

Explaining the Role of User Participation in Information System Use

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Even though user participation in information system development has long been considered to be a critical factor in achieving system success, research has failed to clearly demonstrate its benefits. This paper proposes user involvement as an intervening variable between user participation and system use. Embedding the constructs of participation and involvement into the theoretical framework of Fishbein and Ajzen, a model is developed and tested in a field study of information system projects. Several key findings emerge from the study. User participation and user involvement represent two distinct constructs, with participation leading to involvement, and involvement mediating the relationship between participation and system use. The critical dimension of user participation is overall responsibility. The role of user participation and involvement is different, depending upon whether system use is mandatory or voluntary.

(Information Systems; User Involvement; User Participation; Implementation)

User participation in information system development (ISD) has long been considered to be a critical factor in achieving system success dating to the initial work of Swanson (1974). Over the years, numerous studies have been conducted, investigating the effects of participation on various individual and organizational level criteria such as attitudes, behavior, and performance (for reviews of this work, see Ives and Olson, 1984; Pettingell, Marshall, and Remington 1989).

In spite of the nearly universal acceptance of the value of participation by both the practitioner and researcher communities, research has failed to clearly demonstrate the benefits of user participation and involvement. A meta-analytic review of this research found average correlations ranging from 0.23 to 0.34 between user participation and attitudes toward the system, and an average correlation of 0.12 between participation and reported system usage (Pettingell et al. 1989). These low to moderate correlations have been attributed to severe methodological and measurement problems in past research (Ives and Olson 1984). However, recent

studies which have eliminated many of these problems find similar weak results (e.g., Baroudi, Olson, and Ives 1986; Doll and Torkzadeh 1989; Franz and Robey 1986). An alternative explanation for these outcomes would then seem necessary. The low to moderate relationships observed between user participation and various outcome variables could indicate the presence of intervening variables. Unfortunately, IS researchers have done little theoretical elaboration in this domain (although, see Doll and Torkzadeh 1989; Davis, Bagozzi, and Warshaw 1989).

The objective of this paper is to develop and empirically test a theoretical framework explaining the relationship between user participation and system use. In the paper, user participation and user involvement are first defined as separate constructs. A model describing their influence upon each another is then developed and discussed. Subsequently, the constructs of participation and involvement are embedded in a well-supported behavioral theory, Fishbein and Ajzen's (1975; see also Ajzen and Fishbein 1980, Fishbein 1980)

Theory of Reasoned Action (TRA). Finally, data collected in a longitudinal field survey of IS users is employed to investigate the hypothesized relationships.

Defining User Participation and Involvement

In IS, user involvement has traditionally referred to participation in the system development process and has been measured as a set of activities that users or their representatives have performed (Baroudi et al. 1986, Doll and Torkzadeh 1990, Franz and Robey 1986, Olson and Ives 1980). Recently, however, Barki and Hartwick (1989) have proposed an alternative definition of the user involvement construct that is more consistent with the way involvement is conceptualized in other disciplines. In doing so, they differentiated between user participation and user involvement. The distinction between the two constructs led Barki and Hartwick to four recommendations:

(1) They suggested the term "user participation" be used instead of "user involvement" when referring to the behaviors and activities that users or their representatives perform in the system development process. Further, measures assessing user behaviors and activities (Barki and Hartwick 1994, Baroudi et al. 1986, Doll and Torkzadeh 1990, Franz and Robey 1986, Olson and Ives 1980) should be considered measures of user participation, not involvement.

(2) Consistent with work in other disciplines, they proposed that the term "user involvement" be used to refer to a psychological state of the individual, and defined as the importance and personal relevance of a system to a user. They also suggested that a measure of user involvement reflecting this definition needs to be developed and validated. As a starting point for this measure, they recommended the context-free measure developed by Zaichowsky (1985) in the field of marketing. Since the publication of Barki and Hartwick (1989), several studies have developed and used measures of user involvement consistent with the recommended definition (Barki and Hartwick 1994, Kappelman and McLean 1991, King and Lee 1991).

(3) They also suggested that the relationship between user participation and user involvement be empirically investigated. Barki and Hartwick (1989) noted the implicit relationship between participation and involve-

ment assumed in past discussions of the involvement construct in IS, and proposed user participation as an important antecedent or cause of user involvement. Recently, Kappelman and McLean (1991), using measures of participation and involvement consistent with recommendations 1 and 2, found a correlation of 0.21 between the two constructs.

(4) Finally, they pointed to the need to ground the constructs of user participation and user involvement in a theoretical network that explains when and how these factors influence key criterion variables such as system usage or user satisfaction. Consistent with involvement research in other disciplines, they suggested the use of an attitudinal approach, looking at the effects of participation and involvement on the development and change of individual attitudes and behaviors.

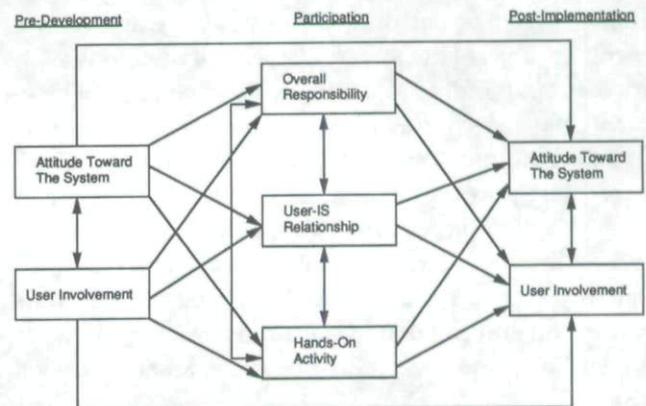
A Model of User Participation and Involvement

A model, describing the relationships between user participation, user involvement, and user attitude toward an IS, is presented in Figure 1. Four sets of relationships may be highlighted in this model.

User Participation

User participation is defined as the behaviors, assignments, and activities that users or their representatives perform during the ISD process. Barki and Hartwick (1994) have identified and validated three statistically distinct dimensions of user participation: overall responsibility, user-IS relationship, and hands-on activity.

Figure 1 Antecedents and Consequences of Participation



Overall responsibility refers to user activities and assignments reflecting overall leadership or accountability for the system development project. Examples include being the leader of the project team, having responsibility for the overall success of the system, and being responsible for selecting hardware or software, estimating costs, requesting funds, etc. User-IS relationship refers to development activities reflecting user-IS communication and influence. Examples include the initial evaluation and approval of a formal agreement of work to be done by the IS staff, being kept informed by the IS staff during various stages of ISD, and the evaluation and approval of work done by the IS staff. Hands-on activity refers to specific physical design and implementation tasks performed by users. Examples include defining screen layouts and report formats, creating a user procedures manual, and designing a user training program. The three facets of user participation are shown in the center of Figure 1. While the three facets may be viewed as conceptually distinct, they are likely to be empirically related. Users who engage in one set of participative behaviors are also likely to engage in the other two sets of behaviors. In Figure 1, bidirectional arrows between the three facets are used to capture this idea.

User Involvement and Attitude Toward the System

In contrast to user participation, user involvement refers to a psychological state. In Fishbein and Ajzen's (1975) terms, user involvement, as defined here, is a belief and refers to the extent to which a person believes that a system possesses two characteristics, importance and personal relevance. According to Fishbein and Ajzen, beliefs link an object or behavior to some attribute, characteristic, or outcome. In the case of user involvement, an object (the system) is being linked to two attributes (importance and personal relevance). Involvement may be contrasted with another psychological variable, attitude. According to Fishbein and Ajzen, attitude refers to the amount of affect one feels for or against some object or behavior, and is measured by a procedure that locates the individual on a bipolar evaluative (e.g., good/bad) scale. Thus, a person's attitude toward an information system refers to the extent to which he or she feels the system is evaluatively good or bad.

User involvement and attitude toward the system are shown to be correlated in Figure 1. Individuals who view the system as both important and personally relevant are also likely to hold positive attitudes concerning the system. Analogous support for this contention comes from involvement research in other disciplines. In attitude research in psychology, highly involved individuals (with an issue) have been found to have more positive attitudes concerning the issue (Sherif, Sherif, and Nebergall 1965). In marketing, highly involved individuals (with a product) have been found to have more positive attitudes toward the product (Gardner et al. 1985, Petty et al. 1983). In organizational behavior, highly involved individuals (with their job) have been found to have more positive job attitudes (Kanungo 1982). It, therefore, stands to reason that a highly involved user will have a more positive attitude toward the system.

The hypothesized correlation between user involvement and attitude reflects two processes. On one hand, attitudes are said to be formed on the basis of beliefs (Fishbein and Ajzen 1975). In the attitude formation process, users holding the beliefs that a system is both important and personally relevant (i.e., users who are highly involved) are therefore likely to develop a positive attitude concerning the system. On the other hand, Sherif et al. (1965) have shown that individuals with extreme (i.e., very positive or very negative) attitudes concerning an issue tend to become more involved (i.e., they develop beliefs that the issue is both important and personally relevant). In cases where individuals' attitudes tend to range from neutral to very positive (a situation that frequently occurs in IS (Millman and Hartwick 1987)), this process will result in a positive relation between attitude and involvement.

Antecedents of Participation

Predevelopment user involvement and attitude toward the system are hypothesized to influence the amount of user participation that will occur during ISD. Prior to system development, users are likely to have vaguely formed beliefs and attitudes concerning the system that is about to be developed. The more important, the more personally relevant, and the better the proposed system is perceived to be, the more likely they will desire and choose to participate in the system development process.

Of course, there will be other influences not depicted in Figure 1 also leading to participation in ISD (e.g., company policies, orders from superiors, number of potential users, etc.).

Consequences of Participation

User participation is hypothesized to influence postimplementation user involvement and attitude toward the system. Individuals who are active in the system development process are quite likely to develop beliefs that the system is both important and personally relevant, and the feeling that the system is good. Analogous support for this contention comes from the organizational behavior literature where meaningful participation in important job decisions has been found to result in increased job involvement and job satisfaction (Bass 1965, Patchen 1970).

Several psychological processes can explain the influence of user participation on user involvement and attitude. Users who participate will likely influence system attributes in accordance with their personal needs and desires (e.g., Robey and Farrow 1982), resulting in a system they perceive as being important, personally relevant, and good. Other processes include Cognitive Dissonance Theory (Festinger 1957) and Attribution Theory (Bem 1972). Each of these theories suggests that an individual's beliefs and attitudes will be aligned so as to be made consistent with his or her behaviors. Thus, in ISD, users who participate (behavior) will align their beliefs and attitudes, resulting in higher levels of involvement and more positive attitudes toward the system.

Attitudes and the Prediction of Behavior

Fishbein and Ajzen's TRA provides a basic framework that appears well suited to the task of explaining the effects of user participation and involvement on system use. Not only does the theory clearly spell out the underlying psychological determinants of individual behavior, it also has been repeatedly shown to have strong practical utility in a variety of domains (for reviews of this work, see Ajzen and Fishbein 1977, 1980; Fishbein 1980; Fishbein and Ajzen 1975; Sheppard, Hartwick, and Warsaw 1988). Evidence of TRA's efficacy in the

IS domain has been provided by Davis et al. (1989). In this section, we will present a brief description of this theory. In the next section, a model linking user participation and involvement to TRA will be outlined.

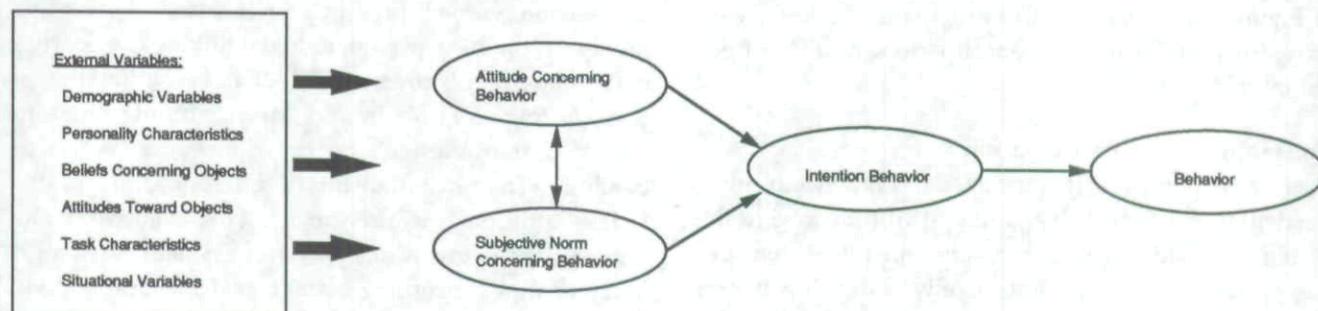
According to Fishbein and Ajzen, attitude refers to the affect that one feels for or against some object or behavior. They distinguish two different kinds of attitudes—attitudes towards objects (for example, "The new system is great" or "The new system is awful") and attitudes concerning behaviors (for example, "My using the new system is great" or "My using the new system is awful"). Using this distinction, an individual's attitude toward a system would be considered an attitude toward an object. On the other hand, an attitude concerning system use would be considered an attitude concerning a behavior.

Fishbein and Ajzen (1974) have argued and empirically shown that attitudes toward objects do not strongly predict specific behaviors toward such objects. Instead, it is attitude concerning the specific behavior that is said to determine whether or not that particular behavior is performed. To explain this difference, Ajzen and Fishbein (1977) introduce the notion of correspondence. They note that behaviors are specific in terms of both the action and the target of the action. Attitudes toward objects are specific with respect to the target of the action, but do not specify the action that is to be performed. Since there is only partial correspondence of action and target, a weak relationship can be expected between this attitude and the performance of a particular behavior. On the other hand, attitudes toward behaviors are specific with respect to both action and target. Since there is complete correspondence of action and target, a strong relationship can be expected between the attitude toward and the performance of a particular behavior.

In IS, this suggests that user attitudes toward a system will be weakly related to system use. Results reported in the IS literature support this contention (for reviews, see Davis et al. 1989, Swanson 1982, Zmud 1979). On the other hand, a strong relationship between user attitudes concerning system use and their actual use of the system would be expected.¹ Recently, Moore and

¹ Davis et al. (1989) and Mathieson (1991) have found that attitude concerning system use significantly influences user intentions to use

Figure 2 Fishbein and Ajzen's Theory of Reasoned Action



Benbasat (1993) have provided empirical evidence for such a relationship.

Fishbein and Ajzen's key concern is the understanding and prediction of behavior. Toward this end, they have developed TRA, a theory that describes the psychological determinants of behavior. This theory is depicted in Figure 2. According to TRA, the immediate determinant of a person's behavior is his/her intention to perform the behavior. The person's behavioral intention is in turn said to be determined by his/her attitude concerning the behavior (whether he/she feels that performing the behavior is good or bad) and his/her subjective norm concerning the behavior (whether he/she believes that other individuals want him/her to perform the behavior). Attitudes and subjective norms are given a weight to reflect their relative importance. This importance is said to vary according to the specific behavior under consideration, the situation, and the person being studied.²

Sheppard et al. (1988) conducted two meta-analyses of studies which have utilized TRA. An average correlation of 0.54 was found for the 86 studies which

have investigated the intention-behavior relationship. An average multiple correlation of 0.67 was found for the 85 studies investigating the relationship between attitudes, subjective norms and such intentions.

In IS, Davis et al. (1989) examined TRA in a longitudinal study of student usage of a word processing package. Following the introduction of the package, attitudes, subjective norms, and intentions were assessed. Fourteen weeks later, attitudes, subjective norms, and intentions were reassessed, and usage was measured. At both times, multiple correlations of 0.56 and 0.51 were found when attitudes and subjective norms were used to predict user intentions at times 1 and 2, respectively (only attitude, however, was found to have a significant regression weight). User intentions were also found to predict use. Intentions at time 1 correlated 0.35 with behavior measured 14 weeks later. At time 2, when intentions and behavior were measured contemporaneously, a correlation of 0.63 was observed. Thus, there would appear to be impressive evidence for the predictive validity of TRA, both in IS and a variety of other fields.

While Fishbein and Ajzen claim that attitude (toward the behavior), subjective norm, and intention are the prime determinants of behavior, they do not deny the possibility that other factors will also have a relationship with behavior. However, they claim that all such factors, labelled external variables, influence behavior indirectly; that is, through their influence on the terms of the model (specifically, through their influence on attitude concerning the behavior, on subjective norm concerning the behavior, or on the relative weight of the two). Examples of external variables include demographic variables, personality characteristics, beliefs concerning

the system. To the extent that user intentions relate to system use, as found by Davis et al., these studies provide support for the Fishbein and Ajzen hypothesis.

² An additional level of description is also included in TRA, that of beliefs. Thus, attitudes concerning behavior are said to be determined by behavioral beliefs—beliefs concerning the consequences or outcomes of behavior. (User involvement is not a behavioral belief; rather, it refers to a belief concerning the attributes of an object, the system.) Similarly, subjective norms are said to be determined by normative beliefs—beliefs concerning the desires of specific referent groups or individuals. In this study, such beliefs were not measured and therefore are not depicted in Figure 2.

objects, attitudes toward objects, task characteristics, and situational variables. Examples of external variables in IS research include education (e.g., Fuerst and Cheney 1982), computer experience (e.g., Fuerst and Cheney 1982), cognitive style (e.g., Huber 1983), system characteristics (e.g., Benbasat and Dexter 1986), attitude toward systems (e.g., Ives, Olson, and Baroudi 1983), system development approach (e.g., Alavi 1984), and user participation (e.g., Baroudi et al. 1986). By examining the effects of such variables on attitude and subjective norm, TRA can provide a useful framework for integrating and explaining their effects on user intentions and system use.

Integrating Participation, Involvement, and TRA

Toward this end, we have developed the model depicted in Figure 3. This model integrates the ideas of Figures 1 and 2. Specifically, the three dimensions of user participation, Overall Responsibility, User-IS Relationship, and Hands-on Activity, are shown to influence User Involvement and Attitude Toward the System. Further, these external variables are shown to influence System Use; however, this influence is indirect, being mediated by the terms of TRA. The nature of this influence will now be discussed.

Antecedents of Attitude Concerning System Use

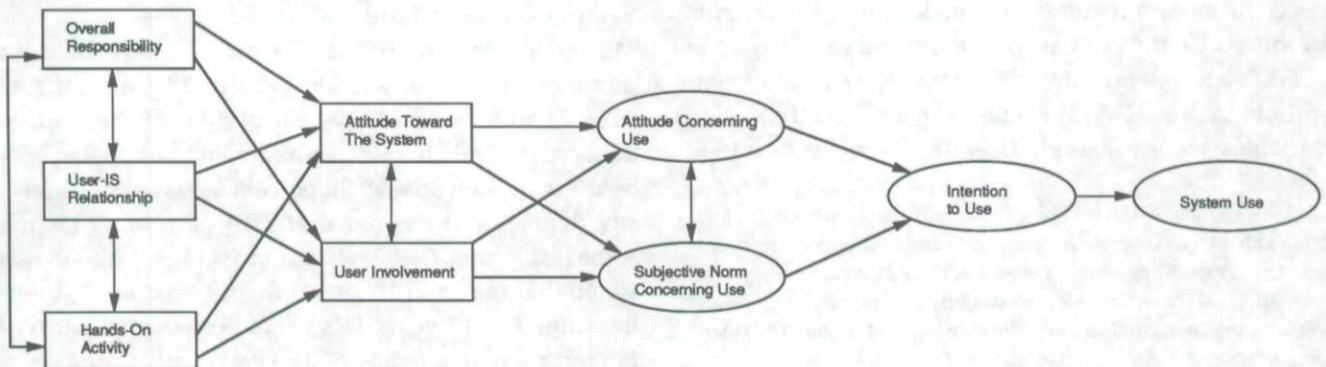
As shown in Figure 3, Attitude Toward the System and User Involvement are hypothesized to be determinants of Attitude Concerning System Use. As noted previously, attitudes concerning behavior are said to be de-

termined by individuals' beliefs concerning the attributes or outcomes of the behavior (e.g., Ajzen and Fishbein 1980; Fishbein and Ajzen 1975). Thus, to the extent that users view a system as being good (a positive attitude toward the system), important and personally relevant (a high level of user involvement), they will develop a positive attitude concerning their use of the system. Evidence for such a relationship is provided by Davis et al. (1989). They found that similar beliefs (i.e., the perceived usefulness and ease of use of a word processing package) were related to attitude concerning use.

Antecedents of Subjective Norm Concerning System Use

Figure 3 also suggests that Attitude Toward the System and User Involvement will be determinants of Subjective Norm Concerning System Use. According to Fishbein and Ajzen, a person's subjective norm may be influenced directly by other individuals (for example, when referents tell the person that they think he or she should use a system), or indirectly (for example, when the person infers that others think he or she should use a system). These inferences may be based on the person's own beliefs concerning the system or its use. The "false consensus" effect, identified by Ross (1977), suggests that individuals who hold certain beliefs think that others also hold them. These latter beliefs may then be used to infer subjective norm. In IS, the reasoning process would be as follows: I believe the system is important, personally relevant, and good; others believe the system is important, personally relevant, and good;

Figure 3 Participation, involvement, and system Use



others think I should use this important, personally relevant, and good system. Support for such a process has been found in consumer research (Oliver and Bearden 1985, Ryan 1982, Shimp and Kavas 1984). To investigate this possibility, links from User Involvement and Attitude Toward the System to Subjective Norm will be examined.

Intention to Use the System and System Use

Consistent with our discussion of TRA, User Attitude and Subjective Norm Concerning System Use are hypothesized to determine User Intention to use the system. In turn, Intention is hypothesized to determine System Use. These hypotheses are supported by the many studies investigating the Fishbein and Ajzen model cited earlier, including those of Davis et al. (1989),³ and Moore and Benbasat (1993) in IS.

Method

In order to test the models depicted in Figures 1 to 3, a longitudinal field study, assessing user perceptions (i) prior to development and (ii) following implementation of a new information system, was conducted. A letter describing the purpose of the study was initially mailed to all 2,603 members of the Canadian Information Processing Society who owned a mini or a mainframe computer. In the letter, respondents were asked whether their organization planned to develop a new, business-oriented, IS application in the near future. Four hundred and sixty responses were received. Of these, 130 respondents stated that they were planning to develop a new application within the next few months. These 130 respondents were contacted by phone to identify the future users of each new system. A user was defined as a person who, as part of his or her regular job, either used the system hands-on or made use of the outputs produced by the system. One thousand and fifty-nine users were identified, and mailed predevelopment questionnaires. On the questionnaire, the following variables were assessed: User Involvement, Attitude

Toward the System, Attitude Concerning System Use, Subjective Norm Concerning System Use, and Intention to Use the System. Two hundred and ninety-three usable questionnaires were returned.

The development process for systems in the sample took from 4 to 22 months. Three months after the system was put into use, users were asked to respond to a post-implementation questionnaire. On this questionnaire, the following variables were assessed: user participation during ISD (Overall Responsibility, User-IS Relationship, and Hands-on Activity), User Involvement, Attitude Toward the System, Attitude Concerning System Use, Subjective Norm Concerning System Use, Intention to Use the System, and System Use. One hundred and twenty-seven usable questionnaires were returned, 105 from respondents in the predevelopment sample and 22 from new respondents (individuals replacing respondents who had been promoted or who had left the organization).

One hundred and five users responded to both the predevelopment and postimplementation questionnaires. This sample was used to assess the longitudinal model of involvement and participation depicted in Figure 1. The same sample was also used to assess the model depicted in Figure 2 (TRA). In doing so, the long-term performance (predicting postimplementation use from predevelopment attitude, subjective norm, and intention) and short-term performance (predicting contemporaneous use with postimplementation attitude, subjective norm, and intention) of TRA were each examined. One hundred and twenty-seven users responded to the postimplementation questionnaire. This larger sample was used to assess the integrated model of Figure 3 cross-sectionally.

Sample Characteristics

Thirty-eight percent of the respondents were male, 62 percent female. Their average age was 38 years, ranging from 22 to 65 years. Fifty-four percent of the respondents identified themselves as having completed elementary or high school, 28 percent as having a university degree, and the remaining 18 percent as having some postgraduate education. On average, respondents stated that they had 16 years of work experience, ranging from 3 to 45 years. They had been in their current organization an average of 10 years, with a range of 0

³ While the data of Davis et al. (1989) provide no support for a relationship between subjective norm concerning use and intention to use the system, the numerous studies which find that top management support (a likely determinant of subjective norm) leads to greater system use (Fuerst and Cheney 1982, Lucas 1981, Robey 1979) lend empirical support for this relationship.

to 25 years. Thus, it can be concluded that a diverse and representative set of respondents form the study sample.

Operationalization of Constructs

User Participation. Three dimensions of user participation, Overall Responsibility, User-IS Relationship, and Hands-on Activity, were assessed in the study. The three dimensions were operationalized with six-, seven-, and five-item scales, respectively, developed by Barki and Hartwick (1994). These scales are presented in Appendix I.

In their study of user participation, Barki and Hartwick (1994) first identified a comprehensive set of 59 participative activities, based upon the works of Olson and Ives (1980, 1981), Ives and Olson (1984), Baroudi et al. (1986), and Franz and Robey (1986). Subsequently, a study was conducted, asking two samples of respondents about their performance of these activities. Factor analyses of the responses revealed similar factor structures for the two samples—the three factors of Overall Responsibility, User-IS Relationship, and Hands-on Activity. Scales, used in the present study, were developed for each dimension, and evidence of reliability (Cronbach alphas of 0.84, 0.84, and 0.78, respectively) obtained. Further, the comprehensive item pool and factor analysis results provide evidence for the construct validity (content, factorial, convergent/discriminant) of these scales.

In the present study, users were asked to respond to the participation questions in the second questionnaire, administered three months following system implementation. While this assessment of participation can be considered retrospective, the factual nature of the behaviors and activities being assessed (i.e., being the leader of the project team, defining screen layouts) and the response format of the questions (yes/no) leaves little room for biased or inaccurate responses. Consequently, a relatively objective assessment of participative behaviors should be obtained. Each question was scored 0 (no) or 1 (yes). Scores for the three participation dimensions were obtained by averaging items on each scale.

User Involvement and Attitude Toward the System. In marketing, Zaichowsky (1985) developed a 20-item scale of consumer involvement. However, by including

both items assessing importance and personal relevance (e.g., unimportant/important, means nothing to me/means a lot to me) and items assessing affect (e.g., useless/useful, worthless/valuable), Zaichowsky's scale confounds involvement with attitude (Barki and Hartwick 1994). In the present study, User Involvement and Attitude Toward the System were operationalized with 9- and 4-item scales developed by Barki and Hartwick. These scales are presented in Appendix 1.

To create these scales, Barki and Hartwick (1994) adapted attitude and involvement items from the works of Osgood, Suci, and Tannenbaum (1957) and Zaichowsky (1985). A study was conducted, presenting these items to two samples of respondents. Factor analyses of the responses revealed similar factor structures for both samples—two factors representing the two involvement dimensions of importance and personal relevance, and one factor representing attitude. Two scales, one representing User Involvement, and one representing Attitude Toward the System, were developed, and evidence of reliability (Cronbach alphas of 0.93 and 0.99, respectively) obtained.⁴ The factor analysis results provide evidence for the construct validity (factorial and convergent/discriminant) of these scales.

In the present study, User Involvement and Attitude Toward the System were assessed twice, once with the predevelopment questionnaire, and a second time with the postimplementation questionnaire. To assess each construct, users were presented with 7-point semantic differential scales. Answers to the 9 involvement and 4 attitude items were each averaged to create scores for User Involvement and Attitude Toward the System.

TRA Constructs. According to Fishbein and Ajzen (1975; see also Ajzen and Fishbein 1977, 1980; Fishbein 1980), a measure of behavior will always specify the action and target being assessed. In the present study, the action is "use" and the target is "the new system." Predictive variables (intention, attitude concerning the behavior, subjective norm concerning the behavior) should then be phrased so as to correspond to the be-

⁴ To be consistent with past theory and research concerning the involvement construct (reviewed by Barki and Hartwick 1989), items from the two involvement factors were averaged to create a single, 9-item involvement scale. Supporting this unidimensional representation, a high internal consistency reliability is observed.

havior in terms of both action and target. Recommended operationalizations are presented in Ajzen and Fishbein (1980).

System Use (behavior) was assessed with the post-implementation questionnaire, presented to users three to six months following system implementation (to ensure a well-established usage pattern). Specifically, users were asked (i) "Are you currently a heavy or light user of the new system?", and (ii) "How often do you use the new system?" Answers were given on 7-point scales with end-points of "heavy/light" and "infrequently/frequently," respectively. The use of two operationalizations was expected to improve the reliability and validity of the respondents' answers. In the analysis of TRA, each item was treated as a manifest variable (as separate measures of the latent construct, System Use).

Operationalizations of other TRA constructs were phrased to correspond to the two behavior items. Each construct was assessed twice, once with the predevelopment questionnaire (concerning the new system to be developed), and a second time with the postimplementation questionnaire (concerning the new system that has been developed). Intention Concerning System Use was assessed with two items: (i) "Do you intend to be a heavy or light user of the new system?", and (ii) "I intend to use the new system . . .". Answers were given on 7-point scales with end-points of "heavy/light" and "infrequently/frequently," respectively. Attitude Concerning System Use was also assessed with two items: (i) "My being a heavy user of the new system . . .", and (ii) "My frequently using the new system . . .". Answers to each were given on four affective 7-point semantic-differential scales (e.g., bad/good). The four affective scales were averaged to create a score for each item. Subjective Norm Concerning System Use was assessed with six questions. Specifically, respondents were asked whether: (i) "My [(a) superiors, (b) peers, (c) subordinates] think that I should/should not be a heavy user of the new system", and (ii) "My [(a) superiors, (b) peers, (c) subordinates] think that I should/should not frequently use the new system". Answers, given on 7-point scales with end-points of "should" and "should not," were averaged across the three referents to create two item scores. As with behavior, the two items obtained for each TRA

construct were treated as manifest variables in the analysis (as separate measures of the latent constructs of Attitude Concerning Use, Subjective Norm Concerning Use, and Intention to Use the New System).

Results

Structural Equation Modelling

The study data was analyzed using EQS, a structural equation modelling program developed by Bentler (1989). EQS implements a general mathematical and statistical approach to the analysis of linear structural equations, incorporating both latent and manifest variables. With structural equation modelling, one is able to do two things: (1) to check the overall goodness of fit of a proposed model, and (2) to compare the relative goodness of fit of competing models, thereby assessing the need for, and strength of, different model paths.

Overall Goodness of Fit. Currently, there is no generally accepted measure of overall model goodness of fit, leading researchers to recommend the use of multiple fit criteria (Breckler 1990, Wheaton 1987). In the present study, five goodness of fit indices are employed. The first is a chi-square statistic, which tests the proposed model against the general alternative where all variables are correlated. With this index, significant values indicate poor model fit, whereas nonsignificant values indicate good fit. The chi-square statistic, while the most popular index, is not without its problems (Bentler and Bonnett 1980, Wheaton 1987). In large samples, the chi-square statistic will almost always be significant, since chi-square is a direct function of sample size. On the other hand, in small samples, the statistic may not be chi-square distributed, leading to inaccurate probability values.

The second index, chi-square/degrees of freedom, provides an indication of the fit of the model per degree of freedom used. For this statistic, smaller values indicate better fit. Two thresholds for reasonable fit have been proposed in the literature: 5 or less (Wheaton, Muthen, Alwin, and Summers 1977), and 3 or less (Carmines and MacIver 1981).

The third index, the Non-Normed Fit Index (NNFI), proposed by Bentler and Bonnett (1980), is a transformation of chi-square. By taking degrees of freedom into

account, this index reflects fit relatively well at all sample sizes. With this index, values typically range from 0 to 1, with larger values indicating better fit. Values greater than 0.9 are considered to reflect reasonable model fit.

The fourth index, the Comparative Fit Index (CFI), proposed by Bentler (1990), has also been found to fit well at all sample sizes and is thought to provide a more stable estimate than NNFI. CFI values range from 0 to 1, with larger values indicating better fit. Again, values greater than 0.9 are considered to reflect reasonable model fit.

The fifth index, the Average Absolute Standardized Residual (AASR), provides an indication of the proportion of the variance not explained by the model. Consequently, small values indicate better fit.

Relative Goodness of Fit. Unlike overall goodness of fit, there is an accepted index, the chi-square difference test (Bentler and Bonnett 1980), for comparing the fit of hierarchical or nested models. This index tests the statistical significance, as a group, of the parameters that differentiate competing models. A statistically significant difference in chi-square indicates that the general model (the model with additional parameters) has a significantly better fit. In addition, the statistical significance of specific model parameters can be individually tested with a *t*-test.

Table 1 General Statistics for Antecedents and Consequences of Participation

	Hypothesized Model (Model 1)	Final Model (Model 1A)
Chi-square	10.32	22.56
Degrees of Freedom	2	11
Chi-square/df	5.16	2.05
NNFI	0.686	0.921
CFI	0.970	0.959
AASR	0.01	0.06
Explained Variance:		
Post Attitude Toward the System	44.5%	42.7%
Post Involvement	26.6	23.6
Overall Responsibility	3.6	0.0
User-IS Relationship	2.8	0.0
Hands-on Activity	2.2	0.0

Testing the Antecedents and Consequences of Participation

The model depicted in Figure 1 shows possible antecedents and consequences of user participation. Specifically, User Involvement and Attitude Toward the System (prior to ISD) are depicted as antecedents of user participation (Overall Responsibility, User-IS Relationship, and Hands-on Activity). Similarly, User Involvement and Attitude Toward the System (post ISD) are depicted as consequences of user participation. To examine these ideas, two model tests were conducted. First, the model depicted in Figure 1 (Model 1) was assessed. Next, nonsignificant paths of Model 1 were deleted to create a final model, which was then tested.

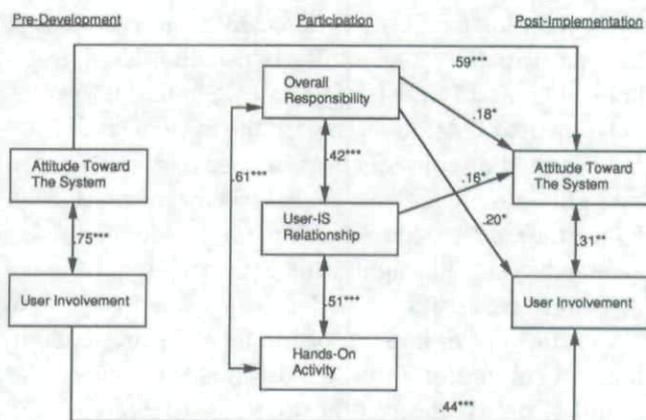
Goodness of fit indices for Model 1 are presented in the first column of Table 1. The chi-square index was found to be significant (chi-square = 10.32, *df* = 2, *p* < 0.01). The remaining fit indices also suggested a poor fit for the model (chi-square/*df* = 5.16; NNFI = .686; CFI = .970;⁵ AASR = .01). Of the 19 paths hypothesized, nine were found to be nonsignificant (all six paths from pre-ISD User Involvement and Attitude Toward the System to Overall Responsibility, User-IS Relationship, and Hands-on Activity; the two paths from Hands-on Activity to post-ISD User Involvement and Attitude Toward the System; the path from User-IS Relations to post-ISD User Involvement; all *t*'s < 1.65, ns).

The nine nonsignificant paths were eliminated from Model 1 to create a second model (Model 1A). Goodness of fit indices for this model are presented in the second column of Table 1; values of model parameters are shown in Figure 4. The chi-square index was found to be significant (chi-square = 22.56, *df* = 11, *p* < 0.05). The remaining four fit indices all suggested good fit for the second model (chi-square/*df* = 2.05; NNFI = 0.921; CFI = 0.959; AASR = 0.06). Further, a chi-square difference test conducted between Models 1 and 1A was nonsignificant (chi-square difference = 12.24, *df* = 9, ns), indicating the deletion of the nine paths did not reduce model fit. Moreover, as can be seen in Figure 4, all remaining model paths are significant (*p* < 0.05).

⁵ Model 1 includes 19 out of 21 possible paths between the constructs being investigated. Two of the indices, CFI and AASR, fail to adequately take this fact into account and, as a result, overestimate goodness of fit.

Figure 4 Structural Equation Analysis—Antecedents and Consequences of Participation (Model 1A)

* $p < 0.05$.
 ** $p < 0.01$.
 *** $p < 0.001$.



Thus, the extent to which users participate in ISD does not appear to be influenced by initial levels of involvement or attitude. On the other hand, participation (specifically, Overall Responsibility and User-IS Relationship) was found to influence involvement and attitude. Users who participate more in ISD develop higher levels of involvement and more positive attitudes toward the system.

Testing TRA

Fishbein and Ajzen's TRA, depicted in Figure 2, was tested as follows. First, the basic model (Model 2), looking at the influence of attitude and subjective norm on intention, and the influence of intention on behavior, was assessed. As a further test of TRA, a second model (Model 2A), looking at the possibility of direct links from attitude and subjective norm to behavior was also examined. According to TRA, no such links should be found. For each model (Models 2 and 2A), both long-term performance (predicting postimplementation use from predevelopment attitude, subjective norm, and intention) and short-term performance (predicting contemporaneous use with postimplementation attitude, subjective norm, and intention) were examined.

Long-Term Performance of TRA. Table 2 presents goodness of fit indices for the long-term performance of Model 2. The chi-square index was found to be significant (Chi-square = 54.98, $df = 16$, $p < 0.001$). The remaining four fit indices suggested an adequate fit for the model (Chi-square/ $df = 3.44$; NNFI = 0.899; CFI = 0.943; AASR = 0.03). As shown in Figure 5A, all hypothesized paths were found to be significant ($p < 0.05$). Thus, pre-ISD attitudes and subjective norms predict pre-ISD intentions, and pre-ISD intentions predict post-ISD system use.

Table 2 General Statistics for Fishbein and Ajzen Model

	Predevelopment Attitude and Norm to Postimplementation Use		Postimplementation Attitude and Norm to Postimplementation Use	
	Hypothesized Model (Model 2)	Model Including All Paths (Model 2A)	Hypothesized Model (Model 2)	Model Including All Paths (Model 2A)
Chi-square	54.98	50.38	38.37	35.10
Degrees of Freedom	16	14	16	14
Chi-square/ df	3.44	3.60	2.40	2.51
NNFI	0.899	0.893	0.953	0.950
CFI	0.943	0.946	0.973	0.975
AASR	0.03	0.02	0.02	0.02
Explained Variance:				
System Use	35.2%	41.2%	73.8%	79.7%
Intention to Use	70.4	71.9	80.8	70.8

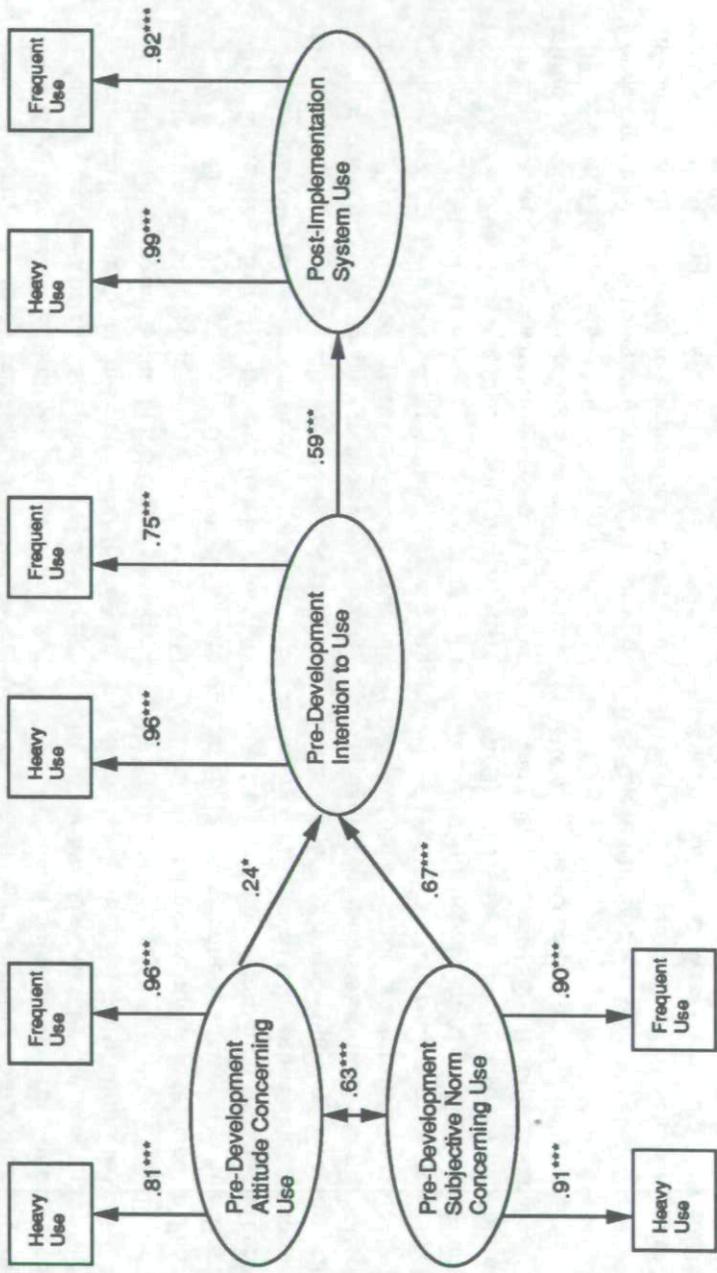
Figure 5 Structural Equation Analysis—Fishbein and Ajzen Model (Model 2)

* $p < 0.05$.

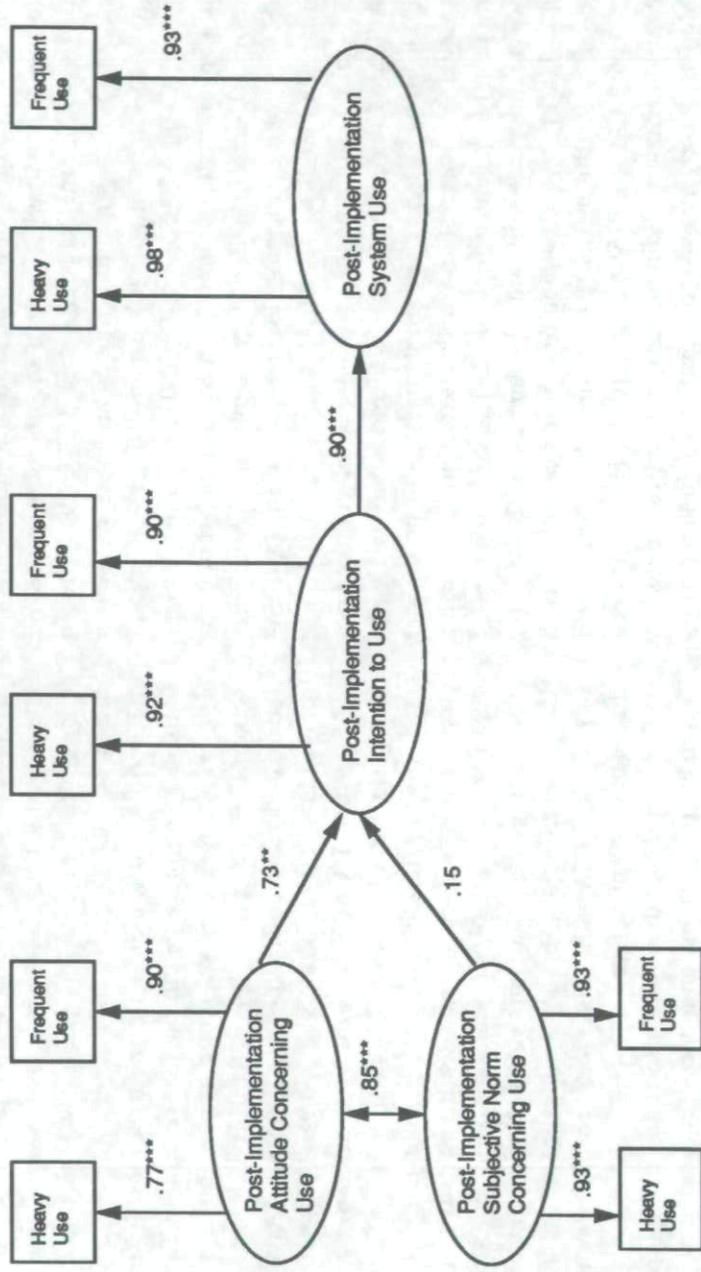
** $p < 0.01$.

*** $p < 0.001$.

5A. PRE-DEVELOPMENT ATTITUDE AND NORM TO POST-IMPLEMENTATION USE



5B. POST-IMPLEMENTATION ATTITUDE AND NORM TO POST-IMPLEMENTATION USE



To examine the possibility of direct links from Attitude Concerning System Use and Subjective Norm Concerning System Use to System Use, a second model (Model 2A) was tested. Goodness of fit indices for this model are presented in Table 2. The chi-square index was found to be significant (chi-square = 50.38, $df = 14$, $p < 0.001$). The remaining four fit indices suggested an adequate fit for the model (chi-square/ $df = 3.60$; NNFI = 0.893; CFI = 0.946; AASR = 0.02). A chi-square difference test conducted between Models 2 and 2A was nonsignificant (chi-square difference = 4.60, $df = 2$, ns), suggesting the new paths of Model 2A did not improve model fit. While the path from Subjective Norm Concerning System Use to System Use was nonsignificant ($t = 0.78$, ns), the path from Attitude Concerning System Use to System Use was found to be significant ($t = 2.11$, $p < 0.05$), but negative. Conceptually, there would appear to be no reason why a user with a positive attitude would be *less* likely to use a system. Therefore, we believe that the negative path results from Attitude Concerning System Use operating as a suppressor variable in the analysis. Thus, the longitudinal data of this study essentially support TRA.

Short-Term Performance of TRA. Table 2 also presents goodness of fit indices for the short-term performance of Model 2. The chi-square index was found to be significant (chi-square = 38.37, $df = 16$, $p < 0.001$). The remaining four fit indices suggested a good fit for the model (chi-square/ $df = 2.40$; NNFI = 0.953; CFI = 0.973; AASR = 0.02). As shown in Figure 5B, all paths but one (from Subjective Norm Concerning Use to Intention) were significant. Thus, post-*ISD* attitudes predict post-*ISD* intentions, and post-*ISD* intentions predict system use.

Again, to examine the possibility of direct links from Attitude Concerning System Use and Subjective Norm Concerning System Use to System Use, a second model (Model 2A) was tested. Goodness of fit indices for this model are presented in Table 2. The chi-square index was found to be significant (chi-square = 35.10, $df = 14$, $p < 0.001$). The remaining four fit indices suggested a good fit for the model (Chi-square/ $df = 2.51$; NNFI = 0.950; CFI = 0.975; AASR = 0.02). However, once again, a chi-square difference test conducted between Models 2 and 2A was nonsignificant (chi-square dif-

ference = 3.27, $df = 2$, ns), indicating the new paths of Model 2A did not improve model fit. Further, tests of the two individual paths from Attitude Concerning System Use and Subjective Norm Concerning System Use to System Use were both nonsignificant (both t 's < 0.90 , ns). Thus, TRA is also supported cross-sectionally.

Looking at the two models depicted in Figures 5A and 5B, two observations are worth noting. First, intentions appear to be determined differently before and after *ISD*. Prior to *ISD*, the prime determinant of intention is subjective norm. Following *ISD*, the prime determinant of intention is attitude. Second, both pre-*ISD* and post-*ISD* intentions are found to strongly predict system use. However, consistent with Fishbein and Ajzen's theorizing (1975, Ajzen 1985, Ajzen and Fishbein 1980, Fishbein 1980), a stronger relationship is found between post-*ISD* intentions and behavior, than between pre-*ISD* intentions and behavior.

Testing the Integrated Model

To test the integrated model depicted in Figure 3, four separate model tests were conducted. First, the hypothesized theoretical model (Model 3) was assessed. Next, two further models (Models 3A and 3B) were tested to explore the need for including additional model parameters. Finally, based on the results of the first three tests, a best-fitting model (Model 3C) was proposed and tested.

Goodness of fit indices for the hypothesized model (Model 3) are presented in the first column of Table 3. The chi-square index was found to be significant (chi-square = 93.08, $df = 52$, $p < 0.001$). The remaining four fit indices suggested good fit for the proposed model (chi-square/ $df = 1.80$; NNFI = 0.950; CFI = 0.967; AASR = 0.03). Of the 18 paths hypothesized, five (the two paths from User-*IS* Relationship to User Involvement and to Attitude Toward the System, the two paths from Hands-on Activity to User Involvement and to Attitude Toward the System, and the path from Attitude Toward the System to Subjective Norm Concerning Use), were found to be nonsignificant (all t 's < 1.12 , ns). Thus, the hypothesized model would seem to require some modification.

Two further models were also tested to explore the possibility of additional influences. In the first of these

Table 3 General Statistics for Specific Participation Models

	Hypothesized Model (Model 3)	Model Including All Participation Paths (Model 3A)	Model Including All Possible Paths (Model 3B)	Final Model (Model 3C)
Chi-square	93.08	87.33	76.25	95.39
Degrees of Freedom	52	40	34	57
Chi-square/df	1.80	2.18	2.24	1.70
NNFI	0.950	0.925	0.921	0.957
CFI	0.967	0.962	0.966	0.969
AASR	0.03	0.02	0.02	0.04
Explained Variance in:				
System Use	75.6%	75.6%	75.3%	75.2%
Intention To Use	75.1	75.3	73.2	74.6
Attitude Concerning Use	37.4	39.9	41.8	35.0
Subjective Norm Concerning Use	9.0	9.9	9.8	8.0
Attitude Toward the System	10.9	10.9	10.9	10.7
User Involvement	7.3	7.3	7.3	6.7

models (Model 3A), 12 additional paths were added to Model 3—direct paths from each of the three participation dimensions (Overall Responsibility, User-IS Relationship, and Hands-on Activity) to the four TRA constructs (Attitude Concerning System Use, Subjective Norm Concerning System Use, Intention to Use the System, and System Use). The significance of any of these parameters would suggest a more direct link between participation and usage behavior than the ones hypothesized. The chi-square difference between Models 3 and 3A was nonsignificant (chi-square difference = 5.75, $df = 12$, ns). Thus, the 12 paths, taken together, do not add to the explanatory power of Model 3. Moreover, in the analysis of Model 3A, none of the additional paths, analyzed individually, was found to be significant (all t 's < 0.93, ns). These findings indicate that the influence of user participation on intentions and behavior is completely mediated by the terms of TRA.

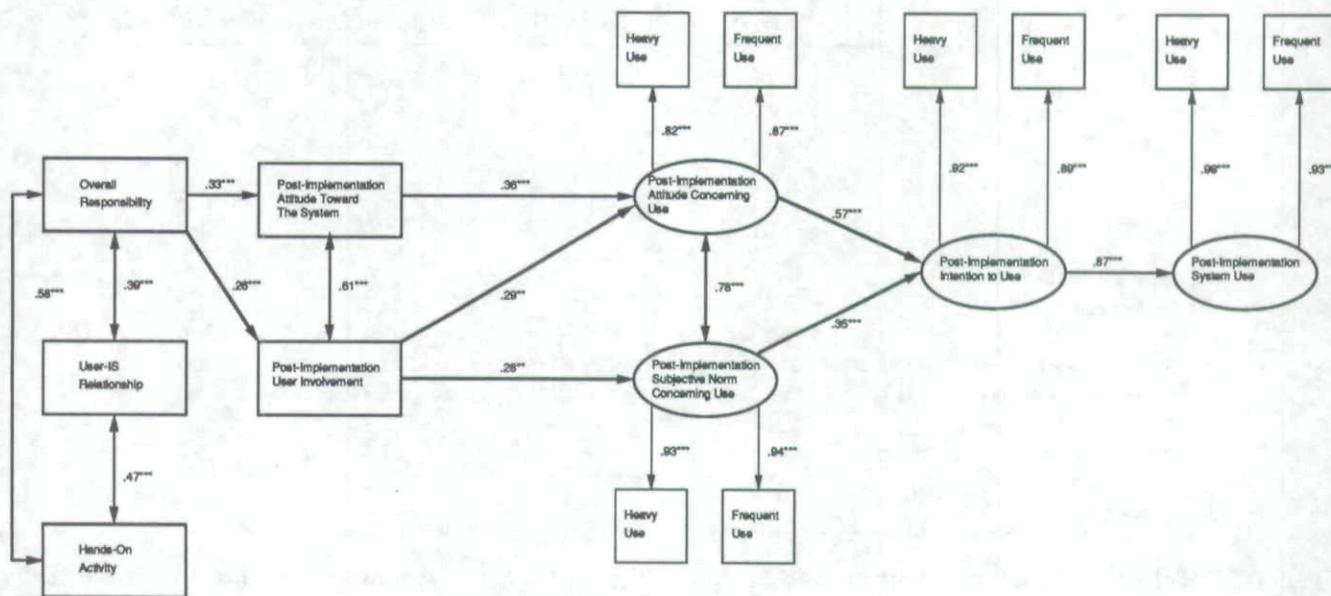
A second exploratory model was also tested. This model (Model 3B) included the 12 additional paths of Model 3A, and six more paths—the four direct paths from Attitude Toward the System and from User Involvement, to Intention to Use the System and to System Use, and the two direct paths from Attitude Concerning System Use and from Subjective Norm Concerning System Use, to System Use. The significance of any of

these parameters would suggest direct links not theorized or empirically supported in past uses of TRA. The chi-square differences between Model 3B and the two previous models (Models 3 and 3A) were both nonsignificant (chi-square differences = 16.83 and 11.08, $dfs = 18$ and 6, both ns). Thus, the additional paths, taken together, do not seem to add to the explanatory power of either Model 3 or Model 3A. Moreover, in the analysis of Model 3B, none of the additional paths, analyzed individually, were found to be significant (all t 's < 1.52, ns). Again, the Theory of Reasoned Action fares quite well.

Based upon the above results, a best-fitting model (Model 3C) was constructed and tested. This model included all the paths of the hypothesized model (Model 3), except for the nonsignificant links (from User-IS Relationship to User Involvement; from User-IS Relationship to Attitude Toward the System; from Hands-on Activity to User Involvement; from Hands-on Activity to Attitude Toward the System; from Attitude Toward the System to Subjective Norm Concerning System Use). Goodness of fit indices for this model are presented in the last column of Table 3; values of model parameters are shown in Figure 6. The chi-square index was found to be significant (chi-square = 95.39, $df = 57$, $p < 0.001$). The remaining four fit indices all suggested

Figure 6 Structural Equation Analysis—Participation and system Use (Model 3C)

* $p < 0.05$.
 ** $p < 0.01$.
 *** $p < 0.001$.



an excellent fit for the final model (chi-square/df = 1.70; NNFI = 0.957; CFI = 0.969; AASR = 0.04). Moreover, as can be seen in Figure 6, all model paths are significant at $p < 0.01$. Thus, the model of Figure 6 appears to represent quite well the constructs being investigated. Further, it is also quite clear that it is Overall Responsibility, not User-IS Relationship or Hands-on Activity, that has the bigger influence on both User Involvement and Attitude Toward the System.

Looking at Mandatory and Voluntary Usage

In organizations, different IS usage patterns can be observed. While usage of a system is mandatory in some organizations and for some systems, elsewhere it is voluntary. Past IS research has largely focused on the study of voluntary usage (cf. Baroudi, et al. 1986, Lucas 1981, Melone 1990). Because mandatory use is required, it is frequently assumed that there is little variance in usage, making it difficult to predict empirically. Further, even if predictable, the mandatory nature of usage makes it meaningless as an indicant of system success. On the other hand, voluntary use, reflecting the individual's own perceptions and feelings concerning the system,

will vary accordingly and may be used as an indicant of system success.

We believe, in contrast to the above opinions, that mandatory usage behavior is variable, and thus predictable. When use is mandatory, a superior or some other individual is requiring the user to use the system; however, the extent of this use may vary. In this study, attitude, subjective norm, intention, and behavior were each assessed with respect to level or extent of use. Thus, even for mandatory use, the TRA model components can still vary and be used to predict the different levels of use.⁶

⁶ TRA aims to describe the determinants of volitional behavior; that is, behavior under one's control. Voluntary use is under one's control and likely to be based on attitudinal considerations. Mandatory use is also under one's control but is likely to be based on normative considerations. Here, one is choosing to go along with the wishes of others. Mandatory users can also choose the extent to which they will use the system. For example, some users will defy their superiors and not use the system at all. Others will use the system selectively, using it when they personally feel it is effective or when they think they are being monitored. And, of course, there will be many who will use the system all the time. The attitudinal and normative components of TRA may be employed to study such possibilities.

Given this belief, we split the respondents into two groups based on their answers to the following question, "Are you required to use the new system (i.e., is it mandatory that you use the new system)?" Users who responded "Yes" were classified as mandatory users ($n = 62$); users responding "No" or "Somewhat" were classified as voluntary ($n = 58$); seven respondents failed to answer this question and were therefore not classified. Because of the relatively small size of each subsample, a complete testing of all possible models was not performed. Instead, our best model (Model 3C) was used to analyze each subsample. This analysis allows a description of voluntary and mandatory usage behavior to be obtained for each group.

Goodness of fit indices for mandatory users were as follows: chi-square = 125.02, $df = 57$, $p < 0.001$; chi-square/df = 2.20; NNFI = 0.840; CFI = 0.883; AASR = 0.09). Of the 13 paths hypothesized, four paths were found to be nonsignificant (from Overall Responsibility to User Involvement; from Overall Responsibility to Attitude Toward the System; from User Involvement to Attitude Concerning System Use; from User Involvement to Subjective Norm; all t 's < 1.50 , ns).

Indices for voluntary users were as follows: chi-square = 97.40, $df = 57$, $p < .001$; chi-square/df = 1.71; NNFI = 0.908; CFI = 0.933; AASR = 0.06). Of the 13 paths hypothesized, only one was nonsignificant, the path from Subjective Norm Concerning Use to Intention to Use the System ($p < 0.10$).

The mandatory and voluntary user models are shown in Figure 7. Three key differences can be observed between mandatory and voluntary users. First, while user intentions predict system use for both groups, the importance of subjective norms in determining such intentions varies. As might be expected, Subjective Norm significantly relates to Intention in the case of mandatory users ($t = 3.92$, $p < 0.001$), whereas it has only a marginal relationship with Intention for voluntary users ($t = 1.81$, $p < 0.10$). Thus, mandatory users would seem to be giving greater weight to the opinions of others, using the system frequently when others think that frequent use is appropriate. Voluntary users are less likely to pay attention to the opinions of others, focusing instead on their own attitudes. This result validates our split of the sample into the two groups.

A second key difference between the two groups is

in the relative importance of user participation and involvement. User participation and involvement are irrelevant for mandatory users, with all four model paths nonsignificant (from Overall Responsibility to Attitude Toward the System, $t = 1.36$, ns; from Overall Responsibility to User Involvement, $t = 1.50$, ns; from User Involvement to Attitude Concerning System Use, $t = 0.62$, ns; from User Involvement to Subjective Norm Concerning System Use, $t = 0.14$, ns). On the other hand, participation and involvement play key roles in explaining the usage behavior of voluntary users, with all four paths significant (from Overall Responsibility to Attitude Toward the System, $t = 4.43$, $p < 0.001$; from Overall Responsibility to User Involvement, $t = 3.13$, $p < 0.01$; from User Involvement to Attitude Concerning System Use, $t = 2.90$, $p < 0.01$; from User Involvement to Subjective Norm Concerning System Use, $t = 3.14$, $p < 0.01$). Thus, voluntary users who engage in activities incorporating responsibility develop more positive attitudes concerning the system and perceive it to be more important and personally relevant. Further, they also develop more positive attitudes and stronger norms concerning system use.

The third difference between mandatory and voluntary users concerns the relationship between Attitude Toward the System and Attitude Concerning System Use. In the case of the mandatory user group, Attitude Concerning System Use is solely determined by Attitude Toward the System ($t = 6.83$, $p < 0.001$). Users who perceive the system to be good perceive their use of the system to be good. In the case of the voluntary user group, however, Attitude Concerning System Use is determined both by User Involvement ($t = 2.90$, $p < 0.01$) and by Attitude Toward the System ($t = 2.11$, $p < 0.05$). Such users, therefore, take into account the importance, the personal relevance, and the goodness of the system as they form their attitudes concerning its use.

Discussion

Participation and Involvement

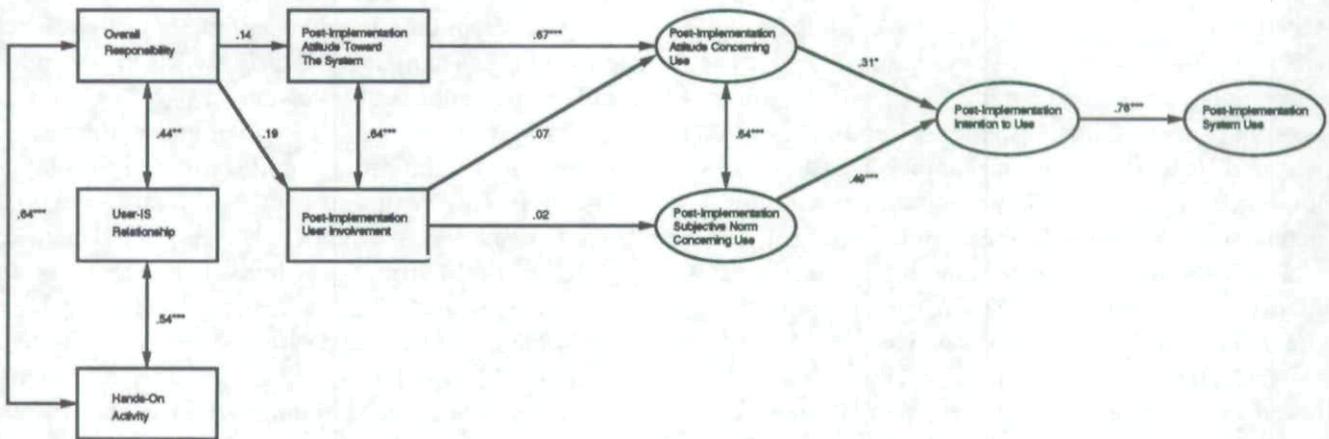
Two Distinct Constructs. According to Barki and Hartwick (1989), user participation and user involvement represent two distinct, but related, constructs. User participation refers to the observable behaviors, activ-

Figure 7 Participation and System Use—Mandatory and Voluntary Users¹

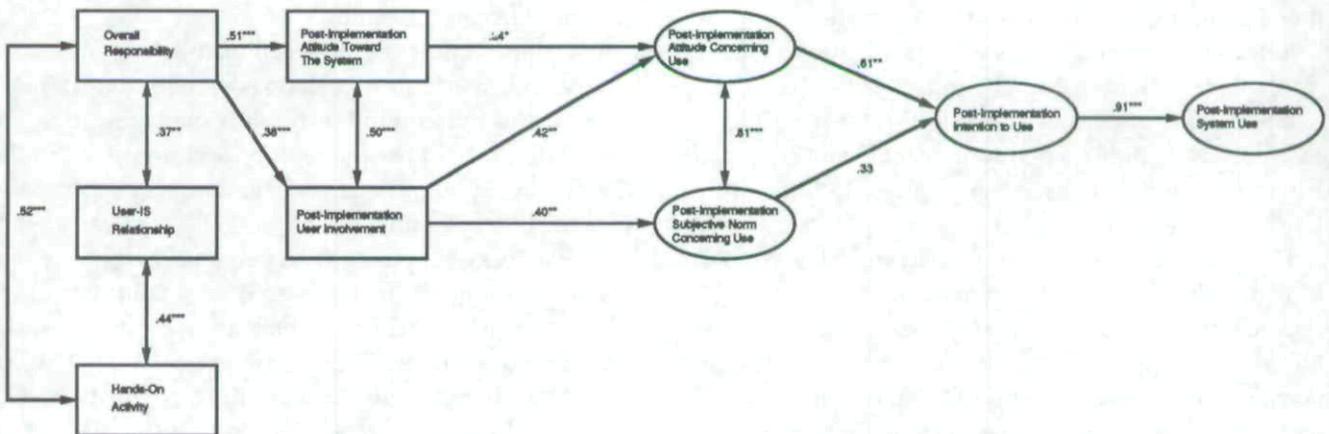
* $p < 0.05$.
 ** $p < 0.01$.
 *** $p < 0.001$.

¹ For clarity, measurement model parameters are not shown.

7A. MANDATORY USERS



7B. VOLUNTARY USERS



ities, and assignments that users or their representatives perform during ISD. Examples include being the leader of the project team, approving formal agreements of work to be done, and defining screen layouts. In contrast, user involvement refers to a psychological state. It reflects a user's beliefs that a system is both important and personally relevant.

It may be thought that users who initially believe that a system to be developed is good, important, and per-

sonally relevant will engage in activities related to its development. However, no evidence for these relationships were found in the study. Initial user attitude and involvement do not influence the level of user participation. One wonders, then, what are the determinants of participation. One distinction which could be useful is that of voluntary vs. mandatory participation. Much of the time, we suspect, users participate because such participation is mandated by superiors or other members

of the organization. Still, there are apt to be occasions where potential users desire, and ask, to participate in the development of the new system. The antecedents of each possibility are likely to be different. Future research needs to be directed towards the discovery of such antecedents.

User participation was hypothesized to influence postimplementation involvement and attitude toward the system. Users who engage in participative activities involving responsibility and influence during ISD should come to view the system as being good, important, and personally relevant. Further, user involvement and attitude toward the system were expected to influence their attitudes and subjective norms concerning system use. Users who believe that the system is good, important, and personally relevant, should also come to believe both that its use is good and that others expect them to use the system. Finally, user involvement and attitude toward the system were hypothesized to mediate the relationship between user participation and users' attitudes, subjective norms, and intentions concerning use, as well as system use. The results of the present study were consistent with these propositions. Significant links were observed from participation to postimplementation involvement and attitude toward the system. However, no additional links between participation and other model variables were found. Together, these results suggest that any influence of user participation on system use is mediated by involvement and attitude toward the system.

These findings are consistent with our position that user involvement, as we have defined it, is not only a different construct from user participation, but also that it is more important than user participation in explaining system use. Given this conclusion, identifying antecedents of user involvement becomes an important empirical and practical issue. Possible antecedents of user involvement include personality characteristics (e.g., need for achievement, locus of control, or dominance), experience (e.g., education, amount of experience with IS, or quality of experience with IS), organizational status (e.g., organizational function, hierarchical level), organizational culture, and, of course, user participation. The present study has shown that user participation leads to user involvement. The influence of other variables needs to be investigated in future research.

It is also interesting to note that the correlation between User Involvement and Attitude Toward the System decreased from predevelopment to postimplementation (from 0.75 to 0.31). A plausible explanation of this result is that, prior to ISD, users' knowledge about the system to be developed is not likely to be well formed. As such, they may not be able to distinguish easily their beliefs and feelings concerning the system. Following implementation, when users are able to actually see and use the system, well-differentiated beliefs and feelings will develop. As a result, users will be able to distinguish more clearly their feelings of whether the system is good or bad from their beliefs of how important and personally relevant it is.

Overall Responsibility—A Key Dimension.

Through factor analysis, Barki and Hartwick (1994) differentiated three distinct dimensions of user participation (Overall Responsibility, User-IS Relationship, and Hands-on Activity). The results obtained in this study indicate that Overall Responsibility is the most important antecedent of user involvement and attitude toward the system. These results are similar to those frequently noted in the field of organizational behavior. There, in discussions of participation, the concept of "meaningful" participation is emphasized, and differentiated from "simple" participation. Meaningful participation is said to involve personal autonomy, control, making important decisions, and performing significant tasks (cf. Bass 1965, Coch and French 1948, Patchen 1970). The other two factors of user participation, while correlated with Overall Responsibility, have no direct influence on user involvement, attitude, or system use. Of interest, items reflecting formal and hands-on activities have frequently been used in past research on participation (e.g., Doll and Torkzadeh 1990, Franz and Robey 1986). Their inclusion could have led to the mixed findings which have been observed (Ives and Olson 1984).

The overall responsibility factor, according to Barki and Hartwick (1994), involves several key tasks. By assigning such tasks to users, responsibility and, as a result, involvement are increased. The ISD responsibilities which users can be assigned can be either of a general or a specific nature. For example, two general responsibilities users may be given are being the project team leader and being responsible for the success of

the new system. Users can also be given responsibilities related to specific ISD tasks. For example, they can be asked to make cost/benefit estimates for the project, they may be given the responsibility of justifying and securing funds needed for the project, or they may be assigned the task of requesting additional funds (to cover unforeseen time/cost overruns). It should be noted that, at present, such responsibilities are typically assigned to just one or two future users of a new system. In order to create a sense of responsibility in a larger number of users, either of two strategies can be adopted. First, additional development activities that lead to a sense of responsibility could be identified and assigned to different users. Alternatively, responsibility activities could be assigned to user groups.

Voluntary vs. Mandatory Use. Important differences between voluntary and mandatory users were observed in the study. For the voluntary group, the overall responsibility component of user participation and user involvement were each observed to be strongly linked to attitudes, norms, intentions, and use. Thus, the contention that user participation and involvement are important predictors of voluntary system use is supported. These results are generally consistent with past research.

On the other hand, for the mandatory group, no significant relationship was found between user participation and other model variables. Further, user involvement also failed to influence attitude and subjective norm concerning system use. Thus, for mandatory users, user participation and involvement would seem unimportant. Instead, the most important antecedent of mandatory users' intentions was subjective norms. In past research, little work has been done to investigate normative factors. The results obtained for the mandatory user group suggest that more work needs to be done in this area.

Attitudes, Intention, and System Use

Beyond the role of participation and involvement, the present study provides several findings concerning the relationship between user attitudes, intentions, and system use. In IS, three theoretical formulations incorporating these variables have recently been investigated—Fishbein and Ajzen's Theory of Reasoned Action (TRA); Davis, Bagozzi, and Warshaw's Technology

Acceptance Model (TAM); and Ajzen's Theory of Planned Behavior (TPB).

Fishbein and Ajzen's TRA. In our study, Fishbein and Ajzen's TRA was employed as the basic theoretical framework within which to explain the effects of user participation and involvement. Strong support was obtained for TRA, both longitudinally (using predevelopment attitude, subjective norm, and intention to predict postimplementation system use) and cross-sectionally (using postimplementation attitude, subjective norm, and intention to predict contemporaneous system use). Descriptively, the results suggest the following picture. System use is determined by the user's intention to use the system. Such intentions, in turn, are determined by the user's attitude toward system use (whether he/she feels that performing the behavior is good or bad) and his/her subjective norm concerning the behavior (whether he/she believes that other individuals want him/her to perform the behavior). These results add to previous support for TRA provided by Davis et al. (1989).

Using TRA, two interesting findings were found concerning the determinants of system use. While the theory was found to provide strong predictions of mandatory and voluntary users' intentions and behavior, the weights of the attitude and subjective norm components were found to vary. As might be expected, mandatory users were found to weight the normative component most heavily. They formed intentions and used the system frequently because they believed important others (for example, their superior) expected them to use it frequently. Voluntary users, on the other hand, weighted the attitudinal component most heavily. Such users paid little attention to the opinions of others. Voluntary users formed intentions to use the system frequently because they personally felt that its frequent use would be good, useful, and valuable.

Second, attitude and subjective norm were found to exert different amounts of influence before and after system development. Prior to ISD, when users' knowledge and beliefs concerning the new system were apt to be vague and ill-formed, subjective norm was found to exert a greater influence on intention. Following ISD, however, when the system, as well as its strengths and its weaknesses were known, attitude was found to exert

the greater influence on intention. These results suggest that various forms of influence will be differentially effective, depending on when they are attempted. Early on, normative influence attempts (e.g., top management support) should prove effective. Later, when the system is operational, informational influence attempts (e.g., providing information concerning system strengths and benefits, or information making use easier) are apt to work better.

One additional aspect of TRA received scrutiny in the present study. According to the theory, performance of a behavior should be determined by intention to perform that behavior. The influence of other variables on behavior should be mediated by intention. For the variables investigated in the present research (Attitude Concerning System Use; Subjective Norm Concerning System Use; Attitude Toward the System; User Involvement; User Participation), this contention was supported. Further, TRA states that intention to perform a behavior is determined by attitude and subjective norm concerning that behavior. The influence of all other variables on intention should be mediated by attitude and subjective norm. Again, for the variables investigated in the present study (Attitude Toward the System; User Involvement; User Participation), this contention was supported.

Davis, Bagozzi, and Warshaw's TAM. In IS, Davis et al. (1989, see also Davis 1989) have proposed an extension of TRA, called the Technology Acceptance Model (TAM). TAM differs from TRA in two key aspects. First, TAM introduces two new constructs, perceived usefulness (the belief that using an application will increase one's performance) and perceived ease of use (the belief that one's use of an application will be free of effort). In TAM, both perceived usefulness and ease of use are said to be determinants of an individual's attitude concerning the use of an application. This is consistent with TRA, where beliefs are said to underlie one's attitudes. However, TAM also states that perceived usefulness is a direct determinant of an individual's intention to use an application. Empirical support for this contention is provided by Davis et al. (1989) and Mathieson (1991). This result conflicts with TRA, where the effect of beliefs on intention is said to be mediated by attitude.

Results of the present research may be relevant to this issue. Davis et al. measure perceived usefulness with items such as "I would find (the application) useful." As such, there is apt to be considerable overlap between perceived usefulness and our construct of Attitude Toward the System. Given that overlap, our finding that Attitude Toward the System influences Attitude Concerning Use is consistent with TAM (as well as TRA). However, our failure to find a direct link from Attitude Toward the System to Intention may be viewed as being inconsistent with TAM (but supportive of TRA).⁷

TAM differs from TRA in a second important way—TAM does not include subjective norm as a determinant of intention. There would appear to be two reasons for this omission, one conceptual and one empirical. Conceptually, several researchers have criticized TRA, suggesting that the theory (with its recommended operationalizations) does not clearly differentiate normative and informational influences on behavior (see, for example, Miniard and Cohen 1979, 1981; Warshaw 1980). They note that measures of attitude and subjective norm are frequently correlated. Such critiques, however, neglect several studies conducted to provide discriminant validity for the two constructs (e.g., Ajzen 1971; Ajzen and Fishbein 1970, 1972). Indeed, the present study provides evidence for the distinctiveness of the two constructs—mandatory users were found to place greater weight on subjective norm; voluntary users weighted attitude more heavily.

Further, these critiques are based on simplistic views of normative and informational influence. As Fishbein

⁷ Several studies have purported to find direct belief-intention links (Bagozzi 1982, Brinberg 1979, Hom and Hulin 1981), providing empirical justification for the TAM contention that perceived usefulness directly influences intentions to use an application. Unfortunately, when viewed as evidence against TRA, each of the studies exhibits flaws. Bagozzi's (1982) measure of beliefs can best be viewed as a measure of conditional intentions, not behavioral beliefs. It is, therefore, easy to see why this measure had a strong relationship with intention. Brinberg (1979) and Hom and Hulin (1981) did not operationalize norm as recommended by Fishbein and Ajzen. A possible mediating role of subjective norm may thus have been excluded. Finally, each of these studies (as well as Davis et al. (1989) and Mathieson (1991)) failed to examine the possibility that the influence of beliefs on intention is mediated by a shift in the relative weight of attitude and subjective norm.

and Ajzen (1975) point out, normative influence attempts may affect intentions and behavior, either directly from subjective norm to intention (in Kelman's (1961) terms, compliance) or indirectly from subjective norm to attitude to intention (in Kelman's terms, internalization). Similarly, informational influence attempts may affect intentions and behavior directly, from attitude to intention, or indirectly, from attitude to subjective norm to intention. Further description and empirical evidence for such processes may be found in Ryan (1982), Shimp and Kavas (1984), and Oliver and Bearden (1985). Thus, normative and informational influences are incorporated into TRA through the interdependent constructs of attitude and subjective norm.

Davis et al. (1989) also justify the exclusion of subjective norm on empirical grounds. Neither Davis et al. nor Mathieson (1991) found significant empirical support for the normative component in their studies. It is important, however, to look at the subjects and context of each study. Davis et al. (1989) studied the use of a word processing package by MBA students. Mathieson (1991) looked at the use of a spreadsheet package by undergraduate students. In neither case can normative influences be expected to be strong. On the other hand, our study looked at the use of information system applications in organizational settings. In organizations, superior/subordinate relationships are apt to foster normative pressures. Consistent with this contention, significant effects of subjective norm were found in our research.

Ajzen's TPB. Mathieson (1991) has recently introduced a third intention theory to IS, Ajzen's (1985; see also Ajzen and Madden 1986, Shifter and Ajzen 1985) Theory of Planned Behavior (TPB). Also an extension of TRA, TPB introduces one new construct, perceived behavioral control (the belief that one is able to control personally the performance of behavior). The greater the resources and opportunity that one has, and the fewer the impediments or obstacles that one faces, the greater one's perceived control. Thus, in IS, a number of individual difference (i.e., system knowledge and ability), task (i.e., task complexity, system ease of use), and situation (i.e., system availability and access) variables are apt to influence perceived behavioral control. In TPB, perceived behavioral control is said to combine

with attitude and subjective norm to determine intention. Individuals form intentions to perform behaviors that are perceived to be affectively positive, normatively expected, and under their control. Further, as a surrogate measure of actual control, perceived control is said to combine with intention to determine behavior. Individuals perform behaviors that they intend to, and are able to, perform.

In the present study, perceived behavioral control was not measured. We view this as an important omission. User participation is likely to improve one's knowledge of, and ability to use, a system. Moreover, through user recommendations and influence during ISD, system access and ease of use could be improved. Thus, like attitude and involvement, perceived behavioral control is apt to mediate the influence of participation on intentions and use of a system. The presence of such relationships needs to be investigated in future research.

Study Limitations

Measurement of Behavior. In the study, System Use was measured through the use of two self-report items contained on the post-implementation questionnaire. Could they be biased? While possible, this seems unlikely. Not only were respondents not asked for their names (users were identified by position only), completed questionnaires were mailed directly to the researchers (not given to superiors or other organization members). Are self-report measures valid indicators of use? While self-report measures of behavior are frequently criticized, Ajzen (1987) defends their use. According to Ajzen, individuals, when they respond to such measures, likely consider actions that they have performed in a variety of contexts and at many different times. On the other hand, objective assessments of behavior, for pragmatic reasons, are often restricted in scope (with assessments made only in certain contexts or at certain times). Consequently, Ajzen argues that self-report measures will often be more valid, since researchers are typically interested in comprehensive assessments of behavior.

Method Bias. In the study, the four TRA constructs (attitude, subjective norm, intention, and behavior) were each operationalized with two items (being a heavy/light user of the system, and using the system infrequently/frequently). Given similarity of phrasing

across the four TRA constructs, the possibility of method bias must be considered. In spite of similar phrasings, different conceptual questions were asked for each construct—indicate your feelings concerning use (attitude), what do other people think about your use (subjective norm), how often do you intend to use (intention), and what is your current level of use (behavior). Evidence for the distinctiveness of such operationalizations has been provided by Fishbein and Ajzen (1975), Ajzen and Fishbein (1980), and Fishbein (1980). The results reported in this paper, comparing mandatory and voluntary users, provide further evidence for the construct validity of the attitude and subjective norm constructs.

The longitudinal data also speak to the issue of method bias. In the study, System Use is strongly predicted, not only by measures of intention contained in the same questionnaire, but also by measures assessed many months earlier. Thus, intention is shown to be a determinant of system use. Still, predictions are stronger when intentions and use are assessed contemporaneously. This could show the existence of method bias (in addition to the conceptual prediction of System Use). Alternatively, the superior short-term prediction of use could result from theoretically meaningful factors. As Fishbein and Ajzen (1975; see also Ajzen 1985, Ajzen and Fishbein 1980) have noted, intentions assessed far in advance of behavior could change before the time of performance. Thus, measured intentions would provide an attenuated prediction of behavior. Factors leading to changes in intention include: the occurrence of environmental events, the receipt of new information, shifts in belief salience, etc. In our situation, the whole process of developing the new system could lead to changes in users' intentions. It is, therefore, not surprising to see the superior short-term prediction of System Use.⁸

Beliefs Were Not Measured. Fishbein and Ajzen's TRA may be considered as having three separate levels

⁸ Another analysis suggested by Bagozzi and Phillips (1982) explicitly modelling method bias was also conducted. In this analysis, two method constructs were added to the model. Each construct represents one of the two phrasings of the attitude, subjective norm, intention, and behavior measures. Through the introduction of these constructs, error terms were dramatically reduced. Further, path coefficients for the conceptual model being investigated in the study became larger. Method bias cannot, therefore, account for the results reported here.

of analysis. First, behavior is said to be determined by behavioral intention. Second, behavioral intention is said to be determined by attitude and subjective norm. Third, attitude and subjective norm are said to be determined by behavioral and normative beliefs, respectively. In the present study, only the first two levels of TRA were investigated. This results in an incomplete analysis, not only of the mediating effects of TRA constructs, but also of the determinants of system use. Using only two levels of TRA, the influence of participation, involvement, and attitude toward the system on attitude and subjective norm concerning system use may be ascertained. Further, it is possible to see whether intentions and use are determined normatively or attitudinally. Thus, we are able to say, for example, that the influence of participation on intention is mediated by attitude and subjective norm, that involvement influences both attitude and subjective norm, and that both attitude and subjective norm influence intentions and use. However, we are unable to determine the precise nature of this influence. That is, we cannot say which particular beliefs are influenced by user participation and involvement, or which beliefs are most important in the determination of intentions and use. As such, this research must be viewed as a first step, not the final answer.

Involvement—Mediator or Moderator. In past research, involvement has been treated both as a mediator and as a moderator variable. As examples of the former, Sherif et al. (1965) have investigated the relationship of issue involvement with attitudes concerning the issue; Kanungo (1982) looks at the relationship of job and work involvement with job satisfaction and performance. As examples of the latter, Petty and Cacciopo (1986) discuss the moderating effect of involvement on the processes of attitude change; numerous researchers (e.g., Oliver and Bearden 1985, Sivacek and Crano 1982) have investigated the moderating effect of involvement on the attitude-behavior relationship.

In the present research, involvement was treated solely as a mediator of the relationship between user participation and attitudes, norms, intentions, and behavior. A moderator effect could also be envisioned, consistent with the work of Sivacek and Crano (1982), and Oliver and Bearden (1985). Specifically, highly involved users could be expected to show a stronger at-

titude-intention relationship; similarly, they could be expected to show a weaker subjective norm-intention relationship. If a system is important and personally relevant, users are likely to focus on their own personal feelings, rather than others' expectations, when forming intentions. Unfortunately, the structural equation methodology employed in the analysis of our data does not easily allow for the testing of such a hypothesis. (However, hierarchical regression analyses failed to support interactive effects of involvement and attitude, or involvement and subjective norm, arguing against the possibility of moderator effects in our data.)

Desire for Participation. Doll and Torkzadeh (1989) have argued that users evaluate actual participation against a baseline of desired participation when determining satisfaction. In the present study, only actual participation was assessed. Doll and Torkzadeh's contention cannot, therefore, be tested. In future research, it would be of interest to determine whether predevelopment attitudes and involvement influence users' desire for participation; it would also be interesting to determine whether actual participation, evaluated against a baseline of desired participation, exhibits a stronger influence on user involvement and attitudes.

Conclusions

A number of important findings emerged in the present study. The results suggest the following conclusions:

(1) User participation and involvement represent two distinct constructs. While participation can be considered an influence on user involvement, involvement seems to have little effect on levels of participation.

(2) The key dimension of user participation is overall responsibility. It is meaningful participation that has the greatest effect on involvement, attitude, and use. Other activities seem to have little influence.

(3) The effect of user participation on intentions and system use is mediated by the psychological constructs of involvement, attitude, and subjective norm.

(4) User participation and involvement seem to be important only for the voluntary users of a system.

(5) System use is strongly influenced by users' intentions to use the system. Intentions are determined by both attitude and subjective norm concerning use.

(6) Early in the ISD process, subjective norm is the crucial determinant. One intends to use the system because others expect it. Later, when the system is operational, attitude is the crucial determinant. One intends to use a system because one feels its use is good, useful, and valuable.

By placing the concepts of user participation and involvement into a theoretical framework, gaps in our knowledge have been identified. Antecedents of user participation, user involvement, and subjective norm need to be specified. Initial involvement and attitude toward the system did not lead to user participation—what factors, then, do lead to participation? User participation was found to influence user involvement—what additional factors lead to involvement? Subjective norm was found to be an important determinant of intentions and use—what are its determinants?

One further need became apparent as we compared our formulation to those of other researchers in this domain. In IS, a number of different constructs are currently being used to model beliefs, attitudes, intentions, and behavior. Examples include user involvement, perceived usefulness, attitude toward the system and its use, perceived ease of use, perceived behavioral control, and user satisfaction. Conceptual and empirical work needs to be done to integrate these psychological constructs into a more unified conceptualization.

While much has been learned in the present research, much remains to be done.⁹

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Appendix I

User Participation

Overall Responsibility Scale

- 1 Were you the leader of the project team? (Yes/No)
- 2 Did you have responsibility for estimating development costs of the new system? (Yes/No)
- 3 Did you have responsibility for requesting additional funds to cover unforeseen time/cost overruns? (Yes/No)
- 4 Did you have responsibility for selecting the hardware and/or software needed for the new system? (Yes/No)
- 5 Did you have responsibility for the success of the new system? (Yes/No)
- 6 I had main responsibility for the development project [during system definition/during physical design/during implementation]

(Yes/No). [item scored as an average of the three stage-specific answers]

User-IS Relationship Scale

1 Information Systems/Data Processing staff drew up a formalized agreement of the work to be done [during system definition/during physical design/during implementation] (Yes/No). [item scored as an average of the three stage-specific answers]

2 I was able to make changes to the formalized agreement of work to be done [during system definition/during physical design/during implementation] (Yes/No). [item scored as an average of the three stage-specific answers]

3 The Information Systems/Data Processing staff kept me informed concerning progress and/or problems [during system definition/during physical design/during implementation] (Yes/No). [item scored as an average of the three stage-specific answers]

4 I formally reviewed work done by Information Systems/Data Processing staff [during system definition/during physical design/during implementation] (Yes/No). [item scored as an average of the three stage-specific answers]

5 I formally approved work done by the Information Systems/Data Processing staff [during system definition/during physical design/during implementation] (Yes/No). [item scored as an average of the three stage-specific answers]

6 I evaluated an information requirements analysis developed by Information Systems/Data Processing (Yes/No).

7 I approved an information requirements analysis developed by the Information Systems/Data Processing staff (Yes/No).

Hands-on Activity Scale

1 For this system, I defined/helped define input/output forms (Yes/No).

2 For this system, I defined/helped define screen layouts (Yes/No).

3 For this system, I defined/helped define report formats (Yes/No).

4 I designed the user training program for this system (Yes/No).

5 I created the user procedures manual for this system (Yes/No).

User Involvement

Indicate your thoughts concerning the new system. I consider the new system to be . . .

1. important/unimportant
2. not needed/needed
3. essential/nonessential
4. trivial/fundamental
5. significant/insignificant
6. means nothing to me/means a lot to me
7. of no concern to me/of concern to me
8. irrelevant to me/relevant to me
9. matters to me/doesn't matter to me

Attitude Toward the System

Indicate your feelings concerning the new system. I consider the new system to be . . .

1. good/bad
2. terrible/terrific
3. useful/useless
4. worthless/valuable

Attitude Concerning System Use

Indicate your feelings concerning your use of the new system.

1. My frequently using the new system . . .
 - a. good/bad
 - b. terrible/terrific
 - c. useful/useless
 - d. worthless/valuable
2. My being a heavy user of the new system . . .
 - a. good/bad
 - b. terrible/terrific
 - c. useful/useless
 - d. worthless/valuable

Subjective Norm Concerning the System

What do other people think about your use of the new system?

1. a. At work, my superiors think that I (should not/should) frequently use the new system.
b. At work, my peers think that I (should not/should) frequently use the new system.
c. At work, my subordinates think that I (should not/should) frequently use the new system.
2. a. At work, my superiors think that I (should not/should) be a heavy user of the new system.
b. At work, my peers think that I (should not/should) be a heavy user of the new system.
c. At work, my subordinates think that I (should not/should) be a heavy user of the new system.

Intention to Use the System

How often do you intend to personally use the new system?

1. I intend to use the new system (infrequently/frequently)
2. Do you intend to be a heavy or light user of this system? (heavy/light)

System Use

The following questions are about your current level of usage of the new system.

1. Are you currently a heavy or light user of the system? (heavy/light)
2. How often do you use the new system? (infrequently/frequently)

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