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Factors determining the behavior and effectiveness of personal decision support systems users: An examination of Fishbein's model

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ABSTRACT

Personal computing, and the microcomputer which support it, are referred to as Personal Decision Support Systems (PDSS) (Lehman, 1985). Empirical studies regarding personal computing have been of the general field study type, primarily examining trends and/or establishing the basic concept of personal computing. This research builds and empirically tests a research model that conceptualizes some "impact" variables which are internal to the user, as intervening in the relationship between the "situational" or external variables identified by previous MIS research and system success (utilization, decision performance, and satisfaction).

This study employs a framework, based on Fishbein and Ajzen's intention-behavior model (1975), to integrate variables indicated to be important by previous findings in MIS studies, and to provide a micro-description of how those variables affect success of personal DSS. The conceptual model consists of six independent variables (users' experience and education, end-user tools, end-user support, end-user training, task repetitiveness, and task analyzability) and their impact on three intermediate variables (attitude, intention, and actual usage) and one dependent variable (user satisfaction).

The methodology employed in this study involves a two-phased cross-sectional field survey of personal DSS users in seven large organizations. To examine the mechanisms by which the independent and intermediate variables affect success, eight hypotheses were investigated using stepwise multiple regression analysis. Three hypotheses were supported. Although the study failed to shed light on how the determinants affect success, it confirmed the underlying conceptual framework of Fishbein's model.

INTRODUCTION

Personal computing — one type of computer technology — enables non-DP personnel to use computing resources to carry out their jobs. Personal computing, and the microcomputer which support it, are referred to as Personal Decision Support Systems (PDSS) (Lehman, 1985). In recent years, the performance of managerial and analytical tasks with the aid of the microcomputer by personnel other than systems professionals has become commonplace.

Personal computing marks a major transformation of the nature of managerial work, and it is one of the most significant developments in corporate information systems in the 1980s.

While the widespread application of personal computers is readily acknowledged, relatively little in the way of systematic empirical analysis has been conducted concerning their use and benefits. For example, the literature on personal computing has generally been exploratory and prescriptive in nature. Empirical studies regarding personal computing have been of the general field study type, primarily examining trends and/or establishing basic concepts of personal computing (Snitkin & King, 1986). This study, in turn, intends to enhance understanding of user behavior in the context of microcomputers used for personal decision support. Attita and Richards (1985) suggested that one of the main research areas in personal computing is the identification of the key variables that should be used in the development of policies for dealing with personal computing. Developing management strategies for personal computing requires identifying the critical issues that should be addressed. Rockart and Flannery (1988) call for better management to improve the success of personal computing. To improve management of personal computing, Cheney, et al. (1986) call for more empirical research on the factors that influence the success of End User Computing (EUC).

In summary, there is a strong need for empirical research findings regarding the factors determining the behavior and effectiveness of PDSS users. These findings would serve to complement the strong opinions and judgments that have accompanied personal computing as a tool of vast importance to business and, at the same time, a potential threat to the traditional role of MIS departments.

RESEARCH QUESTIONS

MIS research at the micro level of analysis suggests that system success is related to four general classes of independent variables. These include implementation process variables, technological variables, individual differences, and the task characteristics (Trice & Treacy, 1988). Most of the previous studies of MIS implementation and personal computing looked at the direct relationship between these four general classes of independent variables and success measures — primarily use, performance, or satisfaction. One shortcoming of such research is that the authors did not examine the chain of intermediate variables between the independent variables and the outcome. Consequently, they contribute little to the understanding of user behavior in using or developing personal DSSs.

It is as important for MIS researchers to know why certain independent variables fail to affect success as it is to know why they succeed. Until MIS research on user behavior progresses beyond the descriptive level, only moderate success at understanding user behavior can be expected. Also, until concrete theory is used to account for the previous diverse findings to guide future research, MIS researchers will have to be satisfied with the descriptive level.

In order to move beyond the current narrow research stream, MIS researchers need to adopt a broader perspective and challenge certain assumptions underlying previous research. Instead of assuming that the four classes of variables independently determine the outcome, it is reasonable to believe that they interact with one another in determining system success or failure. Given this reasoning, we should proceed to determine the mechanism in which

individual, technological, task, and implementation variables affect implementation success of personal DSS. Hence, the research questions of this study are:

1. What determinants affect successful implementation of personal DSS in organizations?
2. How do these determinants interact to determine an individual's use of personal DSS, decision performance, and satisfaction?

The first research question follows the traditional line of MIS implementation studies which try to identify some "critical factors" related to IS implementation success and failure. Such a research question is interested only in predicting user behavior and represents the largest research stream in the IS implementation literature. While such research has identified *what* the determinants of systems success are, it has not succeeded in explaining *why* these factors affect success. Hence, with the addition of the second research question, this study brings in a new perspective in the area of implementation and provides a theoretical foundation for studying the influence of those factors on user behavior. In other words, this study not only helps us *predict* but also helps to *explain* user behavior in using or developing personal DSS.

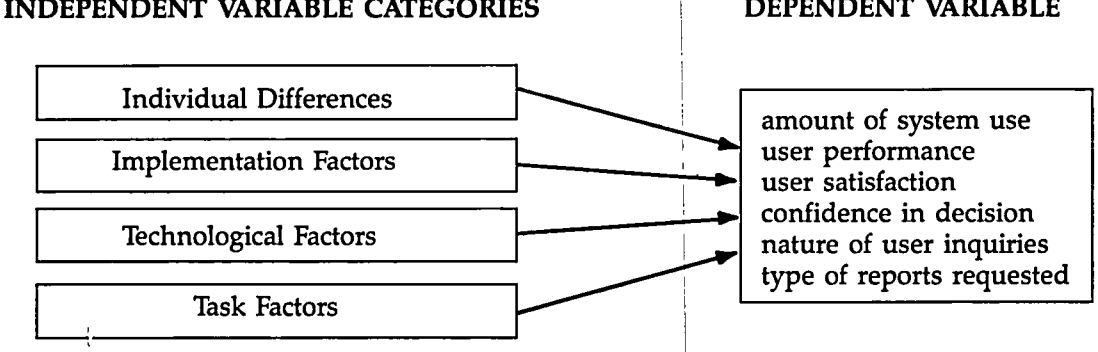
This research proposes a framework, based on Fishbein and Ajzen's intention-behavior model (1975), to integrate the variables of interest from previous findings in MIS, and to provide a micro-description of how those variables affect personal computing success.

PREVIOUS RESEARCH

Factors Research at the Individual Level

A rather large number of studies have been done to understand the behavior of individuals as they use informaiton systems. For the most part, the focus of this research has been devoted to identifying causal and associative relationships between measures of system success on the one hand and attributes of people, technology, implementation, and task on the other. In the classic experimental design sense, the major dependent variables of interest have been system use, user performance, user satisfaction, user confidence in decision making, kind of user inquiry, and type of reports requested by users following experience with a new information system (DeSanctis, 1984). Figure 1 illustrates the conceptual model of the major variables of interest in factors research at the micro level by DeSanctis (1984) and Trice and Treacy (1988).

Figure 1. Major Variables of Interest in the Implementation Research at the Micro Level



For a summary of the factors that have been identified under the four independent categories, refer to Liang (1986), DeSanctis (1984), and Swanson (1987).

Because of the large number of factors that have been identified, it is difficult to test all of them simultaneously. The following variables were selected from the four independent categories as independent variables.

a. Education/Experience
b. End User Training
c. End User Support
d. End User Tools
e. Task Repetitiveness
f. Task Analyzability

Behavioral Research at the Individual Level

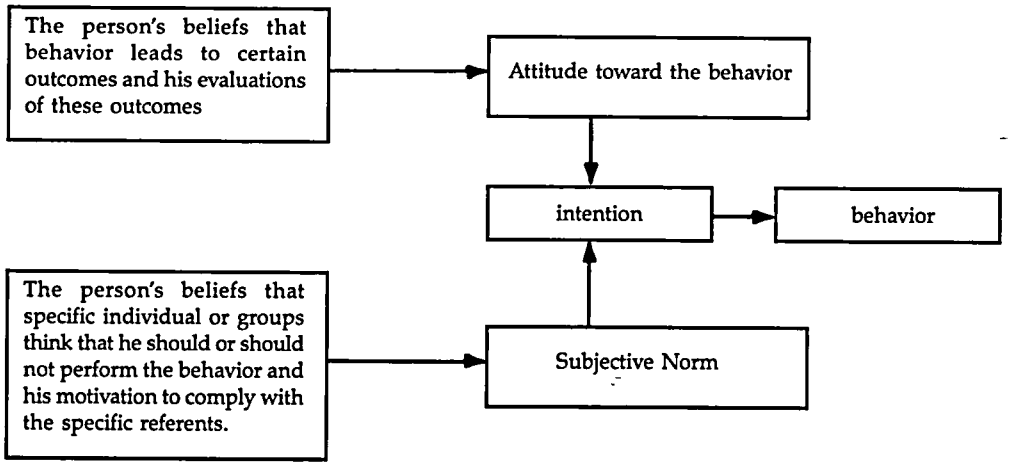
In the past, the lack of theoretical basis for MIS research at the micro level has resulted in models in which "the boxes are arbitrary and the arrows are largely atheoretical" (Keen, 1980).

Without a dominant research paradigm with which to frame MIS implementation research efforts, the MIS literature will remain fragmented. Hence, this study will present an attitudinal theory from the field of social psychology to serve as a theoretical foundation of this study.

Fishbein's Model

Fishbein's (1975) model is a behavior model, describing how situational variables operate through social and psychological variables to influence behavior. The conceptual framework of Fishbein's model for the relationship can perhaps best be presented schematically in Figure 2. It is an especially well-researched intention model that has proven successful in predicting and explaining behavior across a wide variety of domains. It is very general, "designed to explain virtually any human behavior" (Fishbein & Ajzen, 1975).

Figure 2. Fishbein's Intention Behavior Model



According to this framework, the performance or nonperformance of a specific behavior is determined by the intention to perform that behavior. Consequently, the prediction of behavior from knowledge of attitude towards that behavior is accurate only when the attitude influences the intention to perform the behavior. Behavioral intention is a function of beliefs, not about the object of the behavior, but about behavior itself.

A person's intention to perform a given behavior is represented as a function of two types of beliefs. One of these beliefs is that performing the behavior will lead to certain evaluated consequences. The other relevant set of beliefs, subjective norms, are beliefs that certain relevant others think that the person should or should not perform the behavior in question. Subjective norms are combined multiplicatively with an individual's motivation to comply with these norms.

This study will not include subjective norms as a determinant of behavior. As Fishbein and Ajzen (1975) acknowledge, this is one of the least understood aspects of their model. Because of its uncertain theoretical and psychometric status, subjective norms are excluded from this study.

The outcomes of behavior (actual usage) is operationalized in two parts, performance and satisfaction. Performance is the quality of decision making resulting from the use of the microcomputer. Satisfaction is the user's overall attitude towards the behavior, and its impact on performance.

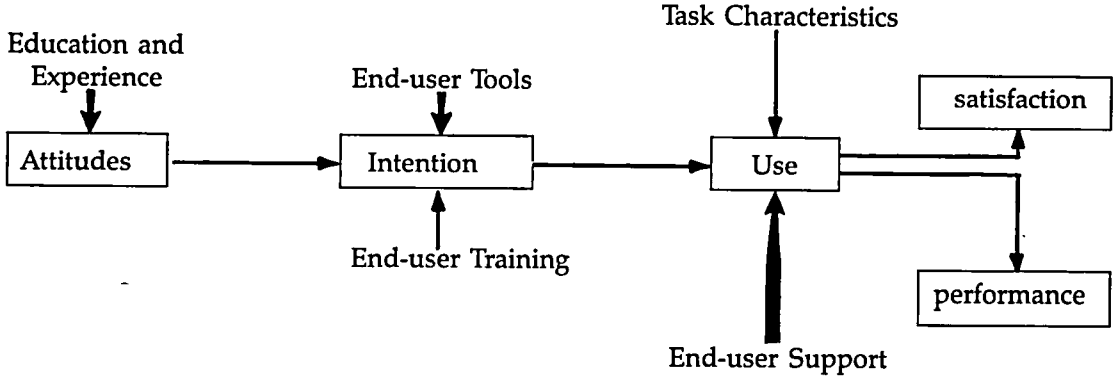
A particular helpful aspect of Fishbein's model from an IS perspective is its assertion that any other factors that influence behavior do so only indirectly by influencing attitude, subjective norms, or their relative weights (Davis, Bagozzi & Warshaw, 1989). Thus, variables such as system characteristics, task characteristics, nature of the development or implementation process and so on would fall into this category, which Fishbein and Ajzen (1975) refer to as "external variables." This implies that Ajzen-Fishbein's model mediates the impact of uncontrollable environmental variables and controllable interventions on user behavior. If so, then their model captures the internal psychological variables through which numerous external variables studied in IS research achieve their influence on user intention, and may provide a common frame of reference within which to integrate various disparate lines of inquiry. In other words, the predictive power of Fishbein's theory increases if the theory is expanded to include the individual characteristics, implementation characteristics, and the like. These variables affect the formation of user attitude, and intention, which in turn determine user behavior. In the case of personal DSS, this implies that demographic and technological factors might be integrated into a model of intention-behavior to achieve a powerful theory for explaining user behavior.

Therefore, we propose that the determinants of success of personal DSS will indirectly affect success by moderating the linkages between attitudes, intention, and use. The incorporation of the six independent variables mentioned in the previous section plus the variables from Fishbein's theory gives us the conceptual framework of this study as shown in Figure 3. Specific relationships which have been empirically supported or have been proposed by available MIS literature are depicted in darker lines.

This model not only helps to predict the outcomes of personal computing, but also to gain an understanding of the factors determining the usage behavior. It is grounded in theory because the underlying structure of the model is the Fishbein and Ajzen (1975) framework:

behavior (e.g., actual usage) results from intention, which in turn is derived from favorable attitudes toward personal computing that vary with user's experience and education. The correlation between intention and use, however, is not perfect. Intention reflects only predisposition toward system use and will be modified by existing conditions. For example, favorable attitudes may not result in system use if (1) there is little organizational support or (2) the user's task is not amenable to computer support. Starting with the intention-use relationship as a central focus, this model moves outward in two directions, examining the antecedents of intention and the consequence of use.

Figure 3. Conceptual Model



Eight hypotheses, shown in Table 1, were formulated and tested in this study.

Table 1. Summary of the Hypotheses

H1:	Greater experience and education by the user will lead to favorable attitude toward using personal DSS.
H2:	Favorable user attitude toward using personal DSS will lead to higher level of intention to use personal DSS.
H3:	End user tools with higher technical quality will result in higher level of intention to use personal DSS.
H4:	The availability of end user training will result in higher level of intention to use personal DSS.
H5:	A higher level of intention to use personal DSS will lead to a higher usage of personal DSS.
H6:	A higher level of end user support will strengthen the intention-usage linkage.
H7:	Individuals with differing task environments will have different levels of personal DSS usage, given the same level of intention.
H7a:	The more analyzable the users' tasks, the greater the level of usage.
H7b:	The more repetitive the user's tasks, the greater the level of usage.
H8:	There exists a positive relationship between usage, decision performance, and satisfaction.

INSTRUMENT DEVELOPMENT

End users were surveyed by a questionnaire using a 5 point Likert-type scale. In the construction of the instrument to test the research model, previously tested measures were used whenever possible. The following is a summary and discussion of the measurement used to study the various dimensions of the constructs.

User's Education and Experience

Users' experience was measured in terms of their different levels of experience on various end user languages, whereas the education level was measured by the highest education level that they achieved.

End User Tools

Reiman's and Waren's criteria for evaluating tools for end-user needs include user-friendliness, flexibility, and the ability to handle different formats (Reiman & Waren, 1975). On a scale ranging from 1 (strongly disagree) to 5 (strongly agree), the users were asked whether they agree that the end user tools they utilized meet those criteria.

End User Training

Schultz et al. (1984) expect that better knowledge of a system's design and capabilities leads directly to increase intention to use a system. This research hypothesizes that end user training increases knowledge of the user and hence increases intention to use personal DSS. The variable end user training, which measured users' perceptions of the quality of training received, was derived from Amoroso (1985).

End User Support

Support for end users can take many forms: 1) Guidance for the selection of hardware and software; 2) Access to corporate data for the development and operation of certain decision support systems; and 3) assistance from IS staff for the development and maintenance of end-user developed personal decision support systems. The variable end user support was again derived from Amoroso (1985).

Task Variables

Van De Ven and Ferry (1980) have developed a battery of psychometrically validated instruments for organizational assessment. Several of the Van De Ven and Ferry dimensions used in the assessment of jobs have been adapted for this research.

Attitude Towards Personal DSS

The users were asked to report their attitude towards personal computing on five scales ranging from 1 (strongly disagree) to 5 (strongly agree). The adjectives that appeared following the statement: "I perceive personal computing activities to be," are "useful," "pleasant," "interesting," and "stimulating."

Intention/Actual Utilization

The specific items of utilization measurement in this study, derived from Cheney's instrument, produced two measures of system utilization, intended and actual usage. Cheney (1980) developed this set of categories of system utilization in a research project which examined the measurement of the success of MIS project. This study used the items from Cheney's instrument and Fishbein's methodology to carry out the measurement of the variables intention and actual usage. Unlike the measurement of Cheney, which collect both intended and actual usage measurements simultaneously, the data collection of intention and actual utilization in this study were taken on two separate occasions over a period of three weeks. Three to four weeks' interval is considered an appropriate period according to many of the studies which adopt Fishbein's methodology.

Decision Performance/Satisfaciton

In this study, Sanders' MIS/DSS success measures (Sanders, 1984) were adapted to measure decision performance and decision-making satisfaction. It is a two-dimensional perceptual measure of DSS success. The first dimension underscores the users' perceived overall satisfaction with the system. The second factor can be referred to as an indicator of improved decision making. The scale development methodology and a thorough review of the literature regarding the measurement can be found in Sanders (1984). The reasons for the adaptation of this instrument are its validity and the small number of question items. The success measures were slightly modified after the pilot test. The new instrument, adapted for the personal computing environment, consists of ten items relevant only to user's satisfaction and decision performance.

RESEARCH METHODOLOGY

Subject Profile

The organizations included in the study met the following criteria:

- have an active personal computing environment;
- have at least 200 employees.

The unit of analysis is a person who uses the microcomputers within a functional area. End users within an organization are defined as those individuals who:

- develop decision support systems for their own use;
- work in a functional area within the firm.

Research Design

The research design employed in this study is a two-phased cross-sectional survey. Phase I was designed to collect information regarding the demographics of the users, end-user tools, end-user support, attitude towards personal computing, and users' intention to perform personal computing for the next three weeks. Phase II was conducted three weeks later to collect information regarding the task environment of the users, the actual usage, and user satisfaction and decision performance. The user was asked to provide an identification code of his or her own choice on both occasions for the matching of both sets of questionnaires. The survey instrument was pretested with a local firm.

Questionnaires were distributed to 20 end users from each company. The response rate was about 97.14% during pahse I, and dropped to 90.71% after phase II. However, the usable rate is only 86.43%, thus the analysis is based on only 121 responses.

The demographic distribution of the respondents is shown in Table 2. More than 60% of the respondents have at least a 4-year college degree. In addition, close to 50% of the end users have at least 5 years of experience in using personal computers.

Table 2. Demographic Information of End Users

Education Level	Frequency	Percent	Cumulative Percent
Some High School	1	.8	.8
High School Diploma	8	6.6	7.4
Some College	23	19.0	26.4
2-year College Degree	11	9.1	35.5
4-year College Degree	56	46.3	81.8
Some Graduate Study	14	11.6	93.4
Master's Degree	8	6.6	100.0
Doctoral Degree	0	0.0	100.0
TOTAL	121	100.0	100.0
Yrs. of Computer Usage	**Frequency**	**Percent**	**Cumulative Percent**
Not at all	0	0.0	0.0
Less than a year	6	5.0	5.0
1-2 years	14	11.6	16.5
3-4 years	41	33.9	50.4
5-6 years	31	25.6	76.0
7 or more years	29	24.0	100.0
TOTAL	121	100.0	100.0

DATA ANALYSIS AND RESULTS

The data used in the subsequent analyses are derived from questionnaire items obtained from the 121 respondents. The scales were constructed empirically and theoretically, using a factor-analytic approach with 65 relevant questionnaire items. Initially, two dependent variables (satisfaction and decision performance) were proposed in this study. Since the items that supposedly measure these two constructs were loaded onto the same factor, only one dependent variable was finally retained. Table 3 presents the reliability test results.

Table 3. Reliability Measures

Factor Name		Number of Items	Cronbach Coefficient
F1	Computer Experience	6	.7545
F2	End User Tools	3	.8050
F3	User Attitude	4	.8763
F4	End User Support	4	.7270
F5	End User Training	5	.6864
F6	Task Repetitiveness	5	.8854
F7	Task Analyzability	4	.8188
F8	Intention	8	.8516
F9	Actual Usage	7	.8523
F10	User Satisfaction	10	.9394

Hypothesis Testing

Correlational analysis was used to answer the first research question. The purpose of this analysis is to examine the relationship between the predictors or external variables and success measures of personal DSS. The success was measured by actual utilization and user satisfaction.

The result, as shown in Table 4, indicated the following findings:

1. Actual usage was significantly affected by education (p=0.1) as well as the experience of the user (p=0.01), end user training (p=0.01), and task analyzability (p=0.1). The relationships between actual usage and task repetitiveness, end user tools, and end user support are found to be non-significant.
2. User satisfaction was significantly affected by education (p=0.01) as well as the experience of the user (p=0.05), end user tools (p=0.05), end user support (p=0.05), and end user training (p=0.05). The relationships between user satisfaction and task repetitiveness and task analyzability are found to be non-significant.

Table 4. Correlations Between Independent Variables and Dependent Variables

	Educa-tion	Exper-ience	User Tools	User Support	Task Rept.	Task Analyz.	User Training
User Attitude	.1179 (121) P=.198	.1871 (121) P=.040**	.3427 (121) P=.000***	.3391 (121) P=.000***	-.1717 (121) P=.060*	-.1041 (121) P=.256	.2571 (121) P=.004***
Intention	.0469 (121) P=.610	.2243 (121) P=.013**	.1117 (121) P=.222	.1403 (121) P=.125	-.2201 (121) P=.015**	-.2184 (121) P=.016**	.2028 (121) P=.026**
Actual Usage	.1667 (121) P=.068*	.3592 (121) P=.000***	.1267 (121) P=.166	.1396 (121) P=.127	-.1244 (121) P=.174	-.1742 (121) P=.056*	.2445 (121) P=.007***
User Sat-isfaction	.2458 (121) P=.007***	.2024 (121) P=.026**	.2190 (121) P=.016**	.1881 (121) P=.039**	-.1322 (121) P=.148	-.1462 (121) P=.110	.2055 (121) P=.024**

* Significant at 10% level (i.e. p = 0.10)
** Significant at 5% level (i.e. p = 0.05)
*** Significant at 1% level (i.e. p = 0.01)
(n) Number of cases

The result is hardly surprising, since most of the independent variables that we investigated have been found to be related to actual usage and user satisfaction in previous research. Hence, this research agrees with the findings of the factor research in MIS.

However, the second research question is really the main purpose of this investigation. If this study has succeeded in answering the first research question, then what is the mechanism by which those factors affect success?

As discussed in a previous section, Fishbein's intention-behavior model was used as a theoretical backdrop to gain a fuller understanding of the mechanism involved. A series of stepwise multiple regression equations were then utilized to test hypotheses generated from the conceptual model shown in Figure 3 (the eight hypotheses were listed in Table 1). Regression results are shown in Table 5. Variable decision performance was deleted from H8 due to the revised composite scales.

Table 5. Summary of the Four Stepwise Regression Models

PREDICTOR	(a) Attitude	(b) Intention	(c) Usage	(d) Satisfaction
Variables Entered	Experience	Attitude	Intention	Actual
B values	.1059 F=0.399	.7596 F=.0014	.5470 F=.0000	.6115 F=.0000
Variables Not In	Education End-user tools	Training	End-user support Task Repetitiveness Task Analyzability	

H1 states that a favorable user attitude towards using personal DSS is positively related to education and computer experience. According to the stepwise regression model (a), this hypothesis is only partially supported. The regression coefficient between user attitude and computer experience is significant at $p = .05$ level. Only 3.5% of the variance is explained by user experience. Evidence from Rivard and Huff (1988) suggested that differences in computer experience might account for user's attitude towards personal DSS, with users with a stronger background having a more favorable attitude towards the concept of personal DSS. These findings substantiate this evidence.

However, with regard to education, the type of education of the user did not enter into the model and hence was found to be a non-significant predictor of user attitude. The lack of a significant finding is surprising, given that the findings of Vasarhelyi (1977) and Lucas (1975) suggest that more educated users are more likely to perceive a closer connection between system use and job performance than are less educated users. A possible reason for this discrepancy is that this study measures the type of education, whereas both Vasarhelyi and Lucas measure the years of education.

The second regression model which tested H2, H3, and H4 was terminated with only user attitude entered during the analysis. Both end user tools and end user training were found not to be included in the model.

This leads to the conclusion that H2 is supported, whereas hypotheses H3 and H4 were not validated. Since H2 states that user attitude towards using personal DSS will lead to a higher level of intention to use personal DSS, a regression coefficient of .7596 at 0.05 level supports this hypothesis. Also, 8.3% of the variance of intention is explained by user attitude. This result agrees with Fishbein's theory which holds that the more favorable a person's attitude towards a behavior, the more likely the person intends to perform the behavior.

H3, which states that, given the same level of user attitude, higher quality of end user tools will lead to a higher level of intention to use personal DSS, was not supported. Davis, et al. (1989) discovered that perceived ease of use had a small but significant effect on intentions, although this effect subsided over time. Since it is difficult to compare the results of a field study to that of a longitudinal study, the result regarding the quality of end user tools on user intention seems inconclusive.

This study also did not support H4, which hypothesizes that availability of end user training will lead to a higher level of intention to use personal DSS. Even though end user training had been found to be related to user satisfaction (Fuerst & Cheney, 1982; Sanders, 1985), no research has been done to investigate the relationship between end user training and user intention. The reliability coefficient alpha for the five items in this scale was 0.68, and is the lowest among the 10 factors. With the lower than desirable level for alpha, care should be taken in interpreting the nature of the measure.

H5, which states that a higher level of intention to use personal DSS will lead to a higher level usage of personal DSS, is resoundingly supported by a variance of 33.4% and a regression coefficient of .5470 significant at $p = 0.000$ in regression model (c).

Although the intention-usage relationship per se has been essentially overlooked in the MIS literature, usage predictions based on numerous other variables have been investigated. Ginzberg (1981) obtained a correlation of 0.22 between a measure of users' "realism of expectations" and usage. DeSanctis (1984) obtained correlations around 0.25 between "motivational force" and DSS usage. Swanson (1982) obtained a 0.20 correlation between usage and a variable referred to as "value" which is similar to perceived usefulness. Baroudin, Olson and Ives (1986) found both user information satisfaction and user involvement to be correlated 0.28 with system usage. The linkage between intention-usage obtained for the three-week periods investigated in the present research compares favorably with these previous MIS findings.

In addition, the stepwise regression model (c) also tests both H6 and H7 which state that, given the same level of user intention, end user support and task environment, respectively, will strengthen the intention-usage link. However, as indicated in Table 5, both variables did not enter into the model.

Intention reflects only a predisposition toward system use and will be modified by existing conditions. Swanson (1982) postulated that intention may not result in system use if the system is inacessible (poor end user support). Nevertheless, this study does not support the hypothesis that end user support moderates the intention-usage linkage, even though end user support was important in determining user satisfaction.

No study has been done to investigate the moderate relationship between characteristics of task environment and intention-usage linkages. However, the assertion that characteristics of task environment moderating the intention-usage linkage has a certain amount of intuitive appeal.

As the user's task environment becomes more unanalyzable, decision aids may burden the decision maker. The decision maker may have to rely on "seat of the pants" judgement to resolve the problems. The result of this study is not encouraging. There is no empirical evidence that the repetitiveness and the analyzability of the user's task moderate the relationship between intention-usage. It is difficult to speculate on the reasons that characteristics of task environment has no influence in the linkage between intention-usage. In light of the findings, it should reaffirm our commitment to additional research perhaps in a lab setting to decipher the mechanism of task characteristics and its effect on user behavior.

H8, which states that there is a positive correlation between actual usage and user satisfaction, is firmly supported by regression value of .6115 significant at .000 level. 22.6% of the variance of user satisfaction is explained by actual usage. This finding is hardly surprising, since use has always been found to have a direct influence on satisfaction (Schultz & Ginzberg, 1984).

In summary, only three out of the eight hypotheses are fully supported by this study, as shown in Table 6. At a quick glance, it may seem that the study was not successful. However, this study confirms the underlying conceptual framework of Fishbein's model. H2, H5, and H8 collectively supported Fishbein's model. This study found that users' favorable attitudes lead to a higher level of intention to perform the behavior, and there is a strong linkage between intention and actual usage. Finally, actual usage will lead to higher user satisfaction. Except for the positive relationship between user computer experience and user attitude, this study fails only to support the hypothesized relationships between the external factors (education, end user training, etc.) and the four internal factors (i.e., user attitude, intention, actual usage, and satisfaction.

Table 6. Summary of the Results of Hypotheses Testing

	HYPOTHESES	CONFIRMED
H1.	Greater education and experience by the user will lead to favorable attitude toward using personal DSS.	partially
H2.	Favorable user attitude toward using personal DSS will lead to higher level of intention to use personal DSS.	Yes
H3.	End user tools with higher technical quality will result in higher level of intention to use personal DSS.	No
H4.	The availability of end user training will result in higher level of intention to use personal DSS.	No
H5.	A higher level of intention to use personal DSS will lead to a higher usage of personal DSS.	Yes
H6.	A higher level of end user support will strengthen the intention-usage linkage.	No
H7.	Individuals with differing task environments will have different levels of personal DSS usage, given the same level of intention.	No
H7a.	The more analyzable the users' tasks, the greater the level of usage.	No
H7b.	The more repetitive the users' tasks, the greater the level of usage.	No
H8.	There exists a positive relationship between usage and user satisfaction.	Yes

IMPLICATIONS OF RESEARCH FINDINGS

The results from this study provide new direction for future research and give additional support to the importance of factors which have historically been shown to affect the successful implementation of computerized systems. Even though this study concentrated only on a single area of the computing environment (personal DSS), the author believes that the findings can be generalized to other computing environments.

One of the theory-related objectives of this research project has been to illustrate to the reader how an MIS researcher can draw from behavioral science knowledge to develop theoretical understanding of implementation at the individual level of analysis. Rather than simply identifying individual differences or situational variables which relate to user actions, MIS researchers can begin to study the cognitive process underlying user behavior and do so within a theoretical framework. This research chose Fishbein's theory as the basis for such a framework. In short, the study of implementation at the individual level needs to move toward theory development, and the model developed in this research represents a starting point.

CONCLUSIONS

This study has explored several variables in the organizational environment thought to influence the success of personal DSS. Further support was given to the importance of determinants which have historically been shown to affect transaction processing systems and management information systems.

The results of this study confirm Fishbein's model which suggests that behavior (system usage) is positively related to intention, which in turn is positively related to attitude. The results suggest the possibility of a simple but powerful model for the determinants of user behavior; in this case, the Fishbein model.

This study succeeds in confirming the relationship between satisfaction, actual usage, intention, and attitude. However, it failed to explain the relationship between these four internal or impact variables and the related variables identified in MIS and EUC literature.

In addition, this research also presents significant progress toward explaining the behavior of users in personal computing environments. This study has used existing theoretical and empirical work from behavioral sciences, together with research in MIS and EUC, to develop a model of user behavior in the personal computing environment. The model also provides a basis for further research. Research in this direction should yield practical information to evaluate and improve the acceptability of end-user systems.

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