User Participation in Successful Application Development: An Exploratory Field Study

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ABSTRACT

It is a widely believed "truism" of information system practice that user participation in the system development process is important for success.

An exploratory field study was conducted to investigate the effects of type, timing, and amount of user participation. Semi-structured interviews were held with user and IS representatives in five firms to discuss eleven different development projects. Each interviewee was asked to describe the application, the development process, and user participation in the development effort. Each was also asked to evaluate system quality, quality of user participation, and quality of IS efforts. Estimates were obtained of the number of hours each group (IS and users) expended on each project.

Users contributed between 9% and 35% of total development hours to the projects reviewed. For this sample, it appeared that there was no relationship between participating level and perceived system quality. In this exploratory sstudy, the sample size was too small to permit meaningful statistical analysis.

Most users and most IS personnel rated the quality of the resulting systems as "very good" or "excellent". Not surprisingly, users tended to rate the quality of their participation higher than did IS; and IS people tended to rate quality of their participation higher than did the users.

INTRODUCTTION

One of the most durable "truisms" of information system practice is that user involvement is necessary for successful system development. (Gallagher, 1974; Swanson, 1974; Vanlommel & Brabander, 1975; Edstrom, 1977.) Many practitioners believe that inadequate participation by users is a virtual guarantee of failure. In spite of widespread acceptance of this idea, researchers have had difficulty in reliably demonstrating the value of user involvement. In a widely cited paper, Ives and Olson (1984) called for more rigorous research into the practice and theory of user involvement.

Partly in response to Ives and Olson's plea for more rigorous research, a number of carefully designed studies followed (e. g., Kim & Lee, 1986; Baroudi, Olson & Ives, 1986; Montazemi, 1988; and Doll & Torkzadeh, 1989). These studies appear to demonstrate a relationship between some measures of user involvement and the satisfaction users feel about the completed system. What the studies do not tell us much about is *when user involvement* should take place, *what kind of involvement* it should be, and *how much involvement* there should be. Baroudi, et. al., (1986) conclude that "... a logical extension of this study is to focus on specific types of user involvement to determine which types, under what conditions, have the greatest effect on system usage and information satisfaction". (p. 237)

The goal of the current study is to fill in some of the blanks that exist between the truism that user involvement is beneficial and the practical problem of how to incorporate user involvement to create an effective systems development process.

This article begins with a review of prior research. It then reports the preliminary results from a field study investigating current practices with respect to user involvement. The article ends with a discussion of the results and remaining questions. (For a review of theories of user participation, see Leitheiser and Hoffman, 1993.)

PREVIOUS RESEARCH

Table 1
User Participation Studies

Study	Participation During Life Cycle	Measure of Participation	Success Measure
Gallagher	report design		est. $ value of report† report value opinions†
Swanson (1974)	updates to data, program, files	frequency	appreciation† usage†
Vanlommel & Brabander (1975)	design & develop phase implementation phase	% of involvement	quality of use quality of project†
Edstom (1977)	determine scope system analysis	perceived influence	perceived success†
Ginzberg (1981)	define system test prototype	degree of personal participation degree of dept participation degree kept informed	user satisfaction† system usage
King & Rodriguez (1981)	info analysis phase	group discussion or not	system worth† system usage decision performance
Olson & Ives (1981)	feasibility phase info analysis phase systems design procedure development conversion phase acceptance phase	degree of relative responsibility type (user mgr; user team members; user responsibility; user sign off; user liaison)	user satisfaction†
Robey & Farrow (1982)	initiation phase design phase implementation phase	participation frequency rating degree of perc'd influence	conflict† conflict resolution†
Baroudi, Olson & Ives (1986)		activity frequency degree	system usage† user satisfaction†
Baronas & Louis (1988)	implementation phase	discussions of process and discussions of outcomes and and choice in scheduling, etc.	implement success implement stress job satisfaction info satisfaction†
Montazemi (1988)		degree of involvement	user satisfaction†
Doll & Torkzadeh	feasibility and info analysis phases	amount of time spent	end-user satisfaction

† Significant relationship with dependent variables

Table 1 summarizes the results of a representative set of empirical studies that have explored the relationship between user involvement and system success. Gallagher (1974), for example, investigated the effects of user involvement in the design of reports. He found that users who were involved viewed the resulting reports as having more value than users who were not involved. Swanson (1974) defined involvement as including use and development of information systems. He found that when users frequently initiate data, program, and file updates, they report higher levels of system appreciation and use.

Several studies attempted to link involvement in particular development phases to system success. Vanlommel and Brabander (1975) asked subjects to rate the percentage of total effort for the project that was performed by users rather than IS personnel. They collected estimates for different phases of the development process and found that the level of participation was directly related to the perceived quality of the project. They found no relationship with perceived quality of using the system, however. Edstrom (1977) explored the relationship of perceived influence on the development project by users. He found that during the initial scoping phase and the system analysis phase, there was a positive relationship with perceived system success. Ginzberg (1981) focused on system definition and prototype testing as avenues of user involvement. He also tried to separate personal participation from department participation in development projects. Ginzberg found that the degree of department participation and the degree to which users were kept informed were both positively related to user satisfaction. The degree of personal participation was not. He also failed to find any relationship between involvement and system use. King and Rodriquez (1981) performed an experiment in which some student subjects were involved in a group discussion that partially defined the information requirements for a system while others were not. The group that "participated" viewed the system as more valuable but neither used the system more nor made better decisions.

Olson and Ives (1981) undertook an ambitious study to relate life cycle phase and type of participation to user satisfaction. They could find no relationship involving phase of the life cycle or the degree of perceived responsibility. Of the various types of involvement that were explored (i.e., user manager of team, user team members, user responsibility for project, user sign-offs, and user liaison), only one — user sign-offs — was positively related to user satisfaction. There were some methodological difficulties with the study including a problem in getting IS and users to agree on the actual level of user involvement in a study. These disappointing results probably led to the previously mentioned critique of user involvement studies.

In their review, Ives and Olson (1984) concluded (1) a lack of rigor exists in prior user involvement research, (2) more attention must be placed on measurement and methodology including measures for user involvement and information satisfaction, (3) better conceptual foundation is needed perhaps with participative decision making and organizational change as a starting point (their proposed model may be useful), and (4) empirical research has not helped practitioners determine when users should be involved and what type of involvement it should be or even if involvement is related to system success.

Subsequent studies attempted to use more methodological rigor and to have better theoretical grounding. Robey and Farrow (1982) attempted to find evidence to support their conflict generation and resolution model of user involvement. They found that conflict and conflict resolution were positively related to the degree of perceived influence that users had in the development process. They did not find a relationship between the perceived frequency of participation and the outcome measures. Kim and Lee (1986) looked for relationships between the perceived degree of participation and system usage for each of the life cycle stages. They found positive relationships for the feasibility, information analysis, and installation phases. Baroudi, Olson, and Ives (1986) found that the perceived frequency of participation activities was directly related to both system use and user satisfaction. They note, however, that their study did not "clearly differentiate the degree of actual user influence in the design process" (p. 237).

Baronas and Louis (1988) focus on user involvement during implementation. In a field experiment, they incorporated a set of activities designed to increase user perceptions of control over the implementation process. They found that the group with the special activities expressed higher information satisfaction. No relationship was found with perceived success with the implementation, perceived stress from the implementation, or satisfaction with their jobs. In a study that targeted the involvement of end-users, Doll and Torkzadeh (1989) found that the perceived level of time spent participating was positively related to user satisfaction. This participation was during the feasibility and information analysis phases.

Most of the previous studies involved large organizations. A study involving small businesses found little participation by users (Montazemi, 1988). This may be due to a lack of specialized systems analysts, the low degree of decentralization, the poor quality of the information analysis, or the low degree of computer literacy.

In summary, research appears to have established a link between the degree of user involvement and the satisfaction that users express with the system. There is much less agreement about when involvement should take place and what form it should take. There is no information about the

appropriate amount of involvement. Most of the findings have been based on linear models associating degree of involvement with degree of user satisfaction. Neither current theory nor research provides any specific guidance to firms in deciding how much involvement is appropriate.

RESEARCH DESIGN AND METHODOLOGY

A field study was designed to investigate the effects of type, timing, and amount of user involvement. The initial part of the study entailed interviews with users and IS personnel involved with the development of significant information systems. A sample of 30 Midwestern firms was identified for the exploratory study. These were firms with which the researchers had prior relationships. The research plan called for the solicitation of firms for participation and the identification of two or three IS applications in each firm. The IS managers in potential participating firms were contacted by the researchers. After describing the study, the managers were asked if they wanted to participate. If the manager agreed to participate, he/she identified possible applications for study. The applications should have been developed by the IS function and been completed between one and five years before the interviews. For each application, interviews were set up with representative(s) of the user community and of the IS function. IS management identified the interviewees.

Interviews were scheduled so that researchers had at least an hour with users and an hour with IS personnel. A semi-structured interview format was followed in the initial interviews (see Appendix A). Users and IS personnel were asked to describe (1) the target application system, (2) the system development process, and (3) the role of user development in the process. These open ended questions were designed to capture information about the types of involvement used and associated problems and successes.

After the qualitative data was collected, an attempt was made to capture quantitative data about the success of the information system and the timing and amount of user involvement. Specifically, each party was asked to rate the quality of the system, the involvement of the IS function, and the involvement of users. Estimates were obtained for the number of hours spent by each area (i.e., users and IS) on each phase of the system development life cycle. The IS representatives were also asked to provide data on the number of hours spent maintaining the information system in its first year of operation. This was intended to provide an objective measure of the quality of the system. In later interviews, users were also asked to fill out a standard questionnaire that measures user satisfaction (based on work by Baroudi, et. al., 1986). This was intended to provide a subjective measure of system quality (see Appendix A).

INITIAL FINDINGS

To date, five firms have participated in the study and eleven applications have been studied. The small number of firms and applications covered in this exploratory study does not allow for testing external validity. This article will, therefore, focus on patterns and problems discovered in the qualitative interview data.

Industries represented include banking, insurance, and manufacturing. Most of the applications investigated have supported basic operations in the supporting organization. They tended to replace older systems with new applications that had extended capabilities and scope. Also, many of the projects involved technology that was new to the organization and/or the IS personnel involved with the project. This included a shift to on-line relational databases, fourth generation languages, and CASE tools. IS personnel tended to use traditional structured and data modeling methods.

User involvement usually began with complaints about the existing system. A formal proposal or request usually followed which may or may not have been tied to an overall systems plan. Users usually took the initiative in developing and defending the initial proposal for the new system.

Once the project was approved, a development team consisting of users and IS personnel was typically established. The users on this team were representatives of the user communities that were involved with the project. The primary task of the user team was to define system requirements but it usually continued after the requirements had been determined. Some teams were headed by users and others by IS representatives. In some organizations special positions were established for individuals who were to represent user areas in systems development projects. This approach solved the problem of obtaining enough time from busy users who have other functional area responsibilities.

The initial task of the development team was to define the application's requirements. The majority of projects in the study used a variant of the Joint Application Development (JAD) approach to define requirements. This took the form of a series of meetings, often away from the firm's offices, where the basic specifications for the system were hashed out. In many instances, there were only modest changes to this set of specifications.

In the cases where JAD was not used, analysts interviewed individual users or held meetings with groups of users. Requirements were documented and assembled by IS personnel and brought back to user representatives for confirmation. In a couple of instances there was a very knowledgeable user who was give almost exclusive responsibility for defining the system requirements. This individual was also very computer knowledgeable and spent large amounts of time working through the design details with the assigned

IS staff.

In most cases, user representatives were involved in the logical or conceptual design of the system. Sometimes CASE tools were used to help model the application with the aid of user participants. Data modeling, data flow diagrams, and event modeling were used as well as screen painters and report generators. In one case, users found the event models to be very helpful but had problems using an entity-relationship modeling tool. Screen painting software was frequently used in the design process to obtain user input on screen formats. This appears to have been successful. In one case where it was not used, users viewed and approved screen designs based on printed images. When they later were shown actual system screens they decided that they were unworkable causing substantial rework of the system design and a significant delay in project completion. This experience is similar to that observed by Newman and Nobel (1990) and supports a view that system generated screens are treated differently by users than printed screens.

In a couple of projects, prototypes of the system were shown to representative user groups. Feedback in these cases resulted in modest adjustments to the system rather than wholesale changes.

For most of the projects, user involvement fell off dramatically after the requirements had been completed and the initial logical or external design was done. User representatives were kept informed of progress and delays. The next major role for users was in testing. For some projects a significant amount of time was spent on this activity. Training could also consume a significant number of user hours.

The applications reviewed by this study were selected by the IS managers. In each case, the final system was viewed as a success by users and IS personnel. Most of the evaluations of systems, IS effort, and user effort were in the VERY GOOD and EXCELLENT categories. (See Table 2.) A couple of the projects were in serious trouble at one point, but were salvaged in part by a change in personnel on the IS side. It is hard to know for certain, but this may have been the result of political pressure applied by user management.

A possibly significant problem surfaced in several of the projects that had high levels of involvement by user representatives. Problems surfaced when systems were installed or reviewed at a late date by other users in the organization. The user representatives had not done a good job of getting the input and support of other important members of the user community. The IS function may have assumed that user involvement was taken care of by the high level of participation by the representative, and therefore was not prepared for the negative reaction of other users. We found that while there usually was a formal means of involving the user representative in development activities, there were no formal mechanisms for the representative to report back to the broad user community. This problem appeared to be worse for those projects where a full time user representative did most of the participation or where a single user was highly involved in development.

Another possible problem that we observed is that little or no project management or record keeping is done for the time users spend on development projects. Since our initial numbers show that 12-35% of the total development hours are user hours, this represents a significant cost that is not being managed.

CONCLUSIONS

Our initial findings suggest that firms have taken user involvement to heart and have used project teams to incorporated representational participation. This involvement appears to have resulted in successful applications but since systems were not randomly selected we can not make any conclusions about this relationship. We can state that users and IS personnel believe that the involvement was important.

In terms of the applicable models and theory, our observations lead us to believe that the Learning Model

Table 2
Satisfaction Ratings (%)

	Info Systems			User		
	System Quality	IS Effort	User Effort	System Quality	IS Effort	User Effort
Poor	0%	0%	0%	0%	0%	0%
Fair	0%	9%	9%	0%	0%	0%
Good	0%	27%	9%	13%	50%	0%
Very Good	64%	27%	45%	75%	25%	75%
Excellent	36%	36%	36%	13%	25%	25%

(Newman and Nobel, 1990) is best represented by the project teams. The teams were able to establish the basic requirements in their JAD meetings and those requirements, for the most part, remained valid for the rest of the project. While conflict arose, especially between some individuals, we did not get the notion that it was a principal force in the development process. The exception to this observation was the previously mentioned case where JAD was not used and users did not see actual screens until at a relatively late date in the process. Politics will always be present in organizations of people, but it only showed up occasionally in our interviews. It may be that the people interviewed did not feel comfortable talking about politics to individuals they didn't really know. Only a longer exposure to an organization is likely to provide insight into the role of politics in user involvement.

This study has added three important facts to our knowledge of user participation in application development. Users in general are more aware than in the past that their participation in the system development process contributes to successful systems. Once adopted, techniques such as JAD seem to make user participation a foregone conclusion, rather than something to be negotiated separately for each project. Finally, quality and timeliness of user participation, in addition to quantity, are of major concern to information systems professionals.

FURTHER RESEARCH

This study attempted to gain information about types, timing, and amounts of user involvement in system development and their relationship to success. At this initial stage, we have identified when and how a select group of firms get their users involved. We have also begun to collect data on the amount of involvement in terms of hours expended rather than a vague rating. When additional firms and applications have been studied we hope to be able to present managers with specific answers to these three important questions.

It may be that events may have overtaken the issue of user participation in application system development, as examined here. Downsizing of computer hardware and decentralization of organizations may mean that fewer large scale systems will be built using the system development life cycle and related methodologies. Emphasis on cross functional teams may make user participation in development so ordinary that the proper level is reached almost automatically.

Further, client/server architecture changes the nature of user participation because in many cases users perform a significant amount of the development work themselves. User participation changes from specifying results (e. g., a specific set of reports) to specifying much more abstract capabilities (e. g., specification of databases and report writing facilities) to actual development of code. These changes will require users to participate in very different ways.

User participation in client/server system development is a promising topic for further research.

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APPENDIX A

Interview Protocols

FROM THE INFORMATION SYSTEMS DEPARTMENT - FOR EACH PROJECT

Name of interviewer Date of interview
Project name
Name of interviewee
Job title
Relationship to project
Brief description of project
Project management methodology
Project characteristics
  New application area or rewrite?
  Technology used
    on-line, batch, cooperative processing, etc.
    new or old (to your company)
  Development methodology
    SDLC, CASE, other
    new, or old (to your company)
  Large, medium, or small (by your standards)
    What are your standards?
Conformance to project plan
  Date started
    planned source of data
    actual source of data
  Date finished (i. e., put into production)
    planned source of data
    actual source of data
  Total ISD work effort (days, months, etc.)
    planned source of data
    actual source of data
Maintenance efforts since installation
  to fix bugs
  to add originally planned functionality
  to add originally unidentified functionality
  to add functionality deliberately omitted
Total user work effort (days, months, etc.), as best you know it
  planned (by ISD) source of data
  actual (by ISD) source of data
Quality of system, as assessed by you
  Summary description: excellent, very good, good, fair, poor
  By what criteria did you reach the above judgement?
  suggestions:
    Does the right things?
    Helps users do a better job?
    Doesn't fail?
    Other?
Timeliness of user participation (availability when needed)
  Summary description: excellent, very good, good, fair, poor
Quality of user participation, as assessed by you
  Summary description: excellent, very good, good, fair, poor
  By what criteria did you reach the above judgement?
  suggestions:
    Business knowledge?
    Ability to communicate?
    Ability to represent department?
    Other?
Timeliness of IS participation, as assessed by you
  Summary description: excellent, very good, good, fair, poor
Quality of IS participation, as assessed by you
  Summary description: excellent, very good, good, fair, poor
  By what criteria did you reach the above judgement?
  suggestions:
    Technical knowledge?
    Business knowledge?
    Application knowledge?
    Other?
Other comments

FROM USER DEPARTMENT - FOR EACH PROJECT

Name of interviewer Date of interview
Project name (to be sure we are talking about the same thing)
Name of interviewee
Job title
Relationship to project
Brief description (to see how perceptions vary)
Total user department work effort
  planned (by user department) source of data
  actual source of data
Quality of system as assessed by you
  Summary description: excellent, very good, good, fair, poor
  By what criteria did you reach the above judgement?
  suggestions:
    Reliability?
    Ease of use?
    Helps you do a better job?
    Other?
Timeliness of IS participation
  Summary description: excellent, very good, good, fair, poor
Quality of IS participation, as assessed by you
  Summary description: excellent, very good, good, fair, poor
  By what criteria did you reach the above judgement?
    suggestions:
    Technical knowledge?
    Business knowledge?
    Ability to communicate?
    Other?
Timeliness of user participation
  Summary description: excellent, very good, good, fair, poor
Quality of user participation, as assessed by you
  Summary description: excellent, very good, good, fair, poor
  By what criteria did you reach the above judgement?
  suggestions:
    Project management skills?
    Business knowledge?
    Technical (IS) knowledge?
    Other?
    Other comments