The Relationship Between User Participation and User Satisfaction: An Investigation of Four Contingency Factors

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Abstract

User participation has been widely touted by the MIS community as a means to improve user satisfaction within systems development. This claim, however, has not been consistently substantiated in the empirical literature. In seeking to explain such equivocal results, the effects of four contingency factors—task complexity, system complexity, user influence, and user-developer communication—on the relationship between user participation and user satisfaction were investigated. As suggested in the literature, this research tests hypotheses that these specific contingency factors should aid in identifying situations where user participation would have a strong relationship with satisfaction.

Analysis of 151 independent systems development projects in eight different organizations indicated that user participation has a direct relationship with user satisfaction. In addition, the four contingency factors were found to play key roles on this relationship. Task complexity and system complexity proved to be pure moderators. *That is, the strength of the participation-satisfaction relationship depended on the level of these factors. In projects where there was a high level of task complexity or system complexity, the relationship between user participation and user satisfaction was significantly stronger than in projects where task complexity or system complexity was low. User influence and user-developer communication were shown to be* independent predictors *of user satisfaction. That is, user influence, or user-developer communication, was positively related to user satisfaction regardless of the level of participation.*

The results help explain the relationship between user participation and user satisfaction by suggesting the nature of the relationship under different sets of conditions. The implications are relevant to systems developers and to academicians seeking to explain how, when, why, and where user participation is needed.

Keywords: User participation, contingency theory, user satisfaction, user-developer communication, system complexity, task complexity, user influence

ISRL Categories: FD, FD02, FD03

Introduction

The importance of user participation in the systems development process has been widely recognized in the literature (Ives and Olson, 1984; Kappelman and McLean, 1991). As pointed out by Ives and Olson (1984), it is *expected to improve systems quality* by: providing a more accurate and complete assessment of user information requirements (Norton and McFarlan,

1975; Robey and Farrow, 1982); providing expertise about the organization the system is to support, expertise usually unavailable within the information systems group (Lucas, 1974); avoiding development of unacceptable or unimportant features (Robey and Farrow, 1982); and improving user understanding of the system (Lucas, 1974; Robey and Farrow, 1982). It is also *thought to increase user acceptance of systems* by: developing realistic expectations about system capabilities (Gibson, 1977); providing an arena for bargaining and conflict resolution about design issues (Keen, 1981); fostering system ownership by users (Robey and Farrow, 1982); decreasing user resistance to change (Lucas, 1974); and committing users to the system (Lucas, 1974; Markus, 1983). Surprisingly, the argumentation for user participation has been largely uncorroborated by research evidence plagued with inconclusive and often contradictory results.

Many of these contradictions are the result of research that has been poorly grounded in theory or methodologically flawed (as noted by Ives and Olson, 1984; Klenke, 1992). These flaws are thought to be partially due to shortcomings in the research designs (i.e., lack of proper theory, measurement, and methodology) and partially due to the omission of important contextual variables. Also, several authors have recognized the possible confusion between various constructs (user involvement, participation, and influence) and the importance of carefully defining the relevant variables to reduce confounding results (Barki and Hartwick, 1989; Doll and Torkzadeh, 1989; Klenke, 1992; Tait and Vessey, 1988).

The purpose of this paper is to investigate the interaction effects of a set of contextual variables on the relationship between user participation and user satisfaction. Given the complexity of the systems development process and the need to see it in context (Franz and Robey, 1986), it may be helpful to broaden the investigation of user participation to include some of the contingency factors that might help determine if, when, and how much user participation is appropriate. The measurement of the effects of selected contingency factors (task complexity, system complexity, user influence, and user-development communication) should increase our understanding of the role of user participation in systems development and increase the likelihood of system success (user satisfaction).

Theoretical Framework

The terms user participation and user involvement have been commonly used interchangeably in the MIS literature. This practice is at odds with the literature in other areas dealing with similar constructs. Therefore, Barki and Hartwick (1989) and others suggest that the term *user participation* be used when "referring to the various design related behaviors and activities that the target users or their representatives perform during the system development process" and the term *user involvement* be used when referring "to a subjective psychological state of the individual and defined as the importance and personal relevance that users attach either to a given system or to MIS in general" (p. 19). This distinction between participation and involvement is considered important for this study, which focuses on user participation as the major independent variable.

Most of the prior research on user involvement has dealt with user participative behaviors during the information systems development process. The psychological aspects of user participation have been for the most part, implicitly addressed by researchers (e.g., Baronas and Louis, 1988; Doll and Torkzadeh, 1989). As pointed out by Kappelman and McLean (1991), when user participative behaviors were studied in combination with user need-based attitudes, as done by Franz and Robey (1986), Baronas and Louis (1988), and Doll and Torkzadeh (1989), the relationship between user participation and system success was found to be stronger than when researchers considered only user participation, as done by Baroudi, et al. (1986).

According to Kappelman and McLean (1991, p. 340), the theory on information systems development relevant to this subject area is graphically shown in Figure 1—Basic Model. This model originally proposed by Swanson (1974), and reinforced by the research and model development of Zmud and Cox (1979), Ives and Olson (1984), Baroudi, et al. (1986), Franz and Robey (1986), Tait and Vessey (1988), and Doll and Torkzadeh (1989), represents the partial theory of informa-

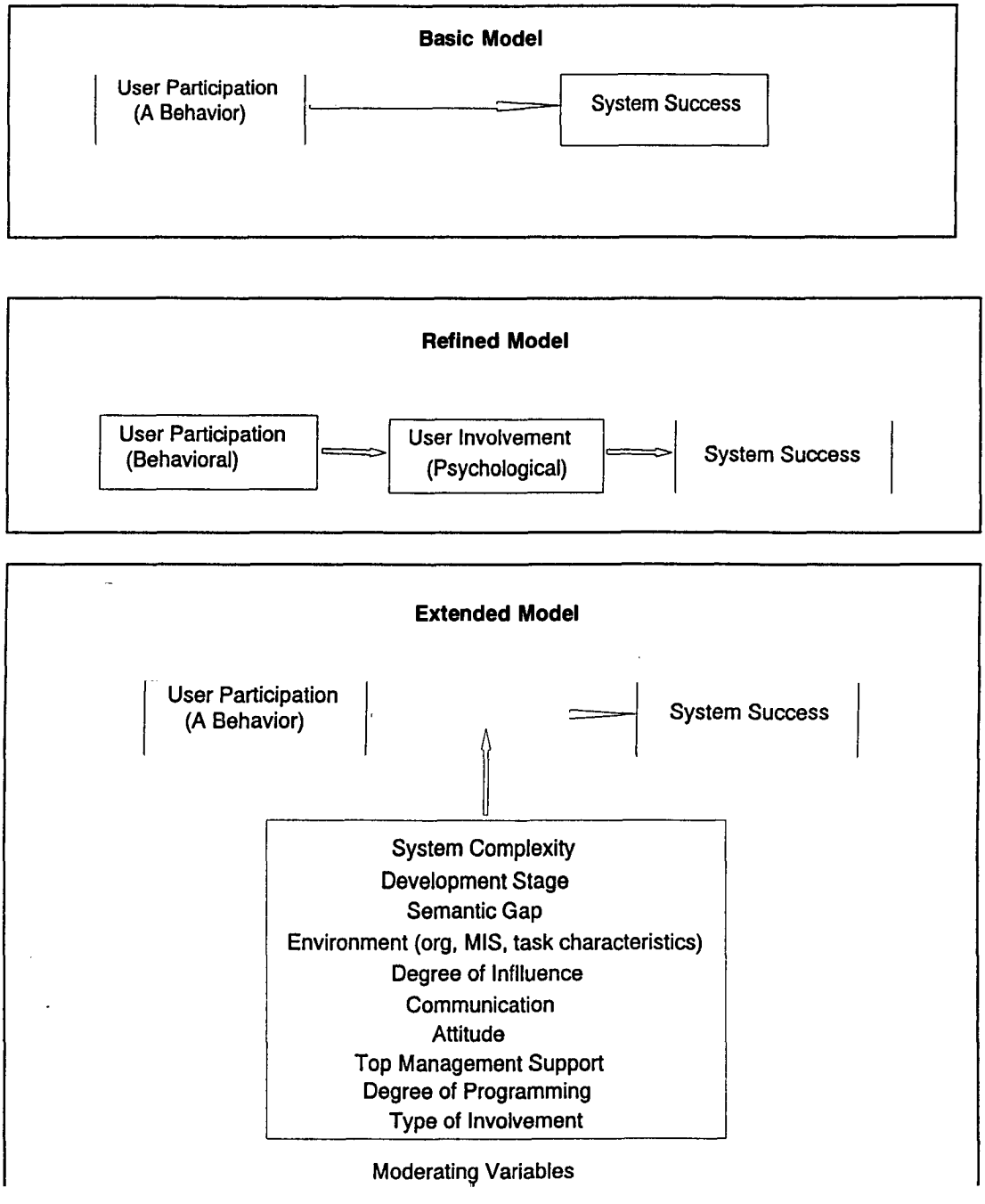

Figure 1. User Participation/System Success Theoretical Models

tion systems development that provided the basis for most of the research concerning user participation as a determinant of system success.

Because these studies did not show much predictive power (Barki and Hartwick, 1989), Kappelman and McLean (1991) proposed a refinement to the original model. The Refined Model shown in Figure 1 proposes a behavioral and an attitudinal component for explaining the impact of user involvement on information system success. The notion that adding the need-based psychological component (user involvement) would increase the predictive power of the original model was empirically supported.

Besides treating the behavioral and psychological components of user involvement as separate constructs, our understanding of the impact of user participation on system success should be enhanced by testing the contingency factors that affect the relationship. Ives and Olson (1984) have called for more comprehensive models to better understand the outcomes of user participation. Their call is reinforced by Anderson (1985), who asks ". . . are there any contexts defined by technology, employees, job responsibilities, and organizational characteristics that would seem to argue for user involvement in systems design and implementation?" (p. 202). Answers to questions such as these await the application of comprehensive models capable of exploring moderating factors, as suggested by Ives and Olson (1984). The usefulness of such models has been demonstrated elsewhere in the field of organizational theory to explain under what conditions participation in decision making is valuable (e.g., Erez and Arad, 1986; Koopmans and Drenth, 1981; Vanderslice, et al., 1987) as well as in the field of information systems to explain when participation is indicated (e.g., Biggs, 1978; Mann and Watson, 1984).

In response, we reviewed the empirical research that has explicitly examined the role of contingency factors and their effect on user participation during information systems development. A research summary is presented in Table 1. The Extended Model for the investigation of user participation is shown in Figure 1. The contingency factors reported include *system complexity* (Edstrom, 1977; Ginzberg, 1979; Kim and Lee, 1986), *stage of development* (Edstrom, 1977; Franz and Robey, 1986; Ginzberg, 1979; Kim and Lee, 1986; Olson and Ives, 1981; Robey and Farrow, 1982; Tait and Vessey, 1988), *desired versus actual level of participation* (Doll and Torkzadeh, 1989; King and Lee, 1991), *semantic gap* (DeBrabander and Thiers, 1984), *mediation* (DeBrabander and Thiers, 1984), *task and decision environment* (Edstrom, 1977; Franz and Robey, 1986), *degree of influence* (Edstrom, 1977; Robey and Farrow, 1982), *communication* (DeBrabander and Thiers, 1984; Edstrom, 1977), *degree of involvement* (King and Lee, 1991), *user attitude* (Kim and Lee, 1986; Tait and Vessey, 1988), *top management support* (Kim and Lee, 1986), *degree of programming in the system environment* (Edstrom, 1977; Ginzberg, 1979), *type of involvement* (Doll and Torkzadeh, 1989), and *organizational characteristics* and *MIS department characteristics* (Franz and Robey, 1986; Tait and Vessey, 1988). Ives and Olson (1984) have categorized the variables thought to impact the role of user participation; these studies have presented the arguments and evidence for how and why these variables affect the process of user participation.

As cited above, past research reveals a plethora of potential contingency factors believed to impact user participation. The incorporation of these factors into a single testable model, however, was deemed unwieldy and thought less prudent than starting with a more parsimonious model. As a result, this study examines the "direct" relationship between user participation and user satisfaction and the "indirect" or interaction effects of four specific variables on the participation-satisfaction relationship: task complexity, system complexity, user influence, and user-developer communication. These variables represent important characteristics of users, developers, and IS projects. Figure 2 depicts the model[1] being tested. The theoretical justification for including each variable in the model is presented next as the rationale for formal hypotheses. Measures for variables used in this study are described later in the Research Methodology section.

[1] The dependent variable shown in Figure 1 is "system success." Since we use "user satisfaction" as our surrogate for the general construct system success, Figure 2 shows user satisfaction as the dependent variable. The justification for using user satisfaction is included in the Research Methodology section of the paper.

Table 1. Empirical Contingency Studies of User Participation and User Involvement

Study	Independent Variable (IV)	Dependent Variable (DV)	Contingency Factors (CF)	Results
Powers and Dickson (1973)	Participation of operating management in design, approval of specifications, and project review	User satisfaction	Project type (MIS, DP, DP spinoff)	IV-DV: Positive relationship CF: Not tested or not reported
Edstrom (1977)	User influence	MIS project success	Type of user, degree of programming of the task environment, stage in the development process, effective communication	IV-DV: Not reported CF: Stage of development and degree of programming were significant
Franz (1979)	User participation	Systems quality	Decision environment structure	IV-DV: Positive relationship CF: Not significant
Ginzberg (1979)	Issue resolution by users and designers during 7-phase systems development process model	Successful implementation	System complexity (ie., amount of organizational change)	IV-DV: Overall strong positive relationship . . . stage by stage differences CF: Weak effect
Olson & Ives (1981)	User participation	Quality of IS function, information dissatisfaction	Stages of development, type of participation	IV-DV: No relationship with information dissatisfaction CF: Type of participation significant
Robey & Farrow (1982)	User participation, influence, conflict, and conflict resolution in a model of conflict resolution		Life cycle phases	Model interactions changed over life cycle phases
DeBrabander and Thiers (1984)	Interaction of user and MIS specialists during design of an IS	Success (efficient task accomplishment)	Power asymmetry, semantic gap, third party interaction	IV-DV: Not reported CF: All significant
Franz & Robey (1986)	User involvement	Usefulness of IS	Nature of decision making, organizational characteristics, MIS department characteristics	IV-DV: Weak positive relationship CF: Decentralization of authority, level of MIS management, and scope of MIS department had moderating effects
Kim & Lee (1986)	User participation	MIS system usage	Task complexity, top management support, type of initiator, stage of development	IV-DV: Positive relationship CF: Weak effects for complexity and stage of development
Tait & Vessey (1988)	User involvement	System success	Systems impact, user attitude, system complexity, and resource contraints	IV-DV: Not significant CF: Systems complexity and resource constraint affected the relationship
Doll & Torkzadeh (1989)	End-user involvement	End-user satisfaction	Gap between desired involvement and actual involvement	IV-DV: Positive relationship CF: Involvement gap significantly affected the relationship
Robey, et al. (1989)	User participation, influence, conflict, and conflict resolution in a model of conflict resolution		Five periodic intervals	Model interactions remained relatively constant over the different time period.
Kappelman & McLean (1991)	User participation	User satisfaction	User involvement	IV-DV: Significant positive relationship CF: Significant user involvement interaction
King & Lee (1991)	End-user participation	End-user satisfaction	User involvement, fit between desired and actual participation	IV-DV: Significant but for general users only CF: All affected the relationship but for general users only

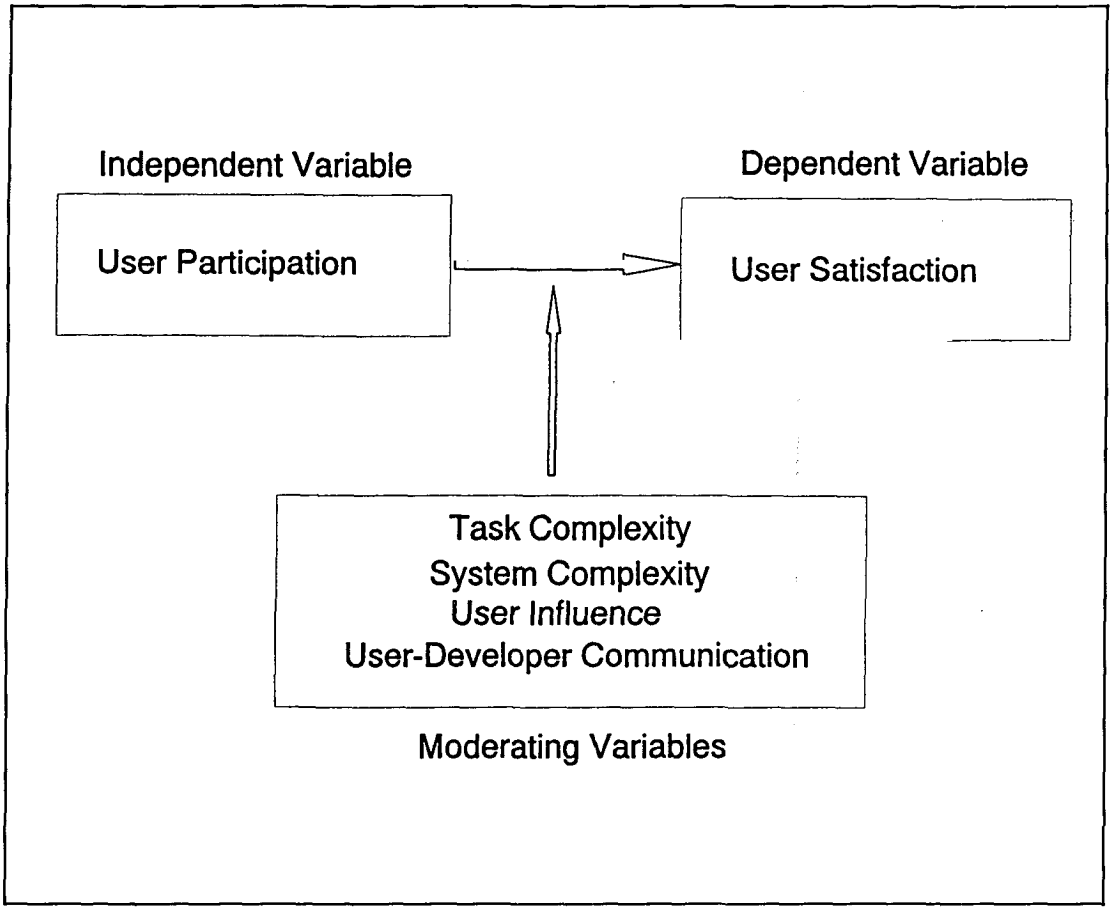

Figure 2. Proposed Relationships Among Research Variables

Hypotheses

Participation-satisfaction relationship

The first hypothesis tests the unqualified link between user participation and user satisfaction. All subsequent hypotheses examine specific interaction effects of four contextual variables on this basic relationship.

Powers and Dickson (1973) found that participation by operating management in the design, formal approval of specifications, and continuous review of systems was directly related to user satisfaction. Another study concerning the valuation of an information system (Gallagher, 1974) found that users who participated in systems design tended to value the resultant systems more highly than those users who did not participate. Supporting evidence is also provided by Alter (1978), who found that users were much more likely to resist system introduction in situations where they had neither initiated the project nor participated in its development. Oppelland and Kolf (1980) found that active user participation enabled better problem understanding and resulted in helpful systems design contributions. Baroudi, et al. (1986) found that user participation in systems development led directly to both user satisfaction and system usage. Also, a meta-analytic review of reported empirical studies (Straub and Trower, 1988) found a correlation of 0.28 (corrected for sample size, low power, and attenuation) between user participation and system success. Many other studies have examined the nature and role of user participation (e.g., Bjørn-Andersen and Hedberg, 1977; Blokdijk, 1980; Boland, 1978; Bostrom and

Heinen, 1977; Edstrom, 1977; Glennon, 1978; Hedberg, 1975; Holmes, 1978; Kappelman and McLean, 1991; King and Lee, 1991; Kling, 1977; Lucas, 1978; Olson and Ives, 1981; Salaway, 1981; 1987; Senn, 1978; Swanson, 1974; Zmud, 1981; Zmud and Cox, 1979). The existing research has refined our notions of user participation, leading to the conclusion that IS project development requires that the appropriate users participate in the project at the appropriate stage and in a manner that enables a meaningful contribution. As predicted by the participative decision-making and group problem-solving literatures in which it is grounded (Ives and Olson, 1984), user participation in systems development activities should lead to greater commitment, involvement, acceptance, use, and ultimately, greater satisfaction. Therefore, we hypothesize:

H1: A positive relationship exists between user participation and user satisfaction.

Role of complexity

It has been shown that the complexity of the systems development process plays a significant role in the relationship between participation and system success (DeBrabander, et al., 1972; Edstrom, 1977; Ginzberg, 1979). Researchers, however, have used complexity interchangeably with other concepts such as ambiguity, uncertainty, and lack of structure. This has caused some confusion. Based on the work of Weick (1979) and others, Daft, et al. (1987) analyzed the relationships among these constructs and concluded that *complexity* arises from *ambiguity* (or equivocality) and *lack of structure* in the tasks and sub-tasks involved. Thus, complexity is relatively higher for tasks that are "fuzzy and ill-defined," and lower for tasks that are "patterned and orderly." For ambiguous and unstructured tasks, "alternatives cannot be identified, data cannot be obtained or objectively evaluated, and outcomes are unpredictable" (Daft, et al., 1987; Weick, 1979). Ambiguity (or equivocality) means confusion, lack of understanding, and disagreement. In contrast, uncertainty refers to the absence of necessary information (Garner, 1962; Miller and Frick, 1949; Shannon and Weaver, 1949), the difference between the information available, and what is needed to properly complete the task (Galbraith, 1973). Managers' reactions to uncertainty would or should be acquisition of data and more information. Ambiguity, on the other hand, requires further definition of the problem and resolution of disagreements (Daft, et al., 1987). User participation should help in both cases. Users and developers will benefit from close interaction by exchanging views, identifying and resolving conflicts, as well as sharing information necessary to effectively accomplish the task (Schonberger, 1980).

Two types of complexity are important for systems development—*task complexity* and *system complexity*. Task complexity originates in the user's environment and refers to the ambiguity and uncertainty that surround the practice of business. System complexity originates in the developer's environment and refers to the ambiguity and uncertainty that surround the practice of systems development. As an illustration, consider the activity of premium billing within an insurance company. Task complexity arises from the existence of ambiguity and uncertainty regarding the decisions on such things as the number of options available, the number of options allowable, the combination of options and their interrelationship to one another, the existence of policy riders, the actual billing cycle, billing methods, and the existence of other related (or indeed, conflicting) policies. In contrast, system complexity arises from the existence of ambiguity and uncertainty regarding the decisions on such things as the choice of technology platform to support the automation of premium billing, the design techniques and computing languages to be used, the size of the project, the development methodology to be used, project management and control, the dynamics of the development team, and the required degree of integration between the proposed new system and the base of existing systems. The level of task complexity does not determine the level of system complexity. Even in situations where the task is highly structured and straightforward, the development of a system may be technically complex due to the presence of new technology (hardware, software, or methods) or lack of training on the technology.

McFarlan (1982) coined the term "company-relative" to convey the notion that complexity is relative. A business task or a development project thought to be highly complex (ambiguous and

unstructured) and full of uncertainties in one organization may not be viewed as such in another simply because they have done it before, have identified and resolved important disagreements, and have developed the requisite information, skills and experience gained through similar previous systems development efforts. Thus, task complexity relates to the level of the user's understanding of the task and system complexity relates to the developer's level of understanding of the development project.

According to a contingency model developed by Naumann, et al. (1980), increased project complexity (i.e., task and/or system) decreases the level of assurance of attainment of project goals. To manage the risk of system failure, they suggest that user participation be increased proportionally with project complexity. Beath (1987) goes further to suggest that there is actually an interaction effect between user participation and task uncertainty in their relationship with system success. That is, the relationship between user participation and system success will differ depending on the degree of task uncertainty.

These results suggest that complexity plays an important role in the participation-satisfaction relationship. In situations where task complexity is low (i.e., the task is well-structured with straightforward requirements), the developer may proceed almost independently of the user (Edstrom, 1977). Thus, the need for user participation is reduced and likely to have less impact on user satisfaction success. For projects where the task complexity is high, the need for effective user participation is crucial (Anderson, 1985). Similarly, where system complexity is low, the need for user participation to resolve development issues arising from the technical environment is reduced. Where system complexity is high, unforeseen and unanticipated events will necessitate changes to original specifications. These will require resolution through effective user participation in order to ensure system success. Therefore we hypothesize:

H2: The greater the task complexity, the greater the relationship between user participation and user satisfaction.

H3: The greater the system complexity, the greater the relationship between user participation and user satisfaction.

Role of user influence

Robey, et al. (1989) define *influence* as the extent to which members of an organization affect decisions related to the final design of an information system, and they define *participation* as the extent to which members of an organization are engaged in activities related to systems development. It is through participation in activities related to systems development that users can exercise influence over systems development. Without participation, there can be no influence. However, the opposite is possible. That is, users are able to participate in systems development without exercising any real influence. It is in this case that participation becomes ineffectual and unproductive (Markus, 1983). Further, without adequate influence to change things and affect results, users are likely to see their participation as a waste of time or, worse still, as an act of social manipulation (Doll and Torkzadeh, 1989). Where users are able to influence the decisions regarding systems development, their participation becomes valued and valuable.

We argue that where user influence is negligible, the relationship between user participation and user satisfaction is expected to be weak. When the user's influence is substantial, there should be a strong and positive link between user participation and user satisfaction. Therefore, we hypothesize:

H4: The greater the user influence, the greater the relationship between user participation and user satisfaction.

Role of user-developer communication

The relationship between users and developers has always been symbiotic (Churchman and Schainblatt, 1965). "Users have the information and the understanding of the dynamics of the environment, [and] analysts have the time and the inclination to do the systematic analysis that complex strategic decisions require" (Mintzberg, 1973, p. 163). What facilitates productive, collaborative effort is effective communication (Bostrom, 1984; Cronan and Means, 1984; Guinan, 1988; Kaiser and King, 1982; Martin and Fuerst, 1984; Salaway, 1987). This is due to the

necessity of users to *convey* their understanding and insight of business practice accurately and completely to developers who, in turn, must *receive* this information and translate it into a working computer system. Accordingly, effective communication works to the benefit of both parties.

Edstrom (1977) found a significant relationship between effective communication and system success. This relationship held for different phases of the development process. The need for meaningful and effective communication between user and developer is repeatedly underscored in the literature on implementation theory (e.g., Boland, 1978; Ginzberg, 1979; King and Rodriguez, 1981; Schultz and Slevin, 1975; Zmud and Cox, 1979). According to Robey and Farrow (1982), effective communication plays the facilitating role during user participation by enabling conflict identification and its subsequent resolution. As in the case of user influence, without effective communication, user participation becomes an ineffectual exercise.

At a superficial level, one might think that the greater the participation, the greater the communication. However, research (e.g., Gingras and McLean, 1982; Hoyer, 1980; Kaiser and Srinivasan, 1982; Keen and McKenney, 1974) has shown that inherent differences between users and developers work against this and effective communication, and shared understanding is not always present. Bostrom (1989) argues that systems designers and users bring "different frames of reference to the situation and. . .the ability to integrate these diverse views into a shared, accurate and complete model of the desired system is essential to successful projects" (p. 281). In a longitudinal study of the development of a single system, Franz and Robey (1984) showed that using a "political" perspective led to very different interpretations of events than using the "rational" perspective. This suggests that the inherent user-developer differences may be the result of their rational-political orientation and, as such, may present barriers to effective communication.

User-developer communication affects the relationship between user participation and user satisfaction directly. In situations where users and developers communicate effectively, users are able to provide input into systems development decisions that is heard and understood. Similarly, developers can impart technical tradeoffs and alternatives to users who similarly hear and understand. Effective communication facilitates the exchange of information that is essential for the derivation of systems requirements (Verrijn-Stuart and Anzenhofer, 1988) and the eventual success of a systems development effort. It is hypothesized that, where there is effective communication between users and developers, participation will exhibit a strong positive relationship with user satisfaction. Without effective communication, we argue that the relationship between participation and user satisfaction will be weakened. Formally, we hypothesize that:

H5: The greater the quality of user-developer communication, the greater the relationship between user participation and user satisfaction.

Research Methodology

Sampling process

Fourteen Midwestern U.S. organizations were asked to participate in the study. Eight subsequently agreed to participate, and the remainder declined for a variety of reasons (e.g., previous commitment to other research projects, undergoing a major reorganization, or simply not interested enough in the proposed study). The sample consisted of four manufacturers, a bank, an insurance company, a retailer and a transportation company. These were large organizations where two had gross revenues less than $500 million, three had gross revenues in the $500 million to $1 billion range, and three had gross revenues in excess of $1 billion. Each organization had a large IS department with many ongoing systems development projects of varying sizes underway.

The entry point in each organization was the senior IS officer. Each site was asked to provide information on its 20 most recently developed applications by the IS department. These were all mainframe (or mini-computer) applications with varying degrees of end-user participation but under IS operational control (i.e., traditional systems development) where the concept of end-user involvement (or lack of) is thought to be an

important factor. The sample did not include applications developed by end users since involvement in user-developed applications is a substantially different concept than involvement in traditional systems development (Doll and Torkzadeh, 1989). Of the 160 applications studied, nine were discarded because the information was either incomplete or unavailable. The final sample size remained at 151. Various characteristics of these applications are shown in Table 2.

The primary targets for data collection were end users and project leaders or project managers. Researchers approached department managers to identify the end users related to specific applications. To mitigate possible bias, the IS department only pointed out the primary user department and was not allowed to control the selection of responding end users. Discussions with user department management identified the primary users for each project. Because the unit of analysis was the IS project, a different end user was chosen to interview for each project.

Data were collected from two sources: the project leader in charge of development and the primary end user(s) of each system. In some cases, additional contacts were made in order to acquire or verify these data. All data were collected by the authors via brief interviews and the personal administration of questionnaires to users and developers. All data were collected during 1990 and all projects were completed between 1987 and 1990. The majority of projects were completed during the 1989-1990 timeframe. In only one organization was it necessary to go as far back as 1987 in order to collect data on 20 completed projects. This particular organization was committed to an inordinately large number of very large projects.

Measurement of variables

All measurement instruments have been previously used and reported in the literature. These instruments (and any modifications to them) are described below for all research constructs.[2] Items within each scale were averaged to produce a measure for the respective construct. Cronbach's (1951) alpha was used as a partial test for instrument reliability.

The concept of **user satisfaction** (US) has been widely used by researchers (DeLone and McLean, 1992; Ginzberg, 1979; Klenke, 1992; Melone, 1990) as a surrogate of system success. It is an important construct in practice, and it is particularly important when usage may be mandatory (DeLone and McLean, 1992). The short form (13 items) of the instrument developed by Ives, et al. (1983) and reviewed by Baroudi and Orlikowski (1988) was used. This instrument was deemed to be most appropriate because it was validated in the context of large IS-developed transaction processing information systems, where user involvement (or lack of) is thought to play an important role (Baroudi and Orlikowski, 1988).

Unfortunately, this instrument contains three items that overlap with other constructs in our research—specifically, user participation and user-developer communication. These three questions asked the respondents to evaluate their feelings concerning their relationship with the IS staff, their participation, and their communication with the IS staff. The dilemma was to use the established instrument "as is" to enable comparison with other published research or to eliminate the three overlapping scales. Because using the instrument "as is" would have run the risk of artificially inflating the correlations between user satisfaction and each of user participation and user-developer communication, we elected to eliminate the three items from our questionnaire. Each of the 10 remaining items was assessed by two pairs of semantic differential adjectives scaled from 1 (low) to 7 (high). All 20 pairs were used to assess user satisfaction. The analysis of this application of the instrument yielded a Cronbach's Alpha of 0.74. This reliability is lower than some others reported in the literature, but it exceeds the commonly accepted level of 0.70 for work in the social sciences. Perhaps the lower coefficient is due to the use of an abbreviated measure of user satisfaction.

User participation is based on the 44-item user participation measure developed by Olson and Ives (1980). Because of the mainframe-based focus of this research and because this instrument was designed to measure participation in

[2] A copy of the research instrument is available from the authors upon request. Please write directly to Dr. J.D. McKeen, School of Business, Queen's University, Kingston, Ontario, CANADA K7L 3N6.

Table 2. IS Project Characteristics
(N = 151)

Project Development				
	Mean	**Std. Dev.**	**Minimum**	**Maximum**
Development Hours	3,672	5,266	240	31,500
Development Cost (Dollars)	167,446	289,334	12,500	1,750,000
Development Time (Months)	17.6	20.1	4.5	56

Primary User Department		
User Department	**Number**	**Percent**
Sales & Marketing	27	18
Finance	24	16
Accounting	23	15
Purchasing	14	9
Production	12	8
Engineering	12	8
HR Management	11	7
R & D	9	6
Others	19	13
Total	**151**	**100%**

Number of User Departments Per IS Project		
Number of User Departments	**Number**	**Percent**
One	48	32
Two	19	13
Three	14	9
Four	14	9
Five	17	11
Six (or more)	39	26
Total	**151**	**100%**

a mainframe-based environment, it was deemed more appropriate than instruments that measure participation in end-user development environments. Each item is a binary variable indicating whether or not a particular participative behavior was exercised. Of the 44 items, all references to general (i.e., not specific to a particular system) participative behaviors between users and the IS department were removed. Only participative behaviors that could be directly associated with a particular system were retained. One item that was removed asked users if "user steering committees did long-term planning for information systems." Of the retained items, some were modified to reflect changes in participation that have occurred over time. Finally, five items representing additional forms of participation were added. For example, it is common now for users to evaluate and approve test data specifications developed by the IS staff. A complete description of all changes (i.e., modifications, deletions, and additions) to the 44 original behaviors in Olson and Ives' list are included in Table 3.

Our approach to the measurement of **task complexity** is based on two principles. First, task complexity appears to be inherent to the individual and not the task. A task found to be complex by one person may be straightforward for another. Therefore, the measure of task complexity needs to be based on the individual's perception of the difficulty of the task. Second, according to Daft, et al. (1987), *complexity* arises from *ambiguity*. This theory and the availability of a well-established instrument led us to adopt Rizzo, et al.'s (1970) measure of task ambiguity (alternatively called role ambiguity) as the surrogate for task complexity. Task complexity was further bounded by instructing respondents to refer only to those tasks directly computerized by the systems development project being studied. The measure contained six scaled items. Each item ranged from (1) very false to (7) very true, with (4) being neither true nor false. The alpha coefficient in this case was 0.75.

System complexity was measured using the 3-item instrument developed by Tait and Vessey (1988). This instrument is based on McFarlan's (1982) notion of "company-relative" technology, which argues that complexity is relative to an individual company and not absolute. For each item, the scale ranged from (1) unclear specification or extremely complex to (7) clear specifications and extremely simple. The alpha coefficient was 0.65.

User influence was measured with the component of Franz and Robey's (1986) instrument developed to measure user involvement in the design stage (six items) and the implementation stage (six items). Since each of the 12 items explicitly addressed the degree of "user initiative" (which implies an attempt to control the development process) regarding specific systems development tasks, rather than just user participation, we used it as a measure of user influence over the development and implementation process. The alpha coefficient for this measure was 0.88.

User-developer communication was measured with the instrument originally developed by Monge, et al. (1983) and modified by Guinan (1988) to assess communication quality. Users were asked to rate the communication process between themselves and the systems developers in terms of 12 items using a scale ranging from (7) very strong agreement, (4) neutral or don't know, to (1) very strong disagreement with statements dealing with whether developers had "a good command of the language," were "good listeners," and "expressed their ideas clearly." The alpha coefficient for this scale was 0.54. The means, standard deviations and correlation matrix for the major study variables are presented in Table 4.

Data analysis

Contingency theory has been used in many contexts, particularly in the field of organizational structure (e.g., Argote, 1982; Drazin and Van de Ven, 1985; Galbraith, 1982; Govindarajan and Fisher, 1990; Ouchi, 1981; Pascale and Athos, 1981; Peters and Waterman, 1982). It has also been studied extensively (Fry and Schellenberg, 1984; Mohr, 1982; Schoonhoven, 1981; Tosi and Slocum, 1984; Van de Ven and Drazin, 1985). This work has increased our understanding of contingency theory and suggested the data analysis techniques for analyzing such models. According to Schoonhoven (1981), two contingency models are possible: a matching model and a multiplicative model. This study has argued

Table 3. User Participation Questionnaire Items By Phases

Item	Participative Behavior (Olson and Ives, 1980)	Modification	Resulting Participative Behavior
System Definition			
1	User is a member of project team for system definition	replaced by	User is a member of the project team responsible for the definition (feasibility study, analysis of information requirements) of the system
2	User is the leader of project team	replaced by	User is the leader of the project team responsible for the definition of the system
3	Users take entire responsibility for definition of the system	retained	✓
4	Users formally review and approve work done by IS staff		
5	Users draw up, and sign off on completion of, a formalized agreement of work to be done by IS staff	replaced by	User develops project management schedules and progress reports for the development of the system
6	IS staff informs users on progress and problems of this stage (no user evaluation)		
7	IS staff solicits project proposals and requests from users	dropped	
8	Users develop cost justification for project	retained	✓
9	Users evaluate and approve cost justification developed by IS staff	retained	✓
10	Users develop information requirements	retained	✓
11	Users evaluate and approve information requirements developed by IS staff	retained	✓
12	Users are interviewed by IS staff	retained	✓
13	Users respond to questionnaires administered by IS staff	dropped	
Physical design			
		added	User is a member of project team for physical design
14	IS staff develops a prototype system for the users	retained	✓
15	IS staff presents a "system walkthrough" for the users	retained	✓
16	IS staff follows a "structured design" methodology	dropped	
17	Users define system controls and security procedures	retained	✓
18	Users review system controls and security procedures defined by IS staff	retained	✓
19	IS staff develops a "user-friendly" system	dropped	
20	Users define I/O forms, screen layouts, report formats, etc.	retained	✓
		added	Users evaluate and approve I/O forms, screen layouts, report formats, etc. defined by IS staff
Implementation			
		added	User as member of project team for installation of the system
21	Users develop test data specifications	retained	✓
		added	Users evaluate and approve test data specifications developed by the IS staff
		added	User conducts the system test for the system
22	Users review and approve results of system test done by IS staff	retained	✓
23	Users perform system training	retained	✓
24	Users design training program to be conducted by IS staff	replaced by	Users evaluate and approve training program to be conducted by IS staff
25	Users create system procedures manual	dropped	
26	IS staff holds an "event" to introduce the system to users	dropped	
27	IS staff rewards "willing" users (eg. providing their own terminals)	dropped	

Table 3. Continued

Item	Participative Behaviour (Olson and Ives, 1980)	Modification	Resulting Participative Behaviour
General Control			
28	All systems development costs are charged back to users	retained	✓
29	Users are responsible for budgeting for their own system development projects	dropped	
30	Users define systems development standards for information services	dropped	
31	A user steering committee does long-term planning for information systems	dropped	
32	A user steering committee sets priorities for new system projects	dropped	
33	Users are responsible for their own hardware and software acquisitions	retained	✓
34	Systems analysts are assigned to, and located in, user departments	dropped	
35	The manager of information services is from a user function rather than data processing	dropped	
36	There is a formal request process for users to initiate information systems activity	retained	✓
37	A member of the IS staff acts as "formal liaison" to information services	retained	✓
38	A member of each user department acts as "formal liaison" to information services	retained	✓
39	Project management schedules and progress reports are made available to users	replaced by	User reviews project management schedules and progress reports on the system development made available by the IS department
40	Information services provides technical seminars to educate users	retained	✓
41	User time on project teams is included in project budgets	dropped	
42	Users are evaluated by their own management on their performance on project teams	retained	✓
43	Users have responsibility for system success rather than the IS staff	dropped	
44	The IS staff is rewarded on the basis of user evaluations of system success	dropped	
Total	**44**		**31**

that the latter model best applies. This model suggests that the relationship between the dependent variable (user participation) and the independent variable (user satisfaction) is always positive, but the slope is different depending on the level of the contingency factor (user influence, task complexity, system complexity, or user-developer communication).

Simple linear regression is used to test the relationship between user participation and user satisfaction. The methodology for testing the interaction effects of the multiplicative contingency model consists of two procedures to be used in tandem—*subgroup analysis* (Hunt, et al., 1975) and *moderated regression analysis* (Sharma, et al., 1981). Subgroup analysis tests the form of the participation-satisfaction relationship across different subgroups using the Chow (1960) test. If the regression coefficients differ across subgroups (formed by splitting the contingency factor at the median), the contingency factor is assumed to be a moderator variable. Without further analysis, however, one cannot determine the type of moderator. In order to do so, moderated regression analysis (MRA) was used. MRA is described here briefly; for a thorough discussion, the reader is referred to the source (Sharma, et al., 1981). In applying MRA for a single predictor variable (i.e., user participation (UP)), it is necessary to examine three regression equations for equality of the regression coefficients (Zedeck, 1971). The criterion variable is always user

Table 4. Mean, Standard Deviation and Correlation Matrix of Research Variables

Variables	Mean	S.D.	UP	US	TC	SC	UI	UDC
User Participation (UP)	11.172	3.134	1.000					
User Satisfaction (US)	3.940	0.588	0.414***	1.000				
Task Complexity (TC)	3.309	0.868	-0.027	0.049	1.000			
System Complexity (SC)	3.845	1.041	-0.048	-0.023	0.528***	1.000		
User Influence (UI)	3.459	0.848	-0.008	0.208*	0.292***	0.237**	1.000	
User-Developer Communication (UDC)	3.815	0.630	0.050	0.195*	0.206*	0.168*	0.132	1.000
Cross-Product Terms†								
UP*TC			-0.094		-0.111			
UP*SC			-0.017			0.131		
UP*UI			-0.303***				0.211**	
UP*UDC			0.078					-0.012

*p ≤ .05.; **p ≤ .01.; ***p ≤ .001.
† All cross-product terms are "centered," as suggested by Cronbach (1987).

satisfaction (US). The moderator variable (i.e., one of the four contingency factors) is represented by "M." The equations to be examined are:

1. $US = a + b_1UP$
2. $US = a + b_1UP + b_2M$
3. $US = a + b_1UP + b_2M + b_3UPM$

According to the MRA technique, if equations 2 and 3 are not significantly different (i.e., $b_3 = 0$; $b_2 \neq 0$), then M is not a moderator variable but simply an independent predictor variable. For M to be a "pure moderator" variable, equations 1 and 2 should not be different but should be different from equation 3 (i.e., $b_2 \neq 0$; $b_3 \neq 0$) (Cohen and Cohen, 1975). For M to be classified as a "quasi moderator," equations 1, 2, and 3 should be different from each other (i.e., $b_2 \neq b_3 \neq 0$).

A multiple regression model with cross-product terms rather than an ANOVA was chosen because the latter, by forcing the data to be split into subgroups, would have wasted information and been inferior to the multiplicative model. In order to avoid the risk of multicollinearity problems due to the use of cross-product terms, all independent variables were "centered" (by subtracting their means) as suggested by Cronbach (1987). As can be seen in Table 4, only one cross-product term (UP*UI) is significantly correlated with its component variables after centering. As an additional test, multiple regression analysis was used to determine the relative contribution of each of the variables (user participation and all four contingency factors) in explaining variation in user satisfaction. In this case, the increment in R^2 was examined rather than the magnitude of the beta coefficients. In all analyses, unstandardized regression coefficients were used, as recommended by Allison (1977) and Southwood (1978).

Results

The results of the moderated regression analysis are shown in Table 5. As hypothesized (H1), user participation does have a significant positive relationship with user satisfaction. The coefficient of determination (R^2) was 0.166. This result is slightly stronger than other research (e.g., Baroudi, et al., 1986; Doll and Torkzadeh, 1989; Franz and Robey, 1986; Tait and Vessey, 1988) where user participation has shown a consistent positive (but relatively weak) relationship with user satisfaction.[3] The meta-analytic review of reported empirical studies (Straub and Trower, 1988) found an overall corrected R^2 of 0.078 between user participation and system success. Most recently, Kappelman and McLean (1991) report an R^2 of 0.083 between user participation and user satisfaction with an information system.

[3] Because the user participation and user satisfaction instruments were modified for this research, this result is not strictly comparable.

Table 5. Moderated Regression Analysis (MRA) Results

Hypothesis Number	Regression Equations†	F-Value (sig.)	R‡ (adj.)	Result	Hypothesis Confirmed
H1	US = 3.940 + 0.078 UP (0.000)‡	30.849 (0.000)§	0.166	UP has a significant positive relationship with US	Yes
H2	US = 3.940 + 0.078 UP + 0.041 TC (0.422)	15.712 (0.000)	0.164	TC is a pure moderator	Yes
	US = 3.942 + 0.081 UP + 0.051 TC + 0.031 UP*TC (0.046)	11.790 (0.000)	0.177		
H3	US = 3.940 + 0.078 UP −0.002 SC (0.967)	15.322 (0.000)	0.160	SC is a pure moderator	Yes
	US = 3.944 + 0.078 UP −0.013 SC + 0.026 UP*SC (0.043)	11.826 (0.000)	0.178		
H4	US = 3.940 + 0.078 UP + 0.146 UI (0.004)	20.394 (0.000)	0.205	UI is an independent predictor	No
	US = 3.940 + 0.083 UP + 0.134 UI + 0.017 UP*UI (0.275)	14.015 (0.000)	0.207		
H5	US = 3.940 + 0.076 UP + 0.163 UDC (0.019)	18.724 (0.000)	0.191	UDC is an Independent predictor	No
	US = 3.940 + 0.076 UP + 0.163 UDC −0.002 UP*UDC (0.926)	12.402 (0.000)	0.186		

† US = user satisfaction; UP = user participation; TC = task complexity; SC = system complexity; UI = user influence; UDC = user-developer communication. All independent variables are centered by subtracting their respective means.

‡ Numbers in parentheses represent significance levels (i.e., alpha) for 2-tailed t-tests for individual regression coefficients.

§ The F-values and their significance levels are for the entire regression equation.

The persistence of this phenomenon, despite considerable refinement (reliability, validity, and administration) in measurement practice, argues against methodological problems as the cause. It is more likely that user participation, by itself, is really only capable of explaining a certain (perhaps low) proportion of the total variance in user satisfaction. The fact that user participation demonstrates a consistent and positive relationship over many studies is significant; the magnitude of the relationship, as measured by the coefficient of variation, may be less significant. User participation is not likely the only explanatory variable nor is it unaffected by other contingency variables (such as proposed in this study).

Also as hypothesized, task complexity (H2) and system complexity (H3) are shown to be pure moderators, indicating that the relationship between user participation and user satisfaction is contingent upon them. In situations where task complexity or system complexity is high, the relationship between user participation and user satisfaction is much stronger. In contrast, both user influence and user-developer communication were shown to be independent predictors of user satisfaction. As such, neither affected the relationship between user participation and user satisfaction directly. Thus, hypotheses H4 and H5 are rejected. It can be seen that in systems developments where there was a high degree of user influence and user-developer communica-

tion, there was also a high degree of user satisfaction regardless of the degree of user participation.

The MRA technique tests the interaction effect of each contingency factor independently. Table 6 shows the results of introducing multiple contingency factors into the regression equation simultaneously. The increment in R^2, rather than the magnitude of the beta coefficients, is used to determine the relative contribution of the four contingency factors in explaining the variance in user satisfaction. The data in Table 6 show that both user influence ($\Delta R^2 = 0.043$, $p \leq 0.01$) and user-developer communication ($\Delta R^2 = 0.024$, $p \leq 0.05$) have significant main effects on user satisfaction over and above that of user participation. Of the cross-product terms, task complexity and system complexity explained the greatest additional variation, but none were significant with all other variables in the equation.

Using the subgroup analysis procedure described by Hunt, et al. (1975), the significant interaction effects noted in Tables 5 and 6 were analyzed further to determine the exact nature of their impact. The four contingency factors were dichotomized at the median, and user participation was regressed on user satisfaction under conditions of low and high task complexity, system complexity, user influence, and user-developer communication. For each of these equations, the slope coefficients of the high and low subgroups were compared to determine the differential effects of the contingency factors on the relationship of interest (user participation and user satisfaction).

Table 7 presents the results of these analyses. In every case but one, there is no significant relationship between user participation and user satisfaction for a low group. In contrast, there is a significant relationship between user participation and user satisfaction for the high groups in every case but three. Thus, in the majority of cases, the low and high groups behave in a significantly different manner. In the high groups, the relationship between user participation and user satisfaction is greater. The most significant slope coefficients involve system complexity, user influence, and user-developer communication, particularly in combined situations—for example, high system complexity, high user influence, and high user-developer communication ($\beta = 0.252$, $p \leq 0.01$). Looking at the zero-order correlations in Table 4, it can be seen that some of the four contingency factors are related, suggesting they would logically move together. This means that it would be likely (at least in our sample) to have situations where two or three of these contingency factors would all be high (or low) in a given system development. Table 7 would predict that, in these situations, there would be a strong (or weak) relationship between user participation and user satisfaction. The only contingency factor at odds with the general pattern in Table 7 was user influence. For the low group, there was a significant positive relationship between user participation and user satisfaction, and for the high group, the relationship between user participation and user satisfaction was not significant.

Figure 3 presents the alterations made to the model in Figure 2 to reflect the results of this study. Since the purpose of the study was to examine the relationship of user participation with user satisfaction (and the interaction of certain contingency factors on this relationship), the independent predictors of user satisfaction (user influence and user-developer communication) are now shown as such in Figure 3.

Discussion, Implications, and Limitations

This paper argues that user participation is related to user satisfaction, and indeed, this has been borne out empirically. The paper also argues that four contingency factors affect this relationship. The form of interaction was hypothesized to be the same for all four factors. That is, in cases where the degree of task complexity, system complexity, user influence, or user-developer communication was low, it was hypothesized that having users participate in systems development may not necessarily lead to user satisfaction. On the other hand, in cases where these factors were high, it was felt that user participation would be linked to user satisfaction. It was subsequently shown that task complexity and system complexity interacted with the user participation-satisfaction relationship as predicted. This suggests that, in well-structured tasks where uncertainty and ambiguity are low, it may be preferable to have the users participate

Table 6. Moderated Multiple Regression Results: User Participation on User Satisfaction

Contingency Factors	Increment in R^2
User Participation (UP)	0.172***
+ Task Complexity (TC)	0.003
+ System Complexity (SC)	0.002
+ User Influence (UI)	0.043**
+ User-Developer Communication (UDC)	0.024*
+ UP * TC	0.012
+ UP * SC	0.012
+ UP * UI	0.001
+ UP * UDC	0.001
Total R^2 (unadjusted)	0.270***

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

Table 7. Slope Coefficients for Split Samples: User Participation on User Satisfaction

Contingency Factors	Slope†	
	High	Low
Task Complexity (TC)	0.137**	0.100
System Complexity (SC)	0.170**	0.072
User Influence (UI)	0.093	0.126*
User-Developer Communication (UDC)	0.130*	0.089
TC + SC‡	0.143*	0.037
TC + UI	0.142*	0.138
TC + UDC	0.174**	0.101
SC + UI	0.161*	0.085
SC + UDC	0.231**	0.106
UI + UDC	0.109	0.102
TC + SC + UI	0.155	0.071
TC + SC + UDC	0.226*	0.084
TC + UI + UDC	0.185*	0.048
SC + UI + UDC	0.252*	0.088
TC + SC + UI + UDC	0.229*	0.010

† Sample was split into a high (above the median) group and a low (below the median) group based on the median of the contingency factor(s).

‡ "TC + SC" should be read as "both TC and SC." In this case, the sample was split into two groups of projects—the high group consisted of those projects with both high task complexity and high system complexity—the low group consisted of those projects with both low task complexity and low systems complexity.

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

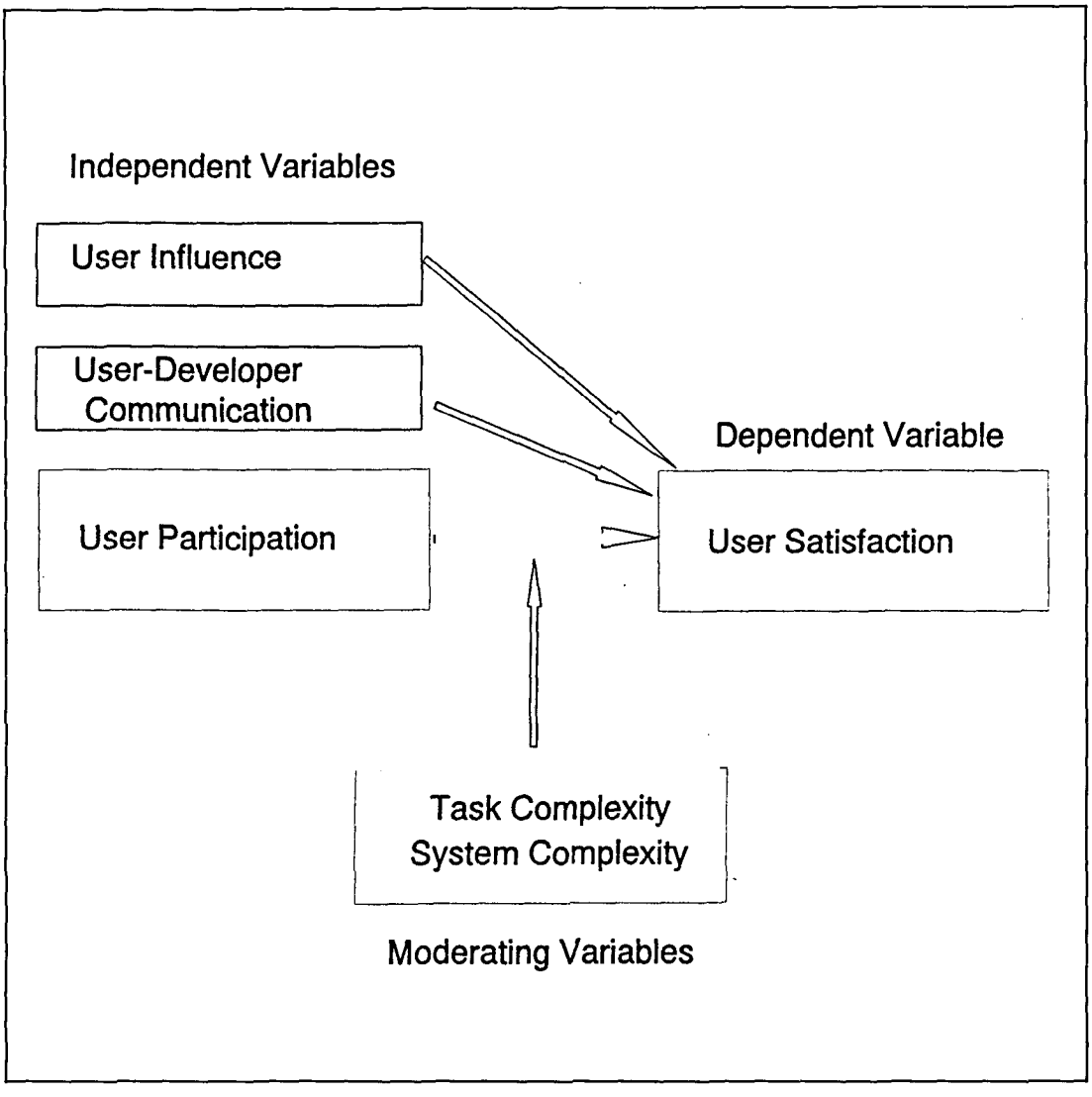

Figure 3. Relationships Found Among Research Variables

minimally. The need for their participation is reduced, and in addition, their participation may have little or no bearing on user satisfaction. Users would certainly appreciate the time saving. Unstructured and ambiguous tasks, however, present situations where active user participation is essential and appears to lead to user satisfaction. System complexity operates in a similar manner. That is, for simple systems of low system complexity, surprises are infrequent and typically resolved without extensive user participation. As the complexity of a system increases, however, surprises are likely to occur as development unfolds, necessitating changes to the original specifications. These changes usually have important ramifications for the final system, and the need for user participation and input into these decisions increases correspondingly. Support for this is found in the data, which indicates a strong relationship between user participation and user satisfaction in those cases of high system complexity.

The factors user influence and user-developer communication did not behave as hypothesized.

Neither showed a significant effect on the relationship between user participation and user satisfaction. They were, however, both related to user satisfaction directly as independent predictors. That is, regardless of the level of participation, greater user influence and better communication were found by users to be satisfying. These results may stem from the fact that the degree of user influence is difficult to accurately assess post-hoc. It is also true that the user-developer communication construct had the lowest reliability measure. These facts may partially explain why the interaction effects of user influence and user-developer communication were not statistically significant.

The results of this study suggest situations where user participation is most needed. Complexity, whether it arises from ambiguity or uncertainty, requires information, negotiation, and decision making to assist in its reduction and resolution. It follows that, where there is a substantial degree of task complexity or system complexity, the need to involve users as active participants in the development process is crucial. Where there is little complexity, the need to involve users actively is probably less important. It was also found that, in systems where users perceive that they have a significant degree of influence or effective communication with the system developers, they tend to be more satisfied. This occurs regardless of the degree of participation. In these systems, users most likely feel that they are being heard and that they can make a difference. Such an environment would be beneficial for organizations to foster.

In order to assess the applicability of the results of this study, its limitations should be examined. We have already identified some of the difficulties with post-hoc collection (in the case of user influence) and measurement reliability (in the case of user-developer communication). The potential difficulties with post-hoc collection may have affected other measures as well. Over the stages of development, users may assess their degree of satisfaction (or participation or communication or complexity) differently. Future research could investigate these variables at various stages of development in order to assess the "process" of development (Robey, et al., 1989). It is also true that the organizations represented within our sample were very large organizations. They had large IS development staffs and well-established systems development methodologies. User participation is generally a requirement of these methodologies. Smaller organizations, or those without the experience and culture of formal systems development, may experience different relationships between the research variables. Therefore, care should be exercised before transferring our results beyond the sample population. Readers are also reminded that, in the best interests of this research, the user participation and user satisfaction instruments had to be modified, and therefore comparisons with other research must be made with caution. Finally, it is tempting to suggest that there may be situations where user participation is actually unproductive, unnecessary, or even dysfunctional. Unfortunately, it is not possible to conclude this based on our study. According to Schoonhoven (1981), to investigate such a hypothesis would require the adoption of a "matching" or "maximizing" contingency theory unlike the multiplicative contingency theory design used in this research.

Conclusions

The overwhelming statement drawn from this research reinforces the conclusion reached by Franz and Robey (1986), who stated that the impact of user participation in system usefulness is not the "simple bivariate relationship typically suggested" (p. 329). Despite demonstrating an overall direct relationship between user participation and user satisfaction, two contingency factors were discovered that altered this basic bivariate relationship significantly. Further, it demonstrated that systems development can be successful in the presence of only minimal user participation.

The prescription of user participation must be reexamined. In our sample of 151 systems, many had high user satisfaction despite little or no user participation. Conversely, many had low user satisfaction despite high user participation. Apparently, while user participation is in general an important factor, it is certainly not the sole determinant of user satisfaction. Because of the unique nature of systems development, situational factors (such as developer's skill and experience, availability of appropriate development tools, and the nature of the business problem be-

ing computerized) may combine to overpower the effects of user participation. It is simply not universally true that more user participation is better in all cases. Therefore, the task becomes one of determining those cases where user participation is most indicated. Our research has started this task by examining four potential explanatory variables—two of which proved to interact with the user participation-satisfaction relationship significantly. Future research may find additional factors. Future research might also examine the interaction among these contingency factors in more detail. For example, it may be that user-developer communication plays a moderating role on the participation-satisfaction relationship *only when task complexity is high.* It may be that user influence plays a moderating role on the participation-satisfaction relationship *only when the system complexity of the system is low.* If future research were to follow this type of examination, our understanding of user participation would be further enhanced. For now, it would seem justified for practitioners to determine the level of task complexity and the degree of system complexity in prospective systems and use this information to formulate an appropriate level of user participation.

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