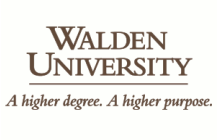

2019

Relationship Between Enterprise Resource Planning System and Organizational Productivity in Local Government

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2018

Abstract

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by

Tambei Chiawah

MBA, University of Phoenix, 2011

BS, Bowie State University, 2005

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Management

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Abstract

Organizations experience challenges despite efforts to increase productivity through implementing large-scale enterprise systems. Leaders of local government institutions do not understand how to achieve expected and desired benefits from the implementation of enterprise resource planning (ERP) systems. Lack of alignment between social and technical elements in ERP implementation depresses organizational productivity. The purpose of this quantitative correlational study was to examine whether social and technical elements increase use and productivity in ERP implementation. The research questions addressed the relationship between ERP and organizational efficiency, cross-functional communication, information sharing, ease of ERP use, and ERP usefulness. Sociotechnical systems theory provided the theoretical basis for the study. Data were collected from online surveys completed by 61 ERP users and analyzed using Wilcoxon matched pairs statistics and Spearman's correlation coefficient. Findings indicated a positive significant relationship between ERP and information sharing, a positive significant relationship between ERP system quality and ease of ERP use, and a positive significant relationship between ERP system quality and organizational productivity. Findings may be used by local government leaders, technology managers, and chief information officers to ensure ERP sustainability and increase productivity.

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Dedication

This study is dedicated to my father, Mr. John Tembei Chiawah, who stood behind the counter for over 30 years and sold books and musical instruments to educate, his loved ones. Ni Director, as he was fondly called, will forever be my source of inspiration because of his loving and caring attitude. To my loving wife, Marie, thank you for your support and for taking care of the children during this doctoral study. To my children, Emmanuella, Lucille, and John, who experienced a temporal vacuum while I was in school, I say thank you for bearing with me. We missed multiple activities because of homework. To my mother, Sarah Njong Chiawah, and siblings, uncles, aunties, nephews, nieces, cousins, and friends, I thank you for your support and understanding during this period. My mother believed in me and encouraged me to complete this program. I am proud of every one of you.

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Chapter 1: Introduction to the Study

Although the leaders of most local government institutions face stringent budgetary challenges, resident demand for outstanding services persists. Kluza (2014) noted that local governments include all subcentral governments, and Rosenbloom (2014) added that there are over 90,000 local governments in the United States, which include about 3,000 counties; 19,500 municipalities; 16,300 towns or townships; 38,250 special districts; and 12,900 school districts. The desire to meet stakeholder demands and increase productivity is compelling leaders of local government institutions to replace outdated technologies with enterprise resource planning (ERP) systems to add value to their business processes. According to Oyana (2008), ERP systems foster business and strategic alignment and increase organizational internal efficiency. Oyana defined internal efficiency as "business and customer specific benefits such as on-time service delivery, accuracy in invoice processing and payment, and producing high-quality products and services" (p. 26). ERP are information technology applications that streamline the business process and information flow in organizations. Although organizational leaders use ERP systems to address technological and operational challenges that local government institutions experience, it is equally important for leaders to examine social changes after ERP implementation to harness the full benefits and functionalities of the system. Sociotechnical systems (STS) theory highlights how the optimization of social and technical subsystems in organizations fosters better alignment and a higher quality work life for employees (Bélanger, Watson-Manheim, & Swan, 2013). My objective in this study was to seek information on how productivity may

increase when close alignment exists between people and technology during implementation and use of a nonlegacy system in an organization.

Enterprise resource planning systems are popular systems in organizations because of their flexibility and ability regarding synchronizing subsystems. However, not all ERP implementations are successful despite the systems' perceived ease of use and usefulness (Goeun, 2013). It is uncertain whether a new ERP system will increase productivity and efficiently streamline business processes. Furthermore, some ERP systems under deliver business values, whereas other systems take longer than expected to implement (Krigsman, 2010). I focused on the following attributes of the systems, applications, and products in data processing (SAP) ERP system implementation in local government institutions:

1. How system implementation fosters information sharing and cross-functional communication in the organization;
2. How aligning STS factors in ERP implementation may increase efficiency and productivity, and
3. Results of ERP implementation in which the system is easy to use and useful to stakeholders, which leads to high levels of job and customer satisfaction, unlike a legacy information technology (IT) system.

Advanced technology does not improve organizational productivity unless contributing factors such as people facilitate the implementation of the technology. Baxter and Sommerville (2011) contended that IT systems often meet technical requirements but are unsuccessful if the systems lack the expected support to function

properly in organizations. The social implication for this study was the provision of information that supports the assertion that ERP systems may increase organizational productivity to bridge the academic gap identified in the problem statement.

This chapter includes a discussion of empirical evidence to show how organizational leaders are implementing enterprise systems in hopes of increasing productivity. I also discuss how the connection between organizational productivity and ERP remains unsettled, which may be because of the misalignment of STS factors in ERP implementation. The major sections of this chapter include the background of the study, the problem statement, the purpose statement, the research questions and hypotheses, the theoretical foundation, the nature of the study, operational definitions used in the study, the assumptions, the limitations, the scope and delimitations, and the significance of the study.

Background

Several researchers have documented the benefits of ERP and the system's relationship to organizational performance in a range of private businesses and corporations. Moalagh and Ravasan (2013) examined a model of ERP success with a focus on three main subgoals: managerial success, organizational success, and individual success. Moalagh and Ravasan drew on the work of Ifinedo and Nahar (2007), who classified ERP success into six main categories: vendor and consultant quality, system quality, information quality, individual impact, workgroup impact, and organizational impact. Moalagh and Ravasan maintained that investigating other successes and factors in post-ERP implementation in the public sector could be an interesting area for future

research. Research on ERP implementation in the public sector is limited even though many local government institutions are implementing ERP systems to improve their business processes and better serve citizens.

Although investment in enterprise applications is plausible, it is also cumbersome due to complexities in ERP system implementation. Coelho, Cunha, and de Souza Meirelles (2016) examined how the dynamic cooperation between a client and an external IT consultant aided an ERP project launch in the state government of Minas, Brazil. Coelho et al. contended that enterprise systems are empowering and transforming the ways citizens interact with their governments, yet there is a lack of research on ERP in public organizations. In this study, I examined the relationship between ERP implementation and organizational performance regarding productivity, which was an under researched area. Tian and Sean (2015) has found that ERP is able to reduce a firm's risk in uncertain circumstances after ERP system go-live. Tian and Sean suggested that future research should examine the volatility of employee job performance following ERP systems implementations. Sociotechnical systems theory addresses the benefits of technology, as well as the social and human aspects. The alignment of both the social and technical functionalities in an organization, as highlighted by STS theory, may be critical to increasing ERP successes.

Organizational leaders often overlook the interaction among social and technical elements that may be inevitable in improving organizational productivity. Previous researchers proposed models to evaluate ERP success and performance in the private sector, but few examined how the alignment of social and human elements may lead to

efficient use of technology in a government institution. Mayeh, Ramayah, and Mishra (2016) posited that ERP users' acceptance of the technology is one of the salient factors when implementing an ERP system. Given the technical complexities involved in ERP implementation, some stakeholders may be skeptical about learning new processes without a prescribed strategy (Ramburn, Seymour, & Gopaul, 2013). In this study, I attempted to fill the gap in the available literature and reduce doubts expressed by government administrators regarding the implementation and adoption of ERP. Government administrators may use the findings to make better use of their resources and avoid costly ERP failures. In addition, the study added to the existing literature regarding how ERP SAP systems may increase productivity in local government institutions.

Problem Statement

The general problem is that leaders of local government institutions do not understand how to achieve the expected and desired benefits from the implementation of ERP. Stanciu and Tinca (2013) posited that, in 2010, 48% of ERP projects realized benefits under 50%. The specific problem addressed in this study was that lack of alignment between social and technical elements when implementing ERP systems reduces organizational productivity. Schoenherr, Hilpert, Soni, Venkataramanan, and Mabert (2010) contended that the failure to address social and technical considerations during ERP implementation may not foster information sharing, knowledge, and organizational learning. To address the problem in this quantitative correlational study, I examined five dimension variables related to ERP implementation and STS theory: (a) cross-functional communication, (b) information sharing, (c) organizational efficiency,

(d) ease of use, and (e) usefulness. I tested the five dimension variables to answer the research questions.

Purpose of the Study

The purpose of this quantitative correlational study was to examine particular social and technical elements (independent variables) that may increase organizational productivity (dependent variable) in ERP implementation. The study was grounded in Trist and Bamforth's (1951) STS theory. Sociotechnical systems theory demonstrates how the alignment of social and technical considerations may improve organizational performance in a large-scale IT infrastructure implementation. The sociotechnical factors identified in STS literature and theory include organizational efficiency, organizational alignment, information sharing, organizational communication, employee and customer satisfaction.

I examined whether social factors may foster and support technical factors to increase productivity when implementing and using an ERP system. Other researchers have discussed the notion that integrating the social and technical perspectives in ERP implementation helps to address people, processes, and technology complexities. Sedmark (2010) noted that the end of an ERP implementation, which is the product launch, is merely an end of the beginning because problems of integration extend beyond technology launch. This study helps to fill the gap in the scholarly research on ERP implementation in local government institutions.

Research Questions and Hypotheses

Research Question 1: Compared to the previous legacy application, how significant is an ERP application in creating organizational alignment that improves cross-functional communication and information sharing?

$H1_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that results in improved cross-functional communication.

$H1_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that results in improved cross-functional communication.

$H2_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that improves information sharing.

$H2_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that improves information sharing.

Research Question 2: Compared to the previous legacy system, how significantly does ERP system quality foster ease of use, usefulness, and organizational productivity?

$H3_0$: There is no statistically significant relationship between ERP system quality and ease of use.

$H3_a$: There is a statistically significant relationship between ERP system quality and ease of use.

$H4_0$: There is no statistically significant relationship between ERP system quality and ERP usefulness.

$H4_a$: There is a statistically significant relationship between ERP system quality and ERP usefulness.

$H5_0$: There is no statistically significant relationship between ERP system quality and organizational productivity.

$H5_a$: There is a statistically significant relationship between ERP system quality and organizational productivity.

Research Question 3: Compared to the previous legacy application, what is the relationship, if any, between ERP adoption and organizational efficiency?

$H6_0$: Compared to the previous legacy application, there is no statistically significant relationship between ERP adoption and organizational efficiency.

$H6_a$: Compared to the previous legacy application, there is a statistically significant relationship between ERP adoption and organizational efficiency.

Theoretical Foundation

The theoretical foundation of this study was STS. The study involved examining conventional theories in a large-scale IT infrastructure implementation. Proponents of STS theory (Yu, Chen, Klein, & Jiang, 2013, Eason, 2009) argued that the alignment of social and technical capabilities in IT systems operations may significantly improve performance. Based on the STS framework, the study addressed organizational productivity from internal stakeholders' perceptions of their ability to use ERP and complete tasks. The study involved using the STS theoretical framework and research

questions to examine the influence of ERP in achieving desired organizational objectives. Scott and Orlikowski (2013) contended that the world consists of individuals and objects with similar properties that create a strong relationship between IT and social settings. Therefore, it may be difficult to ignore the alignment between people and technology in the workplace.

Nature of the Study

I used quantitative research methodology. The correlational design was suitable to examine how particular factors of STS theories (independent variables) may increase organizational productivity (dependent variable) in ERP implementation. Sykes, Venkatesh, and Johnson (2014) contended that the uncertainty accompanying a new ERP system may create pressure on workflows and software solutions. The STS theory highlights particular social, technical, and organizational antecedents that may be critical in ERP implementation to increase organizational productivity. A correlational design was appropriate to examine the relationship between the independent variables and the output variable. Using a causal comparative analysis to determine relationship was not feasible because other moderating variables may affect ERP implementation.

Qualitative research approaches such as phenomenology, ethnography, grounded theory, and narratives received consideration, but they were not appropriate for this study. The focus of these approaches is on the interpretive perceptions and views of individuals (Rea & Parker, 2014), but qualitative research findings are difficult to generalize. The quantitative approach was more appropriate for this study. The study included a 7-point and 5-point Likert-type scale survey instrument consisting of the five

dimension variables under study. The survey highlighted particular STS dimension factors that may improve organizational productivity in ERP implementation and use. The survey instruments were adapted from previous studies and used to collect data from ERP stakeholders in local government institutions at one point in time.

The stakeholders included SAP system users, employees, and consultants within multiple local government institutions. Saravanan and Sundar (2015) reported that Cronbach's alpha is a good tool to demonstrate the reliability of survey instruments. Reliability means that subsequent measurements of the survey instrument should yield consistent results and findings if the data collection and analysis procedures are the same. Cronbach's alpha served to validate the adapted scales that were used in measuring the five dimensions of STS. The collected data were analyzed using SPSS. The study involved a series of Spearman's rho correlations to determine whether a statistically significant relationship existed between the dimension variables and ERP productivity. The Spearman rho coefficient is a bivariate correlation technique, and its values range from negative one (–1) to positive one (+1). Positive coefficients or higher values indicate a direct relationship. I also used a series of Wilcoxon tests to answer the research questions. As a supplemental exploratory analysis, I aggregated the five ERP dimensions (cross-functional communication, information sharing, organizational efficiency, ease of ERP use, and ERP usefulness) into an Overall ERP Quality scale that served as the dependent or criterion variable in a multiple regression model with the independent or predictor variables being the respondents' demographic characteristics (age, education, job function, professional level, etc.). The study involved surveying ERP SAP system

users online through a participant recruitment platform called Quest Mindshare. Study participants received a link from Survey Monkey to respond to the survey questions. Targeted participants for the study worked in a local government institution as consultants, subordinates, or managers and had experience using a legacy system as well as ERP.

Definitions

Correlation research: Correlation research involves a researcher collecting data to determine whether, and to what degree, a relationship exists between two or more variables (Simon and Goes, 2013).

Enterprise resource planning (ERP): Enterprise resource planning is business-integrated information system software that attracts the attention of business organization leaders to improve their business processes and achieve the company goals (Al-Ghamdi, 2013).

ERP post implementation: The post implementation phase occurs when an institution implements an ERP system and begins normal operations (Morris & Venkatesh, 2010).

Go-live: Go-live "marks the beginning of the post-implementation stage where the organization as a whole comes to terms with the new system" (Maheshwari, Kumar, & Kumar, 2010, p. 752) and adapts to using the new system.

Information technology (*IT*): Information technology involves the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data (Merriam Webster's Online Dictionary, 2009).

Organizational alignment: Organizational alignment reflects management's effort to measure organizational performance and systems to ensure sustainability (Parisi, 2013).

Organizational productivity: Organizational productivity refers to the amount of goods and services, resources, machines, etc. that a workforce produces in a given amount of time to bring about economic growth, improvements in standard of living, profit maximization, and organizational competitiveness (Solaja, Idowu, & James, 2016).

Sociotechnical systems (STS) theory: Sociotechnical systems theory, introduced by Bamforth, Emery, and Trist of the Tavistock Institute of Human Relations in London, includes the social system, which represents people and task performance, processes, roles, and management structures, and the technical system, which represents data structures, software, technology design, and infrastructure (Trist, 1981). Sociotechnical systems theory represents work designs focused on human and behavioral attributes.

User satisfaction: User satisfaction refers to a user's response to the use of the output of an ERP software application (Morris & Venkatesh, 2010).

Assumptions

The basis of the identification of five dimensions related to ERP and STS is extensive research and analysis of prior research. I did not formulate new measurement variables. I assumed that the five dimensions were consistent with STS theory and with the migration from a legacy system to an ERP system. I also assumed that most local government institutions would experience ERP challenges if senior management failed to address particular STS factors during and after system implementations. Enterprise

resource planning challenges may affect productivity, efficiency, service quality, and customer and employee satisfaction. Additional assumptions about the study included the following:

1. Stakeholders would collaborate during ERP implementation to ensure a seamless process, as new applications require additional sacrifice and devotion from every member of the team.
2. Survey participants would be willing to provide honest and complete responses to enable me to examine the effects of ERP on organizational productivity.
3. The correlational approach would be the best approach to solicit information from respondents and to understand the relationship between ERP and organizational productivity.
4. Future researchers would be able to replicate the findings of this study in local government institutions with similar cultures as the one under study.

Scope and Delimitations

This study involved the quantitative correlational approach. The correlational design involves determining the relationship between the independent variables and the output variables (Simon and Goes, 2013). The independent variables in this study were the social and technical factors in ERP implementation, and the dependent variable was organizational productivity. The study included local government institutions, which may have limited the generalizability of the study findings to private and other government institutions that do not share a similar organizational culture with the local government

institutions under study. A potential risk in obtaining biased responses existed when using a survey instrument to collect information from stakeholders involved in SAP implementation. I asked probing and direct questions to minimize such biases, but undetected misrepresentations may have occurred. I measured the five dimensions that boost ERP implementation as identified in STS literature. The five dimensions were not used in the same order as they appeared in the SAP ERP implementations prescribed by previous researchers, but this does not limit the dimensions' applicability.

I examined the relationship between ERP systems and organizational productivity. The predictions used in measuring the dimensions came from an established 7-point Likert-type scale survey instrument, which was consistent with other studies (Costa, Ferreira, Bento, & Aparicio, 2016). Other factors exist in ERP implementation that may increase organizational productivity, but they were not the focus of this study. The scope of the study was limited to the SAP ERP implementations in local government institutions. Therefore, the findings may be difficult to generalize to other local government organizations that do not share similar characteristics. I used purposive sampling to collect data from individuals involved in the system implementation in the institutions studied; therefore, a risk of not obtaining honest feedback existed.

Limitations

This study involved the quantitative correlational approach. The main objective of using a correlational design is to determine relationships between variables and make predictions to a population if a relationship exists between the variables (Simon, 2013). The independent variable in this study was the social and technical dimensions in ERP

implementation, and the dependent variable was organizational productivity. The study included government institutions in the United States, which may have limited the generalizability of the findings to private and other government institutions that do not share a similar organizational culture. A potential risk of obtaining biased responses exists when using a survey instrument to collect information from stakeholders online. To minimize the risk of obtaining biased responses, I asked probing and direct questions. I measured the five dimensions that may boost ERP implementation as identified in the STS literature. The five dimensions were not in the same order as used in the SAP ERP implementations prescribed by previous researchers, but this did not limit the dimensions' applicability.

Significance of the Study

This study includes several contributions to the growing body of knowledge for scholars and practitioners. The focus of the study was the relationship between ERP systems and organizational productivity. I placed ERP in a theoretical domain to enable future researchers to examine ERP effect on multiple dimensions in an organization. The findings of this study demonstrated different dimensions for improving people, processes, and technical challenges experienced in local government institutions during and after large-scale IT systems implementations. The leaders of most local governments implement enterprise applications to improve performance, but encounter difficulties sustaining these initiatives (Nurdin, Stockdale, & Scheepers, 2011). Some of the difficulties result from people, processes, and technical complexities. The implications for positive social change include providing information for technology managers and

chief information officers to ensure ERP sustainability. Stanciu and Tinca (2013) performed an analysis of surveys to determine the success of IT projects in 2012 and concluded that the rate of failing ERP projects remained high. The leaders of local government institutions who implement ERP systems may use the findings in this study to align the functionalities of the system and their objectives.

Summary and Transition

The general problem was that leaders of local government institutions do not understand how to achieve expected and desired benefits from the implementation of ERP. The specific problem was that the lack of alignment between social and technical elements in ERP implementation depresses productivity and efficiency. Enterprise resource planning applications are vital in integrating commonly shared data and in standardizing disconnected processes in government institutions. The purpose of the study was to help leaders of local government institutions integrate social and technical perspectives and address people, process, and technology challenges in ERP implementation to increase productivity. The research questions served as a guide to determine whether ERP systems may create an environment that improves cross-team communication, information sharing, and productivity. The findings of the study may lead to positive social change and highlight pertinent information for government administrators to increase productivity when implementing SAP ERP systems. Chapter 2 includes a review of the literature relevant to ERP implementation. Topics include some of the reasons organizational leaders adopt enterprise systems, such as business process reengineering (BPR); increasing productivity; and determining how the interaction

between ERP, BPR, and STS theory may yield more favorable outcomes in organizations.

Chapter 2: Literature Review

The literature review includes information on the relationship between ERP and organizational productivity, including the extent to which particular social and technical elements (independent variables) may increase organizational productivity (dependent variable) in ERP implementation. Strategies for reviewing the academic literature included performing a comprehensive search to obtain diverse and quality information on the effects of ERP systems on organizational productivity. Consistent with Clark (2016), I performed a systematic search of peer-reviewed and professional literature on ERP and STS to establish a foundation for the study. The databases used to collect information were Expanded Academic ASAP, Emerald Management, ProQuest Central, Sage Premiere, Thoreau, and Web of Science. I also used the Google Scholar search engine.

To facilitate the retrieval of information, I completed Box 1 of the database search screen with key terms such as *enterprise resource* or *SAP*. In the second search box, I entered the words *plan*, or *plans*, or *planned*, or *planning*, and the third boxes included words such as *software*, *program* or *programs, organizational AND productivity* to generate articles on SAP and ERP implementation and effects. Checking the full-text feature option box resulted in a broader search. I used the publication date range to limit articles published between 2012 and 2017. The process involved repeating the search criteria strategy for STS relevant searches and for the other dimension variables relevant to the study, which were information sharing, communication, ERP usefulness, and ease of use. I reviewed the academic literature and organized my study using the following themes: theoretical framework underpinning this study, history of ERP systems,

theoretical framework aligned to variables, evolution of the STS theory, sociotechnical alignment in ERP implementation, principles of STS theory, role of people in ERP, BPR, technological change in organizations, integrated nature of ERP systems, quality and ERP, organizational development and ERP, critical success factors of ERP systems, and ERP system failures.

Large-scale enterprise IT systems promise dramatic changes and organizational benefits such as cost reduction, streamlined processes, and expedited decision-making. Due to the complexity inherent in ERP implementation, a number of companies continue to encounter challenges (Seo, 2013) while others do not realize the benefits after implementing ERP systems. The leaders of most government institutions implement enterprise systems with the hope of increasing citizenry satisfaction, efficiency, and productivity. The promise of ERP implementation may be astounding to some organizations, but other organizations such as FoxMeyer lost $100 million and filed for bankruptcy as a result of an ERP implementation failure (Lyytinen & Newman, 2015). The complexities in ERP implementation may be a reason for the high implementation failure rates of the systems in organizations. Stakeholders in organizations may resist the implementation of the systems or may not fully collaborate toward the smooth functioning of the system if they feel pressured by ERP-initiated changes. Despite the large body of information on ERP implementation and use, it remains unclear why organizations do not experience the full benefits of ERP.

Theoretical Framework Underpinning This Study

I grounded the study in the STS theory. Trist (1981) conceived of STS and indicated that the interactions between people and processes in organizations are relevant to achieve organizational objectives. According to STS theory, people use information and communication technology as a medium to communicate (Shortell, 2012). Proponents of the theory argue that the alignment of social and technical solutions in ERP implementation may positively leverage performance (Yu, Chen, Klein, and Jiang, 2013). During ERP implementation, the assumption is that people will use the technology to increase information sharing, communication, job enrichment, and collaboration in meeting customer demands. Leshunda (2010) noted that, compared to the implementation of small technologies, the implementation of ERP causes significant change with broader effects on technology, people, and processes. Change stems from the joint optimization of subsystems and a user's adaptation to new structures as suggested by STS.

Enterprise resource planning implementation leads to a different level of experience among stakeholders due to the interaction of systems and processes, which is not the case with existing legacy systems. Staehr, Shanks, and Seddon (2012) contended that ERP implementation is not merely an installation of a software package, but rather is a dramatic change to the structure and work practices in an organization that affects internal and external stakeholders. People play an important role in using a large-scale IT infrastructure to solve organizational problems, improve quality and performance, and complete tasks and processes within specifications. Researchers have extensively noted the importance of STS in other ERP implementation studies (Appelbaum, Habashy,

Malo, & Shafiq, 2012), but few researchers have examined the theory in relation to a local government institution. It may be difficult to ignore the alignment between people, processes, and technology in the workplace when implementing an enterprise system.

History of ERP

Enterprise resources planning systems are a type of business software that may improve an institution's business processes with proper implementation. Tambovcevs (2012) noted that ERP systems evolved in the early 1960s as a type of inventory control and material requirement planning (MRP) software used to account for customer orders, purchases, production, and the management of supply chains. Another version of MRP called MRP II included a more seamless way of documenting material requisitions. A shortcoming of both MRP and MRPII is their inability to integrate functional units and subsystems in organizations such as inventory, production, manufacturing, supply chain, finance, payroll, contracts and procurement, communication, and human resources. In an effort to address the shortcomings of MRP and MRP II and to coordinate organizational processes, organizational leaders and system developers began designing enterprise planning systems (Tambovcevs, 2012).

The focus of ERP systems began shifting beyond the confines of a material scheduling tool to address organizational processes that were more complex. The chief claim of ERP system designers is that they will use an ERP system and increase efficiency and profitability while simultaneously increasing the level of control that an institution has over its entire operation (Glasgow, 2002). Organizational leaders began taking a closer look at how to be more productive in coordinating business processes.

Another reason for the push toward an enterprise technology is to expand the supply chain base by integrating subsystems within the organization that legacy systems are unable to accomplish. Tambovcevs (2012) contended that because leaders can use ERP systems to synchronize all information systems in an organization, communication and information sharing will improve. Capturing, storing, and retrieving information on demand from a single repository is a salient organizational development attribute that most institutional leaders may need to make timely decisions.

Compared to legacy systems, it may be more cost effective to accomplish particular end-user functions in organizations with ERP systems. Shojaie, Sedighi, and Piroozfar (2011) posited that when organizational leaders began paying attention to customer-oriented strategies such as customer relationship management and supply chain software, the need for ERP became more evident. Leaders needed assurance that updates to data would be accurate, regardless of time and place. Leaders also wanted data updates to occur in real time to facilitate intracompany relationships and eliminate problems, mistakes, and delays in data, language, and monetary unit conversion (Shojaie et al., 2011). Legacy systems are inadequate for providing these benefits to organizations and lack the capability to integrate subsystems at cost-effective rates, which is the reason most organizational leaders are migrating to ERP systems.

Legacy applications are not able to provide integrative capabilities or improve the business process in organizations to the same degree as enterprise systems. Between 2004 and 2005, the acquisition of ERP grew by over 5.4% around the world (Özkarabacaka, Çevikb, & Gökşen, 2014). The ERP market volume was $16.7 billion in 2005, while in

2012 organizational leaders around the world spent an estimated $24.9 billion acquiring new ERP software (Özkarabacaka et al., 2014). In 2013, the worldwide ERP market was €22.4 billion (Costa et al., 2016). The license and maintenance revenue of ERP increased from $19 billion in 1999 to $21.5 billion in 2000, which represented an increase of 13.1% (Özkarabacaka et al., 2014). In 2005, the top 10 ERP vendors were SAP with a market share of 28.21%, Oracle with 9.99%, SAGE with 7.29%, Microsoft with 3.68%, SSA Global (now INFOR) with 2.77%, IFS with 2.21%, Infor (Agilisys) with 2.13%, Kronos Incorporated with 1.83%, Hyperion Solutions with 1.64%, and Lawson with 1.25% (Özkarabacaka et al., 2014). The type of ERP that organizational leaders procure depends on the IT infrastructure, cost, and size (Tambovcevs, 2012). The choice of the enterprise system may also depend on the type of database the institution has and the ability to integrate related legacy applications to the databases. For example, an institution with a SQL database system is more likely to use SAP.

The most popular types of ERP software used by large commercial organizations and government institutions are SAP, Oracle, PeopleSoft, and JD Edwards. Leaders of small organizations often use mid-range ERP software such as QAD, Navision, and iScala, and it usually takes an organization between 6 months and 2 years to transition from a legacy system to ERP (Ünğan & Met, 2012). The large amount of time needed to accomplish an ERP transition is due to the complex nature of the system. It is customary for ERP project management and implementation teams to phase in different divisions and departments of the same institution to the implementation schedule as a risk-avoidance strategy.

Theoretical Framework Aligned to Variables

ERP and Communication

In this section, I identify the relationship between the theoretical framework and the dependent variable to understand the effect of a large-scale ERP system in organizations. Leaders with an ERP system will foster organizational alignment, integrate subsystems, and improve cross-functional communication and information sharing among stakeholders in the organization. Mumford (1987) revealed that when the underlying technology is adequate, deployment may be unsuccessful if management fails to address the social needs of the implementing organization. Mumford advocated for people to have more discretion in communicating with systems and their social environment. Discretion may also mean creating the right environment to train, having flexible system requirements, supporting stakeholders, and obtaining timely and honest feedback about a system to increase productivity, performance, and efficiency. Joshi, Sarker, and Sarker (2007) noted that because information systems development often requires constant communication and negotiation, the desired forms of communication, such as e-mails, face-to-face meetings, and verbal and nonverbal gestures, will generate a more gratifying relationship among the related parties and foster the transfer of knowledge.

Implementing new software technologies without addressing human relation issues may bring additional challenges to implementing institutions. Maguire (2014) noted that new system designers focus in the development labs on design specifications and entities that are compatible with their systems while neglecting how the systems will

interface with users. The role of people in the design and use of new technology is important. The goal of organizational leaders should be to align technical and social elements effectively, as stipulated by STS, to improve communication, information sharing, ease of system use, and usefulness of large-scale technology.

ERP and Efficiency

Organizational efficiency is a vital component in ERP implementation, despite the fact that but efficiency is difficult to measure. Multiple researchers have attempted to define *organizational efficiency*. Vilamovska (2010) maintained that efficiency encompasses the relationship between organizational structure, strategy, organizational roles, people, systems, leadership, organizational culture and values, and employee engagement. Sudhaman and Thangavel (2015) contended that organizational leaders should assess ERP efficiency from a productivity and quality perspective relating to defect counts and functionality. Enterprise system designers should design systems in such a way that technology users have greater autonomy in using technology to improve efficiency consistent with STS theory. Yen, Hu, Hsu, and Li (2015) explained that due to the robust and integrated nature of ERP, discipline among employees and additional task documentation may be necessary to improve efficiency. Management will need to put in place safeguards and procedures to minimize employee resistance and seek higher levels of productivity. Yen et al. noted that because job tasks and workflows in ERP implementation interconnect with employees, such connectedness and interdependency indicate a state of collective system use that provides a basis to determine information

quality and system quality. For continuous quality improvement to exist in an organization, the work of individual employees and their coworkers must be complete.

Senior management must encourage employees to use an ERP system extensively to realize the desired benefits of the technology. STS highlight a theoretical framework for understanding the complex ways in which stakeholders interact with tools and technology to do work (Vespignani, 2012). STS also demonstrate a foundation to link human and technical resources and accomplish tasks. Through social influences, employees can gain sufficient expertise and increase the inclination to use the system proficiently and productively. Therefore, a more adequate measurement of ERP efficacy is the ease of using the system by staff and the usefulness of the ERP system in accomplishing desired tasks that may increase employee satisfaction and productivity. The average employee spends between 1 and 2 hours each day using the Internet for social networking or online browsing (wiseGEEK, 2013). If people do not believe that technology is intuitive enough in helping them achieve self-fulfillment, their commitment to technology use may have limitations that adversely affect productivity. STS theory demonstrates the capability of combining technology and people to achieve desired outcomes in organizations.

Few researchers have highlighted the effects of enterprise systems on productivity in local government institutions. Most researchers of ERP have focused on other aspects of ERP, such as benefits, risks, critical success factors, and failures. Seddon, Calvert, and Yang (2010) examined key factors affecting organizational benefits from enterprise systems, such as integration, process optimization, improved access to information, and

major ongoing business improvement projects. Doom, Milis, Poelmans, and Bloemen, (2010) examined the critical success factors of ERP on small and medium-size enterprises in Belgium. Staehr et al. (2012) focused on a process-oriented framework of achieving ERP benefits beyond go-live and noted that ERP systems will realize business benefits involving the interaction of contexts and processes. Such contrasting research and evidence about ERP indicates that the true effect of the system is unclear. This study adds information to the growing body of knowledge about the effects of ERP on productivity in local government institutions. Sociotechnical systems theory highlights an extended dual-level analytical approach of how social dimensions align with technology to enhance large-scale IT infrastructures. Leaders of organizations should examine productivity by the ease of using technology to accomplish organizational objectives and task requirements. Leaders may also need to examine productivity based on an employees' perception of customer satisfaction, flexibility of sharing information, and communication between functional areas in the workplace.

Evolution of the Sociotechnical Systems Theory

The STS theory highlights the relevance of the interaction between technical and social subsystems in major technological operations. Bamforth, Emery, and Trist of the Tavistock Institute of Human Relations in London first introduced STS in their action research in the coal-mining industry (Trist, 1981). The theory has since evolved into an important theoretical lens in the IT industry. The social system represents people and task performance, processes, roles, and management structures, and the technical system represents data structures, software, technology design, and infrastructure. Yu et al.

(2013) maintained that leaders of organizational systems can only leverage performance when the social and technical requirements work in collaboration. The collaboration of the social and technical subsystems signals a new organizational structure in which technology models the social requirements and humans use them to complete task requirements on the job. The integration of the two subsystems increases the likelihood of ERP success in the organization.

The integration of the social and technical requirements in systems, design, and development fosters better collaboration in organizations. Eason (2009) revealed four elements that IT system designers should take into consideration in the design and study of STS to increase system implementation success. The four elements are as follows:

- The collective operational task where the system undertakes the operational delivery of the task objectives.
- Social and technical subsystems in which human resources undertake task performance in the social system using technical resources in the technical system and where the two are ideally co-optimized.
- The attribute of being an open system influenced by the environment that has to adapt as environmental conditions change.
- The idea of being an unfinished system that needs to be flexible enough to deal with new demands in the short term and where there is a provision to review and refine the system as the demands become new requirements.

It is important for organizational leaders to identify, understand, and capture the requisite technical components and knowledge that humans need to address ERP

challenges. Sociotechnical systems are grounded on the framework that the social aspects will complement the technical aspects in the organization to improve efficiency. Eason (2009) noted that new IT systems should include sociotechnical parameters to facilitate user interfaces with technology, as shown in Figure 1. Eason maintained that one of the reasons IT systems fail is the lack of user input in systems development. The system should be user friendly and incorporate user feedback in new releases and configurations (International Organization for Standardization, 2010). Fostering user flexibility in interacting with both internal and external stakeholders is important to encourage top-to-bottom and bottom-up communication. Similarly, senior management should be able to monitor, support, and train multiple users in different roles and to establish work flow processes and work flows that are easy to navigate and integrate with technology.

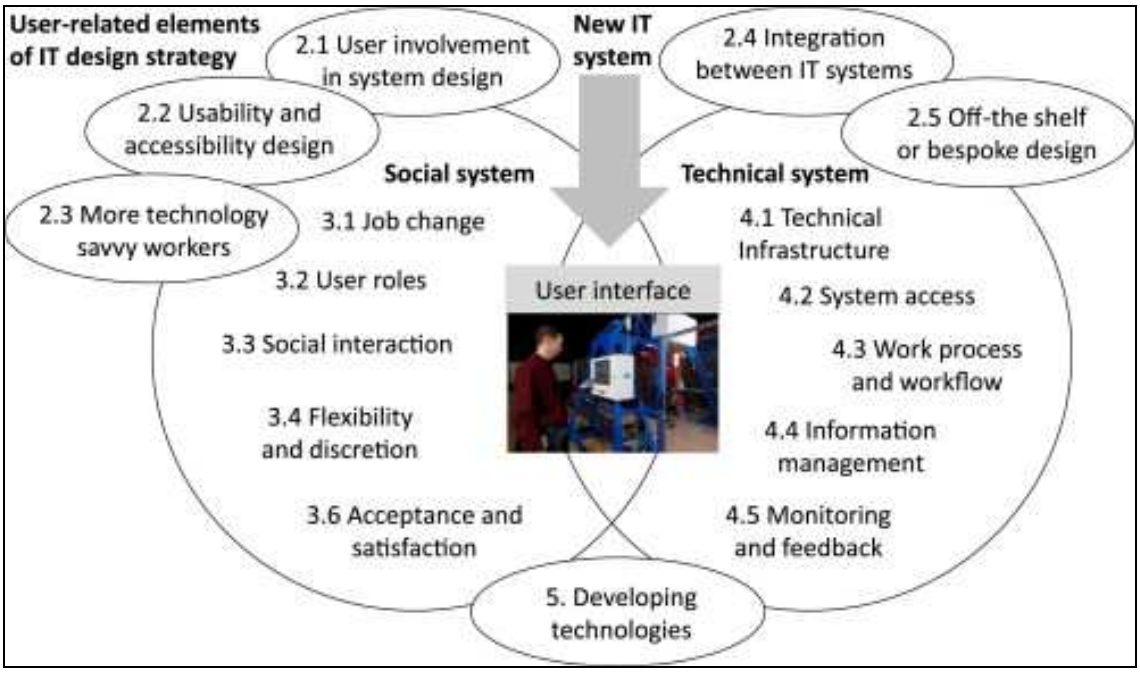

Figure 1. The relevance of sociotechnical systems theory to emerging forms of virtual organization. From "Before the Internet: The Relevance of Socio-technical Systems Theory to Emerging Forms of Virtual Organization," by K. Eason, 2009, *International Journal of Sociotechnology Knowledge Development*, *1*(2). Copyright 2009. Adapted with permission.

While incorporating the above-mentioned strategies is a prudent step in ensuring ERP sustainability, it is still unclear whether local government institutions will realize an increase in productivity. Camara and Abdelnour-Nocéra (2013) concurred that the focus of system design decisions should be addressing technical, social, and tangible considerations. The collaboration of technical and social perspectives may lead to more effective participation between stakeholders in ERP implementation. Hester (2014) administered a survey to employees at SkyCo to understand the reason for the underuse of the wiki software used in the company. SkyCo is a small cloud-computing technology provider in the Midwestern United States that uses wiki software for knowledge management. Hester noted that integrating technology and social capabilities makes a

difference in improving organizational performance. ERP system designers should not minimize the input of humans in addressing ERP complexities such as communication, resistance to change, and the ease to use the system.

Addressing ERP-initiated complexities may increase organizational efficiency and productivity. After performing an exhaustive research in large-scale IT information systems implementations, Norman (2011) contended that organizational leaders should not overlook human elements in the automation of organizational processes. The social and technical elements in a large-scale IT system implementation and use affect employee satisfaction and communication. Youngberg, Olsen, and Hauser (2009) contended that users' acceptance in using the ERP system is critical for success. The social design in STS represents knowledge, skills, values, attitudes, and assumptions about individuals, and the technical design represents task performance and design, processes, and technology that transform work inputs into outputs. Blending the social and technical elements may minimize user challenges and improve ERP chances to affect organizational productivity and efficiency positively.

Sociotechnical Alignment in ERP Implementation

The complexities inherent in ERP implementation and use make it necessary to address social and technical attributes. Pishdad and Haider (2013) posited that the activities involved in ERP development and use are subject to social, technical, organizational, cultural, and institutional pressures, although senior management in most organizations views ERP implementation solely as a technical undertaking. Enterprise resource planning complexities highlight specific challenges that can potentially impede

the success of the system if not properly addressed. The systems are a coveted undertaking in organizations where too many factors are in play during system implementations. Leshunda (2010) argued that compared to the implementation of small technologies, ERP implementation causes significant changes with broader effects on technology, people, and the organization. If government administrators view ERP systems through a sociotechnical prism, they may be in a better position to monitor the implementation process to realize increasing efficiency and productivity. Government administrators should not perceive ERP implementation as an isolated process. Zhu, Kraemer, and Xu (2006) opined that in the initiation stages of ERP implementation, the organization's technical and nontechnical professionals assess the system for suitability, but after implementation, stakeholders must accept, adapt, and assimilate the system to increase usability (Maheshwari et al., 2010), which is often challenging. Pishdad and Haider concurred that the challenges occur because particular organizations lack the expertise and knowledge to leverage the interplay of the social and technical aspects that are complementary in cultivating a favorable environment for ERP success. Also, management should not construe technology as the most critical variable that positively affects ERP institutionalization. According to the STS theory, the interaction between people and technology in most large-scale enterprise system implementations is important.

Other external factors may emerge because of ERP implementation and use. Pishdad and Haider (2013) revealed that normative pressure, coercive pressure, and mimetic pressure from competitors and stakeholders will influence ERP adoption and

success. Mimetic pressure occurs when competitors from the same industry adopt an organization's model to gain competitive advantage (Katsumata, 2011). Coercive pressure occurs when organizational leaders abide by rules, regulations, and sanctions from other actors and institutions, while normative pressure occurs when leaders take actions and make decisions (Pishdad and Haider) for others to accept. Normative pressure may occur because of pressure from trying to belong or acting irrationally. Senior management's influence and input is critical to minimize the effects of these social and cultural elements and enable ERP to achieve full institutionalization.

People's involvement is critical to ERP development and success. Matende and Ogao (2013) contended that human and management issues should be at the center of technology because ERP systems are social systems that benefit from people's efforts. Matende and Ogao defined people in the ERP context as key users who participate in the system development phase or end users who participate during system implementation. People help in developing functional and domain expertise that makes it difficult to dissociate them from an ERP study without experiencing major setbacks. The complexity in ERP implementation makes it even more impossible for the system to produce desirable outcomes without continuous monitoring and control. Upadhyay and Dan (2009) opined that users affect ERP success when they align system requirements in the initiation stages with the social and business requirements within functional units in the organization to sustain the system after going live. An alignment of the system and the business and social requirements may improve ERP performance as highlighted in STS

theory. User involvement enables users to stay engaged and positive while minimizing the potential to resist system-initiated challenges.

Principles of Sociotechnical Systems Theory

The focus of the STS theory is on people and technology in the organization. The theory highlights a framework to examine behavioral relationships in a technology-centric environment. Tesley, Jordan, and Santani (2012) noted that STS is significant in large-scale technology system implementation because of its emphasis on task significance. Sociotechnical systems represent work designs with a focus on human and behavioral attributes. It is important for individuals to use their interpersonal skills to enhance technology.

Human behavioral attributes include task significance, team–goal congruence, employee trust in one another, and a collective desire to garner customer satisfaction. Bostrom and Heinen (1977) predicted that organizational systems would continue to fail if system designers do not recognize STS principles in new IT system designs and implementations. Bostrom and Heinen contended that sociotechnical change plays a pivotal role in enabling the successful adoption and use of an enterprise information system. It may therefore be difficult for management to attain organizational efficiency without aligning individual and technical capabilities. Although the debate on what approach to take in achieving social and technical alignment is ongoing, research on human competencies in technology-centric environments is essential.

Sociotechnical theorists believe that human skills are necessary to optimize technology and increase organizational performance. Trist (1982) contended that both

economic performance and job satisfaction depend upon the goodness of fit between an organization's social and technical systems. The social dimension as stipulated in STS theory complements technology and improves organizational performance and employee- and customer-perceived satisfaction rather than being a secondary consideration. Organizations largely include routine relationships between structures, technology, actors, and tasks (Leavitt, 1964). Organization leaders should use the interactions of these structures to measure productivity during a large-scale technology implementation. Although other studies on ERP predictability in transforming institutions exist, this study involved examining variables along the lines of the STS theory in local government institutions.

The social dimensions may have broad implications for practitioners and implementing institutions. Kaniadakis (2012) noted that ERP implementation is an agora of techno-organizational change in which the challenges for user organizations shift from choices of technical design and process reengineering to choices on how actors behave and manage their relationships in the organization. Kaniadakis believed that ERP implementation centers on three interconnected levels or viewpoints. The view points are namely: enterprise, sectoral, and global that are similar to ERP initiation, design, and implementation. Kaniadakis contended that ERP implementation is not just an isolated incident happening in the organization but rather reflects a system model of change.

During this change, various internal and external actors of the organization must consider ERP implementation as a project-based effort and not an exclusive technology-centric occurrence. Kaniadakis (2012) considered ERP implementation as a

socioeconomic phenomenon marked by the engagement of a variety of different actors (suppliers, users, consultants, etc.) who are engaged in relationships and who experience new challenges from these relationships beyond the technical choices of the system. These actors have diverse interests and levels of understanding and play an integral part in ERP success. Sociotechnical systems highlight a similar perspective in recognizing the interaction between technology and human behavior in a complex organization-wide technology-initiated change such as ERP (Pollock & Williams, 2009). Enterprise resource planning implementation extends beyond organizational and firm boundaries to include the external environment and the interrelationship of different stakeholders.

Role of People in ERP Implementation

Senior management should not overlook the role of people in directing enterprise systems to improve organizational productivity. Human effort is critical in the period following ERP implementation when most large-scale enterprise systems experience failures. Notably, senior management places great emphasis on selecting the ERP system in the initiation stages. Chang, Cheung, Cheng, and Yeung (2008) contended that ERP is the most transformational information system investment in companies worldwide in terms of cost and the number of people involved in implementation. People assist with coordinating activities in the different functional areas of the organization that improve response time when delivering services to customers. Total quality management (TQM) and BPR support removing non-value-added activities in organizations and increase enterprise-wide quality based on human efforts. Similarly, STS dimensions demonstrate that aligning social and technical capabilities in an organization yields better outcomes.

Individual effort and participation are critical in ERP implementation, and senior management has an obligation to help stakeholders realize the smooth functioning of the system.

A power struggle often emerges between external and internal consultants that adversely affect the ERP implementation process. Kaniadakis (2012) noted that ERP implementation is not a spatially restricted narrow episode of organizational change; rather, it should be an interaction of actors and networks with diverse understanding. Stakeholders possess varying levels of interest and motivation in organizations that often lead to potential fallouts; management needs to foster collaboration by aligning individual and group goals to the vision and mission of the organization. It is equally important to cultivate a group culture where people understand the importance of using technology in achieving a common goal for the organization. It may be difficult for ERP to be successful in the pre- and post-implementation phases without human effort.

Although organizational leaders struggle with technological challenges, it is unclear whether they take into consideration human capabilities to ensure a smooth transition as suggested by STS. Caruso (2003) studied a pharmaceutical giant called Wyeth whose leaders implemented an ERP and found that the software has competitive advantage when its integration in the organization is effective. Spear and Venkatesh (2002) noted that user resistance is steep when new technology is incongruous with the organization's identity. A more coherent determination of employees' interest in new technology might be whether the mission and vision of the organization align with employees' individual visions. Dedeke (2012) maintained that a corporate culture

emphasizing allegiance to the company and one with a dominant emphasis on professional culture will yield stronger loyalty to an individual's professional culture than organizational allegiance. Management may have to create better mechanisms in attuning stakeholders to the new organizational climate.

Business Process Reengineering and ERP

Business process reengineering is an enterprise-wide effort to transform an organization in new ways that increases efficiency and productivity. Iizuka, Okawada, Tsubone, Iizuka, and Suematsu (2013) considered BPR a drastic change in organization-wide processes. The implementation of ERP is a complex undertaking that needs guiding to meet the objectives of the organization. Organizations continue to experience negative returns from ERP implementation, although the objective is to transform and improve business processes. Mohadere, Zarah, and Zoudabeh (2015) contended that ERP implementation is a functionality of BPR. The reengineering of an organization mirrors the systems-thinking philosophy, which highlights a more holistic interaction of internal and external processes within organizations. Enterprise resource planning systems fulfill a similar objective. Organizational leaders delve into the concept of business reengineering to address declining productivity and to meet 21st-century marketing and business trends.

Business process reengineering is a novice concept that became popular when leaders realized that it is critical to address complexities in organizations and to meet stakeholder demands. The concept of BPR led organizational leaders to develop enterprise software systems (Özkarabacaka et al., 2014) that could affect positive

organization-wide changes. Designing ERP systems is helping business leaders integrate different functional areas in organizations and track the real cost of doing business more effectively. Johnson (2014) maintained that ERP software enables collaboration between stakeholders of an organization in a timely manner. The capability of ERP systems to process and disseminate information in real time facilitates decision making in both the short and the long term.

Although the concept of business reengineering may sound attractive, keeping stakeholders abreast of drastic changes in the organization is an arduous task for leaders. For example, employees may feel more committed to the goals of the organization if they realize a better alignment between the organization's vision and their individual goals. Lin and Hwang (2014) found that self-efficacy, perception, and the ability to create knowledge using IT systems have a positive effect on affective commitment. The individual employee who develops self-motivation and efficacy because the organization adopts an advanced system to simplify key job roles and processes may be in a better position to foster innovation and productivity. When employees feel motivated and empowered, they are more likely to commit to the organization.

Obtaining stakeholders' interest and commitment in supporting ERP implementation may be a good readiness measurement technique for senior management. Davenport (2000) sampled executive managers of multiple organizations to understand their expectations of an ERP system. About two thirds of the managers insisted on the relevance of the system's quality in producing reliable information and ease of use of the system. Sixty-one percent of the managers favored the ability to obtain real-time data and

improve decision making, while 51% and 38% of the managers noted the importance of improving efficiency and upgrading to a new technology, respectively. The managers favored an application that would enable their organizations to compete with other businesses. Implementing ERP to improve productivity as an aspect of BPR was the goal of this study. Shang and Seddon (2002) classified ERP benefits in different dimensions:

- Operational benefits result from automating and rationalizing daily and routine tasks. By automating processes, organizational leaders reduce cost, human intervention, and the time frame to accomplish particular tasks in meeting customer demands.
- Management benefits occur because ERP systems store information in a single database, which makes it easy for senior management to synchronize and analyze data from different departments in real time.
- Strategic benefits occur due to the integrating nature of ERP. When organizational leaders are able to integrate data from subsystems, the possibility of creating new business alliances and increasing productivity and efficiency exists.
- Organizational benefits occur when the possibility of harmonizing all interdepartmental processes exists. When processes are integrated, internal communication is permissible, which makes it easy for employees to embrace change and the organization's vision.
- Technological benefits result from the integrating nature of ERP. An integrated system increases the flexibility to accomplish more tasks in the

organization, in addition to reducing huge expenditures from adding patches to maintain legacy systems.

Organizations are realigning their structures and policies to meet the needs of stakeholders and functional units that solely depend on ERP systems to run smoothly. Pishdad et al. (2013) maintained that ERP capabilities enable organizational leaders to reengineer key business processes and develop new ones to support business operations. Like BPR, ERP is an effort to redesign business operations, except that ERP is a technology-centric system with more user flexibility to process and access data in real time for quick decision making. Both BPR and ERP foster active user interaction in improving cross-functional communication and streamlining the length of time that it may take to process business transactions between departments. The focus of this study was examining how ERP goes beyond the objective of BPR in increasing organizational efficiency and productivity.

Technological Change in Organizations

Information systems have experienced major transformations in small, medium, and large organizations. Fillion, Braham, and Ekionea (2012) opined that researchers have studied the individual acceptance and use of new technology by the human organization extensively over the past two decades as organizations transition from conventional to functional business processes. Fillion et al. noted that researchers have performed a variety of models and studies on user adoption and use of IT, including the technology acceptance model (TAM) by Davis (1989), TAM2 by Venkatesh and Davis (2000), TAM3 by Venkatesh and Bala (2008), and unified theory of acceptance and use

of technology by Venkatesh, Morris, Gordon, Davis, and Davis (2003). According to the TAM, social influence processes (such as voluntarism) and cognitive instrumental processes (job relevance, perceived ease of use) significantly influence user acceptance of IT (Venkatesh et al., 2000). The leaders of most organizations are replacing legacy information systems with enterprise systems. Legacy systems are existing systems in an organization developed internally or procured over a long time. Dedeke (2012) defined legacy systems as an aggregate package of software and hardware solutions whose languages, standards, codes, and technologies are from past innovations. Dedeke posited that managers should employ models to help them make decisions regarding replacing or retaining a legacy system.

One such model is the portfolio matrix approach. Leaders can use four criteria namely; normal maintenance, conditional maintenance, engineering candidates, and replacement candidates, to compare the business value and the technical value of a legacy system (Dedeke, 2012). Some legacy systems bear such significance to an organization that retiring them may be a difficult decision. One reason for senior management's skepticism about abandoning a legacy system is the fear of potentially losing intellectual and financial investments incurred in acquiring the legacy systems (Dedeke, 2012). It is equally important for senior management to identify which legacy software to migrate to an ERP system, although precautions are important regarding legacy systems with modules that are not compatible with new enterprise systems. Figure 2 shows four criteria of existing applications that senior management may consider prior to replacing a legacy system with an enterprise system.

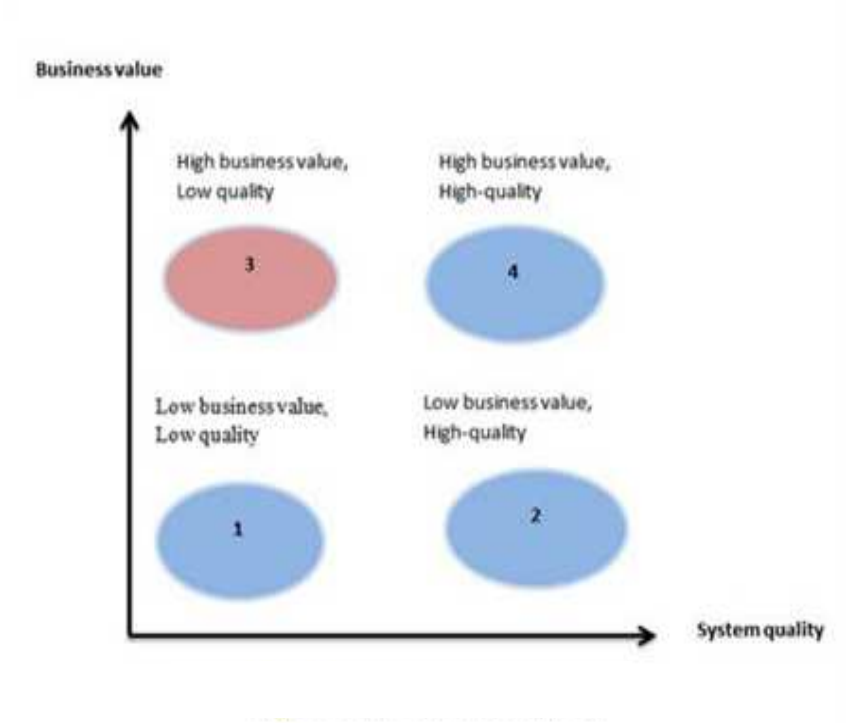

Figure 2. Enhancement of vector method by adapting octave for risk analysis in legacy system migration. From "Enhancement of Vector Method by Adapting Octave for Risk Analysis in Legacy System Migration," by A. Hakemi, J. Seung Ryul, I. Ghani, & M. G. Sanaei, 2014, *KSII Transactions on Internet & Information Systems, 8,* p. 10. Copyright 2014 by Korean Society for Internet Information. Reprinted without permission.

As shown in Figure 2, legacy applications fit into four categories:

- Category 1: Low business value, low quality—Management should consider retiring this legacy system.
- Category 2: High business value, low quality—Management should consider migrating or replacing this legacy system if an alternative system is available.
- Category 3: Low business value, high quality—Management should consider retiring or maintaining this legacy system.
- Category 4: High business value, high quality—The operation of this legacy system should continue using normal maintenance practices.

Senior management should make a decision on migrating three out of the four legacy applications to an enterprise system because they provide better benefits to the organization. Morris and Venkatesh (2010) contended that enterprise systems account for more than 30% of all major change activities in organizations. The implementation of these systems highlights improvements in organizational business processes. Fillion et al. (2012) concurred that enterprise systems facilitate the completion of day-to-day tasks by coordinating disjointed processes and minimizing waste and overhead cost while simultaneously enhancing strategic planning. Botta-Genoulaz, Millet, and Grabot (2005), Mabert, Soni, and Venkataramanan (2000), and Shang and Seddon (2002) noted particular reasons prompting organizational leaders to implement enterprise systems, which include the desire to access information in real time for decision making, increase growth potential, reduce high maintenance costs of legacy systems, and eliminate delays and errors in collecting and processing customer orders. Whether using these technological devices and software is increasing productivity in organizations remains unclear.

The leaders of organizations in different industries continue to transition to new technology with the hope of increasing efficiency and stakeholder satisfaction. Lyytinen and Newman (2015) opined that legacy systems lack the integrated functionality to provide a cradle-to-grave design for the different functional areas in the organization. The absence of collaborative features in legacy systems prompts senior management to advocate for integrated systems. Enterprise resource planning systems are often preferable because they synchronize information between different functional units in the

implementing organization, unlike legacy systems that operate in silos. Figure 3 shows an example of a legacy system with standalone applications and databases.

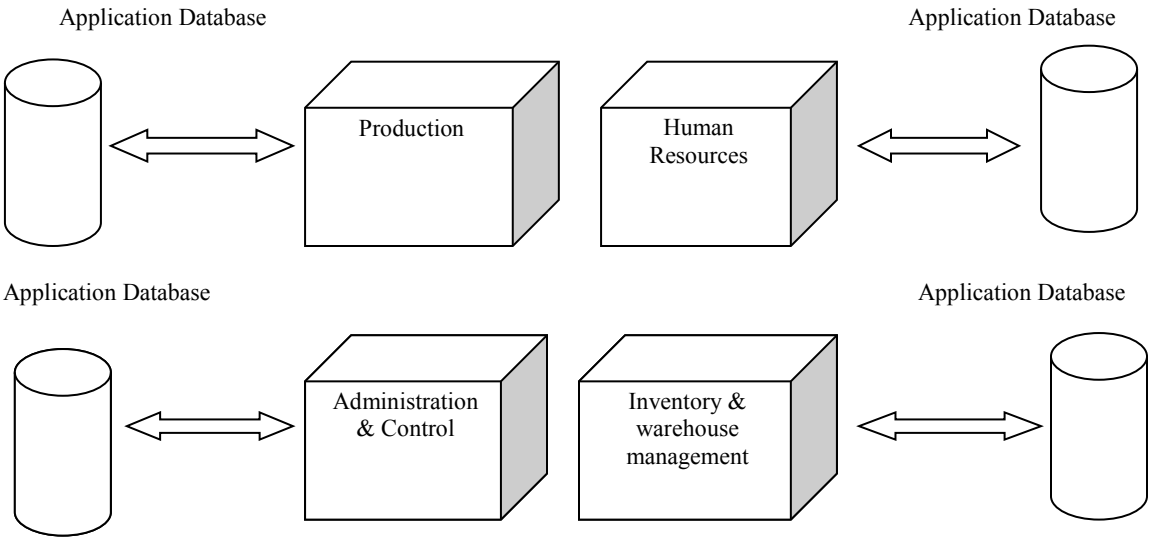

Figure 3. Stand-alone legacy system architecture. From "Critical Elements for a Successful Enterprise Resource Planning Implementation in Small and Medium Sized Enterprises," by T. C. Loh & S. C. L. Koh, 2004, *International Journal of Production Research, 42*, p. 3434. Copyright 2004 by Emerald Group. Adapted with permission.

Developing a unifying technological system constitutes a push for technology change in organizations. Hakemi, Seung Ryul, Ghani, and Sanaei (2014) concurred that migrating legacy systems to new environments improves an organization's IT infrastructure. Enterprise systems should increase organizational coordination and efficiency, unlike legacy systems with standalone databases that do not integrate with one another. Enterprise resource planning has modules that can seamlessly integrate all functional areas and databases in the organization and avoid redundancies and inconsistencies. However, organizational leaders are always wrestling with uncertainties in new enterprise systems implementations. All considerations before selecting new

large-scale IT systems should be thorough because of the high cost and risks to the organization if these systems improve neither efficiency nor productivity.

Integrated Nature of ERP Systems

In the past, businesses suffered with standalone legacy systems that did not communicate with other functional areas and forestalled operations. It was difficult for stakeholders of organizations to address changes and affect change. Organizational leaders should expect ERP systems to have a positive impact on a company's efficiency because ERP enables information sharing and flexibility in delivering services (Roztocki & Weistroffer, 2009). Organizations with properly implemented ERP systems no longer operate silo systems and achieve high levels of process integration. An action in one department in these organizations necessitates a corresponding action in other departments, which is unlikely with legacy systems. Tarhini, Ammar, Tarhini, and Masa'deh (2015) maintained that ERP provides organizations with an integrated software application and a unifying database to collaborate, share data, and streamline processes in key functional departments such as supply chain, procurement, human resources, and payroll administration. Enterprise resource planning systems also link people, processes, roles, and technology, which is a characteristic of STS and critical in increasing user efficiency and organizational productivity.

Figure 4 shows how the ERP system is able to integrate and share information with the different functional areas of an organization in real time. The ability of ERP systems to foster collaboration between these functional areas expedites the decision-making process and increases efficiency. The ERP system minimizes the steps and

procedures that require a legacy system to accomplish a task. Tambovcevs (2012) maintained that since the development of technology such as the Internet, organizational leaders have considered improvements in technology as a critical vehicle for success. The purpose of implementing these new technologies is to reduce the time that organizational stakeholders take to respond to customer demands or address changes in organizations. Although employee satisfaction has a direct correlation with customer satisfaction, the focus of this study was examining if stakeholders' use of technology facilitates and transcends into increases in productivity in the organization.

Most senior management widely considers ERP systems a better solution for coordinating people and processes and for minimizing redundancies in organizations. Azevedo, Romão, and Rebelo (2014) examined ERP success factors in the hospitality industry and posited that the integrating nature of ERP helps businesses within the value chain improve competition and customer service. The ability of ERP systems to consolidate information provides cost savings to businesses and increases efficiency. Johnson (2014) concurred that a good ERP system is easy to adapt and configure with standard update packages, unlike a legacy system. Johnson defined configuration as creating small layers on a software device to simulate updates, as opposed to obtaining a new system every so often. Enterprise resource planning systems therefore embody BPR in using technology to capture, integrate, and disseminate data in a timely manner to improve efficiency. Enterprise resource planning success in improving organizational productivity may hinge on the proper implementation of the system and the alignment of people and technology as stipulated in STS.

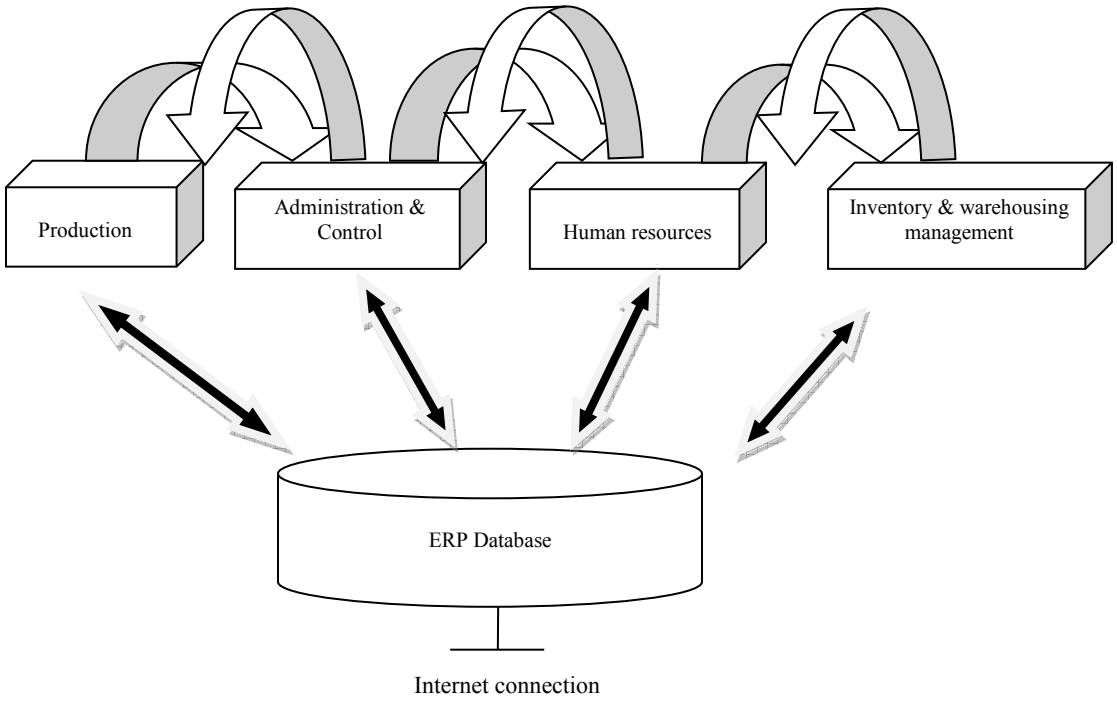

Figure 4. The integrated nature of an ERP system. From "Critical Elements for a Successful Enterprise Resource Planning Implementation in Small and Medium Sized Enterprises," by T. C. Loh & S. C. L. Koh, 2004, *International Journal of Production Research, 42*, p. 3434. Copyright 2004 by Emerald Group. Adapted with permission.

Quality Improvement and ERP

Quality improvement in ERP denotes meeting or exceeding expectations from the normal ways of doing business. Similarly, productivity and efficiency are attainable when there is an unfaltering desire for quality outcomes in an organization. Ahmad (2014) maintained that senior management's quest for quality in organizations is due to the positive relationship that exists between quality management and organizational performance. When organizational leaders invest in enterprise systems, they are in essence adopting a practice aimed at increasing quality and productivity, except that the

leaders may find it difficult to realize organizational objectives without addressing humanistic attributes, as stipulated in STS theory.

Sociotechnical systems highlight how quality and efficiency are easily attainable with the alignment of human relations management styles and technologies. The aim of ERP implementation as an aspect of business process reengineering is toward performance improvement. Yusuf, Gunasekaran, and Dan (2007) indicated that the objective of most organizations is to maximize efficiency and consolidate business processes to meet customer demands. Yusuf et al.'s philosophy of organizational performance aligns with STS, which was the focus during this study. The implementation of ERP involves integrating subsystems and improving organization-wide quality and performance to meet stakeholder satisfaction.

Whereas BPR is process oriented, TQM involves a more radical approach of ensuring organization-wide efficiency. Li, Markowski, Xu, and Markowski (2008) revealed that leaders of U.S. manufacturing companies focusing on TQM implement ERP to obtain seamless benefits and increase productivity. Enterprise resource planning's capability of improving organization-wide processes through standardization and automation is in accordance with TQM. Institutions with ERPs are more apt to meet and fulfill task orders and stakeholder requests than institutions without ERP systems are. Ease of system use and usefulness make the system more desirous for stakeholders to produce quality outputs. Institutions with quality products and services as a result of ERP benefits may gain competitive trading advantages in their respective industries.

Organizational Development and ERP

The leaders of many leading international organizations have successfully implemented ERP systems. Shatat (2015) noted that company leaders are reaping particular benefits from ERP implementation. Such companies include IBM, R/3, and an Autodesk software company that takes 4 hours to accomplish a project that formerly took 2 weeks to complete. Cisco tremendously cut costs and experienced a substantial increase in revenues. Chevron Texaco improved its supply chain and achieved an annual profit of $100 million (Shatat, 2015, p. 39). Prior research on ERP has included a focus on pre- and postimplementation success but overlooked the system's core objective of creating business. Özkarabacaka et al. (2014) posited that business areas such as finance, human resources, procurement, manufacturing, and logistics use ERP to automate core business processes across the enterprise to facilitate service delivery. Enterprise resource planning systems have become an infrastructural landscape that supports day-to-day operations of organizations. For this reason, I examined how ERPs may improve productivity in local government institutions.

Emphasizing the significance of productivity sends a signal to organizational leaders to pay additional attention to post system implementation. Amoako-Gyampah and Salam (2004) noted that most market-leading ERP systems have best practices, and the systems improve business processes in organizations when properly implemented and maintained. Enterprise resource planning systems are one of the most prolific IT systems that are used to improve an organizations' business process. Hsu, Sylvestre, and Sayed (2006) contended that ERP systems are the core of an organization's information and

operations because they positively impact the organization. Organizational leaders use ERPs to improve decision making because of their ability to integrate other systems and process real-time data. Decision making is an important management characteristic, especially when the decision is timely enough to positively affect the organization.

Organizational leaders also use enterprise systems for knowledge sharing. Jones et al. (2006) urged organizational leaders to implement initiatives to overcome cultural barriers and foster tacit knowledge capture and sharing in ERP systems beyond going live. Capturing and sharing knowledge in ERP systems is expeditious because the system can easily link the different functional areas of the organization. The linking and synchronization of information within the different functional areas of an organization may increase user efficiency and productivity. Senior management should strive to implement strategies that enable different stakeholder groups to collaborate before and after ERP implementation to sustain the organization. To understand ERP effects in the organization, a critical analysis of success factors is necessary.

Critical Success Factors of ERP

Enterprise resource planning implementation is a continuous performance improvement process in organizations. Shatat (2015) cautioned organizational leaders to pay special attention when implementing ERP systems because they could adversely affect an organization when not properly monitored. Managing ERP complexities may be the difference between going out of business and improving organizational efficiency. Organizations can experience ongoing issues as a result of having an inadequate or no strategy to manage post-ERP challenges. Doom et al. (2010) opined that there is no rule

of thumb regarding what constitutes critical success factors in ERP implementation, although particular attributes significantly improve ERP functioning. Critical success factors are essential requirements to minimize the likelihood of a system failure. Holand and Light (1999) maintained that ERP success factors are strategic or tactical. Strategic factors represent managing the legacy systems, ERP strategy, an organization's vision, a project plan, and top management support. Tactical factors include system configuration, stakeholder management, and business process change.

The continuous training of employees is critical for ERP sustainability. Similarly, user involvement must extend beyond going live, which is when most institutions experience ERP failures. Iizuka, Takei, and Nagase (2014) contended that factors such as project management, clear goals and objectives, managing ERP implementation, and project teams are highly critical to ERP success. Project management involves establishing targets, defining the targets, and monitoring and controlling targets to garner desired results. Project management also involves continuously tracking schedules and budgets against predefined targets. Some examples of project management approaches in ERP implementation include clearly defining different stakeholder roles such as vendors, external consultants, and internal employees.

A seamless handover strategy from the ERP vendor to internal employees and external consultants that the organization hires might help to prevent ERP system glitches and failures. Organizational leaders should recruit a highly competent project management team with experience in implementing the systems. The project management team should design a schedule and plan in conjunction with the handover

team. Tasevska, Damji, and Damji (2014) contended that employing additional project management practices such as developing a business case, creating a project charter and scope, and baseline planning may yield successful outcomes. The successful development of project management approaches may guide ERP implementation, increase employee commitment, and foster information sharing and communication.

Defining clear goals and objectives in ERP implementation ensures management address ambiguities following implementation. Clarity means analyzing and completing all requirements in the different phases in ERP implementation for continuous progress, such as completing tasks in the chartering and project phases during implementation (Sheddon et al., 2012). Defining a clear goal also means ensuring the ERP projects stay within scope, time, and cost. Encouraging interdepartmental communication will yield a common goal and foster stakeholder collaboration (Kuettner, Diehl, & Schubert, 2013; Lyytinen & Newman, 2015). When stakeholders collaborate, the potential to hone commitment and not just acquiesce to ERP-initiated change increases. Senior management support is also critical in helping stakeholders address complexities in both pre- and postimplementation phases. Ha and Ahn (2014) noted that top management support and maintaining a dedicated internal team after ERP implementation will minimize failures and improve an organization's IT infrastructure. A dedicated internal ERP team usually operates with similar expertise as the vendor and the project implementation team.

Knowledge of STS concepts may also be vital to ERP project and implementation teams. Sociotechnical systems highlight that there is a better alignment between

sociotechnical competencies and technology during a large-scale enterprise system implementation. Kuettner et al. (2013) posited that the skill competencies of both the project and the internal teams are critical to the proper functioning of the system. The internal ERP dedicated team may sometimes operate without clear goals and objectives, but they need senior management support to gain the cooperation of other stakeholders within the organization. Senior management support includes providing strategic direction to high-level cross-functional teams (Tambovcevs, 2012) such as the implementation team. Support is most appropriate when it is timely in addressing the conflicts and challenges inherent in ERP implementation. Successfully implementing ERP goes beyond integrating subsystems and transforming the organization to garnering maximum commitment from stakeholders. Senior management support increases end-users' perception of usefulness and effective use of the system (Nwankpa & Roumani, 2014). End users will be more likely to communicate and use the system when they notice senior management's cooperation and commitment in ensuring a smooth ERP transition. The ERP implementation process may be inefficient if the application is not running at optimal capacity and if senior management does not put in place the proper procedures and processes to foster ERP institutionalization.

ERP Failures

Organizations continue to experience serious challenges with ERP implementations, despite senior management's goals of attaining unprecedented benefits. Shatat (2015) noted that Dell cancelled its ERP project due to declining sales and lost $115 million. Pharmaceutical giant FoxMeyer lost $100 million and filed for bankruptcy

as a result of a failed ERP implementation (Lyytinen & Newman, 2015). Enterprise resource planning systems are arduous and expensive undertakings that may leave organizations with ongoing concerns if the implementation process is not effective. Hossain, Patrick, and Rashid (2002) asserted that because it normally takes between 6 months and 2 years to set up an ERP system, most organizations go out of business as a result of their inability to cope with the high implementation costs. Organizations may forgo other objectives if the planning and forecasting done in the system initiation and chartering phases are not accurate.

An unfavorable organizational attitude toward ERP implementation may adversely affect employee satisfaction and lead to low productivity and customer dissatisfaction. Ha and Ahn (2014) noted that the lack of an ongoing BPR plan after going live will result in cost, time, and budget overruns. A budget overrun may lead to an unfavorable stakeholder attitude toward the system. Organizations with successful ERP implementations usually have procedures in place to guide stakeholders through ERP complexities. Hakkinen and Hilmola (2008) posited that organizations can ensure ERP sustainability and reap its benefits through ongoing training. Employees always leave and join organizations; therefore, continuous training and monitoring are essential for ERP success. Training increases employees' morale and motivation to stay with an organization. Kahn (2003) maintained that it is often difficult to improve user participation without ongoing training considering the lack of interdepartmental integration in most organizations. Training prepares stakeholders to address internal and

external challenges that are independent of the organization but adversely affect productivity.

The lack of resources to address new ERP challenges may also lead to ERP failure. Senior management needs to provide adequate resources to guide and ensure the institutionalization of the ERP system. Sheddon et al. (2012) noted that a lack of resources can impede the accomplishment of particular tasks following ERP implementation. Both human and financial resources serve to support the implementation and the best use of technology. The foundation of sociotechnical systems is the perspective that aligning human and technical factors in an organization yields greater outcomes. Lack of human resources as a result of financial constraints may prevent senior management to accomplishment certain schedules on time. For example, technical experts performing data conversions, upgrades, trainings, and change management are critical to ERP success, but they come at a high price to implementing organizations.

Synthesis of Research

The literature review regarding ERP system adoption and implementation led to seven relevant components identified to foster productivity: (a) management support, (b) information sharing, (c) organizational alignment, (d) efficiency, (e) system quality, (f) employee satisfaction and perception of customer satisfaction, and (g) stakeholder communication. Organizational leaders are seeking ways to minimize errors and exceedingly high ERP implementation costs. Having timely information for decision making may be important to help senior management address ERP complexities and to ensure the institutionalization of the system. Mihai, Alexandra, and Danut (2014)

contended that information management involves analyzing previously collected information to facilitate decision making. Enterprise resource planning may always have an edge and provide better business benefits than legacy systems. Data collection and analysis in the subsequent chapters will be the best measure of this assumption. The integration of subsystems in an organization fosters information sharing, cross-functional communication, organizational alignment, and ease of using other systems within the organization. Legacy systems have shortcomings in that they are unable to yield the benefits of enterprise systems at low costs. Zareshahi, Nayebzadeh, and Heirany (2015) opined that ERP integration can improve supply chains, domestic business processes, and information flow between the different departments within organizations. The question remains whether ERP capability to synchronize subsystems will lead to the timely delivery of services, streamline administrative and operational complexities in government institutions, and increase productivity. This question was a gap in the literature pending the findings from the data collection and analysis in this study. The findings in this study may inform and guide future ERP researchers and users about the effect of the ERP in improving productivity in local government institutions along the lines of STS theory.

Gaps in the Literature

The literature review revealed that researchers had not addressed the dimension variables suggested in this study in local government institutions that face challenges in ERP implementation and use. Existing studies concerned commercial organizations and included a focus on critical success factors and failures, ERP adoption and satisfaction, or

ERP performance management metrics. Studies on critical success factors involved examining success from the organization's point of view as a for-profit institution. No researchers had looked at an ERP system's effect on productivity in a local government institution, which is a service industry. The interests and expectations of stakeholders in the private sector differ from those in government. Most of the studies which I reviewed did not include an examination of the effects of ERP on an organization along the lines of STS. Some authors had examined STS as the theoretical framework using different dimensions. Many of the researchers employed a qualitative approach, but using this approach would have limited the level of findings to a limited number of respondents in my study. Generalizing the findings of this study from a qualitative approach would also have been challenging. My goal was to survey a larger sample size and generalize the findings to other local government institutions whose leaders are implementing ERP. One requirement in my study was that I identified SAP as the implementing system. I consider all the gaps vital in having a good understanding of the effects of ERP SAP implementation in a local government institution.

Summary

Previous researchers have noted that implementing ERP may increase productivity and efficiency in organizations. The STS theory was the theoretical lens for this study. STS demonstrates that the joint optimization of social and technical subsystems during a large-scale IT system implementation will improve organizational effectiveness. Sociotechnical systems highlight the important contributions that humans make during an ERP implementation. Loh and Koh (2004) and Ernst & Young (2006)

considered user involvement to be the second most important success criterion in ERP implementation. Social attributes such as employee satisfaction, training competencies, attitudes and beliefs, and task-order completion are all fundamental to the functioning of the technology.

The link between BPR, TQM, and ERP as exogenous variables of quality improvement was also a topic of discussion. Total quality management is an organization-wide effort to improve quality and efficiency. Senior management implement ERP systems as a form of BPR to improve the way institutions do business when they integrate subsystems and maintain a single repository for easy data retrieval and decision making. The objective of ERP is to increase efficiency and productivity in organizations. The focus of the study was to apply the STS theory and examine whether ERP can meet its objectives.

Chapter 3 included an outline of the research design and methodology of this study, as well as a discussion of the reason for choosing the specific research method and instruments for data collection. Chapter 4 includes a description of the data collection process and the data analysis procedures used in answering the research questions. Chapter 5 includes a discussion on how this study might benefit other researchers and organizations with, or in the process of implementing, enterprise systems. Chapter 5 also includes effects of social change that stems from the findings in this study.

Chapter 3: Research Method

The purpose of this quantitative correlational study was to examine the relationship between ERP (independent variable) and organizational productivity (dependent variable) in local government institutions. Chapter 2 included a review of the literature about ERP and particular STS variables present in ERP implementation. This chapter includes the research questions and hypotheses, study design, research methodology and strategy, survey and scale instruments, participants' rights, sample, sample size, reliability and validity, and ethical issues. I also discuss other research methodologies that received consideration but were not applicable for the study.

Research Questions and Hypotheses

Research Question 1: Compared to the previous legacy application, how significant is an ERP application in creating organizational alignment that improves cross-functional communication and information sharing?

$H1_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that results in improved cross-functional communication.

$H1_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that results in improved cross-functional communication.

$H2_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that improves information sharing.

$H2_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that improves information sharing.

Research Question 2: Compared to the previous legacy system, how significantly does ERP system quality foster ease of use, usefulness, and organizational productivity?

$H3_0$: There is no statistically significant relationship between ERP system quality and ease of use.

$H3_a$: There is a statistically significant relationship between ERP system quality and ease of use.

$H4_0$: There is no statistically significant relationship between ERP system quality and ERP usefulness.

$H4_a$: There is a statistically significant relationship between ERP system quality and ERP usefulness.

$H5_0$: There is no statistically significant relationship between ERP system quality and organizational productivity.

$H5_a$: There is a statistically significant relationship between ERP system quality and organizational productivity.

Research Question 3: Compared to the previous legacy application, what is the relationship, if any, between ERP adoption and organizational efficiency?

$H6_0$: Compared to the previous legacy application, there is no statistically significant relationship between ERP adoption and organizational efficiency.

$H6_a$: Compared to the previous legacy application, there is a statistically significant relationship between ERP adoption and organizational efficiency.

Research Design and Rationale

Research design means developing valid procedures and methods to answer the research questions. Brown and Corry (2011) maintained that research design involves employing substantive knowledge and generating scientific data to create evidence-based outcomes. Researchers often classify research methodology as quantitative, mixed, or qualitative. The quantitative design in this study involved using a questionnaire to collect answers to research questions from participants and testing how study variables correlated with one another to determine the relationship between ERP and organizational productivity. The study involved the systematic collection of evidence through surveying sampled SAP users in local government institutions online. Researchers collect data through sound statistical measurements and instruments such as surveys and analyze the data to make generalizations. In social science, data collection instruments might include Survey Monkey or similar procedures to collect data for Internet, e-mail, or telephone surveys consistent with Ahern (2005).

The Internet serves as a robust platform for conducting social science research, and it has numerous advantages such as reaching a diverse population. The use of technology such as Survey Monkey and Quest Mindshare in this study to access respondents aligned with modern research procedures. Kýlýnç and Fırat (2017) posited that conducting online surveys has advantages such as facilitating data processing, quicker data collection from more participants, reduced data loss, increased voluntary

participation, and the ability to conduct research on sensitive and confidential matters. Kýlýnç and Fırat added that field experts believed data collected using online survey methods, in comparison to face-to-face methods, increases validity and reliability because participation is voluntary. Regardless of the type of research methodology employed, research design involves collecting data to answer research questions. Although it may be difficult to select the most appropriate design, researchers commonly use the following design subtypes: objective, subjective, philosophical, and interpretive (Creswell, 2009). The objective approach often involves generalizing findings that align with research questions. Using the objective design was appropriate in this study because the conclusions were based on analysis of surveyed respondents rather than the subjective opinions of participants.

The objective design is synonymous with postpositivist inquiry used in most quantitative studies to examine cause-and-effect relationships. Postpositivism involves making and testing hypotheses with well-established methods from empirical sciences (Lenzholzer & Brown, 2016). Based on data analysis, I moved to accept or not accept the hypotheses for this study. The variables under study were information sharing, cross-functional communication, organizational efficiency, ease of ERP system use, and usefulness of the ERP system. System quality has a significant relationship with ease of use, perception of usefulness, and user satisfaction in ERP systems (Carlos et al., 2016; Nwankpa et al., 2014; Rajan & Baral, 2015). The qualitative method was not suitable for this study because the study involved gathering direct evidence from participants rather

than their subjective opinions. Qualitative research is somewhat subjective, and participants' responses may sometimes reflect bias.

Rationale for Design Choice

The correlational design was appropriate for this study. Correlational design involves determining the relationship between independent variables and output variables. The correlational design is also suitable for analyzing quantitative data. A good design ensures the effect on the dependent variable is a result of variations in the independent variable. Therefore, a quantitative correlation design was appropriate to determine the relationship between ERP and organizational productivity. Ensuring internal validity involved removing the effects of extraneous factors that may have affected the dependent variable. I did not make inferences about cause and effect in this study. Other research designs received consideration, but were unsuitable for this study.

Action Research

I did not pursue an action research strategy. The focus of action research is on bringing about change rather than reinforcing or extending existing assumptions and dispositions (Myers, 2013). My goal was to examine the relationship between an enterprise IT system such as SAP and organizational productivity, not to change the way organizational leaders perceive, understand, and adopt ERP to increase productivity. This study did not involve challenging an existing theory, but rather examined whether STS attributes are essential during a large-scale ERP system implementation and use. The action researcher sets goals, plans research strategies, and reflects on the outcome of the study (Coghlan & Brydon-Miller, 2014). The intent of the study was generative;

therefore, the study involved encouraging the interaction of sampled participants with the survey questions and understanding their views on the effects of the SAP system on the performance of daily activities in the organization.

Ethnography

Ethnography was not suitable due to time, financial, and legal constraints. Ethnography involves constructing lived experiences relating to actors' emotional link to a phenomenon (Coghlan & Brydon-Miller, 2014). Ethnographic studies can take place over a long period, depending on the narratives of a small group of people or a community, which was not appropriate for this study. Ethnographers often reconstruct participants' dialogues and stories based on events occurring over time, which may be subjective. My goal was to minimize bias when surveying participants and to collect direct evidence for deductive analysis.

Grounded Theory

Grounded theory was not suitable due to the limitations of the approach. Grounded theory involves simultaneous data collection and analysis, continuous comparison of participants' opinions, data coding, and memo writing to generate a theory. Glaser (1978) described grounded theory as an inductive logic approach that works without a preconceived theory. The theory does not support using assumptions and hypotheses to arrive at results. Using grounded theory does not involve challenging established theories (Woolley, C. (2008Wooley, 2008), which was the intent of my study. My goal was to examine how particular STS variables inherent in SAP ERP implementation may lead to increased productivity.

Population and Sampling Using Quest Mindshare

Samples include units of a population with the goal to learn about the entire population. Clow and James (2014) defined *sampling* as the process of selecting a group of individuals to survey a population. Generalizing to an entire population is appropriate if the sample is representative of the population. Antonius (2013) suggested that researchers find representative samples that share the characteristics of the whole population. This study involved sampling individuals, online using nonprobability sampling which is rapidly becoming the prevailing survey data collection method (Antonius, 2013). Nonprobability sampling does not give all members of a population a chance of being in the sample, but professional online panels often provide results that rarely differ from the corresponding benchmarks (Callegaro et al., 2014). In probability sampling, every element in the sample has a known and nonzero probability of selection (Daniel, 2012), which outperforms a nonprobability study; however, cost and time constraints prevented me from conducting probability sampling. Having a clearly defined strategy of recruiting participants for the study enabled me to generalize the study findings and establish external validity.

Surveying the entire population for this study was not possible. When a sampling frame for the target audience does not exist and it is not practical to construct one, using a probability sampling is challenging (Daniel, 2012). The objective of the study was to determine the relationship between ERP SAP, which participants use in the daily performance of work, and productivity. If a researcher selects a sample properly, conducting a survey can provide results that accurately reflect the population within

acceptable degrees of error (Clow & James, 2014). I ensured that my sample only included participants who met the following criteria: (a) were 18 years of age or older, (b) performed work for a local government institution on a full- or part-time basis or as consultants, (c) were either managerial staff or subordinate staff, and (d) were using SAP. To solicit participation, I sent every individual listed as an SAP user in Quest Mindshare a link to an anonymous survey. I informed potential participants that participation would be voluntary, and authorization to quit the survey at any time was not necessary.

Using the Survey Monkey platform and Quest Mindshare was suitable for implementing a nonprobability sampling procedure such as purposive sampling. In purposive sampling, researchers select elements from the target population based on their fit with the purpose of the study and specific inclusion and exclusion criteria (Daniel, 2012), not because of their availability or convenience. The strategy was to define the target audience and solicit responses from SAP users in local government institutions who understand the social and technical aspects of ERP implementation. Purposive sampling was practical for this study because the participant selection criteria were relevant to my research questions and theoretical position. Emmel (2013) noted the validity of research findings are dependent on the quality of the sampling decisions the researcher makes. My goal was to have more control over who participates in the study to illustrate the relationship between a large-scale IT application and organizational productivity.

Other sampling methods considered for this study but not chosen included snowball sampling, random sampling, stratified sampling, and cluster sampling.

Researchers use snowball sampling in situations where it is challenging to identify individuals who meet inclusion criteria, and personal referrals become necessary (Clow & James, 2014). The snowball method was not suitable because I did not need participants to refer other participants (Simon, 2011). Random sampling involves choosing the population in such a way that each participant has a known and nonzero chance of selection. According to Simon (2011), random sampling needs a lot of planning time, which was not suitable for this study. Stratified sampling involves grouping participants into different subpopulations with a related behavior of interest (Clow & James, 2014). Stratified sampling was not appropriate for this study because the study did not involve making a comparison between segments of a population. Finally, cluster sampling, which involves separating participants into different groups and then randomly selecting the groups, was also not appropriate for this study.

Sample size calculations can be cumbersome when conducting a study online. Calculating sample size usually includes the alpha function, effect size, statistical power, variability of the population, confidence level, and margin of error or precision level the researcher is willing to accept. For this study, I used the G*power 3.1.9.2 software tool to calculate sample size for the Spearman rho correlation. I selected the a priori option and a medium effect size alpha of .15, a margin of error of .05, and an increased power of .80 to reach a sample size of 92 participants (see Figure 5).

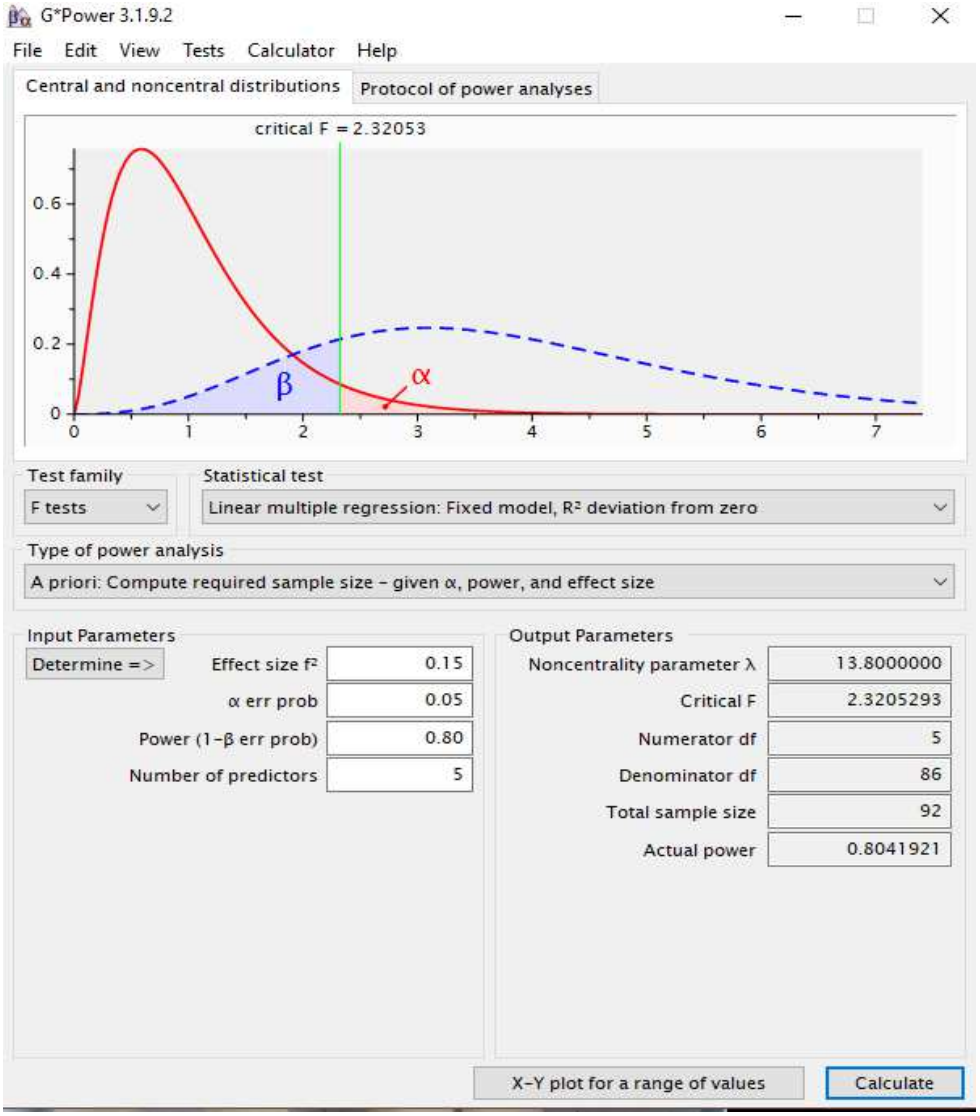

Figure 5. G*power calculation.

G*power indicated that the sample size of the study should be 92. I used purposive sampling as the criterion for selecting the population to examine the relationship between ERP and organizational productivity. The chief claim of ERP system developers is that they will design a system and increase efficiency and profitability while simultaneously increasing the level of control that an institution has over its entire operation (Glasgow, 2002). I submitted the questionnaire to Quest

Mindshare for study participants to take. Study participants included consultants, managers, and subordinate employees (nonmanagerial staff) in local government institutions who used SAP for a minimum of 1 year. The participants were from different local government institutions (state, county, or city) with experience using a legacy system. The mix of participants was appropriate given that managers and subordinate employees use legacy systems extensively and may notice if SAP has any effect on the daily performance of their work.

Ethical Protection of Research Participants

Because the data needed to complete this study might have been sensitive to the operation and functioning of the participants' organizations, I ensured the safety and privacy of all other information. The study complied with Walden University's Institutional Review Board guidelines. Participation in the study was voluntary, and individuals could opt in and out of the study at any time. The study does not include individual responses; rather, conducting the study involved analyzing all responses in the results and interpretation section. I informed participants that the study was for academic purposes and all materials related to the study would remain aligned with that purpose. To ensure participants' privacy and anonymity, I used a strong coding framework for the survey responses so that no one could identify survey participants based on their affiliations to an organization. Finally, raw data from the survey questionnaire will remain protected with a password and saved for a period of 5 years awaiting further analysis.

Instrumentation

I used a Likert-type scale survey instrument to obtain responses from participants. Simon (2011) posited that survey instruments are more probing, and researchers use survey instruments to understand the feelings, beliefs, knowledge, experiences, and activities of respondents. The survey involved closed-ended multiple-choice questionnaires to solicit evidence from participants and answer the research questions. I endeavored to include all possible answer choices to questions and ensured that higher numbers in the Likert-type scale structure (i.e., *strongly agree, moderately agree, slightly agree, neither agree nor disagree, slightly disagree, moderately disagree,* and *strongly disagree*) represented a more favorable response, as suggested by Simon (2011). I eliminated obvious answers to questions, and difficult or sensitive questions appeared near the end of the survey so that if participants quit at any point, earlier responses were still beneficial. The survey scale items are adaptations from previous studies on organizational relationships in IT with established reliability and validity. The dimension variables were cross-functional communication, organizational exchange of information, perceived usefulness, perceived ease of use, and organizational efficiency.

The study involved measuring each dimension variable separately. For example, Hypothesis 1 was suitable for examining the significance of ERP and cross-functional communication. The developers of the cross-functional communication survey scale were Roberts and O'Reilly (1974), the developers of the perceived usefulness survey were Venkatesh and Davis (1996), the developers of the perceived ease of use survey were Venkatesh and Davis (2000), and the developers of the organizational efficiency survey

were Karr-Wisniewski and Lu (2010). The developers of these instruments attempted to determine whether cross-functional communication, information sharing, ease of use, and usefulness positively affect an organization in large-scale IT-system implementations. The instruments were appropriate to determine whether productivity increased in the organization if employees communicate better, share information, find the system easy to use, and use the system efficiently.

Cross-Functional Communication

Cross-functional communication encompasses communication across an organization from top to bottom and from the bottom up. The goal of cross-functional communication is to enable work groups in an organization to track the flow and direction of communication. Measuring cross-functional communication involved using a 35-item Likert-type survey adapted from a measuring organizational communication scale created by Roberts and O'Reilly (1974). The items were scored using 7-point scales. The reliability and validity of this scale were already established. Permission was not necessary to use this instrument for research and educational purposes (see Appendix A). According to Roberts and O'Reilly, the objective of the questionnaire is to determine the relationships of communication variables to performance, objective, and behavioral criteria in the workforce. Cross-functional communication scale items include communication accuracy, summarization, mobility, overload, desire for interaction, communication influence, and directionality of communication. Cross-functional communication was measured on a 5-point test using standard ratings, where 1 = *much better with legacy*, 2 = *somewhat better with legacy*, 3 = *legacy and ERP are the same*

quality, 4 = *ERP somewhat better*, and 5 = *ERP much better*. The cross-functional communication scale items were as follows:

1. Of the total time you engage in communications while on the job, about what percentage of the time do you use the following methods to communicate? (a) Written, (b) Face-to-face (c) Telephone (d) Other
2. When receiving information from the sources listed below how accurate would you estimate it usually is? (a) Superior (b) Subordinate (c) Peers
3. Do you ever feel that you receive more information than you can efficiently use?
4. When transmitting information to your immediate supervisor, how often do you summarize by emphasizing aspects that are important and minimizing those aspects that are unimportant?
5. How desirable do you feel it is in your organization to be in contact frequently with others at the same job level?

Information Sharing

Information sharing encompasses sharing information within an organization among information users. The study involved measuring information sharing using a 7-point scale adapted from an organizational exchange of information scale by Manoj Garg. Pilot testing five ERP experts in an IT department of a manufacturing organization in Virginia established the reliability and validity of the survey instruments. The survey instruments underwent testing a second time with three managers in the same organization, and a third time using the same group of five technology experts within the

organization. Results of the pilot test from an additional 20 randomly selected participants from the same organization were analyzed using SPSS Version 17.0, and a reliability coefficient of 0.7 was acceptable. Permission to use the information-sharing survey instruments and scale from the developer is attached below (Appendix B). The information-sharing survey instrument is a 35-item Likert-type scale that measures stakeholders' ability to disseminate and receive information in a timely manner for decision making. Information-sharing scale items include knowledge sharing, decision making, and information quality. Ratings were as follows: 1 = *much better with legacy*, 2 = *somewhat better with legacy*, 3 = *legacy and ERP are the same quality*, 4 = *ERP somewhat better* and 5 = *ERP much better*. The information-sharing scale items were as follows:

1. The SAP team members are well equipped to share knowledge.
2. The information that the SAP system provides helps improve the decision-making process.
3. Compared to a non-SAP system, the SAP system has improved the quality of information sharing.

Perceived Usefulness

Perceived usefulness refers to using the SAP ERP system and improving employees' job performance. Perceived usefulness also refers to the extent to which a person believes that using a system will enhance his or her job performance (Venkatesh et al., 2000). Perceived usefulness of the system supports ERP adoption and enables users to be more productive in task performance. System quality may improve employees'

ability to accomplish tasks (Costa et al., 2016). Perceived usefulness was measured using a 7-point scale adapted from Venkatesh and Davis (1996) that ranged from *strongly agree* to *strongly disagree*. Permission was not necessary to use this instrument for research and educational purposes (see Appendix B). Reliability and validity of this scale were already established using Cronbach's alpha (0.973). Perceived usefulness scale items were increased performance, productivity, effectiveness, and value. The Perceived usefulness scale ratings were as follows: 1 = *SAP improves the quality of the work I do*, 2 = *SAP improves my productivity*, 3 = *SAP enhances my effectiveness on the job*, and 4 = *SAP enables me to accomplish tasks more quickly*. The perceived usefulness scale items were as follows:

1. SAP improves the quality of the work I do.
2. SAP improves my productivity.
3. SAP enhances my effectiveness on the job.
4. SAP enables me to accomplish tasks more quickly.

Perceived Ease of Use

Perceived ease of use involves seamlessly using the SAP ERP system to accomplish task obligations. Perceived ease of use delineates a person's belief that using a particular system will be free of effort (Venkatesh et al., 2000). The ease of use of the SAP system will foster SAP adoption and enable users to be more productive in task performance. Costa et al. (2016) noted that the quality of a system enables employees to accomplish tasks free of effort. The study involved an attempt to measure ease of use using a 7-point scale adapted from Venkatesh and Davis (2000). Permission was not

necessary to use this instrument for research and educational purposes (see Appendix B). Reliability and validity of this scale were already established using Cronbach's alpha (0.953). Ease-of-use scale items were free of effort, adaptability, accessibility, and information clarity. The questionnaire for Perceived Ease of Use included; 1 = *interacting with SAP does not require a lot of my mental effort*; 2 = *overall, SAP is easy to use*; 3 = *learning to operate SAP is easy for me*; and 4 = *it is easy to get SAP to do what I want it to do*. The ease-of-use items were as follows:

1. Interacting with SAP does not require a lot of my mental effort.
2. Overall, SAP is easy to use.
3. Learning to operate SAP is easy for me.
4. It is easy to get SAP to do what I want it to do.

Organizational Efficiency

Researchers from many schools of thought have attempted to provide a proper definition of organizational efficiency. Vilamovska (2010) maintained that efficiency involves the relationship between organizational structure, strategy, organizational roles, people, systems, leadership, organizational values, and employee engagement. Sudhaman and Thangavel (2015) contended that researchers should assess ERP efficiency from a productivity and quality perspective. Yen et al. (2016) explained that due to the robust and integrated nature of ERP discipline from employees and additional tasks, documentation may be necessary to hone efficiency and improve productivity. I used the technology dependence measurement developed by Karr-Wisniewski and Lu (2010) to measure whether using ERP depresses, rather than enhances, productivity and employees.

According to Karr-Wisniewski and Lu, more information technology use in the workplace can lead to productivity losses. The measurement consists of four items with a 7-point Likert scale. Permission was not necessary to use this instrument for research and educational purposes (see Appendix C). Reliability and validity of this scale were already established (Cronbach's alpha = 0.75). The scale items for the measurement were system feature overload, information overload, communication overload, performance, and knowledge worker/employee productivity. Measuring efficiency involved a 5-point test standard rating where 1 = *much better with legacy*, 2 = *somewhat better with legacy*, 3 = *legacy and ERP are the same quality*, 4 = *ERP somewhat better*, and 5 = *ERP much better*. The ERP adoption and efficiency items were as follows:

1. When I do not have access to the SAP tools I use to support my job activities, this prevents me from being productive.
2. Much of the business process involved in doing my job is embedded in the systems I use. Therefore, performing my responsibilities without these tools would be very difficult.
3. I rely on SAP to the point that if the system is functioning slowly or unavailable, it directly affects my job performance.
4. Information technology problems such as software crashes, hardware failures, and slow network performance interrupt me from getting my job done.

Reliability and Validity of Survey Instruments

Reliability

For the survey instruments and scales to be reliable, the instruments must meet the accuracy test by measuring the constructs exactly at any given time. Reliability requires a measurement instrument that provides the same results repeatedly (Clow & James, 2014). My survey instruments and scales would produce consistent results if another researcher employs a similar design, even on different participants. The goal of quantitative research is to use logical inquiry and provide evidence that the research questions and hypotheses are yielding the same results. Clow and James (2014) contended that reliability means free of errors and offered three methods of measuring reliability: test–retest reliability, equivalent form, and internal consistency reliability.

Determining test–retest reliability involves a two-step measurement process that repeats the measurement with the same instruments and participants (Clow & James, 2014). Determining equivalent form involves developing a second measurement similar to the first measurement and then introducing it to the same subjects (Clow & James, 2014). Determining internal consistency involves introducing an instrument to different samples for example administering the survey to a group of test participants and then randomly separating the participants into two groups and administering the same instrument (Clow & James, 2014). The scores between each group should yield the same results, which indicate a high correlation. For this study, I used instruments that previous researchers had addressed reliability concerns with a high Cronbach alpha score. The need did not exist to test my survey instruments again.

Validity

In quantitative research, validity refers to information quality and the procedures used for collecting data. Coghlan and Brydon-Miller (2014) defined validity as the relationship between the research and the situation researched, where research adequately depicts what was intended to measure. For researchers to consider a measurement valid, the results must be the same after replicating the measurement. A true test of validity measures what the researcher aims to measure, and the outcome of the measurement has a direct correlation to the variables measured. Coghlan and Brydon-Miller mentioned two types of threats to validity that may affect a study: internal and external validity. Internal validity refers to the causal relationship of the variables under study, and external validity refers to the ability to generalize or extend study findings to other studies (Coghlan & Brydon-Miller, 2014). For this study to be consistent with internal validity, adequate information needed to show that a relationship exists between ERP SAP and organizational productivity, and it was necessary to rule out the possibilities of extraneous variables. I may be able to generalize the findings of the study to the entire population under study based on my sample or to another local government agency whose leaders deployed a large-scale enterprise IT system with similar characteristics. The goal of the study was to measure five dimension variables consistent with STS and ERP implementation and organizational productivity. The data analysis showed that three of the variables had a strong correlation. The study participants met all the criteria to participate in the study such as age, end users of SAP in a local government institution, and were either a managerial staff or a subordinate staff.

Data Collection

The data collection procedure for this study involved a survey. I administered electronic surveys to respondents to understand the relationship between ERP and organizational productivity. The self-administered survey used to collect data included scales on cross-functional communication, organizational efficiency, ease of ERP system use, and usefulness of ERP. A survey is an inexpensive and convenient data collection option. Participants received the surveys electronically in Quest Mindshare and responded at their convenience. The use of electronic surveys also precluded me from disrupting participants' normal operations.

The study instruments were adapted from a combination of existing instruments (see Appendices A–D) used with permission. The instruments included closed-ended questions from a Likert-type scale survey to rate participants' responses from *strongly agree* to *strongly disagree* as suggested by Srivastava and Hopwood (2009). The design of the survey was simple to avoid any difficulties in interpretation. The rationale for a closed-ended questionnaire was to prevent or reduce irrelevant responses, as the questionnaire consisted of STS dimensions and their scale descriptions, as shown in Table 1.

Table 1

Factors of the Electronic Survey

Factor	Description
Cross-functional communication	Organizational communication scale
Information sharing	Exchange of information scale
ERP usefulness	Perceive of usefulness scale
Ease of use	Ease of use scale
ERP adoption	Organizational efficiency scale

Participants received a survey link from Survey Monkey in Quest Mindshare. Self accessing the link was beneficial, because I would not have been able to meet face-to-face with every participant. Taking the survey online was also a flexible option. A cover letter accompanied the survey with words that encouraged participants to take the survey, but the participants were also aware that taking the survey was voluntary. Survey questions were designed to answer the research questions, and the questions were in plain English to ensure clarity for every participant who took the survey.

Data Analysis

After collecting the data, I entered the information into Statistics Solutions Pro Version 1.14.12.16 and analyzed the data using a series of Spearman's rho correlations to determine if a statistically significant relationship existed between the dimension variables and ERP productivity. I did not use Pearson's *r* correlation, although a closely related efficiency of Spearman's rho in comparison to Pearson's *r* is 91.2%. Pearson's *r* has the same power for detecting statistical significance as does Spearman's rho but with only 91.2% of the sample size needed for Spearman's rho (Salkind, 2007). Wilcoxon matched pairs tests were also used to address the research questions and hypotheses. Wilcoxon tests were more appropriate than the more common paired *t* tests

due to the ordinal nature of the rating scale (1 = *much better with legacy*, 2 = *somewhat better with legacy*, 3 = *legacy and ERP are the same quality*, 4 = *ERP somewhat better*, 5 = *ERP much better*). The analysis involved comparing respondents' rating for each dimension (cross-functional communication, information sharing, etc.) against a standard of 3 for the 5-point Likert-type scales and 4 for the 7-point Likert-type scale (legacy and ERP are the same quality). Significant Wilcoxon tests lend support to the idea that the ERP application has higher quality in increasing organizational productivity. The objective of the analysis was to find out whether responses from logical inquiry yielded enough evidence in answering the research questions. I examined the relationship between SAP and dimension variables such as (a) information sharing, (b) cross-functional communication, (c) information sharing, (d) organizational efficiency, (d) ease of use, and (e) usefulness in enhancing organizational productivity. I measured the dimension variables as hypotheses. For example, Hypothesis 1 indicated the significance of an ERP application in creating organizational alignment that improves cross-functional communication and information sharing in comparison to a legacy application. Hypothesis 2 indicated the relationship between ERP system quality and ease of use and usefulness by stakeholders. Hypothesis 3 indicated the relationship between ERP adoption and organizational efficiency in comparison to a legacy system. As a supplemental exploratory analysis, I aggregated the five ERP dimensions (cross-functional communication, information sharing, organizational efficiency, ease of ERP use, and ERP usefulness) into an overall ERP quality scale. The new scale served as the dependent or criterion variable in a multiple regression model with the independent or

predictor variables being the respondent's demographic characteristics such as age, education, job function, and professional level. The hypotheses related to each question were as follows:

Research Question 1: Compared to the previous legacy application, how significant is an ERP application in creating organizational alignment that improves cross-functional communication and information sharing?

$H1_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that results in improved cross-functional communication.

$H1_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that results in improved cross-functional communication.

$H2_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that improves information sharing.

$H2_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that improves information sharing.

Research Question 2: Compared to the previous legacy system how significantly does ERP system quality foster ease of use, usefulness, and organizational productivity?

$H3_0$: There is no statistically significant relationship between ERP system quality and ease of use.

$H3_a$: There is a statistically significant relationship between ERP system quality and ease of use.

$H4_0$: There is no statistically significant relationship between ERP system quality and ERP usefulness.

$H4_a$: There is a statistically significant relationship between ERP system quality and ERP usefulness.

$H5_0$: There is no statistically significant relationship between ERP system quality and organizational productivity.

$H5_a$: There is a statistically significant relationship between ERP system quality and organizational productivity.

Research Question 3: Compared to the previous legacy application, what is the relationship, if any, between ERP adoption and organizational efficiency?

$H6_0$: Compared to the previous legacy application, there is no statistically significant relationship between ERP adoption and organizational efficiency.

$H6_a$: Compared to the previous legacy application, there is a statistically significant relationship between ERP adoption and organizational efficiency.

Usefulness to the Field

This study includes several contributions to the growing body of knowledge for both academics and practitioners. The study involved placing ERP within a theoretical domain so future researchers can examine its relationship and effect on multiple dimensions in an organization. The findings highlight the effectiveness of implementing a large-scale enterprise IT system to increase organizational productivity. The results of the

finding show a positive correlation between information sharing, ease of use, and productivity. Local government administrators may use the results to understand the importance of using a mix of people, processes, and IT in organizations to increase ERP successes.

Summary

This chapter included a discussion on the research design, sampling procedure, population, sample size, and data collection and analysis methodologies. Other topics discussed included the instruments used to collect data from participants, the process of selecting study respondents to participate in the study, and ways to protect the participants' rights. I adapted measurements from prior researchers with permission. Chapter 4 includes a discussion on the data analysis procedures, and Chapter 5 includes a discussion on the research findings, implications for social change, and recommendations for future studies and researchers.

Chapter 4: Results

The purpose of this quantitative correlational study was to examine particular social and technical elements (independent variables) that may increase organizational productivity (dependent variable) in ERP implementation. Sixty-one participants met the inclusion criteria for the study, although 80 individuals responded to the survey questionnaire. The tables in this chapter display frequency counts for selected variables, frequency counts for selected questions related to the ERP dimensions, descriptive statistics for SAP implementation items sorted by lowest mean, descriptive statistics of ERP compared to previous system items sorted by highest mean, Wilcoxon matched pairs statistics to test the hypotheses in Research Questions 1 and 2, and Spearman correlations for selected variables and ERP adoption to answer Research Question 3. I did not use Pearson's *r* correlation, although the asymptotic relative efficiency of Spearman's rho with respect to Pearson's *r* is 91.2%, which means Pearson's *r* has the same power for detecting statistical significance as does Spearman's rho, but only using 91.2% of the sample size needed for Spearman's rho (Salkind, 2007).

Data Collection

Data collection involved using a participant recruitment pool called Quest Mindshare. Participants received a link from Survey Monkey containing the survey questions. To achieve the sample size determined for the study, I sent respondents a reminder to complete the consent form and questionnaires in their entirety. Eighty participants responded during a 3-week period. Of the 80 respondents who took the survey, 61 had an affiliation with a local government institution, which was the target

audience for the study. Nineteen respondents had an affiliation with the federal government, and therefore did not meet the study criteria. The final sample size for the study was 61.

Descriptive Statistics

Table 2 displays the frequency counts for selected variables. Over half of the participants (50.8%) worked at the state level of government. More were in a professional role (57.4) as opposed to a managerial role (42.6%). Most of the participants (64.0%) had completed a 4-year college degree (*Mdn* = 4-year college degree). Most (82.0%) had worked in the organization for at least 2 years (*Mdn* = 7 years). Eighty-two percent had been using SAP in the organization for at least 2 years (*Mdn* = 3.5 years). About half (50.8%) worked with SAP for 25–50% of their daily work routine (*Mdn* = 37.50% of daily work routine). Most respondents were performing similar task responsibilities with SAP as with the prior legacy application (82.0%), and of those who were performing similar task responsibilities, most had been performing similar task responsibilities on the non-SAP system prior to the SAP implementation, with a median of 3 years. The median age was 39.5 years, and most participants (68.9%) were female.

Table 2

Frequency Counts for Selected Variables (N = 61)

Variable and category	*n*	%
In what level of government do you work?		
State	31	50.8
County	19	31.2
Municipal or city	11	18.0
Which of the following best describe your role in this organization?		
Management	26	42.6
Professional	35	57.4
What is the highest level of education you have completed? [a]		
High school	11	18.0
Two-year college	11	18.0
Four-year college	25	41.1
Master's	13	21.3
Doctorate	1	1.6
How long have you worked in this organization? [b]		
Less than 1 year	2	3.3
1 year	3	4.9
2 to 4 years	19	31.1
5 to 9 years	11	18.0
10 years or more	26	42.6
How long have you been using SAP in this organization? [c]		
Less than 1 year	5	8.2
1 year	6	9.8
2 years	19	31.1
3 to 4 years	11	18.0
5 years or more	20	32.9
Indicate your frequency percentage of working with SAP in this organization [d]		
Less than 25% of daily work routine	9	14.8
25–50% of daily work routine	31	50.8
51–75% of daily work routine	14	23.0
Greater than 75% of daily work routine	7	11.5
Are you performing similar task responsibilities with SAP as the prior legacy application?		
Yes	50	82.0
No	11	18.0

Table 2 (*continued*)

Variable and category		
If you responded yes to the previous question, how long were you performing similar task responsibilities on the non-SAP system(legacy) prior to SAP application [e]		
Less than 1 year	19	31.1
1 to 5 years	27	44.3
6 to 10 years	13	21.3
11 to 15 years	2	3.3
What is your age? [f]		
25 to 34 years	15	24.6
35 to 44 years	21	34.4
45 to 49 years	9	14.8
50 years and above	16	26.2
What is your gender?		
Male	19	31.1
Female	42	68.9

[a] *Mdn* = four-year college
[b] *Mdn* = 7 years
[c] *Mdn* = 3.5 years
[d] *Mdn* = 37.50% of daily work routine
[e] *Mdn* = 3 years
[f] *Mdn* = 39.5 years

Table 3 displays the frequency counts for selected questions related to the ERP dimensions. Thirty percent of participants indicated cross-functional communication was somewhat better or much better with ERP (*Mdn* = legacy and ERP are the same quality). Sixty-one percent either moderately agreed or strongly agreed that the SAP system has improved the quality of information sharing (*Mdn* = moderately agree). Sixty-two percent either moderately agreed or strongly agreed that that the SAP system was easy to use (*Mdn* = moderately agree). Thirty-five percent indicated the ERP system was either somewhat better or much better at fostering ease of usefulness (*Mdn* = legacy and ERP are the same quality). Seventy percent either moderately agreed or strongly agreed that SAP improved organizational productivity (*Mdn* = moderately agree). Thirty-three

percent indicated organizational efficiency was somewhat better or much better using ERP (*Mdn* = legacy and ERP are the same quality).

Table 3

Frequency Counts for Selected Questions Related to ERP Dimensions (N = 61)

Variable and category	*n*	%
24. Improved cross-functional communication [a]		
Much better with legacy	5	8.2
Somewhat better with legacy	20	32.8
Legacy and ERP are the same quality	18	29.5
ERP somewhat better	14	23.0
ERP much better	4	6.6
11. Information sharing [b]		
Moderately disagree	1	1.6
Slightly disagree	1	1.6
Neither agree nor disagree	9	14.8
Slightly agree	13	21.3
Moderately agree	21	34.4
Strongly agree	16	26.2

Table 3 (*continued*)

Variable and category	*n*	%
17. Ease of use [c]		
Moderately disagree	2	3.3
Slightly disagree	3	4.9
Neither agree nor disagree	2	3.3
Slightly agree	16	26.2
Moderately agree	25	41.0
Strongly agree	13	21.3
25. ERP usefulness [d]		
Much better with legacy	4	6.6
Somewhat better with legacy	19	31.1
Legacy and ERP are the same quality	17	27.9
ERP somewhat better	14	23.0
ERP much better	7	11.5
13. Organizational productivity [e]		
Neither agree nor disagree	6	9.8
Slightly agree	12	19.7
Moderately agree	26	42.6
Strongly agree	17	27.9
26. Organizational efficiency [f]		
Much better with legacy	6	9.8
Somewhat better with legacy	14	23.0
Legacy and ERP are the same quality	21	34.4
ERP somewhat better	15	24.6
ERP much better	5	8.2

Note. $N = 61$.
[a] *Mdn* = legacy and ERP are the same quality.
[b] *Mdn* = moderately agree.
[c] *Mdn* = moderately agree.
[d] *Mdn* = legacy and ERP are the same quality.
[e] *Mdn* = moderately agree.
[f] *Mdn* = legacy and ERP are the same quality

Table 4 displays the descriptive statistics of 14 SAP implementation items sorted by lowest means. These ratings were given using a 7-point metric, where 1 = *strongly agree* and 7 = *strongly disagree*. The highest level of agreement was for Item 23, IT problems interrupt work completion ($M = 2.08$). The lowest level of agreement was for Item 16, Interacting with SAP does not require a lot of my mental effort ($M = 3.20$).

Table 4

Descriptive Statistics of SAP Implementation Items Sorted by Lowest Mean

Item	*M*	*SD*
23. IT problems interrupt work completion	2.08	1.28
13. SAP improves my productivity	2.11	0.93
12. SAP improves the quality of the work I do	2.13	1.01
10. SAP information improves the decision-making process	2.20	0.93
14. SAP enhances my effectiveness on the job	2.23	1.02
15. SAP enables me to accomplish tasks more quickly	2.31	1.26
11. SAP improved information sharing compared to a non-SAP system	2.36	1.17
21. Performing duties without systems would be very difficult	2.36	1.35
17. Overall SAP is easy to use	2.39	1.20
18. Learning to operate SAP is easy for me	2.41	1.24
19. It is easy to get SAP to do what I want it to do	2.49	1.18
22. SAP functioning slowly or unavailable directly affects my job performance	2.93	1.65
20. Without SAP tools, I am less productive	3.15	1.84
16. Interacting with SAP does not require a lot of my mental effort	3.20	1.44

Note. Ratings based on a 7-point metric: 1 = s*trongly agree* to 7 = s*trongly disagree*.

Table 5 displays the descriptive statistics of ERP compared to previous system items sorted by the highest mean. The participants rated the items using a 5-point metric, where 1 = *much better with legacy* and 5 = *ERP much better*. The highest level of favorability for ERP was for Item 25, ERP ease of use, usefulness, and organizational productivity (*M* = 3.02). The lowest level of favorability for ERP was for Item 24, Organizational alignment of ERP that improves cross-functional communication and information sharing (*M* = 2.87).

Table 5

Descriptive Statistics of ERP Compared to Legacy System, Items Sorted by Highest Mean

Item	*M*	*SD*
25. ERP ease of use, usefulness, and organizational productivity	3.02	1.13
26. Relationship, if any, between ERP adoption and organizational efficiency	2.98	1.10
24. Organizational alignment of ERP that improves cross-functional communication and information sharing	2.87	1.07

Note. $N = 61$. Ratings based on a 5-point metric: 1 = *much better with legacy* to 5 = *ERP much better*.

Answering the Research Questions

Research Question 1 was as follows: Compared to the previous legacy application, how significant is an ERP application in creating organizational alignment that improves cross-functional communication and information sharing? $H1_0$ was the following: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that results in improved cross-functional communication. Table 6 displays the Wilcoxon matched pairs test comparing the mean rating ($M = 2.87$) with the test standard (3 = *legacy and ERP are the same quality*) to test $H1_0$. The Wilcoxon statistic was not significant, $z(60) = 0.93$, $p = .35$. This finding provided support to retain $H1_0$.

$H2_0$ was as follows: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that improves information sharing. Table 6 displays the Wilcoxon matched pairs test comparing the mean rating ($M = 5.64$) with the test standard (4 = *neither agree nor disagree*) to test *H20*. The Wilcoxon statistic was significant, $z(60) = 6.07$, $p = .001$. This finding provided support to reject $H2_0$.

Table 6

Wilcoxon Matched Pairs Statistics to Test the Hypotheses (N = 61)

Variable and rating	*M*	*SD*	*z*	*p*
24. Improved cross-functional communication			0.93	.350
Mean rating	2.87	1.07		
Test standard [a]	3.00	0.00		
11. Information sharing			6.07	.001
Mean rating	5.64	1.17		
Test standard [b]	4.00	0.00		
17. Ease of use			6.06	.001
Mean rating	5.61	1.20		
Test standard [b]	4.00	0.00		
25. ERP usefulness			0.20	.840
Mean rating	3.02	1.13		
Test standard [a]	3.00	0.00		
13. Organizational productivity			6.57	.001
Mean rating	5.89	0.93		
Test standard [b]	4.00	0.00		
26. Organizational efficiency			0.14	.890
Mean rating	2.98	1.10		
Test standard [a]	3.00	0.00		

[a] Test standard rating: 3 = *Legacy and ERP are the same quality.*
[b] Test standard rating: 4 = *Neither agree nor disagree.*

Research Question 2 was as follows: Compared to the previous legacy system, how significant does ERP system quality foster ease of use, usefulness, and organizational productivity. This research question had three related hypotheses. $H3_0$ was the following: There is no statistically significant relationship between ERP system quality and ease of use. Table 6 displays the Wilcoxon matched pairs test comparing the mean rating (M = 5.61) with the test standard (4 = *neither agree nor disagree*) to test $H3_0$. The Wilcoxon statistic was significant, $z(60) = 6.06$, $p = .001$. This finding provided support to reject $H3_0$.

$H4_0$ was as follows: There is no statistically significant relationship between ERP system quality and ERP usefulness. Table 6 displays the Wilcoxon matched pairs test comparing the mean rating (M = 3.02) with the test standard (3 = *legacy and ERP are the same quality*) to test $H4_0$. The Wilcoxon statistic was not significant, $z(60) = 0.20$, p = .84. This finding provided support to retain $H4_0$.

$H5_0$ was as follows: There is no statistically significant relationship between ERP system quality and organizational productivity. Table 6 displays the Wilcoxon matched pairs test comparing the mean rating (M = 5.89) with the test standard (4 = *neither agree nor disagree*) to test $H5_0$. The Wilcoxon statistic was significant, $z(60) = 6.57$, p = .001. This finding provided support to reject $H5_0$.

Research Question 3 was as follows: Compared to the previous legacy application, what is the relationship, if any, between ERP adoption and organizational efficiency? The related null hypothesis was $H6_0$: Compared to the previous legacy application, there is no statistically significant relationship between ERP adoption and organizational efficiency. Table 7 displays the Spearman correlations for ERP adoption with 12 selected variables to test $H6_0$. Out of the 12 Spearman correlations performed, only one was statistically significant. The written communication percentage was negatively correlated with ERP adoption (r_s = -.36, p = .005). These findings provided limited support to reject $H6_0$.

In summary, this study used surveys from 61 participants to examine social and technical elements (independent variables) that may increase organizational productivity (dependent variable) in ERP implementation. Hypothesis 1 (improved cross-functional

communication) was not supported (see Table 6). Hypothesis 2 (improved information sharing) was supported (see Table 6). Hypothesis 3 (ease-of-use) was supported (see Table 6). Hypothesis 4 (ERP usefulness) was not supported (see Table 6). Hypothesis 5 (organizational productivity) was supported (see Table 6). Hypothesis 6 (ERP adoption and organizational efficiency) was not supported (see Table 7). In chapter 5, the findings will be compared to the literature and conclusions, implications will be drawn, and a series of recommendations will be suggested.

Table 7

Spearman Correlations for Select Variables and ERP Adoption

Variable	ERP adoption
4a. Written communication percentage	-.36*
4b. Face to Face communication percentage	.18
4c. Telephone communication percentage	-.05
27. Which of the following best describe your role in this organization?	.05
28. What is the highest level of education you have completed?	-.04
29. How long have you worked in this organization?	-.08
30. How long have you been using SAP in this organization?	.00
31. Indicate your frequency percentage of working with SAP in this organization?	.07
32. Are you performing similar task responsibilities with SAP as the prior legacy application?	-.12
33. If you responded yes to the previous question, how long were you performing similar task responsibilities on the non-SAP system (legacy) prior to SAP implementation?	-.15
34. What is your age?	.06
35. What is your gender? [a]	.00

p< .005

[a] Gender: 1 = *male* 2 = *female*.

Summary

The purpose of this quantitative study was to determine the relationship between ERP and organizational productivity based on a survey of SAP users in local government institutions. Wilcoxon statistics and Spearman correlation were performed to test the hypotheses and relationships. According to the Wilcoxon test, the ability of ERP to significantly and positively create organizational alignment that improves information sharing was supported. ERP system quality in fostering ease-of-use was supported. ERP system quality in fostering organizational productivity was supported. ERPs' ability in improving cross-functional communication was not supported. ERP system quality in fostering usefulness was not supported. Of the 12 Spearman correlations performed, only one was statistically significant. Written communication was negatively correlated with ERP adoption, which means that persons who perform a lot of written communication in the organization do not like ERP. Persons who do not perform a lot of written communication like ERP. Chapter 5 includes a discussion and recommendations for future research. Chapter 5 also contains an interpretation of results, limitations of study, implications for social change, and the conclusion. In the implications for social change, I discuss how this study adds to the growing body of knowledge, relating to implementing ERP in local government institutions and increasing productivity.

Chapter 5: Discussion, Conclusion, and Recommendation

The purpose of this quantitative study was to examine the relationship between ERP and organizational productivity based on a survey of ERP SAP users in local government institutions. When leaders implement new technology in an organization, they expect to realize improvement in service performance compared to the previous way business was conducted. The focus of most system implementations has been on the technical aspects of the application with little or no attention paid to the social aspects, the human characteristics, and the attitudes that complement the smooth functioning of technology (Yu et al., 2013, Norman, 2011, Youngberg, Olsen, and Hauser, 2009, & Matende and Ogao, 2013). Previous studies focused on the effects of large-scale IT implementation in the private sector but not in government institutions. In this study, I focused on local government institutions to understanding the relationship between ERP and organizational productivity.

I examined five dimension variables related to STS theory and ERP implementation: information sharing, cross-functional communication, ease of ERP use, usefulness, and efficiency of the system in increasing organizational productivity. Chapter 5 includes the results of the study, limitations of the study, implications for social change, discussions, and recommendations for further study.

In completing the study, I designed research questions and hypothesis. I also designed survey questions in Survey Monkey and a link to the survey was available to respondents in a participant pool called Quest Mindshare. Respondents received a request to complete the consent form and indicating their willingness to participate in the study.

Eighty participants completed the survey questions during a 3-week period. Of these 80 respondents, 61 had an affiliation with a local government and were therefore eligible for inclusion in the study. The results indicated no significant relationship between cross-functional communication and ERP. Information sharing was significantly positively correlated with ERP. The results indicated that ERP system quality fosters ease of use, but there was no statistically significant correlation between ERP system quality and ERP usefulness. The results also showed that ERP system quality fosters organizational productivity, but there was no statistically significant correlation between ERP adoption and organizational efficiency.

Interpretation of the Results

Respondents were ERP users in local government institutions. I collected demographic data from participants so I could understand whether particular qualities and characteristics such as age, gender, and education influenced participants' responses and the relationship between ERP adoption and organizational efficiency. The findings provided no correlation between respondent demographics and ERP adoption. To conduct the study, I designed research questions and transformed the questions into statistical hypotheses to test (see Randall, 2015). An alternative hypothesis reflects the outcome expected, and is the opposite of the null hypothesis. The null hypothesis could be rejected only when the *p* value was greater than the significance value of .05. The research questions and hypotheses for this study were as follows:

Research Question 1: Compared to the previous legacy application, how significant is an ERP application in creating organizational alignment that improves cross-functional communication and information sharing?

$H1_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that results in improved cross-functional communication.

$H1_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that results in improved cross-functional communication.

$H2_0$: Compared to the previous legacy application, an ERP application does not significantly and positively create organizational alignment that improves information sharing.

$H2_a$: Compared to the previous legacy application, an ERP application significantly and positively creates organizational alignment that improves information sharing.

To address $H1_0$, I used Wilcoxon matched pairs test and compared the mean rating ($M = 2.87$) with the test standard (3 = *legacy and ERP are the same quality*). The Wilcoxon statistic was not significant, $z(60) = 0.93$, $p = .35$, which indicated that an ERP application did not significantly and positively create organizational alignment that resulted in improved cross-functional communication. This result contrasted with Mbohwa and Madanhire's (2016) finding that leaders can accomplish operational efficiency in the organization with an ERP by improving effective communication among

departments. A significant Wilcoxon statistic would have yielded a result higher than the test standard 3.00 to reject the null hypothesis. Because the *p* value of .35 was higher than the significance level of .05, the null hypothesis could not be rejected.

To address $H2_0$, I used a Wilcoxon matched pairs test and compared the mean rating ($M = 5.64$) with the test standard (4 = *neither agree nor disagree.*). The Wilcoxon statistic was significant, $z(60) = 6.07$, $p = .001$, which indicated that an ERP application significantly and positively created organizational alignment that improved information sharing. This finding provided support to reject $H2_0$ because the mean rating yielded a result significantly higher than the test standard of 4.00. Because the *p* value of .001 was lower than the significance level of .05, the null hypothesis was rejected. This result was consistent with Tambovcevs's (2012) finding that because ERP systems have the capability to synchronize all information systems in an organization, communication and information sharing will improve. Sharing information in the organization is helpful to keep stakeholders abreast of changes, and to reduce miscommunication. Tarhini et al. (2015) maintained that ERP provides organizational leaders with an integrated software application and a unifying database to collaborate, share data, and streamline processes in key functional departments.

Research Question 2: Compared to the previous legacy system, how significantly does ERP system quality foster ease of use, usefulness, and organizational productivity?

$H3_0$: There is no statistically significant relationship between ERP system quality and ease of use.

$H3_a$: There is a statistically significant relationship between ERP system quality and ease of use.

$H4_0$: There is no statistically significant relationship between ERP system quality and ERP usefulness.

$H4_a$: There is a statistically significant relationship between ERP system quality and ERP usefulness.

$H5_0$: There is no statistically significant relationship between ERP system quality and organizational productivity.

$H5_a$: There is a statistically significant relationship between ERP system quality and organizational productivity.

To address $H3_0$, I used Wilcoxon matched pairs test and compared the mean rating ($M = 5.61$) with the test standard (4 = *neither agree nor disagree.*). The Wilcoxon statistic was significant, $z(60) = 6.06$, $p = .001$, which indicated that ERP system quality fostered ease of use. This finding provided support to reject $H3_0$ because the mean rating yielded a result significantly higher than the test standard 4.00. Because the p value of .001 was lower than the significant level of .05, the null hypothesis was rejected. The results of the study were consistent with Youngberg et al.'s (2009) finding that users' acceptance in using the ERP system is critical because without acceptance and the ease of using the system, the full potential of ERP will not be realized. Eason (2009) opined that, in alignment with the tenets of STS, IT system designers should consider increasing system implementation success by fostering the social and technical subsystems in which

human resources undertake complete task performance in the social system using technical resources in the technical system.

To address $H4_0$, I used a Wilcoxon matched pairs test and compared the mean rating ($M = 3.02$) with the test standard (3 = *legacy and ERP are the same quality*). The Wilcoxon statistic was not significant, $z(60) = 0.20$, $p = .84$, which indicated that no statistically significant relationship existed between ERP system quality and ERP usefulness. This finding provided support to retain $H4_0$, although Venkatesh et al. (2000) argued that using a system would enhance a person's job performance. A significant Wilcoxon statistic would have yielded a result higher than the test standard 3.00 for the null to be rejected. Because the p value of .84 was higher than the significance level of .05, the null hypothesis was retained.

To address $H5_0$, I used Wilcoxon matched pairs tests and compared the mean rating ($M = 5.89$) with the test standard (4 = *neither agree nor disagree*). The Wilcoxon statistic was significant, $z(60) = 6.57$, $p = .001$, which indicated that a statistically significant relationship existed between ERP system quality and organizational productivity. This finding provided support to reject $H5_0$ because the mean rating yielded a result significantly higher than the test standard 4.00. Because the p value of .001 was lower than a significance level of .05, the null was rejected.

Research Question 3: Compared to the previous legacy application, what is the relationship, if any, between ERP adoption and organizational efficiency?

$H6_0$: Compared to the previous legacy application, there is no statistically significant relationship between ERP adoption and organizational efficiency.

$H6_a$: Compared to the previous legacy application, there is a statistically significant relationship between ERP adoption and organizational efficiency.

To address $H6_0$, I used Spearman's correlation. Of the 12 Spearman correlations performed, only one was significant. The only correlation was written communication had a negative correlation with ERP adoption; the more time ERP users spent writing, the less likely they were to adopt ERP. $H6_0$ was therefore retained (r_s = -.36, p = .005), which indicated that no statistical relationship existed between ERP adoption and organizational efficiency. This finding contrasted with Joshi et al.'s (2007) findings, which indicated that because information system development often requires constant communication and negotiation, the desired form of communication, such as e-mails, face-to-face meetings, and verbal and nonverbal gestures, will generate a more gratifying relationship among the related parties and foster the transfer of knowledge.

In summary, of the six alternative hypotheses in this study, three were supported and three were not supported. The first hypothesis supported was Hypothesis 2, which addressed ERPs' ability to create organizational alignment that improves information sharing significantly and positively. Also supported were Hypothesis 3, which addressed the significance of ERP system quality in fostering ease-of-use, and Hypothesis 5, which addressed the significance of ERP system quality in fostering organizational productivity. The first hypothesis not supported was Hypothesis 1, which addressed the significance of ERP applications in creating organizational alignment that improves cross-functional communication. The other hypotheses not supported were Hypothesis 4, which addressed

the significance of ERP system quality in fostering ERP usefulness, and Hypothesis 6, which addressed the relationship between ERP adoption and organizational efficiency.

Limitations of the Study

The sample included local government institutions in the United States, which may have limited the ability to generalize the findings to private and other government institutions that do not share a similar organizational culture with local government institutions. Data collection took place online using a survey instrument, which caused a potential risk of obtaining biased responses. Although I asked probing questions and participants read a disclosure about the importance of the study, a risk existed that a misrepresentation could have been undetected. The study included only five dimension variables; they are other variables that may boost ERP implementation as identified in the STS literature. The final limitation was the methodological approach. The study involved using a quantitative approach. An alternative approach to understand respondent's subjective opinion about ERP implementation is qualitative.

Implications for Social Change

This study contains several contributions for academics and practitioners who are interested in understanding the relationship between ERP systems and productivity in local government institutions. Prior researches have focused on ERP implementations in the private sector and not on a combination of state, county, municipal or city governments. The study revealed an opportunity for local government administrators to understand others aspects of ERP relating to system optimization and performance and not costs. The study findings revealed different dimensions for improving people and

technical challenges in organizations during and after large-scale IT systems implementation. Such challenges include but are not limited to, user involvement, information sharing, cross functional communication, stakeholder satisfaction, ease of use, and product efficacy. A significant positive correlation emerged between ERP systems and information sharing, ease of use, and organizational productivity. The implication for positive social change includes providing information for technology managers and chief information officers to minimize high rates of ERP project failures (Stanciu & Tinca, 2013) and to ensure ERP sustainability.

Recommendations for Further Study

This study represents the first step in examining the relationship between an ERP system and organizational productivity in local government institutions. Prior studies took place in private organizations. I examined five dimensions that are consistent with STS theory and with ERP system optimization. Future researchers may look into other dimensions and attributes of ERP. Future researchers may examine ERP systems in federal government institutions with a different instrument and methodology. This study was quantitative, and data collection took place using an electronic survey. An alternative procedure is a qualitative study involving interviewing ERP users. The finding in this study is limited to the implementation of the SAP ERP system, but future researchers may examine other ERP systems such as Oracle, JD Edwards, and PeopleSoft.

Summary and Conclusion

The objective of this study was to add to the growing body of knowledge how the combine efforts of people, processes, and technology improve productivity in ERP implementation and use. The focus of the study was on local government institutions because previous studies had not addressed ERP challenges in the public sector. The general problem is that leaders of local government institutions do not understand how to achieve the expected and desired benefits from ERP implementation. The purpose of the study was to examine particular social and technical variables that may increase productivity in ERP implementation and use. Enterprise resource planning systems are process centered (Moen & Haddara, 2017) and can synchronize other subsystems, but they are more resourceful to harness optimal potential and functionality with social capabilities. Social capabilities involve human attributes that is often overlooked in large IT projects, but has evolved into an important theoretical lens. Moen and Haddara (2017) contended that after implementing an ERP system, organizational leaders experience social and technological changes that may cause resistance to using the system. User participation and use of the system are critical to ERP adoption and success (Mayeh et al., 2016; Zabukovsek & Bobek, 2013), which is why I used STS theory as the theoretical framework in this study. The goal of implementing an ERP system in an organization is to increase efficiency and productivity, but organizations continue to experience setbacks and failures following implementation. Some organizations have gone out of business as a result of high implementation costs and poor strategies. To complete the study, I focused on the following attributes in ERP system implementation: how system

implementation may foster information sharing and cross-functional communication in the organization, how aligning STS factors in ERP implementation may increase efficiency and productivity, and the results of ERP implementation such that the system is easy to use and useful to stakeholders. The answers to the research questions indicated whether a correlation exists between an ERP system and organizational productivity. The study involved collecting demographic data from participants to enable me to answer the research questions. The study findings demonstrated a positive significant relationship between ERP and information sharing, positive significant relationship between ERP system quality and ease to use, and positive significance relationship between ERP system quality and productivity. Chapter 5 included recommendations for future research in the field of organizational development.

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Appendix A: Cross Communication Questionnaire

Communication Questionnaire. The test **was created** by Roberts, K. H., & O'Reilly, C. A., III. (1974). The questionnaire may be retrieved from PsycTESTS. doi: 10.1037/t13756-000. Items are scored on a 7-point scale. Source: Roberts, Karlene H., & O'Reilly, Charles A. (1974).

Measuring organizational communication. *Journal of Applied Psychology*, 59(3), 321-326. doi: 10.1037/h0036660**. Permissions: Test content may be reproduced and used for non-commercial research and educational purposes without seeking written permission.** Distribution must be controlled, meaning only to the participants engaged in the research or enrolled in the educational activity. Any other type of reproduction or distribution of test content is not authorized without written permission from the author and publisher.

Appendix B: Information Sharing Questionnaire

Information Sharing Questionnaire. The test **was created** by Manoj G, (2010).

Dear Tambei Chiawah,

I grant the permission to use portions of my dissertation as requested in your email. There is no fee involved.

Your dissertation focus is great and quite in-line with the topic I selected. Good Luck and best wishes on your dissertation.

Dr. Manoj Garg

Appendix C: Ease of Use and Usefulness Questionnaire

Ease of Use and Usefulness Questionnaire. The test **was created** by Davis, Fred. D., & Venkatesh, Viswanath. (1996). The questionnaire may be retrieved from PsycTESTS doi:10.1037/t26004-000. Items are scored on a 7-point scale. Source: Davis, F. D., & Venkatesh, V. (1996).

A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. *International Journal of Human-Computer Studies*, 45(1),19-45. doi:10.1006/ijhc. **Permissions: Test content may be reproduced and used for non-commercial research and educational purposes without seeking written permission.** Distribution must be controlled, meaning only to the participants engaged in the research or enrolled in the educational activity. Any other type of reproduction or distribution of test content is not authorized without written permission from the author and publisher.

Appendix D: Organizational Efficiency Questionnaire

Organizational efficiency Questionnaire. The test was created by Karr-Wisniewski, Pamela; and Lu Ying (2010). The questionnaire may be retrieved from PsycTESTS doi: 10.1037/t13013-000. Items are scored on a 7-point scale. Source: Karr-Wisniewski, Pamela, & Lu, Ying. (2010).

When more is too much: Operationalizing technology overload and exploring its impact on knowledge worker productivity. *Computers in Human Behavior*, 26(5), 1061-1072. doi: 10.1037/t13013-000. **Permissions: Test content may be reproduced and used for non-commercial research and educational purposes without seeking written permission.** Distribution must be controlled, meaning only to the participants engaged in the research or enrolled in the educational activity. Any other type of reproduction or distribution of test content is not authorized without written permission from the author and publisher.

Appendix E: The Relevance of Socio-Technical Systems Theory to Emerging Forms of Virtual Organization

Figure 1. The figure was created by Eason, K, (2010).

Dear Tambei,

Thank you for your request. If you want to use the figure in another publication I think you need to approach the publisher who holds the copyright. However, if I understand correctly, you wish to use it in your dissertation and it will not be published. If that is the case I am very happy to give my consent and, of course, there is no charge.

I wish you well in completing your studies.

Best wishes

Ken Eason

Emeritus Professor

Loughborough Design School

Loughborough University

Loughborough

Leics

LE11 3TU

UK

Appendix F: Information Enhancement of Vector Method by Adapting Octave for Risk Analysis in Legacy System Migration

Figure 2. The figure **was created** by A. Hakemi, J. Seung Ryul, I. Ghani, & M. G. Sanaei, (2014).

Dear Tambei Chiawah,

Thank you for your interest in our research article.

I, as the main supervisor of that research, grant you the permission of adapting any figure you wish. No problem.
There is no fee for that and you do not need to obtain permission from other authors. I will inform them.

Just one thing, in order to avoid plagiarism etc, you need to cite our article in your article or dissertation with a statement that the new figure has been adapted from our article.

Good luck for your doctoral dissertation.

Best regards,

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Co-Editor-in-Chief: KSII Transactions on Internet and Information Systems (ISI/SCIE and SCOPUS)
Founder Chairman: Pakistan Agile Development Society (PADS)
Ex-Vice President: Korean Society for Internet Information (International Affairs)
Managing Editor: International Journal of Innovative Computing (IJIC), Faculty of Computing, UTM
Managing Editor: Science International – Lahore Journal
Member: IEEE Circuits and Systems Society & IEEE Computer Society
Member: Agile Alliance

Appendix G: Standalone Legacy System Architecture

Figure 3. Critical elements for a successful enterprise resource planning

implementation in small and medium sized enterprises The figure **was created** by T. C.

Loh & S. C. L. Koh, (2004).

Dear Tambei

Many thanks for this. I am happy for you to adapt my figure from my paper as mentioned in your email below with the condition that you make reference to my paper in the diagram, text and references. Your dissertation topic sounds really interesting, and all the very best for your PhD research. Dr Loh was my PhD student and he has graduated and now working in industry. I will inform him about this.

Thank you and all the best!!

Best wishes and many thanks,

Lenny

Appendix H: The Integrated Nature of an ERP System

Figure 4. Critical elements for a successful enterprise resource planning

implementation in small and medium sized enterprises The figure **was created** by T. C.

Loh & S. C. L. Koh, (2004).

Dear Tambei

Many thanks for this. I am happy for you to adapt my figure from my paper as mentioned in your email below with the condition that you make reference to my paper in the diagram, text and references. Your dissertation topic sounds really interesting, and all the very best for your PhD research. Dr Loh was my PhD student and he has graduated and now working in industry. I will inform him about this.

Thank you and all the best!!

Best wishes and many thanks,

Lenny

Appendix I: Letter of Invitation to Participate in a Survey

Dear Participant,

My name is Tambei Chiawah. I am pursuing a Ph.D. in Leadership and Organizational Change Management from Walden University's College of Management and Technology. As a requirement for graduation, I am expected to complete a dissertation. The focus of my dissertation/ study is examining the relationship between Enterprise Resource Planning (ERP) systems and Organizational Productivity in a local government institution. I am focusing on the Systems, Applications & Products in Data Processing (SAP) system in your institution which is an ERP.

I kindly request your participation in my study because you have been identified as an SAP user. Your participation is voluntary and anonymous, but it is really crucial for the success of this study. I kindly urge you to participate in the study. You are not required to identify yourself if you decide to participate in the study.

I plan to administer an electronic survey with about 32 closed-ended questions from "strongly disagree" to "strongly agree". The survey can be taken online within Quest Mindshare. Once the survey has been completed, the data will be consolidated, analyzed, and incorporated into a doctoral research paper by me.

Please, indicate your willingness to participate in the survey by clicking on the survey link which will accompany this letter of invitation. I am available to answer any questions or concerns regarding the survey via telephone or email as provided below.

Thank you sincerely for participating,

Sincerely,
Tambei Chiawah
Emails – Tambei.chiawah@waldenu.edu OR tembei78@yahoo.com
Cellular Phone: (XXX) XXX-XXXX

Appendix J: Survey Questionnaire Consent Form

I will like to invite you to participate in this research study about the relationship between an Enterprise Resource planning system (ERP SAP) and organizational productivity in a local government institution. I am inviting you as a potential participant in this study because you are identified as someone having relevant experience with SAP, and you meet the following characteristics: 18 years of age or older, perform work for a local government on a full-or part-time basis or a consultant, and you are either a managerial or subordinate staff. This form is part of a process called "informed consent" to allow you to understand this study before making a decision about your participation.

About me:

My name is Tambei Chiawah. I am a Ph.D. student in the School of Management and Technology at Walden University. I am conducting this study as a requirement for graduation.

Background Information:

The purpose of this study is to examine the relationship between ERP SAP and productivity in your organization.

Procedures:

If you agree to be in this study, you will be asked to:

- Respond to a survey comprising of 32 closed-ended questions from "strongly disagree" being 1 to "strongly agree" being 7 on the scale.
- The survey might take approximately 12-15 minutes of your time to complete
- You reserve the right to respond to all or part of the survey, but responding to all the questions will be beneficial to analyzing the results of the survey

Voluntary Nature of the Study:

Your participation in this study is voluntary. You are free to accept or turn down the invitation. No one in your local Government organization will treat you differently if you decide not to be in the study. You can still change your mind later even after deciding to participate in the study. You may stop at any time if you choose without providing any notice to the researcher.

Risks and Benefits of Being in the Study:

There is no risk for participating in this study. Being in this study would not pose any risk to your safety or wellbeing.

The findings of this study may demonstrate how social elements of an organization may foster and support the technical elements to cultivate cross functional communication, information sharing, efficiency and productivity.

By responding to the survey, you have the opportunity to participate in a study that may provide information and knowledge to the general public regarding the effects of an enterprise resource planning system.

Compensation:
There is individual compensation or reimbursement for participating in the study.

Privacy:
Your participation in this study is confidential and anonymous. Anonymity means that no one will know who takes the survey. Reports resulting from this study will not reveal the identities of individual participants. The details that might identify you, such as the location of the study, IP address on your computer will neither be identified nor shared. Please you do not need to identify yourself on the questionnaire. The researcher will not be able to include your name or any information identifying you in any reports of the study.

Contacts and Questions:
You may ask any question you have now. If you have questions later, you may contact me via my cellular phone number on XXX-XXX-XXXX and/or email Tambei.chiawah @waldenu.edu or tembei78@yahoo.com. The researcher's dissertation chairperson is Dr. John Kitoko john.kitoko@mail.waldenu.edu. If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at my university on 612-312-1210. Walden University's approval number for this study is **12-11-17-0354508** and it expires on December 10, 2018.

Obtaining Your Consent
You may print and keep a copy of this consent form for your record. If you feel you understand the study well enough to decide about participating, please indicate your consent by responding to the questionnaire.

To protect your privacy, no signature is required on this consent form which may identify you. Completing the survey indicates informed consent.