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Theoretical framework for a comprehensive model of end user acceptance

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ABSTRACT

Numerous previous studies in the area of user acceptance have proposed several models of user acceptance. These studies have each investigated different components of the user acceptance model. No significant research has been accomplished to combine factors which influence user acceptance into one overall model, which then could be subject of further validation.

The purpose of this paper is to provide the foundation for a comprehensive model of user acceptance by building a theoretical framework that brings together individual models of user acceptance.

INTRODUCTION

Many of the possible benefits of a Management Information System (MIS) get lost due to the users' inability or unwillingness to utilize technology to its full advantage. User acceptance is a crucial component of an information system's effectiveness.

Gaining a better understanding of the components of user acceptance and, in addition, ways to measure user acceptance is imperative for those striving to make certain that their companies' investments in information technology is profitable. Understanding the needs and problems of users can provide managers valuable insight into bringing about information system effectiveness.

A practical definition of user acceptance is given by Reichwald.

Acceptance is the willingness of the user to exploit in a given situation the full potential of the technical (information) system. (Reichwald, 1978, 31).

The purpose of this paper is to provide the foundation for a comprehensive model of user acceptance by building a theoretical framework that brings together stand-alone models of user acceptance. An extensive review of the literature pertaining to user acceptance was performed

and provides the foundation of the theoretical framework. The framework is organized into macro-level and micro-level implications for the user-acceptance model.

First, this paper explores the macro-level implications which are the organizational context factors of the user-acceptance model. After that, the micro-level implications or the end-user factors of the user-acceptance model, are examined.

ORGANIZATIONAL CONTEXT FACTORS OF THE USER-ACCEPTANCE MODEL

The user-acceptance literature pertaining to the organizational context factors of the user-acceptance model can be grouped into three areas: 1) the strategic role of MIS implementations, 2) cost benefit considerations, and 3) organizational implications of IS applications. The research relevant to each factor is discussed next.

Strategic Role of MIS Implementation

The advantages of office automation applications are realized through productivity increases measured by total unit cost per output, increased speed, and quality of work. MIS implementations are primarily used for purposes other than mechanization or automation of the work flow. The MIS task is to provide better information and to enable the user to make better decisions, thus allowing the user to solve complex and sophisticated tasks.

MIS applications, as a result of constant changes in management philosophies, become a vital part in every type of business. MIS implementations now have a strategic role in a company. MIS applications increase market flexibility and support sudden changes in customer demand, decrease administration overhead, optimize day-to-day operations, and allow greater transparency of the corporate information flow. The efficient implementation of MIS applications allows the company to more easily adapt to the management philosophy of the next decade--lean management (Bullinger, 1992), where the company is viewed in the entirety of its value chain, from supplier to customer (Fieten, 1992). Therefore, the concept of lean management is process oriented, not function oriented, resulting in the management and control of an activity chain (Daum, 1992).

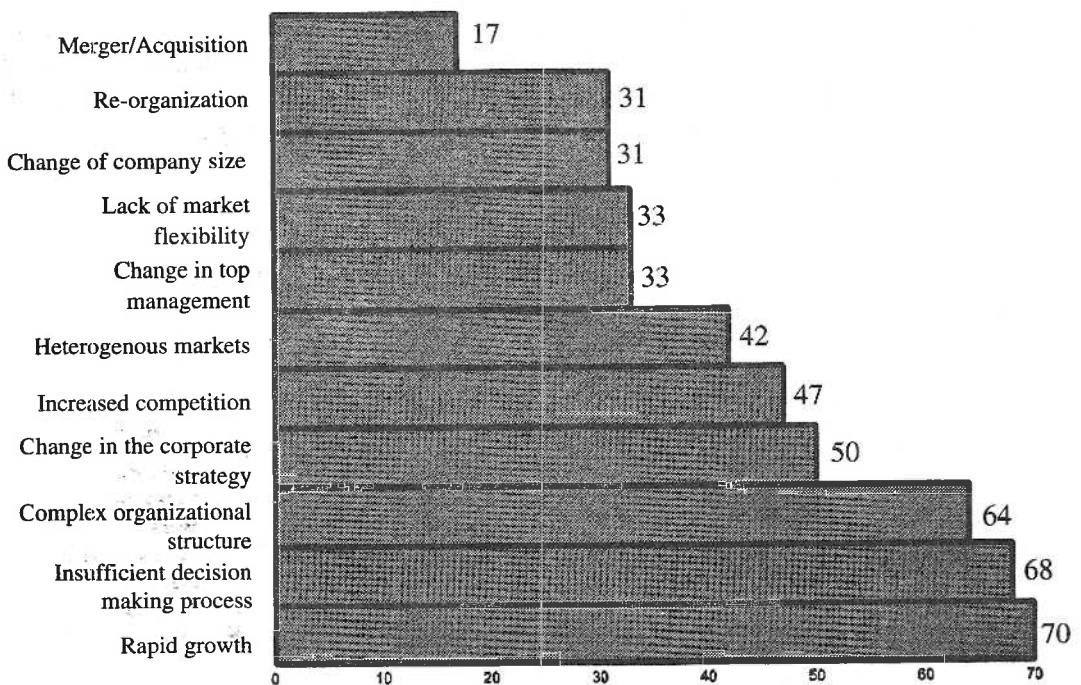
This change in organizational structure to lean management has some risks since it requires an increase in the information structure of the company and it may lead to an unnecessary information overload. This overload would contradict the MIS philosophy, since the MIS system is designed to decrease the information overload of an individual user and increase a person's capabilities in the decision making process. As a result, an MIS application must be based on a precise, up-to-date, and redundancy-free data model of the company and its information flow, requiring an excellent system analysis prior to MIS implementation.

The MIS implementation has the potential to increase the effectiveness and efficiency of the organizational structure. During the MIS application design and implementation process,

slack and redundancies in the organizational structure are often detected.

The reasons for MIS implementations listed in Graph 1 were determined through a survey of 67 companies by Vogel and Wagner (1993). The surveyed companies were from 16 different industries in Germany and Switzerland, where 73 percent had less than 10,000 employees and 89 percent had sales of >100m.DM. This information is found in Graph 1.

Graph 1. Reasons for Information Systems Implementations



Source: *Vogel and Wagner*

As Graph 1 indicates, 50 percent or more of all questioned companies used MIS implementations to adapt themselves to: (1) changes in their strategic environment such as their overall corporate strategy and/or external growth or (2) factors inside the corporation such as the organizational structure or the decision making process.

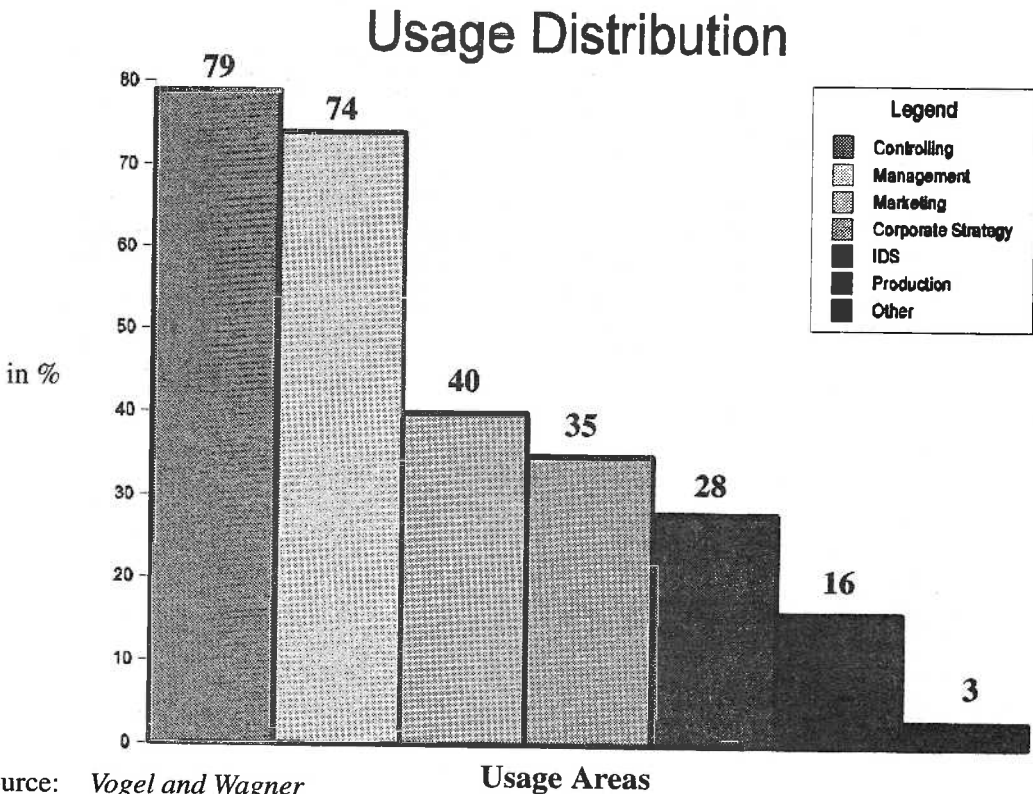
Porter and Miller (1985, 150) have identified three basic objectives for a company to achieve competitive advantage with the use of information systems:

1. It must alter the industry structure.
2. It must improve the company's position in the industry with its existing businesses.
3. It must create new business opportunities.

Although this theory relates to the use of information technology in general, it still is applicable to MIS applications, since its implementation affects a strategic dimension of a company.

Reflecting on the wide range of possible usage for MIS applications, different user groups inside a company can be identified. The diverse user groups are presented in Graph 2; this information is based on research study by Vogel and Wagner (1993). Since the use of MIS applications is not restricted to one usage area, synergy is achieved through multiple usage by different user groups within the company. Most companies which use MIS applications employ the technology in more than one area, resulting in multiple entries to the graph.

Graph 2. Usage Distribution of MIS Applications



Source: Vogel and Wagner

Usage Areas

Within the various usage areas, the usage intensity differs significantly, from daily to weekly or even monthly use of the system, whereas the highest usage intensity on a daily basis can be found inside the marketing usage area (Vogel & Wagner, 1993). The usage intensity does have a significant impact on user acceptance of a given system, since it directly correlates to the system exposure and the learning curve of a user.

Cost/Benefit Considerations

When considering the implementation of MIS applications, companies should conduct a cost-benefit analysis prior to the investment decision. While the costs are more easily determined, the benefits of such MIS implementations cannot be measured accurately most of the time. In the following list of cost drivers that apply to MIS implementations, the costs that are related to user acceptance are in bold print (Neu, 1991, 24).

- **hardware and software cost**
- **system development, design and implementation cost**
- wages/salaries for both pre-implementation and post-implementation personnel
- **user training**
- maintenance cost
- capital cost
- expenditures paid for third-party services
- communication cost

The benefits of MIS implementations are usually not directly measurable; thus, an accurate cost-benefit analysis with the identification of bottom-line savings requires extensive estimation models (Rockart & DeLong, 1988). The Vogel and Wagner (1993) study of 67 different companies pointed out the following advantages of MIS implementations. The quoted percentage of each advantage counts for the total positive selections of all companies of the surveyed advantages, with multiple entries where allowed.

Qualitative advantages:

- increased information quality (98%)
- homogenous databases (95%)
- decrease of decisions made under uncertainty (76%)

Quantitative advantages:

- reduced time required for work tasks (91%)
- decrease in paper-handling needs (42%)
- decrease in administrative personnel (14%)

About 25 percent of the surveyed companies perform a cost-benefit-analysis prior to the planned system implementation, whereas 36 percent of the companies merely determine cost drivers and/or applicable benefits (Vogel & Wagner, 1993).

A goal of the use of the new information system should be to increase productivity of the individual employee or the associated work group in order to recover the investment cost. A lack of productivity gains with the new system often results in the inability of the work force to pay back the cost of the system and maintain the company at the pre-implementation profit level (Vetter & Wiesenbauer, 6/1992). In addition, insufficient resource allocation for system design, implementation, and the required user training at the outset might lead to sub-optimal performance and a significant lack of user acceptance. This lack of adequate initial funding might require additional funds at a later time that push cost beyond what they would have been if the project was funded properly initially.

Organization Implications of MIS Application

Since MIS applications gather, compile, and present information in a mostly automated way, much of the necessary manual work associated with this process gets reduced or even eliminated. Reductions in the employees necessary to do the preliminary work result in cost savings.

Furthermore, the use of MIS and EIS applications reduces the need for information intermediaries, as the necessary information is directly presented through the system to higher levels in the organizational hierarchy. The use of MIS applications might be used as an effective tool to achieve a streamlining or downsizing of the organizational hierarchy, resulting in further cost savings. This organizational implication of MIS applications creates apprehension among employees and should be considered carefully.

END-USER FACTORS OF THE USER-ACCEPTANCE MODEL

The exploitation of the full technical potential of an information system, hence a positive acceptance of the technology, can only be measured indirectly, using multivariate analysis techniques to determine user attitudes such as user satisfaction towards a specific system and its environment. The concept of user involvement also helps to evaluate system usage and user satisfaction, although it cannot conclude the degree of actual user acceptance of the individual (Baroudi, Olson, & Ives, 1986).

In general, user acceptance is primarily based on five factors (Blümling, 1993, B 11).

1. User participation in the planning and design process of a new information system.
2. Organizational incorporation of the technology into the sequence of operations.
3. Hardware and software functionality.
4. Supervisory behavior.
5. User training.

A more detailed structural model for information system implementation and the effects on user acceptance was developed by Lucas, Ginzberg, and Schulz (1990). Their model, which is based on various research findings, is divided into two sub-models, a *manager model* and a *user model*. The logic of this model is based on a two-stage implementation process, where a new system implementation process begins with management initiation and acceptance, followed by user acceptance through user involvement. The user model is based on attitude-intention-behavior relationships and the variables that moderate this relationship in the setting of information systems (Lucas, Ginzberg, & Schulz, 1990). Although major hypotheses of the model could be verified in the study by Lucas, Ginzberg, and Schulz (1990), the general approach of a two-stage implementation process, initiated by management, might be questionable since it might result in sub-optimal user acceptance.

REASONS FOR INSUFFICIENT USER ACCEPTANCE

Insufficient user acceptance is based on an unsatisfactory level of any one or combination of the five previously mentioned factors. Insufficiencies of user acceptance can be classified into three different categories of dissatisfaction:

1. General reasons related to any new system implementation
2. Specific reasons related to a particular implementation process
3. Specific reasons related to a particular software application

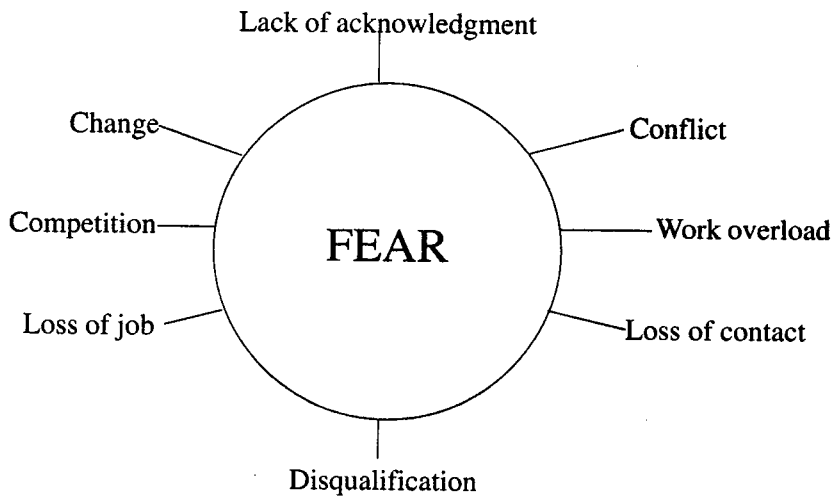
These categories are not mutually exclusive, but are interdependent and influence each other. Research findings pertaining to the three categories of dissatisfaction that lead to insufficient user acceptance are discussed next.

General reasons. Many employees develop resistance to a change in their work behavior or work pattern, which employees believe could result from a new system implementation (Staeble, 1985). They might fear the implementation and perceive it as a possible threat, since in most cases the benefits of new implementations are based on third-person evaluations. The feeling increases when users do not get enough information or no information at all about the new system and the effect on the workplace. As a result, many users might want to preserve their current status and reject the planned implementation. User apprehension might also be based on general feelings in society towards computers and information technology. In a study at Gesellschaft für Mathematik und Datenverarbeitung, 74 percent of respondents felt that computers restrict the users' natural working process. In addition, 64 percent believed that the use of computers and information technology decreases interpersonal relationships and communication at the workplace (Lange, 1984).

The possible causes of the development of user apprehension are summarized in Figure 1. These reasons are primarily based on attitudinal factors and organizational factors, which cause individuals to resist change and increase the risk of dysfunctional behavior (Carey, 1988). Since the use of intelligent information systems might reduce the skill requirements of the user or

replace the user, employees might experience reduced self-esteem and fear a reduction of intragroup acceptance or the loss of the job itself. In contrast, some users might dread a work overload due to deficiencies of the new system. Furthermore, users might fear their inability to operate a system at near optimal performance; hence, they might be afraid of other co-workers, who might be learning much faster than themselves. This fear of failure leads to increased intragroup competition, and might also disrupt the group cohesion, resulting in possible job dissatisfaction (Miner & Brewer, 1976). Employees who have little experience with new technology might fear competition more than those who have extensive training and experience with computers. Users develop certain psychological habits, based on established rules, policies, and procedures, on which they rely for both guidance and protection.

Figure 1. Reasons for User Apprehension



SOURCE: Own preparation

Changes, as they come along with new system implementations, frequently disrupt a user's psychological security by making established habits inapplicable. Dickson and Simmon (1970, 39) identified four organizational factors which promote social inertia and cause individuals to resist change.

1. *Departmental boundaries*: The introduction of new information systems might cause changes in definite departmental boundaries, causing individuals to fear loss of status and territory and cause resistance to occur.

2. *Informal structure*: New information systems might threaten to change or eliminate the informal structure in the organization, which is based on a set of rules, a code of ethics, and a set of informal communication channels. For this reason, people will resist changes.
3. *Organizational culture*: Any given organization has a specific culture with regards to change, as expressed by its top management. This directly influences implementation strategies and hence a positive or negative acceptance of a new system implementation.
4. *Method of introduction*: As addressed by considerable research, the implementation strategy directly influences user acceptance or apprehension.

Specific reasons related to the implementation process. As a result of a bad implementation process, users might develop intense apprehension towards a new information system, leading to dysfunctional behavior. In general, users will evaluate and judge a planned system implementation according to two factors:

1. Their own personal advantage from the implementation
2. The organizational advantage from the implementation

As a result, the matrix illustrated in Table 1 applies (Vetter & Wiesenbauer, 61/1992).

Table 1. Advantage Portfolio

Organizational advantage	high	A	B
	low	C	D
		low	high
		Personal Advantage	

SOURCE: Vetter & Wiesenbauer

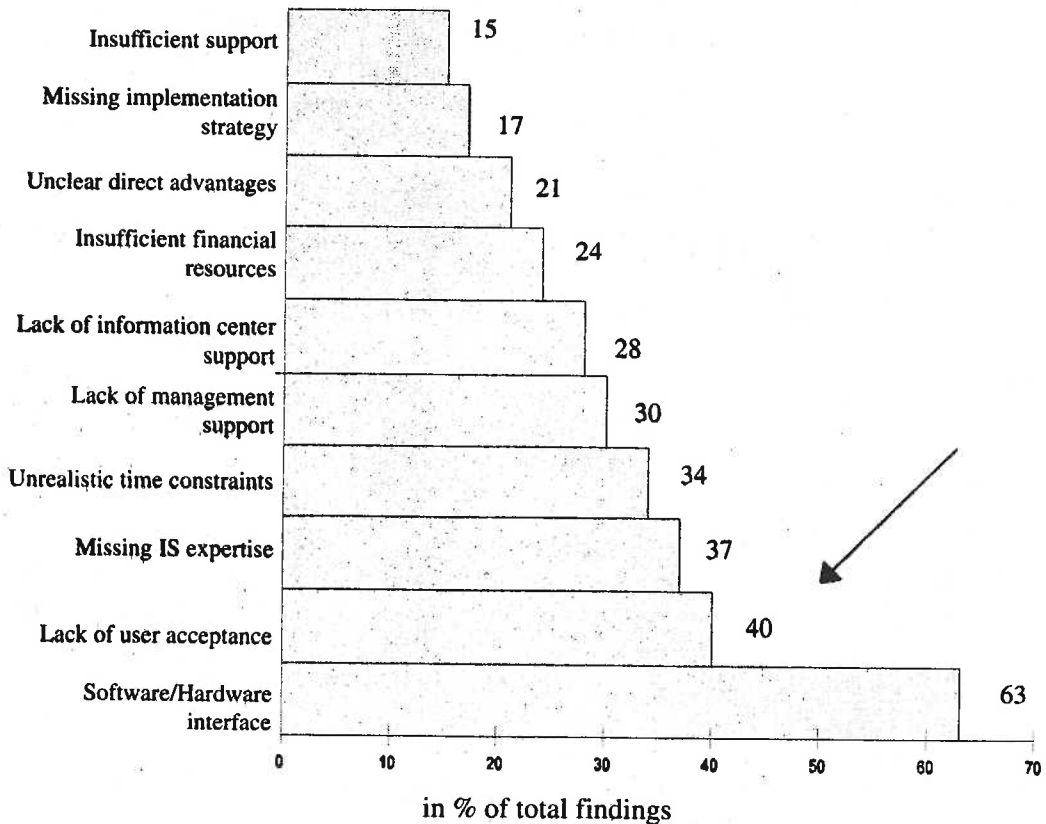
Most companies fit in quadrant A, since they try to optimize the efficiency and effectiveness of their organization with regard to strictly economical factors, neglecting the needs of the individual employee. The individual employee does not perceive any positive outcome for himself from the implementation and fears an increase in workload or loss of employment. This increases the danger of gossip among co-workers with regard to the safety of their workplace and can reduce productivity substantially. Quadrant B reflects the optimal circumstances. The implementation of the information system increases the productivity of the individual and also optimizes the overall organizational performance. This quadrant describes a win-win situation

for both the company and the employee. Quadrant C reflects a lose-lose situation, where the capital investment neither provides any benefits to the company nor increases the productivity of the individual employee. It reflects a typical case of misunderstanding of the problem, misinterpretation of the individual and overall needs, and mismanagement of corporate funds. Quadrant D reflects the implementation in which the system clearly provides information to the individual manager, but the system does not significantly improve the overall organizational performance. Clearly, personal and organizational advantages are interdependent and often hard to distinguish, since an individual's increase in productivity has an interrelated effect on the corporate environment and vice versa (Vetter & Wiesenbauer, 61/1992).

Specific reasons related to a particular software application. This class of user-apprehension factors, which is very important to user acceptance, primarily relates to user interface design and software development factors.

Specific reasons for a lack of user acceptance of a particular software application can be related to any one or all of the five factors cited by Blümling (1993). Based on the study by Vogel and Wagner (1993), Graph 3 gives an overview of specific reasons given for implementation failure.

Graph 3. Reasons for Implementation Problems



SOURCE: Vogel & Wagner

TYPE OF USER CATEGORIES

As pointed out in a study by Joseph Davis (1986), there are three different classes of users:

1. The direct user
2. The autonomous user
3. The indirect user

A direct user is someone who directly interfaces with computer based information systems which are designed and implemented by information systems personnel. This class of users has no direct influence on the process of output generation or the form of the output itself.

Autonomous users develop and use systems or application programs themselves, either individually or in small groups. The autonomous users generally use a variety of developmental hardware and software tools. This class of users has full control over the ultimate outcome.

The indirect users access computerized information systems through intermediaries such as staff analysts or assistants; this class of users has no direct contact with a computer system (Davis, 1986).

A fourth type of user class, hybrid users, use systems in at least two of the usage modes exhibited by direct, autonomous, or indirect users. Although the direct and autonomous users were significantly different in their functional perception of MIS implementations, they did not significantly differ in terms of their perceptions of importance of user satisfaction. The term "user acceptance" might be applicable to all three usage classes. This discussion is limited to persons who have direct access to computer based information systems, direct and autonomous users or its combination as hybrid users (Davis, 1986).

THE IMPACT OF USER EXPECTATIONS

As pointed out in a study by Lyytinen (1988), expectation failures, defined as the inability of the IS to meet a stakeholder group's expectations, are important factors for overall IS failure concepts. The stakeholders' (users, developers, and management) expectations must be taken into consideration in order to evaluate their effects on user satisfaction and acceptance. A study by Szajna (1990) suggests that pre-implementation expectations have an effect on *user satisfaction* and *perceived decision performance*, but have no effect on either *decision performance* or *IS usage*. Mumford (1973, 191) states that it is important to investigate the user attitude towards a proposed system:

The successful planning and implementation of change requires a knowledge of peoples' attitudes both to change in general and to the change that is being proposed. These attitudes will be influenced by such things as personal characteristics, previous experience of change and perceptions of the proposed change derived from various forms of communication media. Some groups may see the change that is to be introduced in very favorable terms, others will see it as disadvanta-

geous and therefore be worried and hostile. Others may be neutral reserving judgement until they know more about it. If management is aware which groups hold which attitudes, it can design communication and consultation strategies to correct misconceptions about the consequences of the proposed computer system.

User expectations might provide early warning signs of possible problems with the implementation and use of the IS system (Ginzberg, 1981). As a result, management has to evaluate the consequences of unrealistic and realistic user expectations, where expectations can be considered as realistic if they are confirmed upon use of the information system and they are unrealistic if they are not confirmed when the system is used (Szajna, 1990).

The level of user expectations influences the user attitudes towards a system. Szajna (1990) found that, based on cognitive dissonance theory, users with unrealistically high expectations (negatively disconfirmed) prior to the implementation process have in general more favorable attitudes towards the system than users with realistic or unrealistic low expectations. As a result, management must try to raise the user expectations prior to the implementation and use in order to increase user satisfaction and acceptance.

THE IMPACT OF USER INVOLVEMENT

User involvement is defined as "a continuous interactive process which involves the participation of the very users who will be most affected by the implementation of a new information system" (Mankin, 1988, 80). User involvement is widely accepted as being important to the implementation process of new MIS applications, mainly for two reasons:

1. Developers must have sufficient insight into the job tasks of targeted users in order to build an operable and effective system. The actual users will, therefore, provide the best information available.
2. Sufficient user involvement in all implementation steps promotes a feeling of ownership of the system, which is especially important for long-term acceptance. It also significantly increases the user's commitment to making the system work. A stronger commitment reflects the user's more positive attitudes about the new system and the changes associated with it.

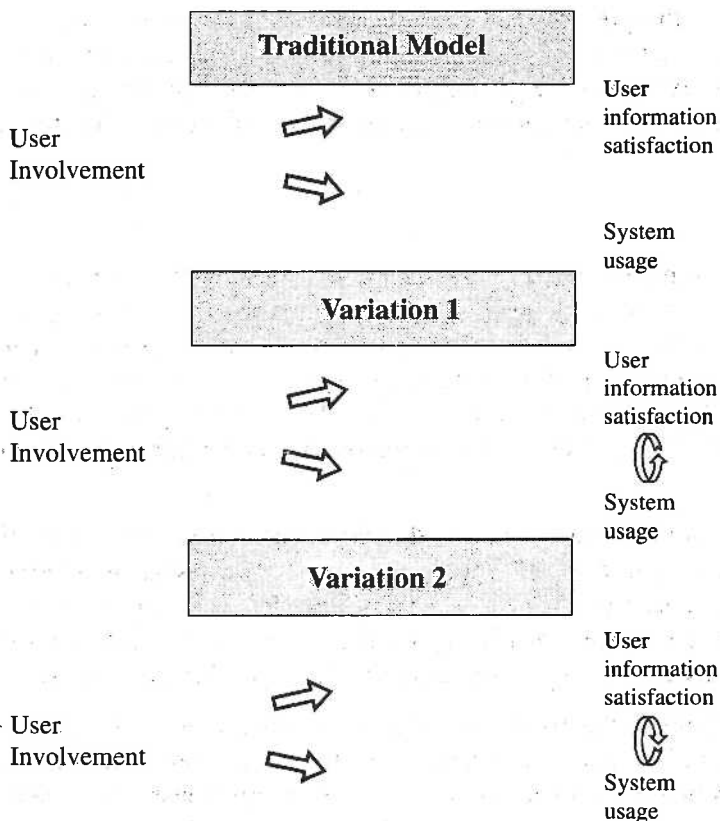
Wong (1990) found that user involvement during the implementation process, resulted in increased user acceptance and increased system quality by:

1. Providing more accurate and more nearly complete assessment of user information requirements
2. Providing expertise unavailable within the IS group about the organization which the system supports
3. Avoiding development of unneeded or unimportant features
4. Improving user understanding of the system

Overall, user involvement research is based on the assumptions that user involvement in the design and implementation process leads to increased usage of the system, more favorable perceptions of system quality, or greater user information satisfaction (Baroudi, Olson, & Ives, 1986). As Alter (1978) points out, these constructs are generally assumed to be indirect indicators of improved decision-making performance, which is the ultimate, but usually unmeasurable goal of system implementation.

However, intensive user involvement may have some negative effects as well. User involvement might result in political problems inside the organization as well as a sub-optimal system and/or longer implementation times (Wong, 1990). The Baroudi, Olsen, and Ives (1986) model of user involvement is represented in Figure 2.

Figure 2. Involvement Models



SOURCE: Baroudi, Olson, & Ives

Traditional Model:

This model presumes that user involvement will induce users to develop a better understanding of the system, which results in both increased system usage and user information satisfaction. This model is in agreement with the theories of participative decision making (Locke & Schweiger, 1979) and planned organizational change (Zand & Sorenson, 1975). However, other studies showed no direct relationship between user involvement and system usage and/or user information satisfaction (Lucas, 1976).

Variation One:

This model presumes that user involvement will lead to both increased system usage and user information satisfaction. As the system usage increases, it will also increase the user information satisfaction, based on the belief that advanced familiarization will direct the discovery of new uses of the system and increase information satisfaction (Baroudi, Olsen, & Ives, 1986). This model is based on dissonance theory, which suggests that behaviors can lead to attitudes. When dissonance with a presently held attitude is created by the performance of a contradictory behavior, the individual may change the belief or attitude to remove or reduce the dissonance (Fishbein & Ajzen, 1975). As a result, dissonance theory supports variation one, which suggests that system usage (a behavior) leads to user information satisfaction (an attitude).

Variation Two:

This model proposes that user involvement, as with the previously described models, will lead to both increased system usage and user information satisfaction. In addition, Variation Two suggests that more satisfied users are more likely to use the system frequently. Satisfaction with the system will encourage the user to use the system more frequently and will in turn affect user satisfaction (Baroudi, Olson, & Ives, 1986). This model agrees with theoretical theories (Fishbein & Ajzen, 1975), where user information satisfaction (an attitude) will lead to system usage (a behavior).

As pointed out in the study by Baroudi, Olson, and Ives (1986), the relationship between user involvement, user information satisfaction, and system usage as referred to in the traditional model is most accurately described in Variation Two. The objective of user involvement in the implementation process of MIS applications must be to create a positive information satisfaction of the user, resulting in increased system usage after the successful implementation.

Hawk (1989) found that user information satisfaction might not only depend on the level of user involvement, but also on the user's locus of control, where locus of control refers to the beliefs held by an individual regarding the cause-effect relationship between personal actions and positive and/or negative events. Internal locus of control individuals believe that positive and/or negative events depend on one's own actions and are under personal control. External locus of control individuals believe that positive and/or negative events are under the control of others, luck, fate, etc. Hawk's study showed a significant relationship between user information

satisfaction and high user involvement with external locus of control users. Hawk's findings regarding the effects of locus of control on user involvement are illustrated in Table 2.

Table 2. Effects of Locus of Control on User Involvement

Locus of Control	User Involvement in the Implementation Process	Effect on User Information Satisfaction
Internal	Low	Little
	High	Little
External	Low	Little
	High	Big

SOURCE: Hawk

As a result, users with a primarily external locus of control must get special attention during the implementation process, which means high user involvement, in order to achieve sufficient user information satisfaction with the new MIS application. If an organization is unwilling or unable to do this, selection of users on the basis of locus of control might be a useful alternative for achieving favorable user attitudes, since users with an internal locus of control tend to have an initially positive attitude towards new system implementation, although this hypothesis was not confirmed (Hawk, 1989).

Wong (1990) found that users' predispositions as expressed by their cognitive differences are equally important factors for the involvement role of the users, where three different types of user involvement exists:

1. *Consultative involvement*: This describes a decision making process where the IS staff makes the design and implementation decisions although the objectives and form of the system are influenced by the user.
2. *Representative involvement*: This describes a decision making process where members of the affected user group, from all levels and functions, participate in the system design team.
3. *Consensus involvement*: This described the involvement of *all* users, at least in communication and consultation roles, throughout the system design process.

The choice of the user involvement type might affect the entire system's quality. As a result, management must evaluate various aspects of user involvement, e.g., the knowledge and characteristics of the individual users, in order to optimize the involvement process and to gain a maximum of user acceptance for the new information system.

SUMMARY

An extensive review of the user-acceptance literature was performed to provide the foundation of a theoretical framework for a comprehensive model of user acceptance. The organizational context factors and the end-user factors of the user-acceptance model that are the basis of the theoretical framework were examined.

The significant importance of user acceptance to a new information system, which may be underestimated by the management community, has been addressed by researchers without a consensus. Further study is needed to fully understand user acceptance of information technology. It is hoped that this theoretical framework will be helpful to future researchers in building a comprehensive model of user acceptance. This "call to action" is vital as the world moves rapidly into the next century where information becomes the driving force.

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