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Abstract

This study presented two models of technology implementation set within the context of the multiple-agency SAP database unification endeavor initiated by the state of Pennsylvania. The individual-level model explored the influence of person characteristics (willingness to learn and openness to change) on implementation process attitudes and behaviors (implementation acceptance, and training quantity and quality), and on outcome variables (commitment to and satisfaction with technological change).

The second model proposed isomorphic relationships at the organization-level, also including adaptability and organizational learning culture inputs, and a measure of inter-agency information-exchange. Using structural equation modeling, willingness to learn and openness to change were associated with implementation attitudes toward training quality and implementation acceptance. These are two related process variables that strengthen the psychological implementation readiness. Training quality also predicted affective and normative commitment to technology change, as well as individual-level implementation satisfaction. Due to sample restrictions, hypothesis testing was used to measure organization-level variables and revealed a significant relationship between training quantity and continuance commitment to change. Archival training data, agency management interviews, and questionnaires assessing employees’ perceptions across various governmental agencies were used to test the proposed relationships.
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“I am a strong believer in luck and I find the harder I work the more I have of it.”

Benjamin Franklin (1706-1790)

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Chapter 1
Introduction

A recent announcement by the United States Postal Service to convert core business functions (i.e., human resources) into a web-based enterprise resource system (ERP) is becoming more common among organizations struggling to conserve costs and increase information accessibility (Songini, 2004). Likewise, the need for fast, efficient, and standardized information-sharing across geographically-distributed offices and governmental agencies is also a rising priority for state and national security, for which interoperability among government information systems is deemed “critical to winning the war on terrorism” (HR 1158, 2001). These mounting needs are increasingly being addressed through ERP systems, with the relative benefit of these systems measured in cost savings. Meanwhile, the expense of such implementations on individuals within organizations undergoing these technology changes has been relatively unexplored. The goal of this study is to analyze an ERP implementation as it affects individual employees---and the multiple organizations they represent---through the technology transition process in order to identify factors that contribute to successful implementation outcomes.

Recent literature cites a “paucity of systematic empirical research addressing the relationships between the cultural and technological aspects” of knowledge management systems, such as ERP technologies introduced into organizations for the purposes of information processing, storage, and coordination (Moffett, McAdam, & Parkinson, 2002, 237). Other calls from the government technology literature cite a “need to incorporate the individual’s motivation” in the understanding of government technology
transfers, as it is expected to play a different role from that of the profit-oriented corporate sector (Kremic, 2003, 157).

In response to the technology implementation literature that calls for research at different levels of analysis within the organizational context (McAfee, 2003; Pinsonneault & Rivard, 1998; Stock & McDermott, 2001), this study proposed two models, one at the individual-level and one at the organization-level, that investigated input characteristics (employee personality and organizational culture) in association with implementation process attitudes and training behaviors. These implementation processes were assessed to test hypothesized relationships with valuable multi-level outcomes, such as individual and organization-level commitment to the technology changes, implementation satisfaction, and increased inter-agency information-exchange. Theoretical and pragmatic contributions extending from the analysis of these two proposed models are discussed.

Organizations are multi-level systems by nature, and although a primary function of many information systems is to enable communication and information-exchange among disparate constituencies (e.g., geographically dispersed offices, partnered organizations, external clients, etc), much of the technology implementation literature measures implementation effectiveness within organizations only (intra-organizationally). Although the body of inter-organizational, multi-level research is growing, it is still young (Klein, Palmer, & Conn, 1997) and faces two shortcomings. Many studies fail to consider the effectiveness of systems in bridging contact with constituencies outside of the central organization or across different organizations (inter-organizationally), while others overlook the impact of individual behaviors and attitudes on technological
transitions. Several studies indicate the need for investigating the individual perspective of organizational change (Bray, 1994; Judge, Thorenson, Pucik, & Welbourne, 1999; Wanberg & Banas, 2000), including a meta-analysis calling for more “frequent and explicit attention [to individual behavior] as a dependent variable” (Robertson Roberts, Porras, 1993, 628).

Past theoretical work by Robertson et al., (1993) described the effect of organizational intervention activities (e.g., technology implementation) on organizational work-setting characteristics, and suggested direct influences on individual behaviors that predict organizational outcomes. In this study, the work behaviors of individuals within these organizations were almost all beneficially affected, except technology intervention activities, which had a negative impact on individual behaviors and no impact on organizational outcomes. The authors cite the variability in implementation time lags (time between implementation and measurement) and multiple types of technology as error sources in the meta-analytic findings (Robertson et al., 1993).

More recently, an integrated model of climate and culture depicted parallel processes that occur at individual and aggregate levels of analysis. This model identified background characteristics (e.g., employee demographics and environmental forces) that influence individual and unit-level values—values that in turn shape multi-level climate perspectives (Ostroff, Kinicki, & Tamkins, 2003). For both individuals and aggregates of individuals, climate influences attitudes and behavior that directly affect multi-level performance. The current study empirically measured select individual characteristics and organizational culture variables depicted in the Ostroff et al. (2003) model in order to provide another look at the impact of technology implementation on multi-level
outcomes. Correcting for limitations of previous studies, this research controlled for the type of technology and the effects of time lag.

**Information Technology**

The term “technology” is ubiquitously used to describe anything from a computer processor to a music compact disc. This study focused specifically on information technology, a critical lever that distinguishes industry competitors and inspires revolutionary organizational changes, and can be broadly defined as “[technology] dedicated to information storage, processing, and communications,” such as hardware, software, telecommunications, and office equipment that transforms and adds value to data (Lai & Mahapatra, 1997, p.1). Information technology includes both information systems (software platforms and databases), as well as communication media (Dewett & Jones, 2001).

The system of interest in this study was the procurement component of an enterprise resource system (ERP) called, SAP. The study’s focus is on the implementation of the SAP Procurement system across Pennsylvania’s government offices. As an information technology, the SAP Procurement system allows employees within government agencies to operate more efficiently by obtaining and sharing more accurate and essential information. This system speeds transaction processes, provides more accurate data, and reduces or eliminates redundancy by removing obstacles such as dealing with lots of paper, hours spent on the phone in obtaining information from others, having to get data access approval, and reconciling data from many sources. The SAP Procurement implementation was chosen as the focus of this study because of its broad impact, resulting in technology transitions across multiple government office. Also, the
system was considered drastically different from previous methods of conducting procurement, thus creating an interesting opportunity for studying reactions to change.

**Technology Implementation**

There are numerous models describing organizational transitions from traditional to technologically enhanced work environments, all of which include an implementation phase that is marked by the appearance of new equipment, devices, and programs in the workplace (Kwon & Zmud, 1987; Mankin, Bikson, & Gutek, 1985; Mirvis, Sales, & Hackett, 1989; Schreier, 1983; Thompson, Higgins, & Howell, 1994; Zmud & Apple, 1989). Research suggests that failed implementation is often the source of disappointing technological interventions; therefore, the implementation period can be considered the most crucial phase of the intervention process (Tyre & Orlikowski, 1999). According to the Mirvis et al. (1989) framework for technology innovation, work attitudes and training are two key factors that influence implementation success. Therefore, this study examines attitudes and training within the context of the work environment in order to better understand and predict desirable implementation outcomes.

Most attempts to introduce new technology into organizations meet their demise before they are fully implemented or very soon thereafter (Beatty, 1992; Blodgett, 1995; Dekkers & McQuaid, 2002; Galbraith, 1990; Griffith, Zammuto, & Aiman-Smith, 1999; Davenport, 1995; McDermott, 1987; Majchrzak, 1988). Although most planning and costs are devoted to technical aspects of an implementation, faulty technology is rarely the primary reason for failure (Bikson, 1987). The human-side of change management and technology adoption is frequently blamed (Klein, Sorra, & Conn, 2001).
Successful technology implementation is dependent upon proactive change management that addresses resistance and training needs. Top management must express support for the change and institute practices aligned to create a climate conducive to successful interventions (Klein, Sorra, & Conn, 2001). In this study, implementation processes thought to be conducive to technology interventions are investments toward building psychological acceptance of the new technology among employees and across agencies, and efforts aimed at teaching system-users required skills and knowledge through high quality training courses.

While the technology implementation literature is ripe with knowledge about factors important to successful implementation, it reveals few pragmatic tools senior management and systems analysts can apply that are specific and particular to an organization’s context and characteristics (McAfee, 2003). This study contributes to applied knowledge by examining input characteristics and implementation processes associated with successful outcomes in hopes that this knowledge can be used to help identify contextual factors that enhance and inhibit technology implementation in the workplace.

The Study Context: The SAP Procurement Multi-Agency Implementation

During the past few years, a number of Pennsylvania state administrative offices requested upgrades to their computer systems used for managing business functions. Rather than address these requests individually, it was determined that significant advantages could be gained by responding in a more coordinated fashion with long-range benefits. This idea became the Integrated Enterprise Systems (IES) (formerly known as, “ImaginePA”)—the state’s effort to streamline and standardize key business processes,
such as accounting, budgeting, payroll, human resources, and procurement. Five SAP ERP components were developed to integrate and serve each of these business processes and to advance the IES initiative.

The focus of this study is the SAP Procurement component that facilitates purchasing and requisitions across all agencies in the Commonwealth. The procurement module provided a unique perspective on technology implementation due to various features associated with the system and the impact of the change. For instance, compared to other SAP components being implemented, the procurement transition was significant because of its scale. SAP Procurement was implemented in numerous offices across all government agencies. In addition, the magnitude of difference between the new system and the legacy system (radicalness) was reported to be substantial. To this point, 95% of all organizations participating in this study rated the new SAP Procurement system as being “very different” from their previously used method of procurement.

Prior to SAP Procurement, the methods of conducting purchases and requisitions in agencies across the state were diverse. Some agencies used traditional paper-based processing, many others used a state-designed system of antiquated electronic spreadsheets, and one agency had an electronic procurement database that was relatively sophisticated, but it was not networked with other business components as SAP allows. For most agencies, the new SAP Procurement system introduced a medium for data entry, required the storage of more detailed information than was previously recorded, and provided greater access to procurement records and histories within and across agencies.
Not only did SAP Procurement introduce a speedier form of information processing and retrieval, it also changed the quality of the communicative interactions among agencies. Interfacing in a virtual work environment decreased the need for some personal interactions, and created a sense of work abstraction with elimination of more tangible hard-copy process markers, such as documents, records, receipts, and communication logs. All of these facets of SAP Procurement system made it a unique information technology to study.

Although the system was deemed a radical change for procurement processing, some aspects of procurement remained the same throughout the implementation, namely state procurement laws and the order with which work processes moved critical information from one part of the agency to another (i.e., chain of command). These things remained relatively constant, as did the intact agency networks that existed prior to the implementation. Those agencies with a history of collaborations, shared services, and/or partnerships continued to work together, independent of the system used to for executing procurement.

The development of the SAP Procurement system began in March 2001, and was implemented in six waves concluding July 2004 (Implementation Schedule, Appendix A). The system that was developed was uniform across all agencies, and allowed for very little customization. While this standardized processes and information across users, the designed system failed to address some agency-specific procurement needs. As a result, employees and agencies were forced to develop “quick-fix” solutions for system misspecifications.
The first implementation wave of the procurement module was introduced to 16 agencies in the summer of 2002. In preparation for the technological transition, agency procurement users initiated mandatory SAP Procurement training sessions one year prior to the first implementation wave. Neither the state government nor SAP, the system manufacturer, designed the training courses for this implementation. Rather, the design and instruction of the formal training program was contracted to a third-party, IBM. Throughout the interviews conducted for this study, this third-party association was cited as a problematic source for training, as IBM was thought to be unfamiliar with government procurement and the software for which it is was commissioned to develop training modules.

While formal training was mandatory across agencies, the enforcement of training requirements varied from agency to agency. Some viewed training as a critical step to successful implementation, while others deemed it a waste of time. As a result, formal training rates varied largely across agencies, but were fairly stable within agencies (e.g., individuals within agencies that enforced training had higher rates of training participation than individual whose agencies did not enforce training).

Another contextual issue that affected the implementation of the SAP procurement system was a change in gubernatorial leadership from the out-going Ridge-Schweiker administration, which initiated the IES effort, to the incoming Rendell administration. This change in leadership was thought to account for some of the implementation delays that affected agencies in the latter wave of transition. Leadership change was prevalent throughout the implementation of this system, affecting some agency structures across many state levels. The intent of this project is to shed light on the individual and
organizational (agency)-level changes associated with technology implementation. However, one cannot overlook the environmental influences from broader levels of analysis (i.e., the state) that introduce political, industrial, and economic forces operating on these models.

While all state agencies operate under the same administrative governances in service to the citizens of Pennsylvania, each agency has its own mission, structure, culture, and clientele. Therefore, in this study, “agency” is equated with the “organization.” Archival training data, interviews with agency management, and online questionnaires obtained from agency employees were all used to test proposed relationships.

**Individual-Level and Organization-Level Models**

Multi-level research on organizational change is relatively uncommon. While organizations operate as multi-level systems, the science of organizations often does not reflect this. More research is needed to synthesize and extend theoretical developments that bridge the gap between micro and macro studies, and to depict a more comprehensive and realistic look at structural forces on individuals within organizations, as well as individual influences on organizational structures (Kozlowski & Klein, 2000). This study advances the literature by introducing a multi-level perspective on technology change that focuses on characteristics, behaviors, and attitudes about technology implementation that exist within individuals, within the organizations to which they belong (intra-organizationally), as well as between organizations undergoing the same type of technology intervention (inter-organizationally).

Two models of technology implementation were presented in this study. The individual-level model introduced psychological antecedents to implementation that link
person characteristics to attitudes of technology acceptance and training. This model also
included measures of commitment to, and satisfaction with, the implementation (see
Figure 1). The second model was conceptualized at the organization-level and proposes
relationships among organizational culture inputs, implementation processes (climate
acceptance and training), and intra- and inter-organizational outcomes (commitment,
satisfaction, and increased information-exchange) (see Figure 2). The intent of these two
models was to show the influence of individual and organizational input characteristics
on implementation processes, which were hypothesized to predict intervention success.

There were two objectives for the statewide implementation: one was the smooth
and efficient use of SAP Procurement for information storage and retrieval within each
agency. With regard to this objective, the current study revealed organizational and
individual-level characteristics that contributed to a positive climate for implementation,
active training behaviors that facilitated the use of the new system, commitment to the
change effort, and satisfaction with the SAP Procurement implementation from an intra-
organizational perspective. The second objective of the SAP Procurement
implementation was to facilitate inter-agency information-exchange across multiple
agencies through the extension of collaborative networks operating among agencies, and
to increase the frequency with which data was exchanged across agencies. This study
contributed a multi-level perspective to the existing technology implementation literature
that included an inter-organizational measure of information-exchange, thereby
addressing expressed theoretical research needs (Griffith & Northcraft, 1996; Tornatzky,
1986).
Hypothesized Relationships

The framework for discussing the models’ constructs and relationships was based on Hackman’s (1987) Input-Process-Outcome (IPO) model of team processes and performance. The IPO framework was adapted here to describe the individual and organizational inputs and processes predicting intra- and inter-organizational effectiveness throughout the technology implementation process.

In this study, the input variables considered significant to the technology implementation process included relatively stable organizational characteristics (adaptability to change and organizational learning) and individual characteristics (openness to change and willingness to learn). The processes of interest in this study were the efforts devoted to preparing for implementation, such as skills training and psychological implementation acceptance. Outcomes were the final component in the IPO framework. The individual and intra-organizational outcome variables measured in this study included implementation satisfaction and commitment to the technological change, in addition to inter-agency information-exchange. According to Kremic (2003), the technology transfer process, when occurring in government agencies, is often an iterative process that involves a feedback loop that moves from process to outcome, then back to process again. The models proposed in the current study observed the technology transition phenomenon through a single iteration of the input, process, to outcome progression.

**Outcome: Inter-Agency Information-Exchange.** Despite the growing focus on inter-organizational relationship dynamics, the literature is deficient in revealing factors internal to organizations that affect the successful implementation of new business
strategies (Kothandaran & Wilson, 2000). In fact, much of the research that addresses group interactions and boundary spanning are analyzed at the unit level. Some of this research shows that frequent within-group communication and cooperation helps to build inter-unit relationships and inter-organizational effectiveness (Brown & Eisenhardt, 1995; Clark & Fujimoto, 1991; Kothandaran & Wilson, 2000). Increased inter-agency information-exchange is a measure of good communication and cooperation between agencies that is valuable to successful technology implementation. This study analyzed some input and process factors important to encouraging inter-agency information-exchange activities across agencies undergoing SAP Procurement implementation.

There are commonalities between the individual and organizational models. They include similar variables that are hypothesized to have a common pattern of relationships in both models. “Parallel processes linking different concepts that generalize to very different systems phenomena” are known as “homologies” (Kozlowski & Klein, 2000, 6). Although certain individual-level concepts have seemingly synonymous meanings and are measured using similar scales at the organization-level, changing the referent of the scale items from the individual (“I believe”) to represent the collective (“People in my agency believe”) yields responses that represent conceptually different phenomena. Variables and relationships that occurred in both the individual and organization models, and retained the same relationships with respect to each other, are described below.

**Outcome: Implementation Satisfaction.** Like many other large-scale organizational change efforts, successful technology implementation is affected by several organizational factors: management support, employee-participation, supporting organizational structures, and socialization about the value and use of the new technology
Sokol’s (1994) Adaptation to Difficult Designs framework identifies five factors that impact technology implementation from the organizational psychology perspective: management support, training, participation, feedback, and rewards. The degree to which organizations are able to successfully manage these five factors to support technology intervention is an estimation of implementation effectiveness within an organization.

User satisfaction is important because dissatisfaction can lead to a variety of negative individual and organizational outcomes: stress (Ettlie, 1986), work slowdowns or sabotage (Zuboff, 1984), and resistance to technology or non-use (Leonard-Barton & Deschamps, 1988). The linkage between these variables and other organizational outcomes is widely supported in the literature (Management: Bikson, 1984; Langer, 1983; Langer & Piper, 1987; Meyer, 1982; Moore, 2000; Pinsonneault & Rivard, 1998; Tyre and Orlikowski, 1994; Weick, 1990; Participation: Ginzberg, 1981; Hartwick, 1989; Ives, Olsen, & Baroudi, 1983; Lucas, 1997; Rewards: Blackburn & Rosen, 1993; Kane, 1992; Moore, 2000; Reich & Benbasat, 2000; Saraph, Bensen, & Schroeder, 1989; Shrednick, Shut, & Weiss, 1992; Feedback Checkland & Scholes, 1990; Ravichandran & Rai, 2000). Individual-level satisfaction and organization-level implementation satisfactions are conceptually similar, and therefore were expected to have similar relationships across levels.

**Outcome: Commitment to Technological Change.** The importance of organizational commitment has long been established in the literature and is shown to have an influence on a wide array of behavioral and organizational outcomes ranging from job satisfaction, absenteeism, organizational citizenship and retributive behaviors
Organizational commitment is conceptualized as a psychological state that increases the likelihood that an employee will maintain membership in an organization. More recent literature has adapted Meyer & Allen’s (1991) widely accepted three-component model of organization commitment toward a model that explains commitment to organizational change (Herscovitch & Meyer, 2002). This model defined commitment to organizational change as the mind-set that binds an individual to a course of action deemed necessary for the successful implementation of a change initiative. In the case of technology implementation, commitment to change would bind individual behaviors to the desired outcomes sought by the organization through this particular technology intervention.

The three components of commitment to technological change include affective commitment (the desire to change), normative commitment (perceived obligation to change), and continuance commitment (the perceived costs or incentives to change). Each has demonstrated differential ability to predict behavioral support for change, and affective commitment and continuance commitment have shown to predict attitudinal compliance with organizational changes (Herscovitch & Meyer, 2002).

Commitment to change is a relatively new construct. Prior to this study, it had not been explored in the context of technological change and had largely been measured at the individual level. This study broadened the commitment to change literature by studying its emergence in the context of technological implementation, and explored commitment as both an individual and organization-level construct. This study proposed that affective, normative, and continuance commitments would accelerate the technology initiative by enhancing implementation satisfaction. Research shows that when an
individual is highly committed to an organizational change, they are more compliant and cooperative with the change initiative (Herscovitch & Meyer, 2002). A strong desire to see a technological change occur could lead one to make more positive assessments of the implementation process by selectively focusing on the benefits of the system. For this reason, as affective commitment increases, implementation satisfaction was expected to increase as well.

Individuals who are committed to technological change out of loyalty to others involved in the organizational intervention (e.g., a sense of doing one’s part to advance the goals of the collective) were also hypothesized to report greater satisfaction with the implementation. It was expected that these individuals might focus on the positive aspects of the intervention with hopes that the new system would have a positive impact on the organization. Conversely, individuals who committed to the change for instrumental reasons, or for fear of the consequences associated with resisting the change, were expected to have more negative attitudes about the implementation. Although hoping for positive implementation benefits, these people are expected to judge the intervention more critically than someone with less instrumental interest in the intervention.

**H1a:** Employees who report higher levels of affective and normative commitment to technological change will report more satisfaction with the implementation effort than employees who express lower levels of affective and normative commitment to technological change. Employees who report higher levels of continuance commitment to technological change will report less satisfaction with the
implementation effort than employees who express lower levels of normative commitment to technological change.

At the organization level, the commitment variable functioned similarly to that of the individual-level model, therefore a similar pattern of relationships were expected. Organizational commitment to technology change binds the organization to achieve desired outcomes sought by the technology intervention. One meta-analysis shows that openness to the organizational change is positively correlated with commitment and job satisfaction (Judge et al., 1999). As with the relationships proposed in the individual-model, affective and normative forms of commitment were hypothesized to accelerate the technology initiative by enhancing implementation satisfaction in agencies, while continuance commitment was thought to diminish satisfaction.

In addition, strong commitment to technological change was expected to motivate employees toward greater inter-agency information-exchange behaviors. Karahanna, Straub, and Chervany (2000) have shown that motivation to use new technology is particularly strong when the system has perceived utility and is an instrumental interest to the individual—a belief related to continuance commitment. Therefore, positive relationships between affective and normative commitment to technological change and inter-agency information-exchange behaviors were anticipated.

H1b: Agencies whose employees report higher levels of affective and normative commitment to technological change will report more satisfaction with the implementation effort than agencies whose employees express lower levels of affective commitment to technological change. Agencies whose employees report higher levels of continuance commitment to technological change will report less
satisfaction with the implementation effort than agencies whose employees expressed lower levels of continuance commitment.

Agencies where individuals are committed to the technological change for reasons of loyalty to the membership and belief in the need for change are hypothesized to report more system use in order to gain the full benefits of the new technology. Likewise, agencies whose employees are committed for continuance reasons are more likely to engage in inter-agency information-exchange behaviors out of compliance with managerial and organizational objectives.

**H1c: Agencies whose employees report higher levels of affective, normative, and continuance commitment to technological change are expected to report more inter-agency information-exchange behaviors than agencies whose employees express lower levels of affective, normative, and continuance commitment to technological change.**

**Process: Implementation Acceptance & Implementation Climate.** In this study, the characterization of organizational cultures and individuals as adaptable to change and willing to learn was expected to support conditions for implementation. An organization prepared for technology intervention should gain support for the implementation among its constituents and should provide adequate knowledge and skills training to support the implementation. In this study, these elements of implementation acceptance and formal training participation are expected to be direct predictors of commitment to technological change and implementation satisfaction.

Hofmann and Stetzer (1996) suggest that organizational climate develops as “individuals attach meanings to and interpret the environment within which they work.
These meanings and perceptions then influence the way in which individuals behave within the organization through their attitudes, norms, and perceptions of behavior-outcome contingencies” (p. 314). It is believed that attitudes about technology can create an acceptance for technological change that can be expected to influence other individual attitudes, climate attitudes, and technology-related training behaviors.

At the individual level, people who are less accepting of organizational change initiatives report increased intentions to quit and less job satisfaction (Wanberg & Banas, 2000). Negative attitudes toward change have been associated with lower job satisfaction and commitment (Schweiger & DeNisi, 1991). Conversely, openness to organizational change is positively correlated with organization commitment and satisfaction (Judge et al., 1999). Accepting attitudes toward implementation could indicate some agreement with the mission and/or values established as the reason for implementing the new system. Agreement with these values could lead to support for the implementation process based on the desire for the change to occur (affective commitment), the belief that the system will provide a better working environment for oneself (continuance commitment), and other members of the organization (normative commitment). Therefore, it is expected that individuals who are accepting of the implementation would also report more commitment to and satisfaction with the organizational change initiative.

**H2a:** Employees reporting more implementation acceptance are expected to indicate higher levels of affective, normative, and continuance commitment to the technological change than those employees reporting less implementation acceptance.
**H2b:** Employees reporting more implementation acceptance are expected to indicate higher levels of implementation satisfaction than those employees reporting less implementation acceptance.

An individual-level attitude of support and acceptance of technology implementation is known as, implementation acceptance. This same attitude shared across members of an organization and conceptualized at the organization-level is called, implementation climate. Implementation acceptance and implementation climate are homologous variables that, while bearing similar relationship patterns across models, are conceptually distinct and exist as phenomena in different systems (Kozlowski & Klein, 2000). Recent studies have used culture and climate variables, such as innovation climate, to predict organizational commitment (Glisson & James, 2002; Gonzalez-Roma, Peiro, & Tordera, 2002). These studies show that employees who are accepting of technology initiatives create a positive climate for implementation. When the mission of the change initiative is aligned with the values of the organization, an accepting climate for implementation is likely to be correlated with affective commitment to change.

Studies also support the idea that social norms greatly affect users’ intentions to integrate the technology (Thompson et al., 1994). When the group norm is to support the technology implementation, commitment is likely to develop out of the shared goals and loyalty to other employees within the organization undergoing the same implementation. Supportive relationships among employees can promote normative organizational commitment because employees can feel a sense of belonging that contributes to fulfilling their affiliation and social needs (O’Reilly & Chatman, 1986; Ostroff & Bowen, 2000). Agencies whose employees are accepting of a new technology are likely to
perceive potential benefits resulting from the implementation; therefore, a positive correlation is expected between continuance commitment and implementation acceptance. In sum, at the organization-level, implementation climate was hypothesized to correlate with affective, normative, and continuance commitment to the technological changes.

In addition to shaping employees’ intent to use new technology, positive implementation attitudes within organizations also encourage training behaviors (Klein et al., 2001). Therefore, positive climate for implementation was anticipated to predict formal training participation. In addition to formal training quantity, it is believed that positive implementation climate would motivate employees to learn the new technology, therefore maximizing the learning opportunity training provides. Therefore, positive climate for implementation was also expected to correlate with higher training quality ratings. Organizations that value technology implementation and have climates that support implementation were expected to be more pro-active in preparing for the change than organizations that were less supportive of the implementation initiative.

**H2c:** Employees reporting more implementation acceptance are expected to participate in greater quantities of formal training than those employees reporting less implementation acceptance.

**H2d:** Employees reporting more implementation acceptance are expected to report higher formal quality ratings than those employees reporting less implementation acceptance.
H2e: Agencies characterized as having a more positive implementation climate are expected to participate in greater quantities of formal training than those agencies reporting a less positive implementation climate.

H2f: Agencies characterized as having a more positive implementation climate are expected to report higher formal training quality ratings than those agencies reporting a less positive implementation climate.

H2g: Agencies characterized as having a more positive implementation climate are expected to indicate higher levels of implementation satisfaction than those agencies reporting a less positive implementation climate.

H2h: Agencies characterized as having a more positive implementation climate are expected to indicate higher levels of affective, normative, and continuance commitment to technological change than those agencies reporting a less positive implementation climate.

Process: Formal Training Quantity and Quality. Information technology training programs commonly accompany innovative implementations. To understand the relationship between learning and technology implementation, some studies have analyzed the influence of training quality (Aiman-Smith & Green, 2002), formal vs. informal training methods (Leonard-Barton, 1990), experiential vs. operational learning models (Kolb, 1984), and learning orientation (Schilling, 2002). This study attempted to link learning culture to formal training quantity and quality in effort to predict relationships with implementation acceptance and commitment to technological change.

Although the motivation for organizations to invest in technological upgrades is often financially driven, the factors that motivate people to use the equipment is
determined by the amount of experience individuals have using new technologies (Karahanna et al., 1999). Studies suggest that exposure to and experience with computers is related to positive technology attitudes and decreased stress (Hudiburg, 1989). Training facilitates technology interventions by eliminating two risk factors to adoption: (1) significance of transition (e.g., new skills are “practiced” on training exercises, not actual work projects) and (2) uncertainty (e.g., guidance is provided in the form of a training instructor or manual) (Beehr and Bhagat, 1985).

In addition to boosting self-efficacy related to applying technology skills necessary to use the new system, training programs also have been shown to have a significant, positive influence on work attitudes by reducing the adoption resistance that typically accompanies organizational change (Wanberg & Banas, 2000; Whistler, 1970). Building immunity to change resistance creates an environment for supportive, accepting attitudes toward technology (Whistler, 1970). For this reason, the amount of formal training (quantity) an individual receives was expected to be associated with positive climate for implementation.

To fully benefit from the training experience, courses must be perceived as useful and of good quality or else their value will be undermined. Recent research shows that when preparing for new technology implementation, perceptions of training have a direct impact on an individual’s intent to implement the new technology (Machin & Fogarty, 2003). Therefore, perceptions of formal training quality were expected to influence employees’ attitudes about the implementation, and build positive attitudes toward the organization and its goals. According to Gonzalez-Roma et al., (2002) “the use of skills promotes personal and professional growth, which in turn enhances work satisfaction and
commitment to the unit that makes this growth possible” (pp. 466). The skills
development initiated by organizations undergoing technology implementation could
promote positive affect and loyalty among employees toward their organizations,
resulting in a greater sense of affective and normative commitment to the organization
and its implementation objectives. Similarly, once an individual possesses the skills and
knowledge needed to operate the new technology, the instrumental uses of the system and
its efficiencies will be realized, thus resulting in a sense of continuance commitment to
the implementation.

**H3a:** Individuals participating in greater quantities of formal training are expected
to express more affective, normative, and continuance commitment to technology
change than those individuals receiving less formal training.

**H3b:** Individuals reporting greater formal training quality are expected to express
more affective, normative, and continuance commitment to technology change than
those individuals who report lower formal training quality.

**H3c:** Individuals participating in greater quantities of formal training are expected
to express more implementation satisfaction than those individuals receiving less
formal training.

**H3d:** Individuals reporting greater formal training quality are expected to express
more implementation satisfaction than those individuals reporting lower formal
training quality.

Compared to the individual-level, organization-level formal training participation
was expected to have a similar pattern of relationships.
H3e: Agencies participating in greater quantities of formal training are expected to express more affective, normative, and continuance commitment to technology change than agencies receiving less formal training.

H3f: Agencies reporting higher formal training quality are expected to express more affective, normative, and continuance commitment to technology change than agencies reporting lower formal training quality.

H3g: Agencies participating in greater quantities of formal training are expected to express more implementation satisfaction than agencies receiving less formal training.

H3h: Agencies reporting higher formal training quality are expected to express more implementation satisfaction than agencies reporting lower formal training quality.

Moderator: Time lag. A moderating factor predicted to influence the relationships between implementation acceptance/climate and commitment to technological change (individual and organization-levels) was the length of time between technology implementation and the point at which attitudinal measures were assessed. Past studies have emphasized the importance of time as a control variable in organizational intervention studies, due to the fact that there might be a delay before workplace changes impact individual behaviors (Robertson et al., 1993). This is particularly important for technology implementation when there might be a short-term decrease in performance due to learning and adaptation. The longer the delay between implementation and measurement, the more time organizations and their employees have to adjust, and to build acceptance and commitment to the new technology infrastructure.
It was expected that immediately following the implementation, people would be required to learn new tasks and develop ways to incorporate the new system into old work processes. These learning needs could produce a source of stress and dissatisfaction for some system users. However, once work processes become smoother and more routinized, greater satisfaction and commitment to the new technology were expected to result.

**H4a: At the individual-level, time lag will moderate the relationship between implementation acceptance and implementation satisfaction such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and implementation satisfaction, and when the time lag is short, the aforementioned influence will be weakened.**

**H4b: At the individual-level, time lag will moderate the relationships between implementation acceptance and affective, normative, and continuance commitment to technological change such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and commitment, and when the time lag is short, the aforementioned influence will be weakened.**

At the organization-level of analysis, the variable time lag was much like the construct expressed in the individual level model. Therefore, at the organization-level, time lag was expected to have a similar moderating impact on implementation climate and its relationships with implementation satisfaction and commitment to technological change.
H4c: At the organization-level, time lag will moderate the relationship between implementation climate and implementation satisfaction such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and implementation satisfaction, and when the time lag is short, the aforementioned influence will be weakened.

H4d: At the organization-level, time lag will moderate the relationship between implementation climate and commitment to technological change such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and affective, normative, and continuance commitment, and when the time lag is short, the aforementioned influence will be weakened.

Up to this point, the variables discussed were predicted to hold similar relationships at the individual and organization levels of analysis. However, input variables were expected to differ across the two levels. Therefore input variables in the individual-level and organization-level models are discussed separately.

Input: Organizational Culture

Climate versus Culture. There is a long-standing debate over the similarities and differences (if any) between organizational climate and culture. In one camp, there is the belief that these two constructs are the same, though they emerge from different literatures and are traditionally measured at different levels of analysis (Denison, 1996; Rousseau, 1990). Culture stems from the social constructivism literature and is thought to reflect collective perceptions of the organization. Climate emerges from Lewin’s Field
Theory, and is typically thought to reflect individuals’ perceptions of the organization with a focus on cognitions/beliefs held by the individual. The second camp proposes that these two are essentially different constructs, with some evidence supporting discriminant validity that differentiates climate as an individual’s perceived personal impact of their work environments, while culture is described as the normative, behavioral expectations that are the properties shared by a group (Glisson & James, 2002; Verbeke, Volgering, & Hessels, 1998). Glisson and James (2002) emphasize the need for multi-level research examining the effects of both climate and culture simultaneously.

This study adopts the view that culture and climate are distinct. As described by Glisson & James (2002), culture is property shared by the collective. In this study, normative attitudes and beliefs about the organization’s adaptability to change and learning shared by all organization members were used to assess culture, while a more specific assessment of attitudes and beliefs about a specific issue (SAP Procurement implementation) was used to determine attitudes of climate acceptance for SAP Procurement technology implementation.

Organizational culture is a social process in which members share values, beliefs, and expectations that normatively shape and control behavior (Rousseau, 1990; Van Maanen & Schein, 1979). According to Denison and Mishra (1995), culture emerges based on the needs of the environment and the strategic focus of the organization; a good fit between which can predict some measures of organizational effectiveness (productivity and growth). Creating a culture that values information technology as a necessary and integral part of the operations and success of the organization is essential (Beaumaster, 2002).
Past research conducted at the organization level of analysis provides evidence that some elements contributing to a technology-supportive environment are embedded in organizational cultures, such as trust, autonomy, flexibility, and team-orientation (Harper & Utley, 2001; Stock & McDermott, 2001). In addition, recent research conducted at the individual level reveals the importance of managerial inclinations toward learning and adaptability in predicting leadership capabilities during times of organizational change, specifically during technology implementation (Karaevli & Hall, 2003). Since no framework presents an exhaustive accumulation of antecedents important to technology implementation, this study looked as two input characteristics thought to facilitate technology transitions as they operate at the individual-level (personality) and at the organization-level (culture): adaptability to change and organizational learning.

**Input: Adaptability to Change.** At the organization-level, cultures that advocate flexibility are thought to have an advantage when implementing technologies than those that do not (Zammuto & O’Connor, 1992). Cultural assessments indicate that adaptability to change enables organizations to accommodate shifts in planning and technical re-tooling of implemented systems, which contributes to implementation success (Harper & Utley, 2001). Cultures characterized as adaptable are also thought to be more proactive in addressing unanticipated needs and renegotiating original terms of contracts when working with external organizational entities (Kothandaraman & Wilson, 2000). For this reason, adaptable organizations were thought to be more likely to adopt technical changes in the work environment than less adaptive organizations. They were expected to have more positive implementation climates, be quicker to put trained skills into action, and to have more successful inter-organization collaborations.
H5a: Agencies characterized by more adaptability to change are expected to be associated with more positive implementation climates than agencies characterized by less adaptability to change.

H5b: Agencies characterized by more adaptability to change are expected to engage in greater quantities of formal training than agencies reporting less adaptability to change.

H5c: Agencies characterized by more adaptability to change are expected to exhibit greater increases in inter-agency information-exchange than agencies reporting less adaptability to change.

**Inputs: Organizational Learning.** At the organizational-level, Brown & Duguid (1991) postulate that information-exchange and organizational learning are the bridges that link traditional work processes to workplace innovation. In this sense, organizational cultures that value and encourage learning are thought to be more innovative than those that do not. Organizations characterized by having a “learning culture” are expected to better support technological transitions in organizations due to their anticipated positive attitudes toward new technology implementation. Consistent with this idea, a questionnaire-based study by Harper and Utley (2001) assessed cultural similarities in organizations undergoing technology implementation and found that appreciation for information-exchange, a basic element of learning, was a common characteristic among implementation success stories. Conversely, organizations that fail to invest in learning are likely to be slower at acquiring necessary capabilities than other firms, and thus less able to respond to technological change and emerging opportunities (Cohen & Levinthal, 1990; Dosi, 1988). It was hypothesized that the failure to acquire necessary skills and
knowledge to accommodate technology interventions would be strongly associated with organizations less likely to be characterized as learning-oriented. Organizational cultures that value learning were predicted to have more positive implementation climates and engage in more formal training than those that do not value learning.

**H6a: Agencies characterized as having more of an organizational learning culture are expected to have more positive implementation climates than agencies characterized as having less of an organizational learning culture.**

In addition to supportive implementation attitudes and behaviors, an appreciation for information exchange and learning is also identified as an important cultural component that aids inter-organizational relationships. This is accomplished by providing the expectation that frequent communication and full-disclosure are appropriate and desired behaviors across organizations (Kothandaraman & Wilson, 2000). Therefore in the current study, organizational cultures that value learning were also expected to engage in more inter-agency information-exchange and formal training activities. This natural inclination toward learning was expected to create a positive outlook on the overall training experience, resulting in higher formal training quality evaluations.

**H6b: Agencies characterized as having more of an organizational learning culture are expected to have greater increases in inter-agency information-exchange than agencies characterized as having less of an organizational learning culture.**

**H6c: Agencies characterized as having more of an organizational learning culture are expected to engage in greater quantities of formal training than agencies characterized as having less of an organizational learning culture.**
H6d: Agencies characterized as having more of an organizational learning culture are expected to rate formal training quality higher than agencies characterized as having less of an organizational learning culture.

**Moderator: Culture Strength.** Culture strength is viewed as a positive contribution to individual and organizational outcomes (Lindell & Brandt, 2000). Strong cultures are defined as a “set of norms and values that are widely shared and strongly held throughout the organization (O’Reilly & Chatman, 1996). When the norms and values support positive work attitudes and behaviors, culture strength can be thought of as an organizational characteristic that promotes organizational effectiveness and financial outcomes (Kotter & Heskett, 1992). Culture strength is thought to benefit performance by building consensus and endorsement of organizational values (Kotter & Heskett, 1992). Developing consensus serves to increase the similarity and predictability of member behavior, thereby decreasing conflict and frustration among employees (Zander, 1994). For this reason, organizations whose cultures are strong and are characterized as adaptable and learning-oriented were expected to have more positive attitudes toward implementation and be more involved in formal training participation than organizations with weaker cultures bearing the same characteristics.

H7: Culture strength will moderate the relationship between agency cultural characteristics (adaptability to change and organizational learning) on implementation preparedness (implementation climate and formal training quantity), such that when culture is stronger, the influence of culture on implementation preparedness will be higher, and when cultures strength is weaker, the aforementioned influence will be weakened.
Input: Individual Characteristics. Historically, individual-level perspectives have not been granted enough attention in the organizational change literature, given the substantiated relationships between individual behavior change and organizational outcomes (Robertson et al., 1991). Individual characteristics, such as attitudes, beliefs, and personality traits, are responsible for motivating the behaviors and creating collective norms in organization. According to the Attraction-Selection-Attrition model (Schneider, 1992), personalities of employees largely account for the culture that develops within an organization, whether through normative shaping or an attraction-selection-attrition mechanism. Recent studies show that dispositional inclinations to resist change can be used to predict reactions to specific organizational changes (Oreg, 2003). More research is needed to understand the individual difference components underlying organizational change.

Inputs: Openness to Change. At the individual-level, adaptability and openness to new ideas are considered two essential attributes of people involved in successful information technology implementations (Burgetz, 1992; Karaevli & Hall, 2003). Such traits help individuals withstand today’s “winds of change” that accompany the enhanced empowerment and knowledge distribution characteristics of information systems implementation. Openness to new experiences enhances workplace flexibility in that it is associated with the tolerance needed to adapt to new job roles and accept novel situations as organizational changes occur (Judge et al., 1999).

Both theoretical and applied articles have suggested factors associated with individual openness to organizational changes; still there is surprisingly little empirical research in this area given its influence on employee readiness for organizational change.
(Armenakis, Harris, & Mossholder, 1994; Wanberg & Banas, 2000). People characterized as being willing to adapt to changes were expected to be more open and adaptable to technology interventions. They were hypothesized to report more supportive attitudes toward technology implementation than individuals who were less adaptable to change.

**H8: Employees reporting more openness to change are expected to express more implementation acceptance than employees reporting less openness to change.**

**Input: Willingness to Learn.** For years the process for understanding how organizations come to learn, and how individuals within organization learn has been treated in two separate streams of literature, one as an organization-level interest and the other from an individual-level perspective. Recent research aims to integrate these two perspectives to better understand how they are related (Sun & Scott, 2003). Contributing to this multi-level comparison, this study treated organization-level learning separate from individual-level willingness to learn.

The acquisition of necessary knowledge, skills, and abilities is essential to task performance. Principles of learning suggest that individuals cannot be forced to learn without their will (Boydell, 1976; Cunningham, 1999). From the individual’s perspective, learning benefits include developed abilities, self-confidence, and enhanced self-expression and self-development (Antonacopoulou, 2000; Temporal, 1984). When personal learning goals are aligned with organizational values, the benefits are two-fold in that developed/trained individuals compose a well-developed/trained organizational collective. The shared value of learning between the individual and organization serves to build commitment to the organization (Antonacopoulou, 2000). For this reason,
individuals that value learning and express willingness to learn might be more motivated
to pursue formal training that facilitates technological interventions driven by intrinsic
motivation to learn. Additionally, learning-inclined individuals might also view formal
training more positively and provide higher quality ratings than less learning-inclined
employees. If the organization was characterized as one that values learning, individuals
within it were expected to develop deeper affective commitments to their employers
based on shared values and appreciation for learning.

**H9a: Employees reporting more willingness to learn are expected to engage in
greater quantities of formal training than those reporting less willingness to learn.**

**H9b: Employees reporting more willingness to learn are expected to report higher
formal training quality ratings than those reporting less willingness to learn.**
Chapter 2

Methods

To test the proposed relationships and models, data were collected using a variety of methods, and were obtained from multiple sources at different organizational-levels. Three forms of data were used in this study: 1) a web-based questionnaire that assessed organizational characteristics and work attitudes, 2) interview data collected from agency representatives regarding information exchange behaviors between agencies, and 3) archival records providing information about work unit participation in SAP Procurement formal training courses. Each form is discussed below. The data were collected from 362 government employees across 28 Pennsylvania governmental agencies recently implemented on the IES SAP procurement system within the past three years.

Web-based Questionnaire

Participants

Web-based questionnaires were administered to employees identified by the state as fulfilling purchasing functions across 40 government agencies in the commonwealth of Pennsylvania. The agencies selected for this study participated in the IES SAP Procurement implementation and were fully implemented using the new system at the time of data collection. The introduction of the SAP Procurement system was executed in six waves beginning July, 2002, and concluding August, 2004. The number of agencies implemented per wave ranged from seven to 17 (see Appendix A for agency titles and implementation waves). About 386 participants from at 29 agencies responded to the questionnaire, resulting in a respond rate of 37%. Of the responses received, two
were employees from one agency that declined participation in the interview portion of the study, and 22 questionnaire responses were unable to be linked to an identifier uniquely associated with each agency. As a result, these cases could not be linked to other form of data, so a total of 24 responses were dropped from analysis. The 28 agencies whose employees participated in the questionnaire portion of this study are geographically dispersed throughout the state, and are varied in size and function (see Table 2 for relative sizes and participation rates).

Procedure

The web-based questionnaire contained 18 scales (see Appendix C) and was administered via the Internet. Purchasers (N = 1040) across all implemented agency were sent email messages inviting them to participate in a voluntary, confidential web-based questionnaire. These purchasers were chosen from agencies that were already implemented (N = 29) of the SAP Procurement system. To provide a greater sense of privacy, participants had the option to respond to the questionnaire from work or personal computers. Upon completing the questionnaire (estimated time 15 minutes), responses were electronically submitted to the research administrator. The data was received in an anonymous format devoid of participants’ names or emails, but included a randomly assigned unique identifier (project identification number) that corresponded to employees’ names and agencies in a separate, confidential database.

The 35% response rate for this study was lower than expected, since some purchasers did not have regular access to the Internet, which prevented them from completing the online survey. Also, this investigation into SAP Procurement was conducted during a time when the state was discussing a cross-agency consolidation of
procurement processing. Such a plan would eliminate procurement from the agency-level and consolidate all purchasing across all agencies into one centralized government office. Implementing such a proposal would result in the loss of jobs for many of the employees responding to this questionnaire. Therefore, the perceived risk associated with discussing procurement might have contributed to a decreased response rate, also.

As presented in Table 1, the average respondent was female (67%), Caucasian (94%) and had 15.6 years tenure with his/her designated agency. Thirty-three (33%) percent reported having a lot of experience using information systems, while 21% had no experience with such systems prior to the implementation of SAP Procurement. The sample was composed of 23% managers, 21% supervisors, and 57% employees, 34% of whom worked at central offices in the state capital, while 54% worked in field offices/bureaus that are distributed in locations across the state. Data for this study were analyzed at the individual and organization-levels to test the proposed hypotheses.

**Measures**

Measures for this study included eighteen scales that assessed individual and organizational phenomena. As presented in the individual-level model (Figure 1), implementation time lag, openness to change, willingness to learn, implementation acceptance, commitment to technological change, implementation satisfaction, information exchange, radicalness, and formal training quality were measured by questionnaire. For the organization-level model, adaptability to change, organizational learning, implementation climate, organization-level commitment to technological change, and formal training quality was also surveyed. Appendix C contains a list of all
items. All scale items were rated on a five-point Likert scale, (1) indicating Strongly Disagree and (5) indicating Strongly Agree.

**Individual-Level Model**

**Openness to Change.** This scale assesses an individual’s general attitude toward change. The items for this scale were adapted from Oreg (2003), who reported reliabilities of $\alpha = .92$. Items from the revised scale include, “I prefer having a stable routine to experiencing changes in my life” and “Generally, change is good.” The coefficient for reliability estimate for this scale was $\alpha = .67$.

**Willingness to Learn.** This scale represents the degree to which individuals are willing to learn new knowledge and skills on the job. This scale was developed for this study and includes items such as, “I like being challenged to learn new skills on my job” and “I would rather apply what knowledge and skills I already than to have to learn anything new on my job.” The reliability estimate for this scale was $\alpha = .65$.

**Implementation Acceptance.** This scale represents the degree to which individuals agree with and accept the changes imposed by the SAP Procurement implementation. This scale was adapted from Klein et al., (2001), with reliability at the individual level of analysis reported $\alpha = .83$. Revisions to the original items entailed changing the technology form referenced in the original study (MRPTOO) to the technology implemented in the current study (SAP Procurement), and organizational referents (“People think…”) to individual referents (“I think…”). Sample items include, “I think that the SAP Procurement implementation is important” and “I think SAP Procurement should be a top priority in this agency.” The coefficient for reliability of this scale for this study was $\alpha = .87$. 
**Commitment to Technological Change.** This scale portrays an individual’s commitment to a course of action and reflects the desire to support change based on the belief in its inherent benefit (affective commitment), the recognition that there are costs associated with resistance to change (continuance commitment), and a sense of obligation to provide support for the change (normative commitment). This scale was adapted from Herscovitch & Meyer’s (2002) Commitment to Change scale, which exhibited reliabilities ranging from $\alpha = .71$ to $\alpha = .91$ for each of the three commitment to change domains (affective, continuance, and normative commitments). The original scale contained 18 items, six items for each commitment domain. The adapted scale contained nine items, three from each commitment domains. Sample items include, “I think that management is making a mistake by introducing this change” and “I feel pressure to go along with this change.” Reliabilities were .69 for affective commitment, $\alpha = .38$ for continuance commitment, and $\alpha = .64$ for normative commitment. Due to low scale reliability, continuance commitment was eliminated from the individual-level model.

**Implementation Satisfaction.** Implementation Satisfaction indicates the degree to which an individual expresses satisfaction with five basic elements of implementation: training, management, participation, feedback, and rewards (Sokol, 1994). Implementation satisfaction had an estimate reliability of $\alpha = .85$.

**Time Lag.** Time lag is the number of months from the time procurement users reported that they first started using the SAP Procurement system until the administration of the web-based assessment. The average time lag across all participants was 10.67 months (9.75 standard deviation).
**Formal Training Quality.** The formal training quality scale contained three Likert scale items assessing the overall quality, usefulness, and satisfaction with the formal training provided to develop skills needed to use the SAP Procurement system. Although factor analysis results showed that all three items represented the same single factor, scale reliability analysis indicated that removing one of the three items in the scale yielded higher reliability ($\alpha = .64$), therefore only two items were used to measure formal training quality.

**Information Exchange.** Information exchange assesses the degree to which the new SAP Procurement system aids the organization in reaching one of the said goals of the system: greater information-sharing across agencies. Four Likert items were used to assess this dimension. For instance, “Since the implementation of SAP Procurement, I communicate with other agencies more frequently.” Reliability analysis indicated a higher overall scale alpha ($\alpha = .73$) when measuring information exchange using only three of the four items.

**Organizational-Level Model**

**Adaptability to Change.** This scale assesses the degree to which an agency can adapt to accommodate changes. This five-item scale was adapted from Denison & Neale (1994). Sample items included, “Attempts to create change usually meet resistance” and “New and improved ways to do work are continually adopted.” Reliability analysis for the adaptability scale yielded an estimate of $\alpha = .83$. Agreement indices were calculated to determine fit for aggregating this scale as a group-level construct. See the Results section for aggregation analysis.
**Organizational Learning.** This scale assesses the degree to which an agency values learning in the workplace. This scale was adapted from Denison & Neale (1994) and includes such items as, “Learning is an important objective in our day-to-day work” and “We view failure as an opportunity for learning and improvement.” Reliability analysis yielded an alpha of $\alpha = .69$. Agreement indices were calculated to determine fit for aggregating this scale as a group-level construct. See the Results section for aggregation analysis.

**Culture Strength.** Measures of adaptability to change and organizational learning culture strength were measured using the average standard deviation of employee ratings for these scales, such that the higher the standard deviation in employees’ ratings of each culture characteristic, the weaker the culture strength. For adaptability, the mean strength score was .90, and .98 was the mean strength for organizational learning. Both of these variables were tested as moderators between culture and process variables.

**Implementation Climate.** This scale represents the degree to which agencies agree with and accept the changes imposed by the SAP Procurement implementation. This scale is adapted from Klein et al., (2001), with reliability at the individual level of analysis reported $\alpha = .83$. Revisions to the original items entail changing the technology form referenced in the original study (MRP-II) to the technology implemented in the current study (SAP Procurement). Sample items include, “People in this agency think the SAP Procurement implementation is important” and “People in this agency think SAP Procurement should be a top priority.” In this study, agency-level climate reliability analysis yielded an alpha of $\alpha = .89$. Agreement indices were calculated to determine fit
for aggregating this scale as a group-level construct. See the Results section for aggregation analysis.

**Commitment to Technological Change.** Agency-level commitment to change reflects a collective mind-set that demonstrates the desire to support change based on the belief in its inherent benefit (affective commitment), the recognition that there are costs associated with resistance to change (continuance commitment), and a sense of obligation to provide support for the change (normative commitment). Organization-level commitment to change differs from the individual-level variable in that it reflects an *agency’s* commitment the change, while the later represents an *individual’s* personal commitment to the change.

This scale was adapted from Herscovitch & Meyer’s (2002) Commitment to Change scale, which exhibited reliabilities ranging from $\alpha = .71$ to $\alpha = .91$ for each of the three commitment to change domains (affective, continuance, and normative commitments) in past studies. The original scale contained 18 items, six items for each commitment domain. The adapted scale contained nine items, three from each commitment domains. Sample items included, “It would be risky to speak out against this change” and “People in this agency feel a sense of duty to work toward this change.”

Reliability analysis for this study yielded an estimate of $\alpha = .66$ for the affective commitment scale. Continuance commitment exhibited a reliability of $\alpha = .51$, while normative commitment showed a reliability estimate of $\alpha = .72$. Agreement indices were calculated to determine fit for aggregating this scale as a group-level construct. See the Results section for aggregation analysis.
Implementation Satisfaction. Satisfaction with formal training, management, participation, feedback, and rewards initiated with the SAP Procurement implementation are five basic elements of implementation satisfaction (Sokol, 1994). The five-item, five-point Likert scale yielded an alpha scale reliability of $\alpha = .85$ for the total sample. These assessments of implementation satisfaction at the individual-level were aggregated at the agency-level. Agreement indices were calculated to determine fit for aggregating this scale as a group-level construct. See the Results section for aggregation analysis.

Archival Training Data

Procedure

In the summer of 2002, Pennsylvania Commonwealth agencies began converting their existing information systems databases to a unified format, SAP Procurement, in order to aid the communication and information-exchange across agencies. To support the conversion to SAP Procurement, skills training programs were offered to employees of these agencies beginning in the summer of 2001. The SAP Procurement formal training programs were designed and delivered to employees in lecture and web-based format. Courses spanning 13 topics were offered to help familiarized SAP procurement users with the system. These courses ranged from an introduction to the SAP system in general (e.g., IES SAP Navigation), to more advanced topics specific to purchasing functions and state procurement laws (e.g., Contract Responsibility/Program Processing and Vendor Master Programming). The number of formal training hours required per individual was dependent upon the employee’s job title and position within his/her agency.
Attendance rates for all state mandated (formal) training courses were tracked by an internal system maintained by IES that logged the number of individuals enrolled in SAP Procurement courses per agency. This training archive only recorded participation in formal training courses mandated by the state, and does not include assessments of informal training resources proactively devised by some agencies to support agency-specific training needs. Such informal training initiatives included the design of instructor-led in-house SAP Procurement training seminars that were designed by some agencies to address their own unique invoice and reporting needs. Other initiatives included the development of information-sharing groups that gathered SAP Procurement users across various cooperating agencies to meet periodically in order to discuss and problem-solve issues that emerged with regard to the new system. And finally, some agencies designated a localized expert who was trained extensively on the functions of SAP Procurement, and whose responsibility it was to respond to questions of other users within the agency. These informal training practices are not reflected in the IES training archive.

**Measures**

**Individual Formal Training Quantity.** At the individual-level, formal training quantity represented the number of courses each individual completed on training topics related to the SAP Procurement system, including such courses as SAP Navigation, Database Warehouse, and Receipts and Requisitions. The number of completed courses per individuals across agencies ranged from 0 to 9, with an average of 2.82 courses per person. All formal training quantity descriptives are presented in Table 3.
Variability across individuals within agencies regarding the number of formal training courses completed was restricted due to policies that some agencies chose to enforce making formal training participation mandatory. While some agencies strictly enforced formal training requirements, others chose not to and left the initiative to train at the employee’s discretion. Due to confounds imposed by inconsistent formal training enforcement across agencies, individual-level training quantity did not adequately measure variability in employees’ willingness to proactively seek training.

**Agency-level Formal Training Participation (Quantity).** At the organizational level, formal training participation was calculated based on the sum of the total number of SAP Procurement formal training courses completed across all individuals in an agency, which was then divided by the number of procurement users in the agency. By this approximation, formal training quantity represented the percent of training engaged by the agency relative to the agency’s demand for training, which was estimated in proxy by the number of SAP Procurement users. At the organization-level, the amount of formal training agencies engaged in ranged from 1% of their total SAP Procurement user population to 200%. Percentages exceeded 100% when many procurement users completed more than one course each, or when every user in an agency completes two formal training courses. The average percent of SAP procurement users per agency engaging in formal training was 50%. All formal training quantity descriptives are presented in Table 3.

As previously mentioned, agencies differed dramatically in their approaches to enforcing formal training requirements mandated for SAP Procurement users by the state. Some agencies strived to strictly adhere to the mandates by providing monetary
incentives that encouraged formal training participation, others applied negative incentives that prohibited employees from have access to the SAP Procurement system until all training was complete (thus rendering them unable to work without training). Other agencies chose not to enforce formal training. While informing employees about the state’s formal training courses, they considered participation optional. The variability in agencies’ approaches to formal training enforcement represented the degree to which agencies valued training, thus provided interesting insight into how the implementation and formal training was viewed differently across each agency.

**Interview Data**

**Participants**

Interview data were collected from 42 procurement and training directors/liaisons from 30 agencies implemented on the SAP Procurement system. Across the total 42 agencies implemented on the procurement system and invited to participate in the interview process, one liaison declined the interview and 11 were unable to be contacted, resulting in a response rate of 71%. Two agencies participating in interviews did not have corresponding questionnaire participants. Therefore, these two cases could not be linked to other forms of data so they were dropped from analysis resulting in a total agency sample size of 28. In the case that an agency did not have an appointed procurement and/or training director, a representative from each agency deemed best able to respond to questions pertaining to procurement before and after the SAP Procurement implementation was interviewed as the agency’s liaison. In small agencies where the training and procurement directors were consolidated into one position, only one interview was conducted.
Protocol/Procedure

A semi-structured interview protocol was used to gather information from agency liaisons about agency size, implementation timing, and formal training quality, along with information about the changes in inter-agency information-exchange resulting from the implementation of the SAP Procurement system. These interviews were conducted over the telephone by the principle research investigator over a period of three months. See Appendix D for a complete listing of protocol items. All scale descriptives are presented in Table 3.

Measures

Changes in Inter-Agency Information-Exchange. This scale described changes in the frequency and number of agencies with which each agency exchanged information with others since the implementation of SAP Procurement. This scale was developed for this study; sample items include, “Since the implementation of SAP Procurement, my agency collaborates with a greater number of agencies across the state” and “Since the implementation of SAP Procurement, my agency shares information with other agencies more frequently.” Inter-agency information-exchange was rated on a five-point Likert scale with (1) indicating Strongly Disagree and (5) indicating Strongly Agree.

Time Lag. Time lag was measured as the number of months between the first implementation of SAP Procurement in an agency, as recalled by the agency liaison, and the administration of the online questionnaire for this study.

Formal Training Quality. Organization-level formal training quality was assessed for the agency using two questions, “How would you rate the quality of the web-based SAP Procurement formal training received by your agency?” and “How would you
rate the quality of the instructor-led SAP Procurement training received by your agency?”

Ratings were evaluated on a five-point Likert scale, *(1)-very poor quality* and *(5)-very high quality*. The quality ratings for these two formal training media were averaged for each agency. These quality assessments only evaluate training that was mandated by the state, and does not include assessments of informal training resources proactively devised by some agencies to support agency-specific training needs (e.g., in-house training, information-sharing groups, and local experts). The mean formal training quality across all agencies was 2.54.
Chapter 3

Results

Preliminary Analyses: Aggregation

Prior to testing the proposed hypotheses, preliminary scale analyses were conducted to assess scale reliabilities and agreement (ICC and rwg analyses). Although 28 agencies participated in this study, in nine agencies only one procurement user completed the questionnaire. Since a single survey respondent cannot adequately represent an organization-level perspective, these single respondents were included in the individual-level analyses only, and were omitted from the agency-level analyses. Only agencies with representation from more than one participant were included in the organization-level analyses (N = 19).

Next, scale reliabilities were calculated and determined to be sufficiently consistent and stable for scales that exhibited moderate to high levels of reliability (\(\alpha = .70\) or above; Murphy & Davidschofer, 2001). Some scales could be characterized as having low to moderate reliability, falling into the \(\alpha = .55-.70\) range (Murphy & Davidschofer, 2001). Only one scale, continuance commitment, was deemed to have unacceptably low reliability (\(\alpha = .38\)) and was excluded from analysis. As a result, all hypotheses involving individual-level continuance commitment were not tested due to inadequate reliability. All reliabilities are presented in Table 5 for the individual-level scales, and Table 6 for the organization-level scales.

The individual-level responses for seven scales (implementation satisfaction and climate, the three forms of change commitment, and adaptability and organization learning) were analyzed to assess whether there were adequate levels of agreement for
aggregation. Both intraclass correlations (ICC) and $r_{wg}$ values (James, Demaree, & Wolf, 1984) were computed and results are presented in Table 4.

As shown in Table 4, most $r_{wg}$ values, on average, ranged from .73 to .80, except affective change commitment, which averaged .56. All but this scale suggested adequate levels of agreement (.70 or above; George & Bettenhausen, 1990). In addition to $r_{wg}$ values, intraclass correlations (ICC) were calculated (James, 1982). In general, ICC1 values indicate that there is sufficient homogeneity within groups to warrant aggregation to the team-level of analysis, whereas ICC2 values indicate whether scale ratings can be differentiated for each work unit. Also shown in Table 4, ICC1 values ranged from .00 to .06, which fell below the median acceptable ICC1 of .12, while ICC2 ratings for this study ranged from .05 to -.96, with acceptable reliability exceeding .70 (James, 1982).

Affective, normative, and continuance commitment scales failed to show significant group-level properties, while organizational learning showed marginal significance ($p < .10$). As a result, evidence supporting group-level effects for these scales is questionable. Low levels of agreement, specifically measured by the ICC2, suggest that attitudes and behaviors associated with information technology implementation are not unique to each agency, but commonly experienced by all agencies undergoing the implementation across the state. While there appears to be some agreement about issues related to the implementation within agencies, there are few between-group differences that distinguish agencies from each other.

This assessment of agreement is consistent with qualitative data collected during interviews with agency directors and liaisons. When commenting on the control agencies had over processes such as formal training, one liaison said, “We [agencies] had no
control, we were the guinea pigs. They [the state] were trying to figure out the next step at the same time we were.” Another liaison commenting on the inability to rely on the state-level administration or other agencies for information about SAP procurement said, “even the [state] trainers could not offer a broader picture of how what state [government] did was related to the bigger picture of government purchasing. Too narrow. They don’t even know how local functions fit together.”

Overall, agencies seemed equally bound by bureaucracy, uncertainty, and lack of understanding about the broader statewide implementation, all of which seemed to restrain any agency-specific advantages or agency-level variability. All agencies operated under the same relative constraints and restrictions and were subject to the same centralized decision-making at the government-level, thus making the implementation experience more a state-level phenomenon than an agency-level phenomenon. The originally proposed organization-level model is presented in Figure 2, but could not be tested using SEM with an agency sample size of 19.

Outcome Hypotheses

Hypothesis 1a stated that employees with high levels of affective and normative commitment to technological change would report more satisfaction with the implementation effort than employees who expressed lower levels of commitment. Both affective and normative commitment were positively correlated with implementation satisfaction supporting the idea that strongly identifying and feeling loyal to the mission of adopting new technology is related to greater satisfaction with the implementation ($r = .41, p < .05; r = .26, p < .05$, respectively). These finding are consistent with Hypothesis
1a. These and all individual-level correlation analyses are presented in Table 5. All organization-level analyses are noted in Table 6.

At the agency-level, Hypothesis 1b proposed that agencies whose employees reported higher levels of affective and normative commitment to technological change would be more satisfied with the implementation effort than agencies whose employees expressed lower levels of commitment. In contrast, agencies whose employees reported higher levels of continuance commitment to technological change were expected to report less satisfaction with the implementation effort than agencies whose employees expressed lower levels of continuance commitment. Correlation analyses presented in Table 6 show that, while the relationships trends are in the expected directions, the correlations are not significant (affective: $r = .24, p > .05$; normative: $r = -.10, p > .05$; continuance: $r = -.23, p > .05$). Commitment to technology change is not related to implementation satisfaction at the agency-level. Therefore, support for Hypothesis 1b is lacking.

In Hypothesis 1c, agencies whose employees report higher levels of affective, normative, and continuance commitment to technological change were expected to report more inter-agency information-exchange behaviors than agencies whose employees expressed lower levels of commitment. Correlation analyses presented in Table 6 failed to find support for affective ($r = -.27, p > .05$), normative ($r = -.19, p > .05$), or continuance ($r = .07, p > .05$) forms of commitment. As presented in Table 6, across agencies, commitment to technology change is not associated with increased information exchange behaviors.
Process Hypotheses

Employees reporting more implementation acceptance were proposed to have higher levels of affective and normative commitment to the technological change than those employees reporting less implementation acceptance, according to Hypothesis 2a. As expected, individuals who were more accepting of the implementation also reported higher levels of affective and normative commitment to the technological change ($r = .55, p < .05; \ r = .40, \ p < .05$, respectively). These results, presented in Table 5, provide support for Hypothesis 2a.

In Hypothesis 2b, employees that reported more implementation acceptance were expected to report higher levels of implementation satisfaction than those employees expressing less implementation acceptance. Providing support for this relationship, implementation acceptance exhibited a moderately strong and positive correlation with implementation satisfaction ($r = .42, p < .01$) indicating that individuals that are open and accepting of technology were also more satisfied with the implementation.

Not only were employees with high levels of implementation acceptance expected to be more satisfied with the implementation, but they were also expected to report higher levels of formal training quantity and quality than those employees reporting less implementation acceptance (Hypothesis 2c and 2d). The correlation analysis used to test Hypothesis 2c was not significant ($r = .00, p > .01$), failing to show any relationship between implementation acceptance and the amount of formal training employees receive.
Testing Hypothesis 2d, individuals who were more accepting of the implementation were also more satisfied with formal training quality ($r = .32, p < .01$) suggesting that implementation acceptance is associated with motivation to learn skills related to the technology implementation. Accepting employees might gain more from the training experience than individuals less open to the implementation. Similarly, individuals who readily accept the implementation might also be more willing to overlook the shortcomings of formal training programs and rate them more highly. Results presented in Table 5 show support for Hypothesis 2d.

At the agency-level, Hypothesis 2e and 2f proposed that agencies characterized as having climate more conducive to implementation would indicate greater formal training quantity and quality than those agencies reporting a less supportive implementation climate. Testing Hypothesis 2e using correlation analysis, implementation failed to correlate with formal training quantity ($r = -.13, p > .05$). The correlation analysis that tested Hypothesis 2f also failed significance ($r = -.59, p > .05$), indicating formal training quality and implementation climate are not related. Results are presented in Tables 5 and 6 respectively.

Hypothesis 2g proposed that agencies characterized as having a more positive implementation climate would indicate higher levels of implementation satisfaction than those agencies reporting a less positive implementation climate. While failing to reach significance, the correlation between climate acceptance and implementation satisfaction is moderately high and in the anticipated positive direction ($r = .41, p > .05$). Although not significant, these findings exhibit the expected pattern of relationships hypothesized
in this study: positive climate attitudes toward implementation acceptance are related to greater implementation satisfaction.

In Hypothesis 2h, agencies with accepting climates for implementation were expected to report greater levels of affective, normative, and continuance commitment to technological change than agencies with less accepting climates. Neither affective, normative, nor continuance commitment were associated with implementation climate ($r = .24, p > .05; r = -.10, p > .05; r = -.23, p > .05$ respectively). As shown in Table 6, correlation results for these tests are not consistent with Hypothesis 2h.

According to Hypothesis 3a, formal training quantity would be associated with higher levels of affective and normative commitments at the individual-level. Two correlation analyses were conducted to test this hypothesis—none reported significance (affective: $r = -.01, p > .05$; normative: $r = -.05, p > .05$). Similarly, at the individual-level Hypothesis 3b proposed that formal training quality would be correlated with affective and normative forms of commitment to technology change. Affective and normative commitment were both positively and significantly correlated with formal training quality ($r = .20, p < .01; r = .28, p < .01$). This finding indicates that higher formal training quality ratings are associated with higher levels of commitment to technology change. All results are presented in Table 5.

Hypothesis 3c stated that individual-level formal training quantity would be associated with implementation satisfaction. Correlation analysis did not find support for this relationship—a person’s level of satisfaction with implementation was not associated with the amount of formal training s/he had received ($r = -.05, p > .05$). Also at the individual-level, formal training quality was hypothesized to positively correlate with
implementation satisfaction (Hypothesis 3d). In Table 5, Pearson’s correlation analysis revealed a significant relationship between these two variables \( r = .58, p < .01 \), such that higher formal training quality ratings were associated with greater levels of implementation satisfaction. These findings support Hypothesis 3d.

According to Hypotheses 3e and 3f, both formal training quantity and quality are expected to significantly predict commitment to technology change at the organization-level. Six linear correlation analyses were conducted to test these hypotheses. Formal training quantity was not correlated with either affective \( r = -.22, p > .05 \) or normative \( r = .19, p > .05 \) forms of commitment. However, continuance commitment was significantly correlated with formal training quantity, but in an unexpected positive direction \( r = .67, p < .01 \) suggesting that the more formal training agencies received, the more continuance commitment they reported. These findings fail to support Hypothesis 3e.

When testing Hypothesis 3f, formal training quality was not significantly correlated with commitment. All correlation analyses fail to find significance (affective: \( r = -.36, p > .05 \); normative: \( r = -.46, p > .05 \); continuance: \( r = -.50, p > .05 \)). These correlations are presented in Table 6, along with the results from Hypothesis 3g, which also failed to reach significance \( r = -.44, p > .05 \). This hypothesis stated that agencies participating in greater quantities of formal training would express more implementation satisfaction than agencies receiving less formal training.

**Process Moderator Hypotheses.** The following set of analyses explored the moderating effects of time lag on both the individual and organization-level relationships proposed to effect process and outcome relationships. All individual-level moderated
regression analyses employ a hierarchical linear regression that enters two control variables onto the first step of the model (the length of tenure of employees and the amount of prior experience they had using information systems prior to the SAP Procurement implementation). After the controls in Step 1, the predictor and moderator are entered into Step 2, followed by the predictor, moderator, and interaction term in Step 3.

According to Hypothesis 4a, at the individual-level, time lag was expected to moderate the relationship between implementation acceptance and implementation satisfaction such that the longer the time lag between the time of implementation and the time of the questionnaire assessment, the stronger the relationship would be between implementation acceptance and implementation satisfaction. When time lag was short, the aforementioned influence would be weakened. As shown in Table 7, the overall model significantly predicted satisfaction \( (F(3, 317) = 21.83, p < .001) \); however, the interaction term was not significant \( (\beta = .05, p > .05) \). Hypothesis 4a was not supported

According to Hypothesis 4b, time lag was expected to moderate the relationship between individual-level implementation acceptance and commitment to technological change. Affective and normative commitments were tested in separate models (Y1 and Y2; see Table 8), each controlling for tenure and information technology experience. The longer the time lag between the time of implementation and the time of the questionnaire assessment, the stronger the relationship was expected to be between implementation acceptance and commitment. When time lag was short, the aforementioned influence would be weakened.
Similar to Hypothesis 4a, the regression models predicting commitment were significant for both affective and normative commitments (affective $F(3, 319) = 49.38, p < .001$; normative $F(3, 313) = 18.91, p < .001$). However, the interaction terms for both models were not significant, thereby failing to support for time lag as a moderator (affective: $\beta = .02, p > .05$; normative: $\beta = .05, p > .05$). Hypothesis 4b was not supported.

At the organization-level of analysis, the variable time lag was much like the construct expressed in the individual level model. Therefore, at the organization-level, time lag was expected to have similar moderating impacts on implementation climate and its relationships with implementation satisfaction and commitment to technological change. Hypothesis 4c stated that time lag would moderate the relationship between organization-level implementation climate and implementation satisfaction such that the longer the time lag between implementation and online assessment, the stronger the relationship would be between implementation acceptance and implementation satisfaction. When the time lag was short, the aforementioned influence would be weakened. In Table 9, a regression analysis using implementation climate and the interaction with time lag to predict satisfaction failed to reach significance $F(2, 26) = .34, p > .05$). Therefore, time lag was not a significant moderator and Hypothesis 4c was not supported.

Hypothesis 4d proposed that time lag would moderate the relationship between implementation climate and commitment to technological change such that the longer the time lag between the technology implementation and web-based assessment, the stronger the relationship would be between implementation acceptance and affective, normative, and continuance commitments. When the time lag was short, the aforementioned
influence would be weakened. Table 10 presents the findings from three regression analyses using climate and the time lag interaction to predict affective, normative, and continuance commitments separately. The findings from these regressions were the same—the interactions with time lag were not significant in the prediction of commitment (affective $F(3, 26) = 2.11, p > .05$; normative $F(2, 25) = .98, p > .05$; continuance $F(3, 26) = .46, p > .05$). Hypothesis 4d was not supported.

**Input Hypotheses**

**Organization Model Input Hypotheses.** Hypothesis 5a proposed that agencies characterized by more adaptability to change would have more positive implementation climates than agencies characterized by less adaptability. This relationship was not supported, indicating that agencies that adapted easily to change did not necessarily have more positive attitudes toward technology changes ($r = .15$, $p > .05$). As presented in Table 5, Hypothesis 5a was not supported.

Similarly, agencies characterized as adaptable were thought to be more likely to participate in technology formal training to support the transition (Hypothesis 5b). Correlation analyses failed to support the association between adaptability and formal training quantity. As presented in Table 5, agencies identified as being more adaptable were not more likely to participate in formal training than agencies whose cultures were described as being less adaptable ($r = -.18$, $p > .05$).

In Hypothesis 5c, agencies characterized as being more adaptable to change were also hypothesized to exhibit greater increases in inter-agency information-exchange than agencies reporting less adaptability to change. In Table 6, a correlation analysis also
failed to find support for this hypothesis ($r = -.26, p > .05$). Agencies identified as having an adaptable culture were not more likely to engage in information-exchange behaviors.

Agencies characterized as having more of an organizational learning culture were hypothesized to have a climate more positive toward implementation than agencies characterized as less learning oriented (Hypothesis 6a). A correlation analysis revealed that organizational learning cultures did not have more supportive implementation climates than cultures that were not identified as organizational learning cultures ($r = .20, p > .05$). Hypothesis 6a was not supported (Table 6).

In Hypothesis 6b, agencies that were more likely to be identified as organizational learning cultures were thought to engage in more information exchange behaviors than less learning-oriented agencies. However, a correlation analysis did not find support for this hypothesis ($r = -.20, p > .05$). Agencies characterized as having more of an organizational learning culture did not engage in more information exchange behaviors than less learning-oriented agencies, thus failing to support Hypothesis 6b (Table 6).

In Table 6, agencies that were more likely to be identified as organizational learning cultures were expected to engage in greater quantities of formal training, and also to report more positive attitudes toward training quality (Hypothesis 6c and 6d). A correlation analysis showed organizations identified as being inclined toward organizational learning reported less training than agencies characterized as being organizational learning cultures ($r = -.42, p < .05$). While a significant correlation exists between these two variables, it is in the opposite direction proposed by Hypothesis 6c. Therefore, this hypothesis is not supported. Furthermore, a separate correlation analysis
failed to find a significant relationship between organizational learning and formal training quality, thus failing to support Hypothesis 6d \( (r = -.39, p > .05) \).

Hypothesis 6e stated that agencies more likely to be characterized as organizational learning cultures would have greater increases in inter-agency information-exchange than agencies less likely to be characterized as organizational learning cultures. A correlation analysis failed to find support for this hypothesis \( (r = -.20, p > .05) \). The agencies identified as being more learning oriented were not more inclined toward information-exchange behaviors.

**Organization Model Input Moderator Hypotheses.** Culture strength has been established in the literature as a construct distinct from either culture or climate mean. In this study, it was hypothesized that culture strength would moderate the relationship between agency cultural characteristics (adaptability to change and organizational learning) on implementation preparedness (implementation climate and formal training participation), in such a way that when culture is stronger, the influence of culture on implementation preparedness would be higher, and when cultures strength is weaker, the aforementioned influence would also be weakened (Hypothesis 7).

As presented in Table 11, a hierarchical linear regression used to measure the moderating effect of culture strength on organization learning and formal training quantity failed to find significance for the overall model, however the interaction term was statistically significant \( (F (3, 19) = 1.58, p > .01; \beta = -.57, p < .05) \). Bedian and Mossholder (1997) argue that when a moderation effect is hypothesized a priori and is found to be significant, the interaction term should be plotted even if the overall regression model is not significant. Because much of the variance estimated in the model
is attributed to main effects, which are inconsequential to the test for moderation, very small main effect sizes could cloak variance contributed to the model by the interaction term—the real effect of interest in the hypothesis. For this reason, the interaction term was plotted and a test of simple slopes was conducted.

The linear regression analyses used to estimate the influence of organizational learning culture on formal training quantity was measured for two conditions, when culture is strong and when it is weak. Results from these analyses, which are presented in Table 12, show that culture strength moderates the relationship between organizational learning and training quantity when culture is strong, but when it is weak (b-strong = -.51, p < .001; b-weak = .42, p > .05). This pattern of moderation, plotted in Figure 3, reveals an ordinal interaction effect that supports Hypothesis 7.

**Individual Model Input Hypotheses.** According to Hypothesis 8, employees who reported more openness to change would be more accepting of implementation than those employees who reported less openness to change. As presented in Table 5, openness to change was positively correlated with implementation acceptance (r = .20, p < .01) supporting the idea that employees who are characterized as open to new experiences are also be more open to accepting the implementation of new technology.

In Hypothesis 9a and 9b, employees who reported more willingness to learn were expected to engage in greater quantities of formal training and were expected to report more favorable quality formal training ratings than those employees who were less willingness to learn. The test of Hypothesis 9a presented in Table 5 showed that willingness to learn was not correlated with formal training quantity (r = .01, p > .05).
When testing the relationship between willingness to learn and formal training quality, a correlation analyses found support for Hypothesis 9b, \( r = .15, p < .05 \).

**Evaluating Model Fit**

Structural equation modeling (SEM) was used to test the proposed individual and organization-level models in this study. The measurement and structural models in this study were tested using AMOS 5.0 software package. Due to constraints posed by the software on the number of parameters that can be tested in one model and the inability to test moderators, the proposed individual-level model (Figure 1) was tested as two separate structures; one including input measures that are antecedents to technology implementation processes (Figure 4). The second structure tests the process variables as they related to important implementation outcome variables (Figure 6). A full individual-level revised model with all input, process, and outcome best-fit parameters is tested and presented in Table 13 and Figure 8.

The chi-square statistic is an inferential test that is used to determine whether the null hypothesis that the model fits the data well should be rejected (MacCallum, Browne, & Sugawara, 1996). Although this statistic is commonly reported in research, it is relied upon less frequently given the tendency for the chi-square statistic to become inflated with increased model complexity and sample size (Garson, 2002). For that reason, this the chi-square test will be used, in addition to other fit indices, as a means for comparing relative fit between different formulations of models so that the comparative best-fit model for the data can be developed.

While there is no clear determination about which indices provide the best measure of fit for a model, researchers agree that using multiple measures to infer fit is
preferable to applying any single index (Gerbing & Anderson, 1999; Vandenberg & Lance, 2000). Fit for the proposed models will be assessed in two ways. One approach is to estimate absolute fit, which compares how the obtained data fit the model compared to a perfectly fitting model. Examples of absolute fit indices include the root mean square error of approximation (RMSEA) and the Goodness-of-Fit (GFI) Index. A second approach to estimating fit is using incremental indices that assess the improvements in fit of the hypothesized model over a null model, which assumes all variables are uncorrelated. Specifically, the Normed Fit Index (NFI), the Comparative Fit Index (CFI), and the Incremental Fit Index (IFI) are examples of incremental fit indices. In general, fit indices greater than .90, and RMSEA less than .08, are considered a close fit between the model and the data (Hoyle, 1995; Vandenberg & Lance, 2000).

In addition to assessing the fit of proposed models, chi-square statistics and absolute and incremental fit indices also evaluate the strength and direction of individual paths in the structural equations model. These paths correspond to relationships hypothesized by this study. Thus, support for the model also indicates support for the associated hypotheses. Revising to the proposed model based on the removal of non-significant parameter estimates is one method for increasing the fit of the model to the data (Joreskog, 1993). However, results based on these revised models must be cautiously adopted since the revised relationships are data-drive hypotheses and not theory-driven. A true test of the revised model should be conducted using a new sample. Such model revisions conducted in this study should only be considered exploratory analyses, and not a test for model confirmation. Results are presented in Figures 5 and 7.
**Individual-level Models.** The first model tested linkages between input characteristics, such as a willingness to learn and openness to change, in relation to training quantity, quality and implementation acceptance attitudes (Figure 4). This model did not adequately fit the data, $\chi^2 = 798.33$, $p < .05$, RMSEA = .096, according to the absolute fit indices. However, the incremental indices, NFI = .95, IFI = .96, and CFI = .96 all were above the acceptable lower bound of fit. Results for all model-fit estimations are presented in Table 14.

When exploring the fit of individual parameters, Hypothesis 9a which states that an individual’s willingness to learn would predict the quantity of formal training courses in which individual participate, was not supported by this model (parameter = -.18, $p > .05$), nor was Hypothesis 2c which stated that implementation acceptance would predict formal training quantity. This parameter was also not significant (parameter = -.10, $p > .05$). In the interest of exploring a better model for the obtained data, these two parameters were dropped from the model, thus removing formal training quantity from the model altogether. A revised best-fit model estimate was calculated based on the remaining model presented in Figure 6.

The revised best-fit model still failed to meet the minimal criteria for absolute fit; however from some improvement regards both the GFI ($\chi^2 = 780.65$, $p < .05$) and root mean squares estimate (RMSEA = .10). Consistent with the proposed model, the revised model for input-process technology implementation met recommended standards for incremental fit indices (NFI = .95, IFI = .96, and CFI = .96).

The second proposed model confirmed linkages between process variables, such as implementation acceptance and formal training quality and quantity, with outcome
variables of interest (implementation satisfaction and commitment to technology change). This model, presented in Figure 6, did not meet absolute fit standards. GFI indices indicated a significant and inflated chi-square estimate ($x^2 = 1116.53, p < .05$). Similarly, the root mean squares estimate (RMSEA = .11) also exceeded the upper-boundary for acceptance fit. As with the proposed input-process model, this process-outcome model shows sufficient incremental fit (NFI = .94, IFI = .95, and CFI = .95). However, taken into consideration with the more stringent test of absolute fit, this model had comparatively low fit with the data. Thus, revisions were made based on the regression weight provided for each parameter estimate.

As with the input-process model, parameters associated with the formal training quantity variable failed to find support. These hypotheses include 3a (parameter = .01, $p > .05$), 3d (parameter = -.01, $p > .05$), and 3h (affective commitment parameter = .00, $p > .05$; normative commitment parameter = -.01, $p > .05$; and continuance commitment parameter = .02, $p > .05$). These parameters, as well as the formal training quantity variable were dropped from the model. The revised model reflects the hypotheses proposed in 3b (formal training quality predicting commitment to technology change) and 3e (formal training quality predicting satisfaction), and is presented in Figure 7. In this model, the GFI still falls below recommended standards for fit ($x^2 = 720.21, p < .01$), however the second absolute fit measure suggests acceptable levels of fit (RMSEA = .08). Also indicating appropriate levels of fitness are the incremental levels that all meet minimum standards (NFI = .96, IFI = .97, and CFI = .97). This revised process-outcome model is considered the better fit for the obtained data. The GFI did not indicate a strong fit ($x^2 = 1428.3, p < .01$), however the RMSEA (.08) and all incremental indices indicated
an acceptable fit (NFI = .95, IFI = .96, and CFI = .96). In addition, parameter estimates revealed linkages between openness to change and implementation acceptance (Hypothesis 8), willingness to learn and formal training quality (Hypothesis 9b), formal training quality and implementation acceptance (Hypothesis 2d), satisfaction (Hypothesis 3e), and commitment to change (Hypothesis 3c), thus providing support for individual-level relationships proposed.

The resulting number of parameter from the two revised models at the individual-level happened to be 7, which is the limit to the number of parameters Amos 5.0 can test in one model. Therefore, the input-process and the process outcomes variables and parameters were combined to test one individual-level model of technology implementation (Figure 8); the results of which are found in Table 13.
Chapter 4
Discussion

The existing research on technology transitions in organizations has been limited in its treatment of person-related issues in workplace interventions. Even still, a great deal of research emphasizes the importance of the human perspective in the technology implementation process (Klein et al., 2001; McAfee, 2003), and specifically the need to understand individual-level attitudes and behaviors (Bray, 1994; Judge et al., 1999; Kremic, 2003; Wanberg & Banas, 2000). This study responded to the need for multi-level research by proposing two models of technology implementation, one at the individual-level and one at the organization-level. In addition, this research offered theoretical developments in the exploration of a new construct, commitment to technology change. It also extended research that takes a comparative look at culture and climate simultaneously, and provided parallel analysis of homologic constructs, such as organizational learning culture and individual willingness to learn. Few empirical field studies provide a multi-organization perspective on technology implementation that includes individual and organizational characteristics, implementation processes, and measurement of valued outcomes. Future research suggestions and practical implications of this research are provided.

The data from this study were collected in a field setting and involved numerous government agencies (organizations) that had recently implemented new information technology for procurement processing. Data regarding the implementation, formal training, and use of the technology across these agencies was obtained, in addition to culture characteristics thought to facilitate technology implementation (adaptability and
organizational learning). To enhance depth of understanding about transition, data were also obtained from system-users within these agencies representing multiple levels of the organization (employees, supervisors, and managers). From these individuals, information pertaining to implementation attitudes, behaviors, and person traits, such as willingness to learn and openness to change were collected.

The proposed hypotheses explored the inputs, processes, and outcomes associated with being introduced to, learning to use, building acceptance to and commitment toward new technology. Moderate support for these hypotheses was found, with greater support provided for individual-level model relationships. While some relationships were supported at the organization-level, small sample size restricted the ability to adequately measure the proposed model using significance testing. Critics of null hypothesis significance testing recommend that interpretations of hypotheses should be made with consideration for probability-values, effect sizes, effect direction, and repetition of findings (Wainer & Robinson, 2003). Considering these broader components of assessment, the pattern of findings at the organization-level suggest some degree of congruence with the relationships proposed in this study’s model.

In support of Hypothesis 1a, individuals with higher levels of affective and normative commitment to technological change were more satisfied with the implementation efforts than their less-committed counterparts. This finding is consistent with research that shows that individuals who are more committed to an organizational transition are more attitudinally compliant and cooperative with changes (Herscovitch and Meyer; 2002) and committed to longer-term tenures (Wanberg & Banas, 2000). Organizations that are concerned with creating positive affect for employees during times
of change, might consider individual-level affective and normative commitment as an important component for building compliant attitudes and greater satisfaction.

However at the agency-level, the proposed relationship between commitment and satisfaction was not supported (Hypothesis 1b), nor was the proposed linkage between commitment and inter-agency information-exchange (Hypotheses 1c). Positive organizational outcomes, such as high levels of commitment, were not significantly associated with any other valued outcome proposed in the organization model. Although this study proposed reasons why organizational commitment might be expected to correlate with satisfaction and information exchange behaviors, the ability to detect these relationships were likely prohibited by the small sample size and limited measurement power.

In both the individual and organization-level models, three process variables were deemed important for new technology acquisition. One is the psychological acceptance of the implementation; the other two involve training with respect to quantity obtained and quality received. Employees who expressed more acceptance of the technology implementation were also found to exhibit greater levels of affective and normative commitment, supporting Hypothesis 2a. They were also reported greater levels of satisfaction with the implementation as a whole (Hypothesis 2b). These results are aligned with findings from two previous studies that link accepting attitudes toward change to organizational commitment and satisfaction. The present study suggests that these relations hold true for organizational changes involving new technology acquisitions and extends the conceptualization of organizational commitment to a more specific form, commitment to technology change imposed by organizations.
In addition to correlating with valuable outcomes, implementation acceptance was also expected to be associated with the amount of formal training individuals receive and perceptions of training quality (Hypotheses 2c and 2d). Although attitudes of acceptance for the implementation were expected to motivate to participate in greater quantities of training, this association was not substantiated. Individual-level implementation acceptance did not correlate with the number of formal training courses individuals completed.

However, the inconsistent way formal training requirements were enforced across agencies might have obstructed this relationship. In order to prepare procurement users for the new skills and knowledge needed to operate the SAP Procurement system, the state-level administrators overseeing the implementation process required that certain quantities of formal training be received by all individuals associated with procurement—the amount of required training was dependent upon the user’s job function and needs for the system. Although formal training was mandated across all agencies, and the quantities partitioned in a relatively standardized way, the degree to which agencies enforced these mandates varied dramatically across the state.

Naturally, some agencies were more inclined and accustomed to technology than other agencies—in some cases making them more receptive to using a technology-based medium for procurement, in other cases making them more resistant due to a preference and comfort with a legacy system already in place. Some agency were not open to the idea of learning a new technology in order replace a process they viewed to be already adequately functioning “the old fashioned” paper-based way. In one interview, a director stated, since the implementation of SAP Procurement “nothing has really changed in the
way we do procurement. We still do it the way we used to [paper-based], just now we need to put it into the computer once we’re done” indicating a parallel process in which a true switch to the new system had not occurred. For these reasons, agencies varied in their assessments of how important the new system was to procurement processing, but also in their willingness to enforce the formal training to facilitate the implementation.

Secondly, as reported in Table 3 scale descriptives, formal training quality was relatively poor. Agencies that implemented in the earlier waves were more prone to enforce formal training requirements. However, as the quality of the formal training programs became known across agencies, late implementers chose to provide their own agency-specific supplementary training, and in some cases discouraged participation in the state-constructed formal procurement training. Thirdly, some agencies provided incentives to encourage formal training, while others did not. For this reason, the formal training quantity variable did not necessarily represent an individual’s motivation or proactivity toward training. Rather, formal training quantity was probably more representative of their employer’s assessment about the value of the training and willingness to enforce requirements.

Considering another component of training, as expected, implementation acceptance was associated with formal training quality (Hypothesis 2d). The more accepting individuals were toward implementation, the more positive their assessments of formal training quality. Support for this hypothesis was also revealed the test of this relationship parameter in the revised individual-level process-outcome model shown in Figure 6 (parameter = .36, <.01).
This result is consistent with a recent study by Machin and Fogarty (2003) that establishes a connection between individual attitudes about implementation and training perceptions. This finding is particularly interesting since the current study shows relatively low quality ratings. The fact that assessments about quality co-vary with implementation “buy-in,” such that more acceptance of implementation is linked with higher quality points to the importance of psychological factors throughout the technology implementation process. When people are accepting of the proposed organizational change, they might be more willing to overlook challenges associated with the transition than people who are already skeptical or opposed change. Acceptance attitudes might be a potential anecdote for building immunity toward the inevitable negative barriers that can be associated with implementation (stress, frustration, resistance, etc.)

At the agency-level, similar relationships between acceptance attitudes (this time measured as a climate variable) and formal training quantity and quality were proposed (Hypothesis 2e and 2f). Failing to find support, agencies characterized as having a more positive implementation climate did not participate in greater quantities of formal training, nor were they more inclined to rate training quality more positively. These results contradict similar measures that show that at the individual-level implementation acceptance is positively correlated with active training behaviors (Klein et al., 2001). While this relationship is thought to hold true at the organization-level, limitations associated with the sample are thought to have made this correlation more difficult to detect if it exists. This is a rationale that is also used to explain the failed support for
Hypotheses 2h, which found that agencies with positive climate for implementation attitudes were not more committed to the technology change.

While correlation analysis also failed to statistically support Hypothesis 2g, the magnitude and positive direction reflected the expected pattern of covariance, which indicates that agencies with positive climate for implementation attitudes reported more implementation satisfaction. This positive correlation is also replicated in the individual-level model, thereby providing support for a pattern of repetitive findings that critics of hypothesis testing claim is necessary for interpreting statistical significance (Wainer & Robinson, 2003). Also, the moderately high strength of the correlation that was produced by this relatively small organization-level sample could indicate a substantial effect size that might have been significant provided a larger sample.

The next set of process-related hypotheses established relationships between formal training quantity and quality with outcome variables. While formal training quantity was not associated with commitment to change (Hypothesis 3a), training quality was significantly correlated with commitment (Hypothesis 3b). The more positive the training quality ratings, the stronger the commitment individuals expressed regarding technology change. Similarly, when measuring these training variables in relation to implementation satisfaction, a similar pattern of findings persists. Formal training quantity is not correlated with satisfaction (Hypothesis 3c), but training quality is (Hypothesis 3d). The replication of this pattern of results strengthens the importance of attitudinal perceptions, in this case, feelings about formal training quality in relation to valuable implementation outcomes. This same pattern of findings was also supported using SEM, model results for which are presented in Figure 8.
One should be cautious when interpreting these results, for this study does not advocate that training quantity is irrelevant and that “satisfying training” should be the goal for implementation. It is obvious that users must be adequately prepared to apply needed skills in order to use new technology and should engage in an adequate number of courses to meet that goal. Most organizations recognize the need for plentiful training in preparation for implementation. However, for reasons explained earlier, the individual-level formal training quantity variable was weakened by inconsistent enforcement of training across agencies, rendering this variable difficult to interpret in this model. Therefore, what these findings illustrate is the relevance of quality perceptions.

According to information gathered in interviews, training quantity was rather plentiful for most agencies. The state offered regional training sessions that were commensurate in quantity to the number of users in a particular geographic location. However, perceptions of quality seemed to be an after thought. Training programs were designed with very little input and participation from end-users by a third-party organization that was neither familiar with the technology nor government operations. Therefore, the skills that were taught were not tailored to the needs of those taking the courses.

For this reason, across numerous agencies, many attributed their real substantive learning to informal training that occurred AFTER the required training courses were complete. This informal training was enacted in the forms of local in-house training created by the agency to address organization-specific needs, local expert models of training that involved choosing one or a small group of individuals to become fluent in the system to assist others in the learning process, and inter-agency knowledge-sharing
groups that were coordinated between some agencies to provide a forum for users across agencies to meet and discuss problem-solving solutions related to the technology. This is a typical example of organizations focusing on structural elements of an implementation (i.e., the technology, the training courses), while overlooking person-related interests (i.e., end-user needs).

Another explanation for this pattern of finding could be attributed to common method bias. Training quality, satisfaction, and commitment to change were all collected via questionnaire, while training quantity data were obtained through archival means. This could result in inflated relationships among data collected using a common measurement instrument.

Exploring the relationship between training variables and outcome measures at the organization-level of analysis, most of the correlations linking training quantity and quality to satisfaction and commitment are not statistically significant, however supported (Hypotheses 3e, 3f, and 3g) with the exception of one significant finding that revealed a surprising negative correlation between training quantity and continuance commitment—the opposite direction in which it was hypothesized. This finding suggests that the more training an engaged by an agency, the more continuance commitment the agency is likely to report. While the individual-level training quantity measure was confounded by agency influences relating to training enforcement, at the organization-level training quantity reveals interesting information about the agency. Agencies with high levels of training participation were very likely those agencies that provided either positive or negative incentives to motivate their employees to train. At the organization-level, training quantity reflect the agency’s perceived value of training. From this finding
it seems clear that training enforcement using incentives such as money or fear of retribution to encourage participation might have had an unintended psychological bi-factor—continuance commitment. Employees in these agencies engaged in training, but the interest in training seemed to be instrumental. While commitment among employees is considered a positive strength for an organization, it would be interesting to know whether engendering commitment based on continuance during technology transitions is actually a helpful disposition to encourage, or ultimately might lead to technology resistance, careerist attitudes, and dissatisfaction over time.

The next components of the two models address hypotheses related to input characteristics of the agencies and the employees within them. Agencies characterized by more adaptability to change were expected to report process attitudes and behaviors that would be more amenable to changes associated with the implementation, such as positive climate attitudes toward implementation (Hypothesis 5a), active training participation (Hypothesis 5b) and increased information-sharing (Hypothesis 5c). None of these hypotheses were significantly supported. It could be the case that adaptability to change is not a culture variable that would be associated with facilitating technology transitions in organizations, or given the small sample size and limited power, existing relationships may have been difficult to trace.

Similarly, another agency characteristic expected to correlate with positive implementation processes was identification as an organizational learning culture. Agencies that reported more characteristics described as organizational learning traits were hypothesized to have more positive climate attitudes toward implementation (Hypothesis 6a) and were expected to engage in more information exchange behaviors
than less learning-oriented agencies (Hypothesis 6b). However, neither hypothesis was supported. Likewise, expectations that organizational learning cultures would be engage in greater quantities of training due to value placed on learning, and the expectation that these cultures would be more inclined to report high training quality rating were also unsupported. Interestingly, organizational learning was significantly correlated with training quantity, but in the negative direction, indicating that the more an agency identified itself as learning-oriented, and the few training courses the agency completed. This finding seems to contradict the logic of the proposed hypothesis. However, considering the poor quality of training and associated troubles that were communicated across agencies, it is likely that learning-oriented took a more proactive approach toward training, and developed informal training mechanisms within their agencies. These agencies are likely the ones that created in-house agency-specific training courses, local experts, and information-sharing sessions, and therefore relied less on the state-authorized training that was measured in this study.

The last agency-level hypothesis (6e) proposed relationships between organizational learning culture and increased inter-agency information-exchange behaviors, such that the more learning-oriented an agency, the more likely they were to actually put learned-skills to use. This relationship also failed to find support. Through interviews with agencies it was learned that, as the mission of the technology aimed to increase information-exchange across agencies, this results was achieved. However, the nature of this information exchange was not as intended. Agencies were forced to communicate more with other agencies, but the content of this communication tended to be problem-solving related to troubles the new SAP Procurement system created, not
knowledge-sharing based on the exchange of information critical to developing overall state and agency effectiveness. Therefore, the finding that agencies identified as organizational learning cultures were not exchanging information any more readily than other agencies could be a statement to the type of information was being shared in the immediate aftermath of a complex implementation, rather than the knowledge creating mechanism the system was hopeful to create.

Future research might explore a longitudinal perspective on the relationship between organizational learning and information sharing that includes the time period after the immediate shifting and learning has slowed and settled. The information-sharing patterns that occur post-implementation might be more indicative of the exchange behaviors intended for the system, rather than those captured in this study during and immediately following implementation.

The final individual-level input hypotheses explained characteristics of the employee in relation to implementation process attitudes and behaviors. In support of Hypothesis 8, employees who were more open to change were also more accepting of implementation than other employees. Support for this hypothesis was provided in the SEM revised individual-model (Figure 8) which yield a significant relationship between change and acceptance (parameter = .04, \( p < .01 \)). This result is consistent with research that associates openness and flexibility to tolerance of novel situation and organizational changes (Judge et al., 1999). This finding highlights the importance of person-variables in understanding the factors that facilitate technology transitions.

A second employee characteristic deemed important to technology implementation was willingness to learn (Burgetz, 1992; Karaevli & Hall, 2003).
Individuals who were more willing to learn were expected to engage in greater quantities of training (Hypothesis 9a) and rate training quality more positively (Hypothesis 9b). Once again, a hypothesis measuring individual training quantity failed significance, but the relationship between willingness to learn and training quality was supported. Hypothesis 9b was also supported in the test of this measure using SEM (parameter = .03, $p < .01$). Research suggests that individual learn only when they are willing, indicating that a degree of conscious acceptance of learning is usually necessary (Boydell, 1976; Cunningham, 1999). This current study indicated that individuals who are more willing to learn might also be more tolerant of limitations associated with training quality—tolerance which could be derived from innate acceptance of learning.

The final hypotheses addressed in this study involved predicted moderation effects that were expected to attenuate relationships between input and process variables (culture strength variable, Hypotheses 4a-c) and between process and outcome variables (time lag, Hypothesis 7). The first set of moderated regression analyses were conducted to test for interaction effect of time lag on relationships between implementation acceptance and outcome variables such as commitment and satisfaction. These analyses were conducted to address call in the research to correct for the omission of time in past studies that looked at technology transitions (Robertson et al., 1993). The effects of time lag were measured at both the individual and organizational-levels, however no significant interactions were detected.

The second moderated regression was tested to detect the influence of organizational learning strength on the relationship between willingness to learn and training quantity (Hypothesis 7). Although the overall moderated regression model was
not significant, post-hoc analysis of the significant interaction term revealed a simple ordinal interaction effect when culture strength is strong. Organizational learning cultures engage in greater quantities of training when culture strength is strong, a finding that reinforces the important of the social context throughout the technology implementation process.

Limitations to the tests of these hypotheses include the use of correlation analyses that only measure co-variations in the variables and do not indicate directional influences, in addition to common method biases that results from using a single method of collecting data for most model variables. At the individual-level, this study tried to prevent this bias by using an archival source of training quantity data, however as explained above, the variability across agencies regarding the enforcement of training altered the conceptualization of that training variable, rendering it relatively uninformative at the individual-level. Also, only perceptual, self-report outcome measures were assessed. Future research should integrate more objective, multi-sources measures related to implementation success.

Providing measurement alternatives to self-report data could also help to decrease motivated response styles associated with the social desirability--reporting a falsely held attitude because it is thought to be valued or socially accepted. In this study, participants might have framed their attitudes toward the SAP Procurement in a positive light for fear of perceived negative repercussions associated with seeming unsupportive of the implementation effort. In interviews conducted with agency directors, it was revealed that job stability speculations circulated after it was learned that procurement consolidation plans were being discussed at the state-level. The proposal was to
eliminate all purchasing at the agency-level and create a central purchasing office that manages all procurement for the state. The degree to which these concerns affected participants’ willingness to report negative feedback about the implementation during data collection is unknown. Multi-source data would help to control for confounding affects related to social desirability and job insecurity.

Other limitations included low scale reliability for some scales, one of which had to be excluded from the individual-level model (continuance commitment), and low agreement indices for determining fit for aggregation. As shown in the ICC statistics and discussed in the preliminary analyses, there was consistency in the responses within agencies regarding implementation attitudes and behaviors, however variability across agencies was lacking, indicating that an agency-level phenomena did not exist, and perhaps the effects of interest might be better suited for another level of analysis. These inferences were consistent with data provided in interviews regarding the lack of control agencies had over decision-making and actions regarding implementation.

In response to these measurement constraints at the individual-level, structural equation modeling was applied to provide an estimate of the overall model fit to the data. The revised model, in Figure 9, presents the input, process, and outcome variables of greatest significance from the individual-level perspective on technology implementation. Employees who were open to change were most accepting of implementation. Employees who were willing to learn were most optimistic about training quality, which was also associated with implementation acceptance. Ultimately, positive attitudes toward training were linked to important implementation outcomes, such as
implementation satisfaction and commitment to technology change—two factors organizations undergoing change would strongly value.

Other limitations to this study included the small sample size used to test organization-level analyses (N= 19 agencies). As a result, the ability to detect significant relationships using hypothesis testing was diminished due to limited power. Given the small sample size, the organization-level analyses conducted to detect average effect sizes (d = .5) approximated a power level of .29 ($t(18) = 1.73, p <.05$), while acceptable levels of power (.50) would have required a sample size of 46 agencies ($t(44) = 1.68, p <.05$). Although the proposed organization-level model was tested, the low sample renders the results meaningless. Future research should include larger samples in order to better understand the true relationships occurring at the organization level.

Due to additional limitations imposed by AMOS 5.0, moderator effects could not be estimated in the tested models. As a result, tests for moderation effects were only conducted using moderated regression analyses. In order to get a full understanding of the broad, complex, and interdependent influences operating on individuals and organizations, it is necessary that future research consider testing models in such a way that provides for analysis of moderation effects.

**Extensions and Contributions**

Despite the limitations of this study, there are numerous theoretical and pragmatic extensions that can be derived from these findings. While a great deal of effort and concern has been given to the development of the technology in large-scale information system implementation, often little regard is given to the people-issues that contribute to the success and satisfaction with the implementation (Klein, et al, 2001). Few empirical
studies provide a multi-organization perspective on technology implementation that controls for organizational and individual characteristics. This multi-method, multi-level, multi-organization study enabled the exploration into research questions that contribute to both our pragmatic and theoretical understandings of technology implementation and organizational change. These findings provide support the importance of psychological person-related components in the study of success information technology implementation.

**Pragmatic Extensions.** Applied researchers and practitioners have expressed frustrations over technology and organizational change research that provides “too much knowledge” (McAffee, 2003) about systems implementation that is too narrow for practical application. As a result, much of what is known about the success of technology in organizations depends largely on the context of the organizational environment. By measuring organizational change at the individual level, some concrete person-related factors emerge as practical levers to adjust toward successful implementation. One, the notion that certain individual disposition are more amenable to change and learning required for technology implementation might suggest potential implications for selection in organizations and industry that are characterized by frequent changes and innovations, particularly those involving lots of technology use and training.

Second, there might be implications for change management and those who direct large-scale organizational change initiatives—particularly those related to technology although not exclusively. Workplace change can be unsettling and stressful, not only for the organization, but for the individuals within them. This study highlights the importance of psychological acceptance of implementation in determining positive
implementation outcomes. Change management agents might be wary of that incentives and enforcement structures, while linked with commitment to change, might be engendering individual-focused continuance commitment, and not a more organization-focused affective or normative form of commitment.

**Theoretical Extensions.** Theoretical extensions include the development of a new construct in the organization literature, commitment to technology change. While past research has focused on the merit of organizational commitment of valued outcome, recent literature by Herscovitch and Meyer (2003) introduced the concept of commitment to change, explored here in the context of a technology transition. In this study, good construct support has been established with positively correlated implementation acceptance and satisfaction—two related constructs in a new technology-based nomological network. Additional research is need to improve the measurement of this construct, to develop better reliability, and ultimately to establish better validity for use in predicting and understanding technology change.

A second theoretical extension was information learned from the separate treatment of score means from score spread (strength) measures. In this study, two strength scores were measured based on two organization culture variables: organization learning strength and implementation climate strength. Strength measures were obtained by computing the standard deviation of the scale measured (the smaller the standard deviation, the greater the strength). The first finding is that agencies that exhibited weak organizational learning characteristics also reported weak climate implementation strength, thus indicating that strong culture agencies were strong regardless of the trait, likewise, weak culture agencies were weak regardless of trait. Future research might
explore an underlying construct that identifies agencies as strong or weak independent of a culture description to better understand the influence of strength measures.

Secondly, measuring strength measures simultaneously with scale means allows for a unique comparison of how these variables operate differently on a system of relationships like those proposed by these models. Organizational learning strength was highly correlated with all three measures of commitment where as the mean of organization learning was only correlated with affective commitment. Additional analyses could be explored to understand why strength would exert a stronger relationship than organizational learning in the context of technology change.

Conclusions

Currently, many state laws allow for local governments, school districts, and higher education instituted to “piggyback” on existing state contracts of SAP inter-agency systems, such as the one implemented in the state of Pennsylvania (Harris, 2004). While it is evident that there is potential for economic and efficiency gains, systems interested in adopting such models should be cautiously aware of the challenges such system can create. As was revealed in this study, there are a great many challenges associated with successfully implementing a large-scale integrated resource system beyond selecting a technology system and a training program. Person-factors explored in this study show the importance of adaptability and learning among employees, their understanding and acceptance of technology change, and their appreciation for quality training efforts. These factors have significant relationships with valuable outcomes such as implementation satisfaction and commitment to technology change. In effort to achieve successful technology implementation, organizations should strive to attain these
positive factors that facilitate successful implementation, and address negative implementation consequences that deleteriously affect individual-level attitudes and behaviors throughout the technology transition.
References


Klein, Palmer, & Conn (1997)


Appendix A

Tables

Table 1
Sample Demographics

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<tr>
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**Note.**

- Agency size is based on estimates provided in interviews with training and procurement liaisons. In some interviews, liaisons were unable to provide an estimate of the overall size of the agency. These agencies are marked (NE) for “No estimate.”
- Agencies with only one survey respondent were omitted from organization level analyses, N=9
Table 3
Variable Descriptives

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**Note.**
- Individual-level training quantity represent the number of technology-related courses taken by an individual. Range: [0,9] per individual. Organization-level training quantity represents the average number of courses taken by individuals within an agency divided by the number of SAP Procurement users in an agency. The percentage represents participation in training per agency relative to agency size. Percentages can exceed 100% when all individuals within an agency each complete more than 1 training course.
- Quality ratings on a 5-pt Likert scale (1 very poor quality; 5 very high quality)
- Culture Strength ratings are based on the standard deviation of ratings on both the Adaptability and Organizational Learning Scales. Larger strength numbers represent greater standard deviations, thus less agreement and weaker culture strength.
- Time lag refers to number of months between individuals actually using the SAP procurement system and completing the questionnaire for this study.
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<th>Rwg Average, % agencies above .70</th>
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<td>.78, 90%</td>
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<tr>
<td>Organizational Learning</td>
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<td>.02+, .27+</td>
<td>.75, 80%</td>
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</table>

Note.
- Average number of responding members per agency, k = 17, N = 20 agencies
- (**) significant at alpha .01, (*) significant at alpha .05, (+) marginal significance at alpha .10
- “% agencies above .70” represents the percent of agencies exhibiting an Rwg of .70 or higher. For example, 90% of participating agencies had an Rwg of .70 or higher for the Implementation Satisfaction scale.
Table 5
Individual-Level Model Scale Correlations

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Note.  
- Bolded numbers along the diagonal represent scale reliabilities.  
- Individual-level Continuance Commitment had an unacceptably low reliability (alpha = .38), therefore it was eliminated from the model. All related hypotheses were not tested.
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Note. Bolded numbers along the diagonal represent scale reliabilities. At the organization-level, Information Exchange, Radicalness, and Training Quantity ratings were not based on aggregated questionnaire scales, but informant interviews. Therefore, reliabilities are not provided in the table above.
Table 7
Individual-Moderating Effects of Time Lag on Implementation Acceptance and Satisfaction (Hypothesis 4a)

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<th>Mean, SD</th>
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<th>R²</th>
<th>F-value</th>
<th>df</th>
<th>p</th>
<th>β</th>
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<td>Satisfaction (Y)</td>
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</tbody>
</table>

**Step 1**
| Tenure Experience        | 14.72, 9.68, 3.29, 1.55 | .17** | .17** | 32.28** | 4,279 | .00 | .05 |
|                          |                       |       |       |         |       |     | .00 |

**Step 2**
| Tenure Experience        |                       |       |       |         |       |     | .42** |
| (X)                      |                       |       |       |         |       |     |       |
| (Z)                      |                       |       |       |         |       |     | .03  |

**Step 3**
| Tenure Experience        |                       |       |       |         |       |     | .05  |
| (X)                      |                       |       |       |         |       |     | .00  |
| (Z)                      |                       |       |       |         |       |     | .43** |
| (XZ)                     |                       |       |       |         |       |     | .03  |

Note. Percentages can exceed 100% when all individuals within an agency each complete more than 1 training course.
Table 8  
Individual-level Moderating Effects of Time Lag on Implementation Acceptance and Commitment to Change (Hypothesis 4b)

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Step 1
| Tenure Experience              | 14.72, 9.68 | .03** | .03** | 4.73** | 2,280 | .01  | .04    |
| Experience                     | 3.29, 1.55  | .00   | -.00  | .46    | 2,275 | .63  | -.01   |

Step 2 (Y1 Affective)
| Tenure Experience (X)          | .32**       | .34** | 37.27** | 4,280 | .00  | .02   |
| Experience (Z)                 |             |       |         |       |      | .08   |

Step 3 (Y1 Affective)
| Tenure Experience (X)          | .00         | .34** | 29.77** | 5,280 | .00  | .02   |
| (Z)                            |             |       |         |       |      | .08   |

Step 1
| Tenure Experience              | 14.72, 9.68 | .15** | .15** | 14.03** | 4,275 | .00  | -.02   |
| Experience                     | 3.29, 1.55  |       |       |        |       |      | -.01   |

Step 2 (Y2 Normative)
| Tenure Experience (X)          | .15**       | .15** | 11.37** | 5,275 | .00  | -.02   |
| (Z)                            |             |       |         |       |      | -.01   |

Step 3 (Y2 Normative)
| Tenure Experience (X)          | .00         | .15** | 11.37** | 5,275 | .00  | -.02   |
| (Z)                            |             |       |         |       |      | -.01   |

| (XZ)                           |             |       |         |       |      | .42**  |
|                                |             |       |         |       |      | .08   |
|                                |             |       |         |       |      | -.05   |
Table 9
Organization-level Moderating Effects of Time Lag on Implementation Climate and Satisfaction (Hypothesis 4c)

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Note. Percentages can exceed 100% when all individuals within an agency each complete more than 1 training course.
Table 10
Organization-level Moderating Effects of Time Lag on Implementation Climate and Commitment to Change (Hypothesis 4d)

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Table 11
Moderating Effects of Learning Culture Strength on Organizational Learning and Training Participation (Hypothesis 7)

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Note. Percentages can exceed 100% when all individuals within an agency each complete more than 1 training course.
Table 12
Simple Effects of Organizational Learning Culture on Training Quantity When Culture Strength is Strong and Weak

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<td>1.46**</td>
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Table 13
Fit Indices of for Measurement Models

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Appendix B

Figures

Figure 1
Individual-Level Model of Technology Implementation
Figure 2
Organization-Level Model of Technology Implementation
Figure 3
Effect of Organizational Learning Culture on Training Quantity When Culture Strength is Strong and Weak
Figure 4
Individual-Level Model Tested: Input-Process of Technology Implementation

- Openness to Change
  - .06**
  - Implementation Acceptance
  - .39**
  - Training Quantity
  - -.18

- Willingness to Learn
  - .03*
  - Training Quality

- Training Quantity
  - .02
Figure 5
Revised Model of Input-Process of Technology Implementation

- Willingness to Learn
- Training Quality
  - Openness to Change
  - Implementation Acceptance

Path coefficients:
- Willingness to Learn → Training Quality: 0.03*
- Openness to Change → Implementation Acceptance: 0.06**
- Training Quality → Implementation Acceptance: 0.39**
Figure 6
Individual-Level Model Tested: Process-Outcome of Technology Implementation
Figure 7
Revised Model of Process-Outcome of Technology Implementation

Implementation Acceptance

Training Quality

Satisfaction

Affective Commitment

Normative Commitment

Implementation Acceptance

Training Quality

Satisfaction

Affective Commitment

Normative Commitment

.36**

.37**

.82**

.54**
Figure 8
Total Revised Individual-level Model

- Openness to Change
- Willingness to Learn
- Implementation Acceptance
- Training Quality
- Satisfaction
- Affective Commitment
- Normative Commitment

Correlation Coefficients:

- Openness to Change to Implementation Acceptance: .04**
- Willingness to Learn to Training Quality: .03**
- Implementation Acceptance to Training Quality: .35**
- Training Quality to Satisfaction: .81**
- Training Quality to Affective Commitment: .54**
- Training Quality to Normative Commitment: .38**
Appendix C

Implementation Waves

Wave 1 – July 1, 2002
- Executive Offices OA
  - Governor's Office
  - Lt Governor's Office
  - Pardons
  - Crime and Delinquency
  - Public Employee Retirement
  - Public Television Network
  - Executive Offices General Counsel
  - Ethics
  - Infrastructure Development [PennVEST]
  - Milk Marketing
- Executive Offices OB
- Aging
- Agriculture
- Banking
- Emergency Management
- Health
- Human Relations
- General Services
- Insurance
- Military and Veterans' Affairs
- State
- State Police
- Public Utility
- Securities Commission
- Attorney General
- Human Relations

Wave 2 – October 1, 2002
- Community and Economic Development
- Conservation and Natural Resources
- Corrections
- Education
- Revenue
- Municipal Retirement
- Public School Employee Retirement System
- State Employee Retirement System
- Civil Service
- Fish and Boat
- Game
Wave 3A – January 2, 2003
· Public Welfare
· Pittsburgh Ports
· Liquor Control Board
· Probation and Parole
· Tax Equalization
· Historical and Museum

Wave 3B – April 1, 2003
· Environmental Protection
· Environmental Hearing Board
· Labor and Industry
· Liquor Control Board

Wave 3C – July 1, 2004
· Department of Transportation
· WorkFlow
· Business Warehouse (BW)
· Travel Planning
· Construction Project Administration (CPA)

Wave 4 – March 8, 2003
· Human Resources
· Payroll/Time
· ESS (Employee Self-Service)
· WorkFlow
· Travel Expense Reporting

Wave 5 – January 1, 2004
This includes Automated Time Rules

Wave 6 – July 1, 2004
· Enhanced Recruitment Functionality
· Personnel Development, Training & Event Management
· Business Warehouse (BW)
Appendix D

Hypotheses

H1a: Employees reporting higher levels of affective and normative commitment to technological change will report more satisfaction with the implementation effort than employees who express lower levels of affective and normative commitment to technological change. Employees reporting higher levels of continuance commitment to technological change will report less satisfaction with the implementation effort than employees who express lower levels of normative commitment to technological change.

H1b: Agencies whose employees report higher levels of affective and normative commitment to technological change will report more satisfaction with the implementation effort than agencies whose employees express lower levels of affective commitment to technological change. Agencies whose employees report higher levels of continuance commitment to technological change will report less satisfaction with the implementation effort than agencies whose employees express lower levels of continuance commitment.

H1c: Agencies whose employees report higher levels of affective, normative, and continuance commitment to technological change will report more inter-agency information-exchange behaviors than agencies whose employees express lower levels of affective, normative, and continuance commitment to technological change.

H3a: Individuals participating in greater quantities of training will express more affective, normative, and continuance commitment to technology change than those individuals receiving less training.

H3b: Individuals reporting greater training quality will express more affective, normative, and continuance commitment to technology change than those individuals reporting lower training quality.

H3c: Individuals participating in greater quantities of training will express more implementation satisfaction than those individuals receiving less training.

H3d: Individuals reporting greater training quality will express more implementation satisfaction than those individuals reporting lower training quality.

H3e: Agencies participating in greater quantities of training will express more affective, normative, and continuance commitment to technology change than agencies receiving less training.

H3f: Agencies reporting higher training quality will express more affective, normative, and continuance commitment to technology change than agencies reporting lower training quality.
H3g: Agencies participating in greater quantities of training will express more implementation satisfaction than agencies receiving less training.

H3h: Agencies reporting higher training quality will express more implementation satisfaction than agencies reporting lower training quality.

H4a: At the individual-level, time lag will moderate the relationship between implementation acceptance and implementation satisfaction such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and implementation satisfaction, and when the time lag is short, the aforementioned influence will be weakened.

H4b: At the individual-level, time lag will moderate the relationships between implementation acceptance and affective, normative, and continuance commitment to technological change such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and commitment, and when the time lag is short, the aforementioned influence will be weakened.

H4c: At the organization-level, time lag will moderate the relationship between implementation climate and implementation satisfaction such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and implementation satisfaction, and when the time lag is short, the aforementioned influence will be weakened.

H4d: At the organization-level, time lag will moderate the relationship between implementation climate and commitment to technological change such that the longer the time lag between the time of implementation and the time of the online assessment, the stronger the relationship will be between implementation acceptance and affective, normative, and continuance commitment, and when the time lag is short, the aforementioned influence will be weakened.

H5a: Agencies characterized by more adaptability to change will be associated with more positive implementation climates than agencies characterized by less adaptability to change.

H5b: Agencies characterized by more adaptability to change will engage in greater quantities of training than agencies reporting less adaptability to change.

H5c: Agencies characterized by more adaptability to change will exhibit greater increases in inter-agency information-exchange than agencies reporting less adaptability to change.
H6a: Agencies characterized as having more of an organizational learning culture will have more positive implementation climates than agencies characterized as having less of an organizational learning culture.

H6b: Agencies characterized as having more of an organizational learning culture will have greater increases in inter-agency information-exchange than agencies characterized as having less of an organizational learning culture.

H6c: Agencies characterized as having more of an organizational learning culture will engage in greater quantities of training than those agencies characterized as having less of an organizational learning culture.

H6d: Agencies characterized as having more of an organizational learning culture will rate training quality higher than those agencies characterized as having less of an organizational learning culture.

H7: Culture strength will moderate the relationship between agency cultural characteristics (adaptability to change and organizational learning) on implementation preparedness (implementation climate and training quantity), such that when culture is stronger, the influence of culture on implementation preparedness will be higher, and when cultures strength is weaker, the aforementioned influence will be weakened.

H8: Employees reporting more openness to change will express more implementation acceptance than those employees reporting less openness to change.

H9a: Employees reporting more willingness to learn will engage in greater quantities of training than those reporting less willingness to learn.

H9b: Employees reporting more willingness to learn will report higher training quality ratings than those reporting less willingness to learn.
Appendix E

Questionnaire Items

I Scales Applied to the Individual-Level Model

Demographic Questions
1. What is your job function? (HR, accounting, etc)
2. What is your job level? (manager, supervisor, employee)
3. How long have you worked in this position?
4. How long have you worked for (Agency)?
5. In what department/unit within (agency) do you work?
6. What is your gender?
7. What is your age?

Openness to Change
1. I’d rather be bored than surprised.
2. Generally, change is good.
3. I’ll take routine over a day full of unexpected events any time.
4. Whenever my life forms a stable routine, I look for ways to change it.
5. I prefer having a stable routine to experiencing changes in my life.
6. I generally consider changes to be a negative thing.
7. I like to do the same old things rather than try new and different ones.
8. I like to experience novelty and change in my daily routine.

Willingness to Learn
1. I enjoy learning new things on my job.
2. I like being challenged to learn new skills on my job.
3. I do not enjoy teaching myself how to apply new work processes.
4. I consider myself a student to life’s lessons.
5. Continuous learning is important to me.
6. I would rather apply knowledge and skills I already have than learn anything new on my job.

Implementation Acceptance
1. I think SAP Procurement should be a top priority in this agency.
2. I think SAP Procurement should take a back seat to other projects in this agency.
3. I put a lot of effort into using SAP Procurement effectively.
4. I think that the SAP Procurement implementation is important.
5. I really don’t care about the success of SAP Procurement.
6. I try to make the most of SAP Procurement.
7. I think SAP Procurement is a good for this agency.

(Adapted from Oreg, 2003)

(Adapted from Klein, Conn, & Sorra, 2001)
Commitment to Technology Change

Affective Commitment
1. I believe in the value of changing to SAP Procurement.
2. I think that management is making a mistake by introducing SAP Procurement.
3. Things would be better without SAP Procurement.

Continuance Commitment
1. I feel pressure to go along with this change to SAP Procurement.
2. I have too much as stake to resist this change to SAP Procurement.
3. Resisting this change to SAP Procurement is not a viable option for me.

Normative Commitment
1. I do not think it would be right of me to oppose this change to SAP Procurement.
2. I would not feel badly about opposing this change to SAP Procurement.
3. I would feel guilty about opposing this change SAP Procurement.

(Adapted from Herscovitch & Meyer, 2002)

Implementation Satisfaction
Please indicate your degree of satisfaction with…
1. …the rewards put in place to encourage use of SAP Procurement.
2. …the training opportunities available to you to help you learn to use SAP Procurement.
3. …the ability for you to provide feedback about the problems, concerns, and suggestions about the way SAP Procurement is used on the job.
4. …your level with which you were involved and informed about the SAP Procurement.
5. …the level of support the managers in your agency devote to ensuring SAP Procurement is effective on the job.

Time Lag
When did you first get access to SAP Procurement?
When did you first start to use SAP Procurement?
How long did it take you to learn to use SAP Procurement?

Information-Exchange
Please indicate you level of agreement with each statement…
1. SAP PROCUREMENT allows me access to greater quantities of data than I have had in the past.
2. SAP PROCUREMENT allows me to receive greater quantities of data from other agencies.
3. SAP PROCUREMENT allows me to receive data from a greater number of agencies than I have had access to in the past.
II Scale Applied to the Organization-Level Model

Adaptability
1. The way things are done is very flexible and easy to change.
2. We respond well to changes in the business environment.
3. New and improved ways to do work are continually adopted.
4. Attempts to create change usually meet with resistance (reversed).
5. Different parts of the organization often cooperate to create change.
(Adapted from Denison & Neale, 1994)

Organizational Learning
1. This agency views failure as an opportunity for learning and improvement.
2. Innovation and risk-taking are encouraged and rewarded.
3. Lots of things “fall between the cracks.” (reversed)
4. Learning is an important objective in our day-to-day work.
5. This agency makes certain that the “right hand knows what the left hand is doing.”
(Adapted from Denison & Neale, 1994)

Implementation Climate
8. SAP PROCUREMENT should be a top priority in this agency.
9. SAP PROCUREMENT should take a back seat to other projects in this agency.(R)
10. People in this agency put a lot of effort into using SAP Procurement effectively.
11. People in this agency think that the SAP Procurement implementation is important.
12. People in this agency really don’t care about the success of SAP Procurement.
13. People in this agency try to make the most of SAP Procurement.
14. SAP PROCUREMENT is good for this agency.
(Adapted from Klein, Conn, & Sorra, 2001)

Commitment to Technological Change
Affective Commitment
1. This agency believes that change is a good strategy.
2. This agency believes that change serves an important purpose.
3. Most people in this agency think that change is not necessary.
Continuance Commitment
1. People in this agency have no choice but to go along with this change.
2. It would be too costly for my agency to resist this change.
3. It would be risky to speak out against this change.
Normative Commitment
1. People in this agency feel a sense of duty to work toward this change.
2. It would be irresponsible for my agency to resist this change.
3. People in this agency do not feel any obligation to support this change.
(Adapted from Herscovitch & Meyer, 2002)
Time Lag
When did people in your agency get access to SAP Procurement?
When did people in your agency first start to use SAP Procurement?
How long did it take your agency to completely switch from the original system to SAP Procurement?
Appendix F

Interview Protocol

The following interview was conducted by phone with the a deputy from each agency, or with a person from each agency considered best able to answer questions relevant to information exchange behaviors before and after the SAP Procurement intervention.

Agency and Implementation Information
1. How many departments or sub-units operate within your agency?
2. Are these departments centrally located in the state? If not where is the major department located?
3. How centralized is this agency?
   (Depts operate alone)   (Moderately central)   (Highly central/Top-down)
   1   2   3   4   5
4. Roughly, how many people are employed by this agency?
5. Is SAP Procurement currently implemented in your agency?
   a) Yes, fully implemented (100%).
   b) Partially implemented.
      i. If then, roughly what percent of departments within your agency have access to SAP Procurement?
         (Less than 25%, 25%, 50%, 75%, More than 75%)
   c) No, not implemented (0%).
6. What are the primary uses of SAP Procurement in your agency?
7. How different is the new SAP Procurement system from the way the agency used to operate before the implementation?
8. In term of information-exchange, does SAP Procurement aid this agency’s ability to receive great quantities of information from other agencies? Greater quality information?
9. In terms of information-exchange, does SAP Procurement aid this agencies ability to give greater quantities of information to other agencies? Great quality information?

Change in Inter-Agency Information-Exchange
Please indicate your level of agreement with the following statements on a scale from 1-5.
1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree
1. Since the implementation of SAP Procurement, …(agency)…collaborates with a greater number of agencies across the state.
2. Since the implementation of SAP Procurement, …(agency)…exchanges information with other agencies more frequently.
3. Since the implementation of SAP Procurement, very little has changed regarding the number of agencies with which we do business.
4. Since the implementation of SAP Procurement, very little has changed regarding the frequency with which ...(agency…) collaborates with other agencies.
5. Information exchange has been an important SAP Procurement component to this agency.
6. I do not have enough information to determine whether SAP Procurement has affected the frequency or network of information shared with other agencies.

**SAP PROCUREMENT Training Courses**
1. What type of training courses have been offered to employees to help prepare them for the SAP Procurement intervention?
2. When were these courses first made available to employees?
3. Are the SAP Procurement training courses offered on a voluntary or mandatory basis?
4. Are any incentives, monetary or otherwise, offered to employees to encourage SAP Procurement training?
Appendix G

Qualitative Extensions of Contextual Issues

The context for this study was positioned among one of the more hotly political and closely-watched technology implementations of its time for two reasons, the potential the success systems such as SAP offer other states in establishing a greatly sought and promoted system for inter-government information-sharing. And two, the benefits associated with cost-saving strategies and “comparison shopping” for corporations looking to tighten procurement budgets. Expectations for the SAP Procurement implementation was anticipated to result in a “$100 million [savings] in the next year—not by cutting purchases, but by buying smarter” in the commonwealth where the implementation is underway (Harris, 2004, 2).

The pressure of such a high-profile endeavor was not without its costs to the work environment. The qualitative component of this study exposed some of the challenges imposed, such as the system’s political support and resistance, the escalating pressures to succeed, and the residual issues of job security that evolved as the efficiency and use of the system threatened to replace job positions across the agencies. Extensions from this research will include a qualitative analysis exploring the following reoccurring SAP Implementation themes.

----Summaries related to these themes are available upon request.----

Political support and resistance: Favored groups

Political support and resistance: The “Winners” and “Losers”

Pragmatic resistance: Why do we need this system anyway?

Job security
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II Peer Review Activity

Journal Article


Conference Presentations
