Effects of User Participation in Systems Development: A Longitudinal Field Experiment

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Abstract
This study examines the efficacy of user participation in developing an accounting application. The research takes place over a 19-month time frame, involves 516 clerical-level accounting subjects, and includes experimental manipulations in a field setting. The model of user participation and involvement proposed by Hartwick and Barki (1994) provides the foundation for the research framework. Their model is augmented by the inclusion of concepts from procedural justice and self-efficacy research. Participation is manipulated at three increasing levels: (1) no voice, (2) non-instrumental voice, and (3) instrumental voice.

Research findings suggest that users' pre-experiment level of involvement with and attitude toward the present system are positively associated with their desire to participate in the development of the new system. Study results also indicate that users' a priori self-efficacy beliefs regarding their perceived ability to effectively contribute to the development process are positively related to desired participation. Pre- to post-experiment gains in psychological and behavioral variables are next assessed. In the instrumental voice condition, user involvement, user attitude, and performance gains are significantly highest. User attitude and involvement gains are significantly higher in the non-instrumental voice condition than in the no voice condition; however, gains in user performance are not significantly different between these treatment conditions. Research findings indicate that user participation can be effective, particularly when users perceive a noticeable degree of instrumental control over the decision outcome.

Keywords: Participation, involvement, accounting, procedural justice, self-efficacy

ISRL Categories: FA05, FA06, FB03, FD02, FD03, GB02, GB03

Introduction
This research examines the impact of allowing clerical accounting personnel the opportunity to participate in developing software. User participation is considered to be an important factor in the successful implementation and ultimate performance of information systems (Cushing 1990). Motivated by recent studies in user participation and involvement (Barki and Hartwick 1989, 1994; Hartwick and Barki 1994), the current study focuses on the influence of participation on user involvement, user attitude, and behavior.
The proposition that the success of an information system (IS) is directly proportional to the extent of user participation in developing the system has guided a variety of research endeavors (Cushing 1990; Ives and Olson 1984; Martin 1984). However, IS research examining the consequential effects of user participation has produced equivocal results (DeLone and McLean 1992; Hartwick and Barki 1994; Ives and Olson 1984; Lawrence and Low 1993; Pettingell et al. 1988). It has been suggested that experiments conducted in field settings may provide valuable insight into key participation factors leading to IS success (DeLone and McLean 1992). In that light, this study incorporates a longitudinal field experiment including 516 professional accounting personnel working in 162 field offices.

Recent advances in the participation literature have refined the predictive and nomological validity of key participation constructs. In particular, the user participation and user involvement constructs have been clarified and differentiated (Barki and Hartwick 1989, 1994), and a theoretical model of user participation and involvement has been developed (Hartwick and Barki 1994). The current study extends and complements this line of inquiry in four key areas. First, the user participation and involvement model is expanded by including concepts from procedural justice research (Hunton 1996, forthcoming; Lind and Tyler 1988) and self-efficacy literature (Bandura 1986; Compeau and Higgins 1995a, 1995b). Second, this study focuses on mandatory users engaged in hands-on activity. It has been suggested that user participation and involvement may be unimportant to mandatory users (Hartwick and Barki 1994); however, we believe that participation by mandatory users may be an integral factor in the ultimate success of an IS. Third, the current research operationalizes a longitudinal experimental design in a field setting, whereas prior research used a survey method (Hartwick and Barki 1994). Finally, that research relied on self-reported measures of user involvement and attitude as consequence variables, while the current study enlarges that scope by also including an objective measure of performance.

The research context is presented in the next section since it establishes parameters for the research model. The theory and hypotheses are then developed, followed by a description of the research method. Finally, research results are provided and key study findings are discussed.

Research Context

The setting of this study is a state agency. Due to the nature of the agency's mission, field offices are autonomous and it was the desire of the state legislature for the agency to continue to operate in this fashion. The decentralized environment made it difficult for agency management to coordinate and control central agency functions. For example, various accounting and management information systems had evolved at each field office with little or no coordination between offices or with the central office located at the state capital. Accountants at each field office were familiar with their local accounting systems; however, they were not exposed to the specific accounting systems used at other field offices. As a result of the decentralized environment and fragmented approach to developing accounting applications, it was difficult for the central accounting office to perform necessary accounting functions in an accurate and timely manner.

State auditors had performed numerous financial, operational, and management advisory audits over the past several years regarding the agency's accounting and management information systems. The agency had been consistently criticized for its outdated and inefficient information systems. In particular, internal controls over the agency's accounting systems were characterized as seriously deficient. The expenditure cycle application, including purchasing, receiving, accounts payable, and disbursements, particularly disturbed the auditors. One specific deficiency concerned late vendor payments. The state had enacted a prompt pay law that required all agencies to make vendor payments within 30 days after being billed for receipt of goods/services.
Auditors had determined that the agency was not in compliance and that delays and errors in the accounting function were primarily responsible for late payments. The agency was in violation of this law to such an extent that vendors filed a class action lawsuit against the agency demanding interest and penalty payments.

The lawsuit grabbed the attention of the state legislature. A special committee of the legislature found that the agency had made little headway correcting information systems deficiencies. As a result, the agency was mandated by the state legislature to revamp all information systems. Immediately thereafter, the agency director resigned under pressure. The newly appointed director hired a chief information officer (CIO) whose primary mission was to standardize and modernize the agency's accounting and management information systems.

The CIO developed an information systems development plan (ISDP) which called for all systems to undergo dramatic redesign and development. The first phase of the ISDP consisted of revamping the expenditure cycle application. The CIO felt that agency accounting managers and auditors should play an important role in the systems development process. To accomplish this, the CIO established a steering committee comprised of accounting managers from the central and district offices, state auditors, and IS analysts to oversee development of the expenditure cycle application. The agency director suggested that lower level accounting clerks who will use the new system on a regular basis also should be involved in the development process. However, neither the CIO nor accounting managers were convinced that participation by accounting clerks would significantly improve the new system, particularly considering the additional commitment of agency resources required by such participative efforts. Successful implementation of the ISDP was critical to the agency's strategic plan and the director was not sure whether the cost of clerical participation would outweigh the benefits. The director felt that he could not afford to sub-optimize the system's potential; hence, he hired the researchers as consultants to investigate the efficacy of allowing participation by accounting clerical personnel.

After reviewing the proposed expenditure cycle application development plans and conducting preliminary interviews with users at various levels throughout the agency, the researchers advised the director and CIO that some degree of participation by clerical level accounting personnel during development was warranted. The researchers suggested that, aside from cognitive advantages (e.g., enhanced understanding and exchange of information), there would probably be important affective (e.g., ownership of the new system and trust in superiors) and motivational (e.g., expectancy beliefs and self-efficacy perceptions) benefits arising from clerical level participation.

The researchers' advice was met with skepticism by the CIO. He believed that clerical level personnel lacked sufficient knowledge and expertise to effectively contribute during the systems development process. Additionally, the CIO was under considerable time pressure and felt that engaging clerical level users in development efforts would seriously jeopardize pre-established deadlines. Instead, he proposed developing the system without up-front participation from clerical users and then conducting post-development group meetings at each field location to demonstrate and explain the new system's attributes, functions, and benefits. In essence, he suggested selling and justifying the system to users after development but prior to training and implementation. The proposed user meetings would include a question and answer session to address and discuss concerns over perceived system deficiencies and to minimize efforts to resist the new system. However, according to the CIO's plan, the concerns, preferences, and opinions expressed by clerical level users would not be further incorporated into the IS design.

After reviewing the researchers' and CIO's preliminary reports, the director was unsure of the appropriate action. However, the director knew the agency would be revamping numerous accounting and management information systems over the next decade and he wanted to understand and execute the most effective
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development technique while keeping a watchful eye on time and cost constraints. As a result, the director decided to allow the researchers to conduct a field experiment designed to determine whether participation by clerical level personnel during systems development produced significant benefits in terms of improved employee attitude and performance.

In field experimentation, there are a host of legal, economic, political, and other constraints. From an experimental design perspective, there are limitations that restrict the degree of internal validity attainable. However, given the rich contextual setting and professional subject pool, field experimentation can nevertheless provide valuable contributions to extant research streams. The theoretical foundation for the experimental design is next presented.

Theory and Hypotheses

Hartwick and Barki propose a model of user participation and involvement reflecting two antecedent factors: user involvement and attitude. User involvement reflects subjective psychological beliefs regarding the importance and personal relevance of the system to the user. User attitude represents affective or evaluative feelings toward the system. Hartwick and Barki suggest that higher levels of user involvement and attitude concerning a proposed system should lead to an increased desire to participate in development activities. They delineate three dimensions of user participation in the information system development process: (1) overall responsibility, (2) user-information systems relationship, and (3) hands-on activity. Their model proposed that higher levels of actual participation along one or more of these dimensions would heighten post-development user involvement and attitude. Finally, psychological benefits of participation are predicted to increase an individual’s intention to use the system which, in turn, should manifest itself in increased system use.

The Hartwick and Barki model of user participation and involvement serves as the cornerstone for our research model (see Figure 1). Model 1a (Figure 1, panel A) depicts an association between antecedent conditions and desired participation. Model 1b (Figure 1, panel B) illustrates the effect of user participation on user involvement, user attitude, and user performance.

The effect of antecedent conditions on desired participation

Hartwick and Barki suggest that predevelopment states of user involvement and attitude toward a proposed IS are positively related to a user’s desire to participate in upcoming development activities. They primarily base their assertion on the theory of reasoned action (TRA) (Fishbein 1980; Fishbein and Ajzen 1974, 1975). The TRA indicates that a priori user involvement beliefs can exert a relatively strong influence on users’ desire to participate, since these beliefs act as a linking mechanism between an object (i.e., the proposed system) and a behavior (i.e., participative activities). A user who believes that an object is personally relevant and important is likely to form positive attitudes toward that object, since attitudes are generally formed on the basis of beliefs (Fishbein and Ajzen 1975; Lind and Tyler 1988). Conversely, a priori attitudes toward an object can influence the development of beliefs about the object (Hartwick and Barki 1994); however, the influential strength of attitudes on beliefs is relatively weak (Fishbein 1980). Hence, there is an expected co-variance between user involvement and attitude. Finally, Fishbein suggests that attitudes toward an object can affect an individual’s desire to engage in a target behavior (e.g., hands-on activity).

In this study, the users’ a priori levels of involvement with and attitude toward the present IS are assessed, whereas Hartwick and Barki refer to beliefs and attitudes toward a proposed system. It is our contention that if users believe the existing system is personally relevant and important, they will desire to participate in development activities aimed at enhancing the existing system beyond its current level (i.e., making it more efficient and
Panel A: Research model 1a—effect of antecedent conditions on desired participation

Panel B: Research model 1b—effect of user involvement, user attitude, and user participation on user performance

Figure 1. Research Model
If beliefs play a large part in the formation of attitudes, as indicated by Fishbein and Ajzen (1975), we also expect a positive relationship between the users' attitude toward the existing system and their desire to participate in a process that is expected to improve the system. One could counterargue the existence of a negative relationship between an existing system and the desire to participate in the development process. However, in order to accept that argument one would have to believe that users will desire to expend valuable time and energy developing a system that they feel is personally unimportant and irrelevant. In this study, a position congruent with Hartwick and Barki is taken, as we believe that higher levels of user involvement and attitude with the present IS will result in an increased desire to improve the IS through participative activities. Based on the theoretical linkages between beliefs, attitudes, and desires, the first three parts of hypothesis one (alternate form) are presented here and depicted in Figure 1, panel A:

**H1a:** There is a positive relationship between predevelopment user involvement with and user attitude toward the present information system.

**H1b:** There is a positive relationship between predevelopment user involvement with the present information system and the user's desire to participate in the development of a new information system.

**H1c:** There is a positive relationship between predevelopment user attitude toward the present information system and the user's desire to participate in the development of a new information system.

An additional antecedent condition included in research Model 1a is user self-efficacy. The concept of self-efficacy refers to the extent to which individuals believe they can effectively perform certain behaviors (Bandura 1986). Individuals who believe they can successfully execute given behaviors typically desire to engage in such behavior. Conversely, individuals tend to avoid situations where failure is deemed likely (Bandura 1986). In an IS setting, self-efficacy refers to the users' belief that they can successfully perform the behaviors necessary to effectively contribute to the system development process (Compeau and Higgins 1995a, 1995b; Hunton forthcoming). As suggested by Compeau and Higgins (1995a), based on the theory of reasoned action (Fishbein 1980), self-efficacy beliefs can become an influential link between an object (i.e., the system) and a related behavior (i.e., participation). Self-efficacy was not included as an antecedent factor in the Hartwick and Barki model; however, self-efficacy theory would suggest a positive link between the users' a priori perceived level of self-efficacy and their desire to engage in development activities. Accordingly, part four of the first hypothesis (alternate form) is presented and shown in Figure 1, panel A:

**H1d:** There is a positive relationship between pre-development self-efficacy perceptions regarding the users' beliefs about their ability to effectively contribute to the information systems development process and their desire to participate in the development of a new information system.

**The effect of user participation on involvement, attitude, and performance**

User participation refers to a set of behaviors, activities, and assignments in which users may be engaged throughout the systems development process (Barki and Hartwick 1994). The model presented by Hartwick and Barki incorporates the assumption that users will increase their actual participation commensurate with desires. It has been suggested that allowing individuals to set their actual participation level proportionate with their desired level likely optimizes consequential perceptions, attitudes, and behavior (Vroom and Jago 1988).
However, depending on an individual's level in the organizational hierarchy, actual participation may or may not be at the users' discretion. Users at lower organizational levels, for example, may not be allowed participation in development activities regardless of their desire to participate, as was the case in the state agency. Subjects in this study represent mandatory users at lower organizational levels, where the degree of participation allowed is a choice made by upper level managers. Since some level of participation was not only allowed but also required of accounting personnel in this experiment, participation is treated as an independent variable manipulated with three decreasing levels: instrumental voice, non-instrumental voice, and no voice (a control condition).

**Participation by Instrumental Voice**

One way to operationalize participation is to provide users with instrumental voice during the course of hands-on activity. The term instrumental voice originates from the control-oriented perspective of procedural justice theory. Procedural justice refers to the perceived fairness of a decision making process in accordance with expected or accepted norms (Lind and Tyler 1988; Thibaut and Walker 1975, 1978). Instrumental voice provides users with an opportunity to express their opinions, preferences, and concerns to decision makers. This form of participation provides users with a sense of control during the development process, since the expression of instrumental voice is expected to become manifest in the decision outcome (Folger 1977; Houlden et al. 1978; Leventhal 1980). Procedural justice researchers stress the critical, influential nature of control perceptions on resulting attitudes and behavior (Greenberg 1990; Lind and Tyler 1988). Researchers in the field of IS (Ives and Olson 1984; Lawrence and Low 1993; Lodge 1989; Mumford 1981; Mumford et al. 1983; Mumford and Henshall 1979) also suggest the critical nature of control perceptions during the systems development process. They indicate that development strategies providing enhanced levels of perceived control are expected to yield higher levels of user involvement, attitudes, and performance.

In a recent field experiment, unrelated to the current study, instrumental voice was manipulated regarding the development of an IS (Hunton 1996). That study found that subjects in the instrumental voice condition, as opposed to a no voice condition, believed the decision process was more fair, perceived a higher degree of control over the decision outcome, felt more satisfied with the resulting IS, and performed at a higher level. The current study expands on the procedural justice aspect of that research by incorporating a participation mode called non-instrumental voice.

**Participation by Non-Instrumental Voice**

The value-expressive perspective of procedural justice asserts that voice can enhance judgments of process fairness for reasons other than influence or control (Lerner 1981; Lind et al. 1990; Lind and Tyler 1988). Advocates of the value-expressive perspective contend that participation by voice can engender heightened affective feelings, such as inclusion and self-esteem, thereby promoting perceptions of being treated fairly, even when voice has no instrumental impact on the outcome. One way to operationalize the value-expressive theory is to provide non-instrumental voice to affected parties.

Non-instrumental voice allows users to evaluate a decision outcome after the decision is made; however, the outcome is unaffected by the expression of non-instrumental voice. It has been suggested that the exercise of non-instrumental voice can create a perception of illusory control in which people may believe they experience objective increases in control over the outcome, particularly when non-instrumental voice is expressed throughout the decision process (Hunton and Price 1994). Overall, non-instrumental voice is considered a weaker form of participation than instrumental voice but stronger than no participation (Lind et al. 1990). Non-instrumental voice has been shown to enhance attitudes of affected parties;
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however, research evidence regarding the influence of non-instrumental voice on individual behavior is equivocal (Lind and Tyler 1988).

Consequences

In this study, it is expected pre- to post-experiment gains in user involvement and attitude will be highest in the instrumental voice condition, as this treatment affords the highest level of user control. Barki and Hartwick (1994) indicate that user involvement might be enhanced if users develop a better cognitive understanding of the new system and gain awareness of how the system can help them in their job. In the current study, attempts to justify and explain the new system in the non-instrumental participation condition are expected to fulfill these cognitive criteria. As well, the value-expressive perspective of procedural justice theory would predict enhanced favorable attitudes toward the system due to the psychological, symbolic contributions offered by non-instrumental voice (Lind and Tyler 1988). Finally, a positive relationship between user involvement and user attitude is anticipated, based on the same premise articulated for H1a. Hence, the following hypotheses (alternate form) are presented and depicted in Figure 1, panel B:

H2a: A positive relationship exists between user involvement pre- to post-experiment gains and user attitude pre- to post-experiment gains.

H2b: Pre- to post-experiment user involvement gains will be highest in the instrumental voice participation condition, followed by the non-instrumental voice participation condition, and lowest in the no voice (i.e., control) condition.

H2c: Pre- to post-experiment user attitude gains will be highest in the instrumental voice participation condition, followed by the non-instrumental voice participation condition, and lowest in the no voice (i.e., control) condition.

Researchers suggest positive relationships between beliefs, attitudes, and behavior (Barki and Hartwick 1994; Fishbein 1980; Locke and Latham 1990). The theory of reasoned action indicates that beliefs (i.e., personal relevance and importance) about an object (i.e., the system) can exert a positive influence on individual behavior. Attitudes toward an object can also affect behavior, but this relationship is generally less influential than the belief-behavior linkage, unless there is complete correspondence between the attitude and the target behavior. In the current study, user attitude toward the newly developed system is measured, not toward tasks associated with using the system. As such, there is only partial correspondence between attitudes and observed behavior (i.e., using the system more efficiently and effectively). Hence, while positive relationships are anticipated between (1) user involvement and performance and (2) user attitude and performance, it is expected that the attitude-performance link will be relatively weak.

A direct relationship between the participation manipulation and user performance is also expected. Although evidence linking participation to individual performance is mixed (Baroudi et al. 1986; Ives and Olson 1984; Pettingell et al. 1988; Wong-On-Wing 1988), there is some indication that instrumental voice can lead to improved performance (Earley and Lind 1987; Hunton 1996; Lind and Tyler 1988). The primary thrust behind the instrumental voice-performance relationship is increased user control over the outcome. The influence of non-instrumental voice on performance is not predictable with any degree of confidence, since non-instrumental voice offers no objective increase in outcome control. The argument has been made that user participation may be causally related to performance for reasons other than control (Lind and Tyler 1988). For example, participative activities can evoke feelings of work group inclusion, system ownership, and outcome responsibility, thereby motivating users to increase their extant
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performance levels (Locke and Latham 1990). While expecting the influence of instrumental voice on performance to be stronger than non-instrumental voice, it is anticipated that the non-instrumental voice manipulation will positively impact performance for the reasons just provided and because non-instrumental voice can evoke perceptions of illusory outcome control (Hunton and Price 1994). Accordingly, the final hypotheses are presented (alternate form) and illustrated in Figure 1, panel B:

H3a: User involvement pre- to post-experiment gains positively influence user performance pre- to post-experiment gains.

H3b: User attitude pre- to post-experiment gains positively influence user performance pre- to post-experiment gains.

H3c: The direct influence of user participation on pre- to post-experiment user performance gains will be highest in the instrumental voice participation condition, followed by the non-instrumental voice participation condition, and lowest in the no voice (i.e., control) condition.

Instrumental voice participation manipulation

The agency had a centralized management information systems (MIS) staff that reported to the CIO. There were 51 field offices in the instrumental voice participation manipulation. Small groups of clerical level accounting employees provided input into four hands-on activities: defining and designing (1) report formats, (2) screen layouts, (3) input and output forms, and (4) user procedure manuals. MIS personnel performed the bulk of the technical work in these four areas and the accounting clerks made suggestions for improvements based on prototype designs of reports, screens, forms, and procedure manuals. Accounting clerks at each field office met in small groups. Each consecutive Friday for eight weeks, there were two-hour morning meetings at each field office. By Friday evening, suggestions from each group were forwarded to the MIS department. Based on this input, MIS analysts created an updated set of prototypes.

In each field office, accounting clerks received an initial four-hour training session in effective group techniques. Each group learned to use the consensual conflict resolution (CCR) technique (Hall and Watson 1970; Innami 1994). Group members were taught to maximize their productivity by using the six steps of CCR (see Appendix A). The CCR instruction was intended to increase reasoning orientation and decrease positional orientation of group verbal behavior. There were no supervisors in these groups. During the initial group meeting, the members elected a leader and a recording secretary.

Since there were 51 field offices, the researchers did not have enough time to conduct the initial group meetings. The researchers trained 10 human resource personnel in how to conduct the initial meeting at the field locations. This training session lasted approximately five hours. The trainers were randomized to the 51 field offices and they conducted all initial group meetings in a one-week time frame. Trainers were instructed not

Experimental Design

The state agency was divided into nine districts; each district director was responsible for field office operations. At the clerical level, there was little interaction between field offices within the same district and virtually no interaction between field offices located in different districts. The researchers randomized three districts to each of three experimental treatment conditions: instrumental voice, non-instrumental voice, and no voice. District directors and accounting managers were aware of the experiment; however, other district and field office employees were unaware that an experiment was in progress.
to discuss either the identity or number of field offices involved. The trainers were aware that an experiment was in process, but they were blind to the manipulations and hypotheses.

During the eight-week instrumental voice participation period, the groups were self-sustaining. In order to maximize the free exchange of feelings and information during meetings, no supervisors, managers, or observers were present. However, field office accounting managers made certain that all group members attended all meetings and that meetings lasted approximately two hours.

Non-instrumental voice participation manipulation

Once the new expenditure cycle application was completed, subjects in the non-instrumental voice participation condition attended an orientation session lasting approximately six hours. The purpose of the session was to demonstrate the new application, explain the benefits of the new system, and listen to user comments. Participants were told their suggestions could not be incorporated into the expenditure cycle application, as it was already developed and ready for conversion/implementation.

There were 56 field offices in the non-instrumental voice participation condition. Twelve MIS analysts conducted the orientation meetings, with one analyst per meeting. Prior to holding the orientation meetings, the researchers, CIO, and 12 analysts first held an eight-hour meeting to standardize the orientation session agenda and procedures. Each analyst conducted either three or four orientation meetings. Analysts were aware of the experiment but blind to the manipulations and hypotheses. Analysts were randomly assigned to field offices and all orientation sessions were completed within five consecutive workdays.

No participation manipulation

There were 55 field offices in the no participation condition. Accounting clerks in this condition were aware that MIS was developing a new expenditure cycle application, however they were not informed that some accounting clerks were participating during development or that other accounting clerks attended an orientation meeting.

Training session

Two weeks before implementation, all affected accounting clerks at all field offices, regardless of their participation treatment condition, attended an eight-hour, on-site user training session on how to operate the newly developed expenditure cycle application. The 10 human resource personnel who initially trained the groups and the 12 analysts who conducted the orientation meetings held the training sessions. These trainers were cautioned not to mention their prior involvement during the training meetings. The 22 trainers were randomly assigned to the 162 field offices. Training was completed within nine working days.

Timing of manipulations and measurement of variables

The experiment was conducted during a 19 month period. Ten months prior to implementation of the new system ($t_{10}$), all participating accounting clerks at all 162 field offices responded to a pre-experiment questionnaire (see Appendix B). The survey instrument was contained on diskette and all items were randomized per individual subject. Survey items included (1) user involvement and attitude toward the existing expenditure cycle application, (2) perceived self-efficacy in participating in hands-on activity regarding new systems development, (3) desire to participate in hands-on activity, and (4) demographic information. Group effectiveness training also took
place during month $t_{10}$ for participants in the instrumental voice participation condition.

One month after administration of the pre-experiment survey, the instrumental voice participation development meetings commenced and were concluded in two months ($t_3$ and $t_4$). The expenditure cycle system was completed during the next five months ($t_5$ through $t_9$). The non-instrumental voice participation orientation sessions were next conducted ($t_2$). During the month of system conversion ($t_1$), training sessions were provided to all accounting clerks.

The first three months of operation were labeled learning curve months ($t_{11}$, $t_{12}$, and $t_{13}$) and observation of the system operation continued for an additional six months ($t_{14}$ through $t_{19}$). At the end of the sixth month of system operation ($t_9$), a post-experiment survey was administered (see Appendix C). The survey instrument was contained on diskette and all items were randomized per individual subject. Survey items included user involvement and attitude toward the new expenditure cycle application, as well as manipulation check questions.

**Performance Measurement**

A monthly performance measure was calculated for each field office as follows:

$$\text{Vendor payments in violation of the state's 30-day prompt payment law}$$

where $t = \text{experimental months} - 6 \text{ through } +9$

This performance indicator, percentage of late vendor payments by month, is directly related to the efficiency and effectiveness of the expenditure cycle application under development, since vendor payments are the ultimate output from this system. While tracking late vendor payment rates by field office, it was not possible to isolate violations to individual accounting clerks who took part in this experiment; accordingly, a research limitation is acknowledged. That is, while it was possible to restrict the analysis of survey responses to accounting clerks who were employed by the agency throughout the entire 19 months of the experiment, the field office level performance indicator impounds inherent turnover effects. Great effort was taken to ensure there were no changes in policies or procedures surrounding the expenditure cycle that may have accounted for the difference in performance gain scores across experimental conditions. As a result of a thorough investigation into this issue, the researchers are confident that the only differential treatment across experimental conditions was the extent of participation provided to accounting clerical level personnel.

**Results**

**Sample characteristics**

Sample statistics are provided in Table 1. At the beginning of the experiment, there were 615 accounting personnel in 162 field offices (Table 1, panel A). At the end of the experiment, only 516 (83.9%) of the original 615 accounting personnel were still employed by the agency (Table 1, panel B). Agency personnel records indicate that the retention rate during the 19 month experimental period was not unusual, as the retention rate for the same level of clerical employees for the 19 month time-frame prior to commencement of the current study was 82.4%.

MANOVA was used to determine whether there were significant individual differences among treatment conditions for the 99 subjects who left the agency between pre- and post-experiment testing. The set of dependent variables included age, years of education, years of accounting experience, years with state agency, and gender. No significant differences among treatment conditions were found, as the F-ratio (p-value) for the MANOVA model was 0.82 (.6058). Only pre- and post-experiment survey responses from the 516 who remained with the agency throughout the entire experimental period were subsequently analyzed.
Table 1. Sample Statistics

Panel A: Employees per region at the beginning of the experiment (t_{10})

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Instrumental Voice</th>
<th>Non-Instrumental Voice</th>
<th>No Voice</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of field offices</td>
<td>51</td>
<td>56</td>
<td>55</td>
<td>162</td>
</tr>
<tr>
<td>Number of accounting clerks</td>
<td>193</td>
<td>221</td>
<td>201</td>
<td>615</td>
</tr>
<tr>
<td>Average number of clerks per group</td>
<td>3.8</td>
<td>3.9</td>
<td>3.7</td>
<td>3.8</td>
</tr>
<tr>
<td>Mean age of accounting clerks</td>
<td>28.2</td>
<td>27.9</td>
<td>28.1</td>
<td>28.1</td>
</tr>
<tr>
<td>Mean years of education completed</td>
<td>13.7</td>
<td>13.6</td>
<td>13.6</td>
<td>13.7</td>
</tr>
<tr>
<td>Mean years of accounting experience</td>
<td>5.0</td>
<td>5.1</td>
<td>4.9</td>
<td>5.0</td>
</tr>
<tr>
<td>Mean years with the State agency</td>
<td>4.3</td>
<td>4.1</td>
<td>4.0</td>
<td>4.1</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>53.4</td>
<td>52.8</td>
<td>54.1</td>
<td>53.2</td>
</tr>
</tbody>
</table>

Panel B: Regional breakdown of employees present at the end of the six-month post-implementation observation (t_{39}) who were also present at the beginning of the experiment (t_{10})

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Instrumental Voice</th>
<th>Non-Instrumental Voice</th>
<th>No Voice</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of accounting personnel</td>
<td>159</td>
<td>188</td>
<td>169</td>
<td>516</td>
</tr>
<tr>
<td>Percentage Retention Rate</td>
<td>82.38</td>
<td>85.07</td>
<td>84.08</td>
<td>83.9</td>
</tr>
</tbody>
</table>

Preliminary testing

Reliability estimates were calculated on responses to the pre- and post-experiment survey items using Cronbach's alpha (α) statistic (n = 516). Research indicates that reliability estimates exceeding .70 are desirable (Cronbach et al. 1972; Neter et al. 1990). Reliability estimates for pre-experiment survey responses are as follows: α = .789 (nine items representing user involvement), α = .946 (four items representing user attitude), α = .904 (four items representing user self-efficacy), and α = .958 (four items representing desired participation). Post-experiment survey reliability estimates are as follows: α = .846 (nine items representing user involvement) and α = .959 (four items representing user attitude). Because reliability estimates were satisfactory, related survey item responses were averaged to obtain pre- and post-experiment variable indices.

Manipulation Checks

Manipulation check survey items are shown in Appendix C. Items assessing the extent to which users perceived they actually participated in development activities served as a manipulation check for the instrumental voice condition. Based on a seven-point scale, mean responses by treatment condition were 5.54 (instrumental voice), 1.79 (non-instrumental voice), and 1.82 (no voice). The ANOVA model indicated an F-ratio (p-value) of 246.65 (≤ .0001). Scheffe's multiple pairwise comparison (α = .01) revealed that 5.54 was significantly higher than either of the other two means, and the other means were not significantly different from one another. Consequently, the instrumental voice participation manipulation was considered successful.

The next set of manipulation check items were designed to assess the subjects' degree of perceived control over various aspects of the decision outcome (i.e., the new expenditure cycle application). Based on a seven-point scale, mean perceived control responses by treatment condition were 6.02 (instrumental voice), 3.16 (non-instrumental voice), and 1.15 (no voice). The ANOVA model F-ratio (p-value) was 187.49 (≤ .0001). Using Scheffe's multiple pairwise comparison (α = .01), these three means were all significantly different from one another. These results provide evidence that the three treatment conditions
evoked varying levels of perceived control, in accordance with procedural justice theory. Hence, differential attitudinal and behavioral responses observed during hypothesis testing might be partially attributable to the manipulation of perceived control.

To test the success of the non-instrumental participation manipulation, one of the survey questions asked the subjects whether they participated in a six-hour orientation meeting. All subjects in the non-instrumental voice condition properly indicated yes (n = 188) while one of 159 subjects in the instrumental voice condition and two of 169 subjects in the no voice participation condition indicated yes. The few affirmative responses from the instrumental voice and no voice participation conditions likely arose from confusion over orientation versus training sessions. Overall, the non-instrumental voice participation manipulation was deemed successful.

Another manipulation check question assessed a constant condition provided to all subjects: user training. All subjects indicated that they had attended an eight-hour user training session. The final manipulation check question asked participants whether they believed accounting clerks throughout the agency were allowed to participate in developing the expenditure cycle application. Based on a seven-point scale, mean responses were: 6.22 (instrumental voice), 0.56 (non-instrumental voice), and 0.68 (no voice). Using ANOVA (F-ratio = 388.44, p-value ≤ .0001) and Scheffe’s post-hoc test (α = .01), the instrumental voice mean was significantly different from the other two means and the non-instrumental voice and no voice means were not significantly different from one another. Hence, the treatment conditions were considered independent.

Systematic Bias Checks

The research tested for differences in demographic factors across experimental conditions for the 516 subjects who completed the experiment. The demographic factors examined were (1) age, (2) years of education, (3) years of experience, (4) years with the state agency, and (5) gender. To test for possible differences, four ANOVA models were used, where the dependent variable for each model represented the first four demographic factors listed above, and the independent variable was the participation treatment condition (i.e., no voice, non-instrumental voice, and instrumental voice). Additionally, a chi-square test was used to determine whether the proportion of male and female subjects differed across the three conditions. The overall ANOVA model F-ratios (p-values) were 1.01 (.8567) for age, 1.74 (.5921) for years of education, 0.84 (.9477) for years of experience, and 1.49 (.6432) for years with the state agency. ANOVA results indicate no significant differences across conditions. Also, there was no significant difference in the proportion of male and female subjects across experimental conditions (chi-square = 0.88, p-value = .46).

The research also tested for differences in demographic factors between the 99 subjects who left the agency during the experimental time period and the 516 subjects who remained. To accomplish this objective, t tests of each demographic factor were conducted, where those who left the experiment represented one group, and those who completed the experiment represented the other group. The t-statistic (p-value) for each variable follows: 1.25 (.45) for age, 0.94 (.61) for years of education, 1.55 (.37) for years of experience, 1.81 (.24) for years with the state agency, and 1.02 (.56) for gender. Based on t test results, we find no significance differences in demographic characteristics due to attrition.

The research examined the extent to which trainer, field office, or both may have influenced post-experiment survey responses. Although trainers were randomized to field offices and field offices were randomized to treatment conditions, there may have been unintended, systematic influences due to these factors. A MANOVA model was calculated where the independent variables were (1) trainer, (2) field office, and (3) interaction of trainer and field office, and the set of dependent variables included post-experiment user involvement and user attitude responses. The
overall F-ratio (p-value) was 1.22 (.4873). Based on the overall significance level, systematic effects of trainer, field office, or both on the two dependent variables were deemed unlikely.

Hypothesis testing

Consistent with Hartwick and Barki, EQS, a structural equation modeling program (Bentler 1989), was used to test the hypotheses. Since there is no generally accepted measure of overall model goodness of fit with structural equations, leading researchers recommend that multiple criteria be evaluated and compared to determine how well the data fits the model (Breckler 1990; Wheaton 1987). In this study, three key goodness of fit criteria, suggested by Bentler (1989, 1990), were used.

The first goodness of fit indicator is called the normed fit index (NFI), introduced by Bentler and Bonett (1980). The NFI transforms the chi-square statistic into a 0 to 1 range, where 1 indicates a perfect fit. However, NFI can be affected by sample size, such that in small samples the index may not reach 1. As a benchmark, Bentler and Bonett suggest that a NFI of .90 or above represents a good fit.

The second goodness of fit indicator, also proposed by Bentler and Bonett, is called the non-normed fit index (NNFI). The NNFI modifies the NFI by accounting for the degrees of freedom in the model. As a result, it works well at all sample sizes. A negative feature of the NNFI is that in sampling studies the NNFI is sensitive to sampling error; therefore, the variance of NNFI can be considerably larger than the variance of NFI. As with the NFI, a NNFI of .90 or greater indicates a good fit.

The third criteria is called the comparative fit index (CFI). Bentler (1990) indicates that the CFI works well at all sample sizes and is more stable than the NNFI because the CFI is less sensitive to sampling error. Consequently, the CFI is often used as the key goodness of fit index in structural equation models. Possible CFI values also range from a low of 0 to a high of 1. According to Bentler, a CFI of .90 indicates a good fitting model.

Hypothesis 1

The first hypothesis predicts positive relationships between the antecedent variables and desired participation (see Figure 1, panel A). Specifically, the four parts of hypothesis one posit significant associations between user involvement and user attitude (H1a), user involvement and desired participation (H1b), user attitude and desired participation (H1c), and user self-efficacy and desired participation (H1d). The unit of analysis for the first hypothesis is at the individual level (n = 516), since no experimental treatments had been administered at the time subjects responded to the pre-experiment survey instrument.

EQS results provide standardized path coefficients and related significance levels (p-values based on t statistics). Initially, all possible paths on research model 1a were tested and goodness of fit indices were obtained as follow: NFI = .792, NNFI = .826, and CFI = .811. All indices were below the recommended threshold of .90. The paths between user self-efficacy and user attitude (path coefficient = .02, p-value = .5426) and user self-efficacy and user involvement (path coefficient = .04, p-value = .4177) were not significant. These two paths were subsequently dropped from the model and the EQS program was re-executed. The resulting model, including all hypothesized paths, is depicted in Figure 2.

The goodness of fit indices of the model shown in Figure 2 all exceed the recommended benchmark of .90 (NFI = .938, NNFI = .954, and CFI = .941). Accordingly, the data appear to adequately fit the model. For purposes of assessing the reliability of survey items to represent their underlying constructs, the EQS model was designed to determine the significance of paths between the survey items and model constructs. To accomplish this, EQS uses factor analysis to determine path coefficients and significance levels. All survey items loaded high on their respective factors, as the
Notes:
1. Pre-experiment survey responses (n = 516) are used in the EQS model.
2. UI-Rx = User Involvement – Relevance, UI-Ix = User involvement – Importance
   UAx = User Attitude, SEx = Self-Efficacy, DPx = Desired Participation, where x = survey item number shown in Appendix B.
3. Standardized coefficients are shown along paths.
4. Path significance levels are as follow: a < .001, b < .01, c < .05.
5. EQS uses factor analysis to calculate the path coefficients from survey items into constructs.

Figure 2. Results of EQS Structural Equation Modeling on Research Model 1a
lowest standardized path coefficient was .85 and all paths were significant at p-value < .001. Hence, the survey items appear to be reliable.

Paths among model constructs are all significant at p-value < .001. The standardized path coefficients are as follows: user involvement and user attitude equal .21 (H1a), user involvement and desired participation equal .53 (H1b), user attitude and desired participation equal .42 (H1c), and user self-efficacy and desired participation equal .31 (H1d). Based on EQS results, the first set of hypotheses are supported.

Hypotheses 2 and 3

Due to interactions between subjects in the instrumental voice participation hands-on meetings and in the non-instrumental voice participation orientation meetings, there was a lack of independence between individual subjects at field locations. Therefore, the unit of comparison for testing hypotheses two and three is the group level (i.e., field location) and the sample sizes are as follows: instrumental voice (n = 51), non-instrumental voice (n = 56), and no voice (n = 55). The theoretical model developed by Hartwick and Barki represents how user participation and involvement affects individuals; yet, changes in group means are reported here. It is recognized that an individual's beliefs, attitudes, and behavior likely do not completely correspond to the group mean.

Comparisons between pre- and post-experiment beliefs, attitudes, and performance were analyzed using group gain scores. To obtain gain scores, the research first calculated mean user involvement and user attitude indices by field location using individual pre- and post-experiment survey responses. Next, each group's mean post-experiment index was subtracted from its mean pre-experiment index to obtain a gain score. Group gain scores are used as independent observations in statistical testing for the second and third hypotheses. Shown in Table 2 are the pre-experiment mean responses (panel A), post-experiment mean responses (panel B), and gain scores (panel C) for user involvement and user attitude.

Regarding the performance measure (percentage of late vendor payments), it was not possible to specifically identify late vendor payments with individual accounting clerks. However, it was possible to record late vendor payment percentages by field office during each experimental month. Objective measures of performance gain scores are reported in Table 2, panel C. In this study, performance gain scores represent the difference between post- and pre-experiment late vendor payment percentages at each field location. As requested by agency management, the actual late payment percentages for the pre- and post-experiment periods are not shown.

EQS and ANOVA models were used to test the second and third hypotheses. Group gain scores were used as inputs for EQS and ANOVA calculations. EQS model results are shown in Figure 3. The data appear to adequately fit the model, as two of the three goodness of fit indices exceed the recommended level of .90 (NFI = .892, NNFI = .922, and CFI = .914). EQS standardized path coefficients and ANOVA results are next discussed with respect to the hypotheses.

Hypothesis 2: The second hypothesis predicts a significant association between user involvement and user attitude gains (H2a) and posits increases in user involvement (H2b) and user attitude (H2c) gains as the participation treatment moves from no voice to non-instrumental voice to instrumental voice. As anticipated, the path between user involvement and user attitude gains (.18) is significant (p-value < .01). The standardized path coefficient (p-value) between participation and user involvement gains is .42 (< .001) and the path between participation and user attitude gains is .20 (< .01). These significant, positive paths are consistent with a priori expectations. To further investigate changes in gain scores across treatment conditions, ANOVA was used and the results are presented in Table 3.
Table 2. Descriptive Statistics and Gain Scores

Panel A: Response means from pre-experiment survey

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrumental Voice</th>
<th>Non-Instrumental Voice</th>
<th>No Voice</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Involvement</td>
<td>4.06</td>
<td>4.04</td>
<td>4.28</td>
<td>4.13</td>
</tr>
<tr>
<td>User Attitude</td>
<td>4.81</td>
<td>5.02</td>
<td>4.79</td>
<td>4.67</td>
</tr>
</tbody>
</table>

Panel B: Response means from post-experiment survey

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrumental Voice</th>
<th>Non-Instrumental Voice</th>
<th>No Voice</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Involvement</td>
<td>5.31</td>
<td>4.52</td>
<td>4.32</td>
<td>4.72</td>
</tr>
<tr>
<td>User Attitude</td>
<td>6.07</td>
<td>5.61</td>
<td>3.95</td>
<td>5.21</td>
</tr>
</tbody>
</table>

Panel C: Gain scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrumental Voice</th>
<th>Non-Instrumental Voice</th>
<th>No Voice</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Involvement</td>
<td>+ 1.25</td>
<td>+ 0.48</td>
<td>+ 0.04</td>
<td>+ 0.59</td>
</tr>
<tr>
<td>User Attitude</td>
<td>+ 1.26</td>
<td>+ 0.59</td>
<td>- 0.84</td>
<td>+ 0.34</td>
</tr>
<tr>
<td>Performance*</td>
<td>+ 0.0586</td>
<td>+ 0.0470</td>
<td>+ 0.0472</td>
<td>+ 0.0508</td>
</tr>
</tbody>
</table>

*Performance gains were calculated as follows:

\[
\text{SUM} \left[ \text{Late Vendor Payments} \right]_{(t-6 \text{ through } t-1)} \text{ minus } \text{SUM} \left[ \text{Total Vendor Payments} \right]_{(t-6 \text{ through } t-1)} \text{ minus } \text{SUM} \left[ \text{Late Vendor Payments} \right]_{(t+4 \text{ through } t+9)} \text{ minus } \text{SUM} \left[ \text{Total Vendor Payments} \right]_{(t+4 \text{ through } t+9)}
\]

Months \( t-1 \) through \( t+3 \) were considered learning curve periods. Agency management asked the researchers not to reveal actual late-pay violation percentages. Accordingly, only the difference between post- and pre-experiment late-pay violation rates are shown.

As with the EQS model, mean gain scores by field location were used as dependent variables in the ANOVA models. This provides a conservative test of differences since the variance among individuals at field locations is averaged.

Table 3, panel A presents the results of testing hypothesis H2b. The overall model is statistically significant (p-value = .0013), mean gain scores are significantly different across treatment conditions (\( \alpha = .05 \)), and the direction of gain scores is consistent with the hypothesis. Table 3, panel B shows the results of testing hypothesis H2c. The ANOVA model is significant (p-value < .0001), treatment means are significantly different from one another (\( \alpha = .01 \)), and mean gain scores are directionally consistent with predictions. Based on the combined results of the EQS and ANOVA models, hypothesis two is supported.

Hypothesis 3: The first two parts of the final hypothesis predict positive associations between user involvement and performance (H3a) and user attitude and performance (H3b). EQS model results show a significant involvement-performance path (standardized coefficient = .16, p-value < .01) and a significant attitude-performance path (standardized coefficient = .11, p-value < .05). As anticipated, the attitude-performance link is statistically significant, yet relatively weak. Accordingly, hypotheses H3a and H3b are supported.
Notes:
1. Pre-experiment minus post-experiment gain scores (n = 162) are used in the EQS model.
2. UI-Rx = User Involvement – Relevance, UI-Ix = User Involvement – Importance
   UAx = User Attitude, where x = survey item number shown in Appendices B and C.
3. Standardized coefficients are shown along paths.
4. Path significance levels are as follow: a < .001, b < .01, c < .05.
5. EQS uses factor analysis to calculate the path coefficients from gain scores into constructs.
7. Model chi-square, degrees of freedom, p-value = 230.16, 84, < .0001.
8. The participation condition variable was treated as an ordinal scale, where 9 = no voice,
1 = non-instrumental voice, and 2 = instrumental voice.

Figure 3. Results of EQS Structural Equation Modeling on Research Model 1b

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Table 3. Supplemental Analyses of H2b, H2c, and H3c

Panel A: H2b—ANOVA model results on user involvement gain scores

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>D.F.</th>
<th>Sum-Squares</th>
<th>Mean-Square</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation Treatment</td>
<td>2</td>
<td>40.68</td>
<td>20.34</td>
<td>6.94</td>
<td>.0013</td>
</tr>
<tr>
<td>Error</td>
<td>159</td>
<td>465.96</td>
<td>2.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>161</td>
<td>506.64</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scheffe’s Pairwise Comparison of Mean Gain Scores [means with the same (different) superscript(s) are not (are) significantly different from one another at $\alpha = .05$].

- Instrumental Voice: $+1.26^a$
- Non-instrumental Voice: $+0.47^b$
- No Voice: $+0.03^c$

Panel B: H2c—ANOVA model results on user attitude gain scores

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>D.F.</th>
<th>Sum-Squares</th>
<th>Mean-Square</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation Treatment</td>
<td>2</td>
<td>126.74</td>
<td>63.67</td>
<td>12.18</td>
<td>.0001</td>
</tr>
<tr>
<td>Error</td>
<td>159</td>
<td>790.53</td>
<td>4.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>161</td>
<td>917.27</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scheffe’s Pairwise Comparison of Mean Gain Scores [means with the same (different) superscript(s) are not (are) significantly different from one another at $\alpha = .01$].

- Instrumental Voice: $+1.26^a$
- Non-instrumental Voice: $+0.59^b$
- No Voice: $-0.84^c$

Panel C: H3c—ANOVA model results on performance gain scores

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>D.F.</th>
<th>Sum-Squares</th>
<th>Mean-Square</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation Treatment</td>
<td>2</td>
<td>.00466</td>
<td>.00233</td>
<td>14.06</td>
<td>.0001</td>
</tr>
<tr>
<td>Error</td>
<td>159</td>
<td>.02632</td>
<td>.00017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>161</td>
<td>.03098</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scheffe’s Pairwise Comparison of Mean Gain Scores [means with the same (different) superscript(s) are not (are) significantly different from one another at $\alpha = .01$].

- Instrumental Voice: $+.0586^a$
- Non-instrumental Voice: $+.0470^b$
- No Voice: $+.0472^b$

H3c predicted increasing performance gains across the no voice, non-instrumental voice, and instrumental voice treatment conditions. Agency management asked the researchers not to reveal the actual pre- or post-experiment vendor payment violation rates. Accordingly, only performance gains (i.e., pre- minus post-experiment violation rates) are shown. Figure 4 depicts monthly performance gains by treatment condition, using the following formula:
User Participation

SUM [Late Vendor Payments (t-6 through t-1)]

SUM [Total Vendor Payments (t-6 through t-1)]

minus

Late Vendor Payments (t+x)  
Total Vendor Payments (t+x)

where x = experimental months 1 through 9

Months labeled t+1, t+2, and t+3 reflect the first three months of system operation. These three months were considered learning curve periods since the gains had not settled into a discernible pattern until t+4, as evidenced in Figure 4.

The dependent variable for hypothesis testing was obtained by subtracting the mean six month (t.6 to t.1) pre-experiment late pay violation rate from the mean six month (t+4 to t+9) post-experiment rate for each field office using the following formula:

SUM [Late Vendor Payments (t-6 through t-1)]

SUM [Total Vendor Payments (t-6 through t-1)]

minus

SUM [Late Vendor Payments (t+4 through t+9)]

SUM [Total Vendor Payments (t+4 through t+9)]

EQT model results, shown in Figure 3, reveal a significant path between the participation treatment and user performance (standardized coefficient = .31, p-value < .0001). Additionally, ANOVA was used to examine mean gain score differences among experimental treatment conditions. The results are shown in Table 3, panel C. The overall ANOVA model was significant at p-value ≤ .001. The highest gain was in the instrumental voice condition (+.0586), followed by the no voice (+.0472) and non-instrumental voice (+.0470) treatments. All conditions experienced positive performance gains, presumably due to an improved expenditure cycle application; however, the gain in the instrumental voice participation condition was significantly higher than in the other two conditions. While the performance gain in the non-instrumental condition was expected to be significantly higher than the no voice condition, ANOVA results do not support this proposition. As a result of hypothesis testing, H3c was partially supported.

Discussion

In this study, the efficacy of hands-on participation by accounting clerical personnel in the process of developing an accounting application was examined. The field experiment involved administering pre- and post-experiment surveys, manipulating participation at three increasing levels (instrumental voice, non-instrumental voice, and no voice), and monitoring performance data for 15 months. Three psychological antecedent factors were measured: user involvement with the present IS, user attitude toward the present IS, and user self-efficacy beliefs regarding perceived ability to effectively contribute during the IS development process. All three antecedents were significantly associated with the user desire to engage in systems development activities. After the system was implemented, a post-experiment survey assessed user involvement with and attitude toward the new IS.

Mean gain scores (post- minus pre-experiment responses) for user involvement and user attitude were highest in the instrumental voice participation condition, followed by the non-instrumental voice condition, and lowest in the no voice condition. The gain in user performance (i.e., change in percentage of late vendor payments) was significantly highest in the instrumental voice participation condition, while performance gains in the non-instrumental voice and no voice participation conditions were not significantly different from each other.

This study enhances the Hartwick and Barki model of user participation and involvement by integrating theory from self-efficacy (Bandura 1986) and procedural justice (Hunton 1996, forthcoming; Lind and Tyler 1988; Thibaut and Walker 1975) into the research framework.
Research findings support the Hartwick and Barki model of user participation and involvement. Additionally, results suggest that participation by mandatory users in systems development activities may be more effective than Hartwick and Barki conclude.

Hartwick and Barki (p. 458) state the following: "Thus, for mandatory users, user participation and involvement would seem unimportant." They arrive at this conclusion because their data showed that, for mandatory users, there is no significant relationship between user participation, user involvement, user attitude, and intention to use the system. The primary reason behind their assertion is that mandatory users may not have felt a sense of overall responsibility for the newly developed IS because their participation was directed, limited, and controlled by their superiors. However, Hartwick and Barki recognize the importance of mandatory users in the development process and call for more research in this area.

In our study, the accounting clerks were mandatory users and the nature and degree of their participation was established by their superiors. Yet, significant gains in user involvement, user attitude, and performance were found. There could be several explanations for the differences found in this study as compared to the Hartwick and Barki research. For example, study participants, contextual factors, and research methods were not the same. However, there may be a common thread between these two studies.

Hartwick and Barki conclude that mandatory users in their sample did not feel a sense of overall responsibility for the proposed IS. In
the current study, subject perception of control over the newly developed IS was manipulated and measured and this concept of control is similar to Hartwick and Barki’s notion of overall responsibility. Assuming that these two constructs are somewhat comparable, the results here reveal that participation by mandatory users is important if the participation strategy is implemented in such a way that users recognize the instrumentality of their participative input on the resulting IS. Hence, Hartwick and Barki are correct in concluding that participation by mandatory users may be ineffective, particularly if the users do not gain a sense of overall responsibility (i.e., control). The results of the current study support this assertion, as a positive relationship was found between control perceptions and consequential beliefs, attitudes, and behavior.

The current study predicted that the non-instrumental voice manipulation would result in improved user involvement, attitude, and performance. While the first two propositions are supported, the latter is not. That is, performance gains between the non-instrumental and no voice treatment conditions are not significantly different. One explanation for the lack of a performance effect between these two conditions could be the way in which non-instrumental voice was manipulated in this study. Hunton and Price indicate that the exercise of non-instrumental voice can evoke perceptions of illusory control. In fact, subjects in this study indicated a higher level of perceived control than did subjects in the no voice condition. However, Hunton and Price emphasize that the impact of non-instrumental voice is strongest when such voice is expressed throughout the decision process and users believe they actually participated in the development process.

In this study, the non-instrumental voice treatment was administered after the IS had been developed. When subjects were asked the extent to which they participated in hands-on activities, mean responses across the non-instrumental voice groups were relatively low since they did not express their voice throughout the entire development process. Consequently, for subjects in the non-instrumental voice condition, an incongruent situation exists where control perceptions are elevated but participation perceptions are not. Therefore, it is likely that the one-time expression of non-instrumental voice dampened its potential effect and that increased control perceptions were not strong enough to evoke significant performance differences.

There are some limitations to this research. External validity of study findings may be somewhat limited since this research was restricted to a single state agency and cultural and other contextual factors specific to this organization may constrain generalizability. There is a possibility that training in group effectiveness for subjects in the instrumental voice condition may be confounding the results to some extent. Mean group differences in pre- to post-experiment assessments of user involvement and attitude were examined. Changes in individual responses due to an independence problem were not examined. Hence, it cannot be said that individuals will react to the experimental manipulations in the same way as did the groups as a whole. Objective performance data from each field office were collected, but it was not possible to identify performance criteria to individuals within each field office; accordingly, the performance measure impounds various effects inherent with personnel turnover.

Future research in user participation should continue to test and elaborate the framework presented in this study. In particular, it would be interesting to provide users with non-instrumental voice opportunities throughout the development process to determine the behavioral impact. Also, one could examine the effect of providing various levels of user control at different phases of the systems development life cycle, such as planning, analysis, design, and implementation. Another fruitful area for future research would be to examine group decision processes and techniques in an effort to maximize group contributions in developing accounting and management information systems. In particular, researchers could study process gains and losses inherent in group decision making to determine whether group participation strategies demon-
strate significant gains as compared to individual strategies.

There are three broad managerial implications that can be drawn from this study. First, an important antecedent condition leading to a successful participation strategy seems to be the user's desire to participate in the development process. User involvement is a key factor influencing desired participation. Post-development cognitive, affective, and motivational factors can be optimized by providing meaningful participation opportunities to users who deem the IS to be personally relevant and important. Second, even in situations where user involvement is relatively high, low self-efficacy perceptions may inhibit the user's desire to participate in development activities. It is interesting to note that unless and until affected parties engage in participation activities, self-efficacy perceptions are unlikely to change. Hence, managers should provide users with opportunities to participate in IS development activities, especially where the users are likely to judge the experience as successful. In this manner, experientially enhanced self-efficacy perceptions should increase the user's level of desire to participate in subsequent IS development projects. The final, and perhaps most important, message from this research is that user participation in developing information systems may revolve around one core issue: user control. It appears as though a successful participation strategy is one that maximizes the user's instrumental control over the proposed system. The appropriate participation strategy to employ is contingent on many factors, including the IS context, organizational constraints, and resources limitations. Judiciously selecting a participation strategy that best provides users with a sense of overall responsibility and system ownership is a key IS success factor.

References


Doll, W. J., and Torkzadeh, G. "A Discrepancy Model of End-User Computing Par-
User Participation


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Appendix A

Consensual Conflict Resolution (CCR) Instructions
(Hall and Watson 1970; Innami 1994)

The CCR instructions were provided to all team members to increase the reasoning and decrease the positional orientation of group verbal behavior. Team leaders were requested to continually refer team members to the CCR instructions throughout deliberations.

1. Present your position as lucidly and logically as possible.

2. Avoid “win-lose” stalemates in the discussion.

3. Avoid changing your mind only to avoid conflict and to reach agreement and harmony. Withstand pressures to yield.

4. Avoid conflict-reducing techniques such as majority voting, averaging, bargaining, coin flipping, and the like. If you do not understand an issue or you desire additional discussion, press for additional sharing of information.

5. View differences of opinion as both natural and helpful rather than as a hindrance in decision making.

6. View initial agreement as suspect. Explore the reasons underlying apparent agreements.
Appendix B

Pretest Instrument Administered at Beginning of Month t≤10

Introductory Statement: Thank you for participating in this survey. Agency management is genuinely interested in your answers to the following statements/questions. Your answers will become a critical part of the planning process regarding the development of a new expenditure cycle application for the agency. We ask you not to write your name on this survey, as your responses will be completely anonymous. Your specific responses will not be revealed, rather responses from all participants in this survey will be averaged. You are encouraged to be completely open and honest in your answers.

User Involvement (Barki and Hartwick 1994): The following items used a seven-point, bipolar scale. The first set of five items represents the importance subscale of involvement. The second set of four items represents the personal relevance subscale of involvement.

Please circle the answer that best describes your beliefs toward the existing expenditure cycle application used at your field office. I believe the current expenditure cycle application is:

1.* 1 = Nonessential          7 = Essential
2.   1 = Trivial               7 = Fundamental
3.* 1 = Insignificant         7 = Significant
4.* 1 = Unimportant           7 = Important
5.   1 = Not Needed            7 = Needed
1.   1 = Irrelevant to me      7 = Relevant to me
2.   1 = Of no concern to me   7 = Of concern to me
3.* 1 = Doesn’t matter to me   7 = Matters to me
4.   1 = Means nothing to me   7 = Means a lot to me

*These items were reverse-scored in the survey instrument.

User Attitude (Barki and Hartwick 1994): The following items used a seven-point, bipolar scale.

Please circle the answer that best describes your attitude toward the existing expenditure cycle application used at your field office. I believe the current expenditure cycle application is:

1.* 1 = Useless               7 = Useful
2.* 1 = Bad                   7 = Good
3.  1 = Worthless             7 = Valuable
4.  1 = Terrible              7 = Terrific

*These items were reverse-scored in the survey instrument.
User Participation

User Self-Efficacy (Bandura 1986; Hunton forthcoming): The following items used a seven-point, bipolar scale.

If you were allowed to participate in developing accounting and management information systems applications, to what extent do you believe you could effectively contribute in the following areas:

1. Defining report formats (1 = Not at all, 4 = Much, 7 = A great deal)
2. Defining screen layouts (1 = Not at all, 4 = Much, 7 = A great deal)
3. Defining input and output forms (1 = Not at all, 4 = Much, 7 = A great deal)
4. Creating user procedural manuals (1 = Not at all, 4 = Much, 7 = A great deal)

*These items were reverse-scored in the survey instrument.

Desired Participation (Barki and Hartwick 1994; Doll and Torkzadeh 1989): The following items used a seven-point, bipolar scale with a mid-point reference.

As the new expenditure cycle application is being developed, to what extent do you desire to participate in each of the following activities:

1. Defining report formats (1 = Not at all, 4 = Much, 7 = A great deal)
2. Defining screen layouts (1 = Not at all, 4 = Much, 7 = A great deal)
3. Defining input and output forms (1 = Not at all, 4 = Much, 7 = A great deal)
4. Creating user procedural manuals (1 = Not at all, 4 = Much, 7 = A great deal)

*This item was reverse-scored in the survey instrument.

Demographic Questions:

Please indicate your age. ______

Please indicate your gender ______ (Female) ______ (Male)

What is the highest year of education you have completed? ______

How many years experience do you have working in the field of accounting? ______

How many years have you worked for this state agency? ______
Appendix C
Post-Test Instrument Administered at the End of Month $t_{+6}$

Introductory Statement: Thank you for participating in this survey. Agency management is genuinely interested in your answers to the following statements/questions. Your answers will become a critical part of the planning process for future development of new accounting and management information systems applications throughout the agency. We ask you not to write your name on this survey, as your responses will be completely anonymous. Your specific responses will not be revealed, rather responses from all participants in this survey will be averaged. You are encouraged to be completely open and honest in your answers.

User Involvement (Barki and Hartwick 1994):
Please circle the answer that best describes your beliefs toward the recently developed expenditure cycle application used at your field office. I believe the new expenditure cycle application is:

Reader Note: The same nine adjective pairs used in the pre-experiment questionnaire (see Appendix B) were also used in the post-experiment survey.

User Attitude (Barki and Hartwick 1994):
Please circle the answer that best describes your attitude toward the recently developed expenditure cycle application used at your field office. I believe the new expenditure cycle application is:

Reader Note: The same four adjective pairs used in the pre-experiment questionnaire (see Appendix B) were also used in the post-experiment survey.

Manipulation Checks:
1. Manipulation check for Instrumental Voice Participation (Barki and Hartwick 1994; Doll and Torkzadeh 1989):
   During the process of developing the new expenditure cycle application, to what extent did you actually participate in each of the following activities:

   1. Defining report formats (1 = Not at all, 4 = Much, 7 = A great deal)
   2. * Defining screen layouts (1 = Not at all, 4 = Much, 7 = A great deal)
   3. Defining input and output forms (1 = Not at all, 4 = Much, 7 = A great deal)
   4. * Creating user procedural manuals (1 = Not at all, 4 = Much, 7 = A great deal)

   *These items were reverse-scored in the survey instrument.
2. Manipulation check for Perceived Control (Leventhal 1980):

To what extent do you feel you had personal control over the defining the following attributes of the new expenditure cycle application?

1. Report formats
2. * Screen layouts
3. Input and output forms
4. * User procedural manuals

(1 = Not at all, 4 = Much, 7 = A great deal)

3. Manipulation check for Non-Instrumental Voice Participation treatment condition:

Did you participate in a six-hour meeting called “Expenditure Cycle Application Orientation Meeting?” (Yes/No)

4. Manipulation check for Training manipulation administered to all users:

Did you participate in an eight-hour meeting called “Expenditure Cycle User Training Meeting?” (Yes/No)

5. Manipulation check administered to determine independence between treatments:

As far as I know, accounting clerks throughout the agency were not allowed to participate in the process of developing the new expenditure cycle application (1 = Agree, 4 = Not Sure, 7 = Disagree).

*These items were reverse-scored in the survey instrument.