.*

*I can now rejoice even in the falsification of a cherished theory, because even this is a scientific success.*

*- Sir John Carew Eccles<sup>1</sup>*

## INTRODUCTION: THE QUESTION OF THEORY

One of the hallmarks of highly esteemed social science research is the development of, and the reliance upon, sound theory. Regardless of the reference discipline or paradigm of a researcher, sound theory is necessary to ensure rigor and believability (Sekeran, 1984). Believability is the heart of the matter. Can the reader be assured that what the researcher has found is, in fact, real and believable? Without a sound theoretical basis, most research is little more than speculation.

During the past 15 years, there have been calls for improvement in the quality of published MIS research. These concerns have centered partly on the need to develop or build theory (McFarlan, 1983). Such concerns are understandable. MIS, as academic disciplines go, is in its

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<sup>1</sup> Nobel Laureate in Medicine, 1963, as quoted in Popper (1965).

infancy. Early research in MIS had, with notable exceptions, a poor reputation owing to weak operationalization of constructs, poor statistical methods and experimental designs, and weak theoretical underpinnings.

The quest for acceptance in academe has motivated the move toward sounder and more grounded research. The desire to build theories unique to the field is understandable. MIS is still a child of its reference disciplines. No notable theories in MIS have originated in the field itself. Even the most well known MIS models and theories find their origins in one of the reference disciplines. By building theory and a cumulative tradition, it is hoped that MIS will become universally recognized as a unique and contributing discipline.

The lack of MIS theory building may be disturbing and lead some to complain that MIS is a "theme" rather than a field, the situation is not as bleak as is imagined. Theory building as a formal scientific process is relatively rare, even in the more mature social sciences (Bourgeois, 1979). The *formal* notion of grounded theory building in the social sciences is less than 30 years old, the landmark work having been published by Glaser and Strauss in 1967. Numerous other works have expanded upon this work, including Yin (1984), Eisenhardt (1989), Fry and Smith (1987), Bourgeois (1979), and Weich (1989). The continuing focus of social scientists in developing the idea of theory building indicates that while MIS may be the little brother of the social sciences, the older siblings aren't that much more advanced. In other words, the concern over MIS's use of accepted social science techniques might be misplaced.

This paper explores the process of theory construction in MIS research. The first half of the paper examines the general notions of theory, model, and hypothesis and discusses methods of theory construction, including both deductive and inductive methods. The second half of the paper examines classic, not so classic, and newer lines of MIS research and their application of theory and theory construction methods.

## THE NATURE OF THEORIES AND MODELS

### Science and Truth

Scientific research is a way of generating and testing the truth of statements about the world of human experience (Wallace, 1974). The fundamental goal of research is, in a single word, truth. The scientific method seeks to discover fact unbiased by both the observer's viewpoint and methodology. We know, of course, that this is difficult, but the goal remains and is attainable through a rigorous approach and attention to methodology. Integral to the scientific method is creating, developing, and testing theory through formulating and testing hypotheses. This type of activity addresses the quest for understanding.

Another goal of science is prediction (Dubin, 1969). This goal can be somewhat orthogonal to the goal of understanding. Indeed, in the view of some authors in the philosophy of science, it is possible to attain one without reference to the other. The difference lies in the focus and goals

of the researcher. In the desire for understanding, the focus is upon interaction between constructs. In the desire for prediction, the focus is upon outcomes.

### **Theories, Models, and Hypotheses**

The concepts of theory and model are inexorably linked and intertwined. The distinction between the two often is obscured, even in formal research discussions. In fact, some authors deliberately do not distinguish between the two (notably Dubin, 1969). Other authors make at least some distinction. Kaplan (1964)<sup>2</sup> regards models as representations of reality and theories as fundamental explanations. Other authors (Diesing, 1974; Kidder & Judd, 1986) use similar definitions and distinctions. However, Dubin's point is well taken: Theory and Model are not orthogonal concepts. If we accept Dubin's viewpoint, we might conclude that theory building and model building are the same. This proposition certainly has appeal from the philosophy of science perspective, but it is generally accepted that there is a difference, even a distinction, between these activities.

We should not, however, become overly concerned with the philosophical underpinnings of the model/theory discussion. Let it suffice to assume that modeling or model building is one of many activities that allow us to construct and explore theory. Generally speaking, the term model implies a symbolic or mathematical formulation of the relationships between constructs. Such models are sometimes referred to as formal theories (Diesing, 1974).

Often linked as a companion in the discussion of model and theory is the notion of hypothesis. The formal definition of hypothesis requires a companion concept known as a proposition or research question, which is a statement about a theoretical model. A hypothesis is a proposition's operational analog (Dubin, 1969). Through forming and testing hypotheses we can arrive at a conclusion regarding the validity, or believability, of a model or theory.

It is important not to overlook the importance of the hypothesis testing process in the theory construction process. Normal science, according to Kuhn (1970), proceeds incrementally. It is through developing and testing the "small" hypotheses that most ordinary science proceeds and builds the cumulative tradition that is so essential.

Since MIS research is generally considered to have multiple reference disciplines (Kaplan & Duchon, 1989), there are different propensities to emphasize models, theories, and hypothesis testing depending upon the subject matter and reference disciplines of the MIS sub-discipline in question.

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<sup>2</sup> As reported by Dubin (1969)

## **APPROACHES TO THE CONSTRUCTION OF THEORIES AND MODELS**

### **Logico-Deductive and Grounded-Inductive Methods**

The literature on the origins of theory generally admits two general approaches to theory construction or theory creation. These are well described in Glaser and Strauss (1967), and this paper adapts their terminology. The first, known as the logico-deductive method, relies upon deductive reasoning. The researcher relies on existing literature and logical inference in developing new models and theories. Such an approach in the social sciences is denigrated by Glaser and Strauss (1967) and others who share their philosophy.

Research in economics, computer science, or management science usually employs theories developed in the logic-deductive method. In MIS, for example, Codd (1971) and Chen (1976) began with the literature and proceeded to develop from it new theory.

Codd (1971) used mathematical set theory to develop a new model for databases, known as the relational model. Today it serves as the basis for most modern Data Base Management Systems. The work of Chen (1976) also has its roots in formal mathematical theory. Chen employs set mathematics, but focuses on relationships between entities and their attributes. This work does not build directly upon Codd's, but is a reaction to the poverty of the relational model in capturing data semantics. Other examples of this genre are discussed in more detail below.

The second method of theory construction is grounded theory; that is, theory based upon data. In this methodology, the researcher forms hypotheses and theory from observation, or data. Here, the dominant form of inference is induction; the researcher moves from the specific instance to statement about general law, or theory.

Good examples of MIS research that employ such methods are considerably less easy to find. To be fair to MIS, it is also difficult to find good examples in the social sciences (Bourgeois, 1979). Part of the problem in detecting or identifying such efforts is the tendency of case studies to masquerade as theory testing pieces, when they are actually theory building.

### **Where Inductive and Deductive Methods Intersect**

Research is, of course, considerably more complex than the above discussion of the literature implies. Theory discovery does not exist independently from theory or hypothesis testing, and vice versa. The two processes or activities are connected, and frequently fold upon each other (Wallace, 1974). Often the initial idea or hypothesis to be tested derives from inductive reasoning. This serves as the starting point for deductive reasoning based investigation, which in turn may generate inductive reasoning in the investigator. The process is circular, but may proceed in an unpredictable fashion with backtracking and beginning again. While Wallace (1974) wrote on this phenomenon with the social sciences in mind, it may be true in the natural sciences as well.

This describes a good portion of the research that is in the MIS literature. Most observers will note that testing dominates over discovery, which appears to be both natural and desirable.

An excess of theory building could lead to fragmentation of the field (Bourgeois, 1979). Such an imbalance would lead to many simultaneous open lines of inquiry. This may result in a lack of focus, and lines of research may be abandoned prematurely.

### **THE QUEST FOR HEGEMONY IN MIS RESEARCH-- COMPETING REFERENCE DISCIPLINES**

How theory should be built and developed is part of the appropriateness of methods and the legitimate goals of research, which is part of the struggle over which of the competing reference disciplines, if any, will dominate MIS research. It comes down to the question of hard vs. soft science. Recent articles in MIS and related literatures address the issue by advancing the cause of qualitative methodologies, either alone or combined with quantitative methods. These include Eisenhardt (1989), Lee (1989), Kaplan and Duchon (1988), and Benbassat et al. (1987). The tide of research in this area seems to favor a combination of methods, and an acceptance of multiple perspectives. This is a very positive trend for the quality of MIS research. All research methodologies and perspectives are subject to natural biases and blind spots. Using multiple research methodologies to address a question will mitigate the bias introduced by any particular methodology. The result will be to dramatically improve the validity of MIS research.

The battle of hard vs. soft science is not over, however; neither is MIS alone in the struggle. Hirsch et al. (1990), describe the movement of management policy toward the use of economic models. Similar movement also is seen in certain areas of MIS research. The past decade has seen both information economics and agency theory join the "hard" reference disciplines of operations research/management science, and computer science. The "soft" reference disciplines of organizational behavior and management have been joined by organization theory. Notable in this stream of research is the organizational information processing framework of Daft and Lengel (1986).

Both the trend towards multiple methodologies and the acceptance of reference disciplines are good. We ought to value multiple viewpoints, since this increases the potential for intellectual "cross-fertilization" and hence increases the possibilities for scientific discovery.

However, if Kuhn (1970) is correct, one viewpoint may become dominant and achieve hegemony over the field. The word *hegemony*, used in the title of this section, comes from political science. It is the process whereby one group extends control or influence over others. This phenomenon is also associated with "political correctness," where those who don't believe as other members of a group do are placed outside the group as "them." The trend poses real danger to the field. We ought to work to maintain MIS's current openness for as long as possible. Failure to do so may result in MIS stagnating and falling into the pit of marginal relevance.

## THE STATE OF THEORY CONSTRUCTION IN MIS RESEARCH

MIS research is generally believed to be in a pre-paradigmatic state with little or no theory-building activity taking place (Culnan, 1987; Banville & Landry, 1989). Until recently, the literature had a dearth of good quality case studies, the usual theory building methodology. The work of Glaser and Strauss (1967) is the standard in the social sciences for the construction or discovery of grounded theory. The Social Science Co-Citations Index reveals only 2 MIS articles in the 1980s that cited the Glaser and Strauss book. On the other hand, theoretical modeling appears to be used extensively in MIS research in the areas of information economics, software engineering, data base, and telecommunications. These areas of research have the closest link to the quantitatively oriented reference disciplines. MIS appears to have lagged behind in its adopting accepted theory building techniques from the social sciences.

A conclusion from this observation is that the logico-deductive methods are used commonly, while inductive methods of grounded theory discovery are used infrequently. Alavi et al. (1989) find that the MIS literature has been weak in the area of theory building. They report a recent increase in the proportion of empirical articles appearing in the major journals. They also report only 15 theoretically oriented articles in a sample of 800 articles published since 1968.<sup>3</sup>

As noted above, while these methods are well known, they are not frequently employed in other social sciences either. The explicit use of the Glaser and Strauss (1967) framework for grounded theory development is rare. The reasons for this are unclear. Perhaps the framework is not highly regarded. It seems more likely that it is due to the difficulty encountered in its use and the apparent preference of investigators for testing and extending of theory through other means.

The dominant treatment of theory in MIS, other than model building, is theory development. By this we mean the adopting theory from reference disciplines, and extending it into the context of MIS problems. In addition, research using this bias may extend theory already adopted for MIS. One example extending the user information satisfaction literature to include end user satisfaction (Doll & Torkzadeh, 1988). The category of theory development can also include research that is in the normal science model of Kuhn (1970). This includes most empirical research, regardless of methodology, as long as it is based or grounded in theoretical proposition. Research in this category generally employs a theory or hypothesis testing strategy.

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<sup>3</sup> The paper by Alavi et al. (1989) includes only papers that have been published in major American journals. Papers published in ICIS, HICSS, and other conference proceedings are ignored, as are papers published in European journals and new journals.

## THEORY BUILDING IN CLASSIC LINES OF MIS RESEARCH

The remainder of this paper examines papers that employ, directly or indirectly, theory building strategies. The papers chosen to illustrate theory building strategies are drawn from the more well known MIS literature, including user involvement, and user information satisfaction, and user acceptance of technology. In addition, a relatively new area, Task-Technology Fit, is included.

### Nolan's Stage Theory

One of the best known papers in the management of information systems is Nolan (1973), which was later revised and updated (Nolan, 1979). Nolan posited that data processing budgets over time will grow in a manner that follows an S-curve pattern. Nolan divided the history of IS development into first four stages, and later, six stages. His work in this area is known popularly, and perhaps erroneously, as the "Stage Theory."

The Nolan Stage Theory, despite its current lack of standing, employed a grounded theory approach to theory building. It is apparent that Nolan did follow an approach that allowed him to make significant generalizations based on data.

Nolan's research spawned a series of responses, including Drury (1983), King and Kraemer (1984), Benbasat, et al. (1983), and Gurbaxani and Mendelson (1990). These articles have, for the most part, disputed Nolan's findings. King and Kraemer (1984) criticize Nolan's work as incomplete, and question Nolan's interpretation of the empirical evidence. Gurbaxani and Mendelson (1990) found that Nolan failed to account for declining technology cost and that the shape of the expenditure curve was different than predicted.

However, these findings do not mean that Nolan's work has no value. On the contrary, Nolan generated a considerable volume of theory testing research. The theory ultimately wasn't built, but there was a clear attempt to follow the process of normal science. If we examine this stream of research in light of Eccles' quote at the beginning of the paper, we can conclude that this research stream produced important, significant results.

### Cognitive Styles

One of the most infamous lines of research in MIS is in the role of cognitive style in DSS design. This line of research was quite popular in the late 1970s and early 1980s. A number of papers written during that period investigated how the cognitive style of individuals could be exploited to produce more effective information systems. Notable papers include Bariff and Lusk (1977), Benbasat and Taylor (1978), and Zmud (1979). This impressive array of research certainly was done with the intent of developing theory.

The end of this line of research generally is defined by Huber (1983). Huber points out that the body of research produced contradictory results, many studies may have been poorly done, and researchers made faulty operationalizations, or overlooked other important individual differences (confounding factors).



However poorly done certain studies might have been, the general quality of this research should have been acceptable. It is clear that the body of literature in this area represents theory building, in the classical, normal science model. Why, therefore, did it fail to develop enduring theory? The answer may lie deeper than the individual studies go.

The entire notion of cognitive style is based on the personality types of Carl Jung. However, the operationalization of the Jungian personality theory and its measurement of the constructs is far removed from the original work. There is also a question of construct validity. The original theory of Jung likely fits the criterion of grounded theory. It was derived from hundreds, if not thousands, of contacts with individuals in a clinical setting. It is clear that the researchers in the area didn't understand the limits of the underlying theory. The principal use of the underlying literature of cognitive style appears to be useful in psychological counseling, and not for behavior prediction.

The investigators in this area built their research on the shifting sand of unstable theory, and failed to consider other and more powerful independent variables such as learning effects as alternative explanations. This very promising line of MIS research failed to develop theory in MIS because of poor foundations in psychological theory. It is, however, an excellent example of how normal science should proceed from preliminary papers through testing hypothesis. Finally, it died an inglorious death at the hands of Huber (1983). It was a "failure" for MIS, but it must be considered scientific progress based on Eccles' criteria.

### **User Involvement**

The user involvement literature is an area of MIS research that suffers from poor grounding in theory. This body of literature, like that of cognitive styles, is extensive and contradictory. Unlike cognitive styles, it appears to have no pretense to a theoretical underpinning, save plausibility. To be fair, user involvement developed early in the history of MIS, and user involvement in systems development sometimes makes a significant difference.

This stream of research was described well by Ives and Olson (1984), who called for an improvement in the quality of research in the area and suggested for theoretical starting points, including participatory decision making and planned organizational change. These authors criticized prior research in this field as lacking in rigor, control, and theoretical foundation. These criticisms are similar to those hurled by Huber (1983) at the cognitive styles literature. The Ives and Olson literature review reveals that a large number of papers examined the user involvement construct. Like the cognitive style research, it appears that there has been an extensive attempt to conduct "normal" science; in other words, an attempt to develop and extend theory has occurred.

It is interesting to note that unlike the effect of Huber (1983) on cognitive styles research, Ives and Olson (1984) set this line of research on a new course. Notable in this area is Franz and Robey's (1984) work on rational and political perspectives of systems development. This piece used a case study approach to the question of user involvement influence on system success. The paper compared rational and political perspectives of the actors in the subject organization. While

the paper is written so it appears to be an informal theory testing piece, it is possible that the actual research was conducted (in the field) using a grounded theory approach. The not entirely novel proposition is that political or power considerations influence user behavior, and therefore outcomes of the development process.

Whether user involvement makes a difference at this point is moot. The question today is when does it make a difference, or under what conditions does involvement matter. One line of inquiry examines user-analyst communication. Work in this area, including De Brabander and Thiers (1984) looks at the relationship between user and analyst. The general thrust of this research is to identify the communications behaviors of analysts with regard to users that lead to more effective implementations. This work is well grounded in communication theory, and is a very clear attempt to use existing theory and extend to an MIS venue.

This line of research should be considered one of MIS's continued successes in an attempt to build theory. The normal science model can be seen guiding researchers' efforts to develop involvement theory. That this stream of research hasn't run in the direction of the original authors should surprise no one. The early simple model has evolved to embrace more variable situations, thus greatly increasing its ultimate value.

### **User Information Satisfaction (UIS)**

The UIS literature is well known in MIS research. It begins with the Bailey and Pearson (1983) paper, which establishes the initial measure of satisfaction and suggests that satisfaction is linked to effectiveness. This paper spawned several derivative works, including Ives, Olson, and Baroudi (1983). These works generally concentrate on developing alternative instruments for measuring UIS. The UIS instruments appear to be popular among other researchers for measuring system effectiveness.

The theoretical basis for connecting of satisfaction to effectiveness is weakly based on Cyert and March's (1963) *Behavioral Theory of the Firm*. The original authors, Bailey and Pearson (1983), base their paper primarily on this work; however, Bailey and Pearson make only a brief reference, without elaboration, to Cyert and March. It is interesting to note Ives, et al. (1983) do not challenge this assertion, and accept Bailey and Pearson's work as a *given*.

The validity of the UIS instruments' ability to measure effectiveness is seriously questioned by Melone (1990), who finds no theoretical link between the effectiveness and satisfaction constructs. The validity of the instruments to measure satisfaction has not been seriously questioned; however, the link between satisfaction and effectiveness is weak. UIS is an incomplete measure of effectiveness, but does account for a portion of the construct. Melone (1990) also proposes that future research must look at user attitude, and recommends the "theory of reasoned action" of Ajzen and Fishbein (1980) as an area of inquiry that is likely to be productive.

This line of research began with a weak link to established theory. The use of satisfaction as a proxy for effectiveness is tenuous and fragmentary. While the researchers succeeded in developing good measures of satisfaction, their failure to have a sound theoretical framework prevents

their work from having the desired impact in its current form. The Melone (1990) paper will likely be viewed in the same light as the Huber (1983) and the Ives and Olson (1984) papers. It establishes a call for reflection and redirected research with better attention to theoretical foundations.

### **User Acceptance**

The UIS instruments, as noted above, have limited application due to weak association with theory. A new stream of research may supplant UIS. This is the technology acceptance model (TAM) of Davis, et al. (1989), which attempts to understand and predirect user acceptance of technology. This model is very closely linked to accepted theory, the Theory of Reasoned Action of Ajzen and Fishbein (1980). This model (TRA) is a general model that can be used to understand the choices people make in a number of circumstances. The TRA was adapted by Davis to help in understanding why people choose to use software.

This stream of research includes a number of papers that have extended and replicated the results of the original paper. Notable in this category are Mathieson (1991) who compared the TAM with the Theory of Planned Behavior (Ajzen, 1985). The Mathieson paper is an important paper in that it replicates the earlier Davis et al. (1989) TAM paper, but also because it compares TAM to the successor to the Theory of Reasoned Action, e.g., the Theory of Planned Behavior. The results of the original paper also were replicated by Adams et al. (1992). As a consequence of these papers and a number of conference papers, the TAM model is considered stable and well established in the field.

The TAM literature is an area where we see clear examples of theory building. The acceptance literature has borrowed from, and built upon established theory in psychology. The TAM literature has proven to be the natural evolutionary product of the UIS literature even though the two streams of work have different origins in the reference disciplines.

### **Task-Technology Fit Models**

Another stream of research which addresses some of the concerns which stimulated the development of the TAM model is the Task-Technology Fit model (Goodhue, 1995). This model examines the link between TTF and performance. However, it proceeds from a somewhat different theory base than TAM, as its origins are found in the volitional behavior model of Bagozzi (1982). A comparison of the parent models for TAM and TTF show these models while concerned with related constructs, proceed from different theoretical directions. However, both the TAM and TTF models are similar in their use of established social science models of attitude, intention, and behavior.

In the development of TAM and TTF, MIS has begun to show a trend which is typical of other social sciences. Researchers are developing parallel, somewhat overlapping theories. Recent research has begun to conceptualize TAM and TTF as related models, in part because of the

similarities in the parent models. Dishaw and Strong (1997) posit that the TTF variable may be included in a TAM model as an antecedent construct to the key independent variables in TAM, perceived usefulness, and perceived ease of use. Their results are promising and show that the addition of the TTF construct significantly improves the explanatory power of the basic TAM model.

The theoretical development of models in the TAM and TTF areas have employed techniques associated with normal science. The underlying models have been well tested in replications conducted in multiple research studies. Each study builds upon what has come before it, and extends those findings in a significant fashion.

## CONCLUSION

This paper has explored the development of theory in MIS research. Theory building strategies were examined from the perspective of grounded theory building and theory development using normal science. While the development of grounded theory building in the model of Glaser and Strauss (1972) is still relatively uncommon, there are numerous examples of theory development. The research discussed in this paper is not intended to be an exhaustive examination of theory building in MIS. There are certainly a number of other papers which might have been used as examples. However, the papers discussed were chosen both for their ability to illustrate theory construction and their widespread familiarity.

With the maturing of MIS as a research discipline, it has become necessary for MIS researchers to be more attentive to the theoretical underpinnings of their work, to use and extend established theory, and to develop new theories when appropriate. To accomplish this, it is necessary for the researcher to understand the nature of theory and how it has been used, both well and perhaps not so well, in some of the better known MIS literature. This paper explored the basic notions of theory and model in the context of their use in MIS research in hope of sensitizing other MIS researchers to use theory in their work, and in hope of calling for higher standards for MIS research as the field matures.

If the process of normal science is allowed to proceed in MIS research, then we will see gradual progress interspersed with the inevitable paradigm shifts, backtracking, and abandonment of formerly promising lines of research. Our discipline is young, and a "Unified Field Theory" of MIS may be far away. MIS researchers need to be patient with themselves and their colleagues and build on the significant advances made in the last decade.

Earlier calls for building theory in MIS have been answered. While some of the results to date have been disappointing, there are a number of promising streams of research in progress. This paper dispels the myth that MIS is a discipline that desperately needs theory building. Normal science, together with theory building and testing, is progressing in many corners of our field. Through the application of rigorous methods in combination with judicious amounts of patience, MIS theory is being built.

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