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Erp Implementation: an Investigation Into Social Capital and Knowledge Extraction in the Public Sector.

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**ERP IMPLEMENTATION: AN INVESTIGATION INTO SOCIAL CAPITAL
AND KNOWLEDGE EXTRACTION IN THE PUBLIC SECTOR.**

A THESIS

SUBMITTED ON THE THIRD OF AUGUST, 2011

TO THE DEPARTMENT OF INFORMATION TECHNOLOGY
OF THE SCHOOL OF COMPUTER & INFORMATION SCIENCES
OF REGIS UNIVERSITY

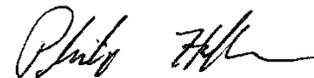
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF MASTER OF
SCIENCE IN
INFORMATION TECHNOLOGY MANAGEMENT

BY



Corey E. Jensen

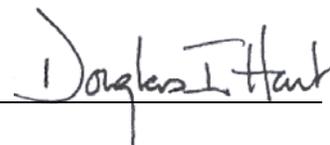
APPROVALS



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Abstract

The elements of a successful Enterprise Resource Planning implementation strategy have been widely researched in the information technology field. Many have sought to compile a complete list of attributes that, if utilized, would guarantee a successful ERP implementation while also adhering to relative time and budget constraints. While several critical success factors have been identified and further enabled higher success rates in evolving ERP implementation strategy, there appears to be room for additional improvement. Extracting essential corporate knowledge from existing information systems in effort to implement an ERP solution is often one of the most challenging tasks of the implementation project, particularly for public sector organizations having deeply-rooted business processes that have evolved over many years. This study explores the relevance and value of social capital as it relates to knowledge extraction tasks during ERP implementation in the public sector.

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Chapter 1 – Introduction

Project Introduction

The topic of enterprise resource planning is heavily discussed throughout many large organizations; it seems ERP has more recently become a ‘buzz-word’ among many organizations striving to achieve more efficiency and fiscal savings. The term is often universally heard throughout all levels of the organization ranging from executive leadership to functional employees working on the front-lines. The reason ERP has become such a widely known term can be attributed to the notion most all organizational employees would experience some degree of impact to their daily job function during an ERP implementation; an unprecedented scope of change for many organizations. Public sector organizations are no exception to the ERP whirlwind. Several public sector organizations are currently or have previously attempted ERP implementation initiatives; some yielding success while others accounted for significant financial losses.

Similar to smaller-scale information system implementation initiatives, ERP projects often face similar but larger challenges in transitioning the organization from its current state to a future state with a new system in place. During the early and evolutionary years of ERP, the term was ‘branded’ with the negative connotation of having a high failure rate as many ERP projects were written-off as losses for an assortment of reasons. This historical and noteworthy implication of ERP solidifies the associated risks often incurred during these projects.

Organizational leaders must own high stake, high risk strategic decisions often involving enough capital to cripple the organization if the project fails. However, those organizations opting to take on the ERP challenge understand the philosophy that with risk comes reward – a theory which largely drives investments made by organizations.

This paper seeks to further explore an element narrowly discussed with respect to public sector ERP implementation – social capital. Social capital can be described as the sum of actual and potential resources within, available through, and derived from the network of relationships possessed by an individual or social unit (Nahapiet & Ghoshal, 1998). The research within this paper focuses specifically on social capital and its relevance to knowledge extraction. Although social capital may primarily be seen as a granular attribute in the overall scope of an ERP project, it may nonetheless be a fundamental concept in achieving ERP success.

Thesis Statement

Given the public sector's unsuppressed demand to invest in new ERP initiatives while considering the associated risks; social capital is an essential element of knowledge extraction which must be given consideration during the ERP implementation process.

Problem Statement

Public sector organizations are under pressure to adopt new information systems in order to retire outdated and inefficient legacy applications which are expensive to maintain and often inflexible in accommodating evolving business processes. A growing number of organizations continue to heavily invest in ERP project implementation initiatives (Simon et al, 2007) to achieve cost savings, better data visibility, and process efficiency despite the associated risks and historical failure implications. These perceived failures can often be attributed to a number of factors identified in IT project management which are commonly referred to as critical success factors or CSFs (Slevin & Pinto, 1987). Congruently, a faulty approach to information system knowledge extraction in effort to develop new system requirements may also be contributing to failed ERP initiatives. The problem is whether ERP project success is impacted as a result of

social capital when extracting ‘as is’ organizational knowledge from information systems in the public sector.

Goals and Objectives

The goal of this study is to examine the process of ERP implementation in the public sector and further evaluate the element of social capital with respect to knowledge extraction. More specifically, this research will target the methods used to extract information system knowledge needed to define ERP system requirements. The objective of the research is to determine whether social capital is utilized during information system knowledge extraction; and further assess its value as it relates to successful and unsuccessful knowledge extraction methods.

The research will include an analysis of methods used in information system knowledge extraction tasks during public sector ERP implementation projects. Additionally the study will examine how these methods relate to social capital and further gauge whether public sector organizations are overlooking social capital as an element to derive project success.

Contributions

This study aims to make a contribution to the body of knowledge surrounding critical success factors in ERP implementation; more specifically, why social capital may be a critical success factor largely ignored in past research. This research was focused explicitly on the methods used for information system knowledge extraction, a critical element in the ERP implementation process. The conclusions drawn from primary research will provide valuable insight to current and future information technology professionals engaged in the ERP implementation process, and further drive ERP implementation success.

Limitations and Scope

While there are several factors which often contribute to the success or failure of an ERP implementation in the public sector, the research conducted in this project focused only on social capital as it relates to knowledge extraction. The project is limited to defining the value of social capital and how social capital may correlate with successful or unsuccessful knowledge extraction methods. For purposes of this paper, public sector organizations are interpreted as mature and large-scale government enterprise organizations consisting of numerous legacy information systems having significant challenges with respect to knowledge management. Knowledge extraction is interpreted as any task involving the action of obtaining organizational knowledge and limited within this study to knowledge required for ERP implementation.

Chapter 2 – Literature Review

Introduction

Early evidence has shown that custom large-scale information technology projects are very expensive and carry huge risks as over fifty percent of the projects are deemed failures (Lyytinen & Hirschheim, 1987). Later research suggests organizations moved away from tainted customized application development projects while moving towards standardized ERP solutions (Scheer & Habermann, 2000). As ERP initiatives emerged in the 1990's, the risk of failure remained a top concern; Krasner indicated implementation complications were often the result of problems with management, users, and technical issues (Krasner, 2000). Sheer and Habermann further suggested, "Many improvement plans fail because of little transparent business processes and structures" (Scheer & Habermann, 2000).

Recently ERP projects have yielded higher success rates as many lessons have been taken from previous failures (Kansal, 2006) however; implementation initiatives continue to indicate noteworthy problems. Research conducted by Brown suggests the IT industry is still working to attain a conclusive list of critical success factors needed to derive success in ERP implementation (Brown, 2004). The following literature review will focus on elements believed to be essential in the success of ERP; these elements include: critical success factors, organizational knowledge, and social capital.

Critical Success Factors

There has been a push in current literature to better understand the attributes driving ERP success otherwise known as critical success factors (CSFs). In the past, CSFs have been defined as the things which must go well to ensure success for a manager or an organization (Boynton

and Zmud, 1984). While many such factors have been cited having relevance to ERP success, a core set of CSFs have been generally applied including: management support, the implementation team, organization-wide commitment, and proper fit between the ERP system and the implementing organization (Grabski et al, 2011). In addition to these generally prescribed CSFs which are often transparent to most organizations; industry or organization-specific CSFs have been identified. The process of defining industry or organizational specific CSFs involves structured one-on-one interviews or dialogue between skilled CSF analysts and key personnel. Defining specific CSFs in this manner supports in communicating the role of information technology to senior management and is particularly effective in supporting planning processes (Boynton and Zmud, 1984).

Recent research indicates the IT industry is getting closer to defining a conclusive list of defensible CSFs. In 2007 García-Sánchez & Pérez-Bernal completed a study which sought to validate and prioritize a cumulative and summarized list of fourteen critical success factors which were consolidated from nine previous studies, these include:

1. Top management support
2. Business process reengineering
3. Project management
4. Project champion
5. End users involvement
6. Training and support for users
7. Having external consultants
8. Change management plan
9. ERP system selection

10. Vision statement and adequate business plan
11. To facilitate of changes in the organizational structure in the “legacy systems” and in the IT infrastructure
12. Communication
13. Teamwork composition for the ERP project
14. Tests and problem solutions

A rigorous process was used to develop this consolidated list including the analysis of frequency in which factors appeared, their description, and justification. Through primary research in small to large size enterprises the study confirmed that the previously defined critical success factors were in fact relevant to success in ERP implementation (García-Sánchez & Pérez-Bernal, 2007). They further concluded that the list was cumulative and complete as none of the study’s participants suggested any new critical success factors be added to the list (García-Sánchez & Pérez-Bernal, 2007).

A similar approach of utilizing already defined critical success factors found in previous research was used in a study conducted by Loh & Koh in 2004. Their study had the objective of categorizing and collating elements critical to ERP success with the different phases of the ERP life cycle. Similar to García-Sánchez & Pérez-Bernal’s paper, this study summarized and grouped previously defined critical success factors from other researchers using a similar methodology of consolidating the results of each study. Loh and Koh ultimately presented a framework consisting of three critical elements needed for ERP success: ten critical success factors, nine critical people, and twenty-one critical uncertainties (Loh & Koh, 2004). It was further concluded that each of these elements were critical at a particular phase of the ERP implementation (Loh & Koh, 2004). The conclusions of this study imply there may be more

depth to the clichéd lists of previously defined critical success factors by introducing two new elements to derive ERP success (critical people and critical uncertainties).

Change Management

One of the most difficult and underestimated challenges of ERP implementation is change management or managing the process of transitioning an organization from its 'as-is' to its future 'to-be' state. Change management is often regarded as a top CSF however, is commonly underestimated thus resulting in an overall decrease in the benefits of ERP. Past research has highlighted the importance of change management. The results of a 2003 study conducted by Fui-Hoon Nah et al indicated Fortune 1000 Chief Information Officers perceived change management as one of five factors critical to the success of ERP implementation. An organizational culture where employees share common values and goals and are receptive to change is most likely to succeed in ERP implementation; commitment to change is necessary for the implementation to succeed (Fui-Hoon Nah et al, 2003).

Research conducted in 2004 by Naslund further broke down change management into four essential interrelated components: organizational roadblocks, resistance to change, training and education, and communication. During most ERP implementations, each of these cultural elements are a factor and any one of them could potentially derail a project absent an effective change management strategy to supplement a smooth transition. Naslund concluded that in developing a change management strategy, organizations should take a systemic and holistic approach to addressing each of these cultural elements to ensure enterprise wide buy-in during ERP implementation (Naslund, 2004).

The risks associated with the complex task of ERP implementation have highlighted the importance of defining CSFs. These studies indicate CSFs are continuing to evolve and become more focused and relevant in current ERP implementations. While many organizations and researchers have sought to define a definitive list of CSFs in order to increase ERP success, the interpretation is still somewhat broad and subjective thus leaving more room for granular exploration.

Organizational Knowledge

Knowledge Management

The principles of effective change management complement those of knowledge management. A fertile ground for research in knowledge management has been to investigate how post implementation knowledge of a new system or process is transferred from ERP consultants to the organization's users, IS dept, and management (Soh et al., 2000). Fewer studies have explored how knowledge is captured from legacy information systems in order to transition the organization from its 'as-is' state to the future 'to-be' state during ERP implementation.

Knowledge management has been an ongoing concern for organizations as many of their business processes and information systems have evolved over the years. Ineffective knowledge management of the existing business processes and legacy applications exposes further risks when implementing an enterprise system. Tilley stated, "Such knowledge is difficult to recover after many years of operation, evolution, and personnel change" (Tilley, 1995). Further research suggests legacy system knowledge stems from diverse sources including code, documentation,

end-users, and maintainers; however most of the knowledge stays in one's head as opposed to being formally documented for later retrieval (Anquetil et al., 2007).

Inadequate knowledge management has attributed to a phenomenon known as 'staff poaching' and 'knowledge drain' (Gable et al., 1997). This occurs when management specifically targets and recruits employees possessing critical knowledge, experience, or expertise where there is an associated supply shortfall. Staff poaching and knowledge drain can particularly be an issue for public sector organizations having competing bureaucratic objectives thus creating employee turnover and retention challenges internal to the organization. While this strategy may endorse compartmentalized success for a specific manager or team, such actions may destabilize an ERP project. This appears to be a relevant factor in public sector organizations having deeply-rooted business processes which have also struggled with effective knowledge management methods (Marilena & Elena-Mihaela, 2008).

Tacit and Explicit Knowledge

The challenges associated with knowledge management outlined above can incorporate two different types of knowledge, tacit or explicit. The concept of categorizing knowledge as either tacit or explicit can be attributed to the work of Michael Polanyi. Polanyi's findings spawned from his philosophy which states, 'we know far more than we can tell' (Polanyi, 1968). The conclusions of his work challenged the notion that all knowledge could be explicitly communicated and transferred from person to person.

Organizations are comprised of tacit and explicit knowledge. Tacit knowledge within an organization can be described as knowledge that is subconsciously understood and applied, difficult to articulate, developed from direct experience or action, and usually shared through

highly interactive conversation and shared experiences (Sedera et al., 2003). The required knowledge for ERP implementation is more diverse than the knowledge required for employees to execute their function; the knowledge is mainly in the form of 'know-how' and individual experiences (Vandaie, 2008). Vandaie's research further concludes that a substantial portion of process based knowledge can be regarded as organizational memory, knowledge embedded with the organization and not confined to a specific individual's mind.

Other research has highlighted the importance and value of tacit knowledge to an organization and more specifically the difficulties faced in exploiting the knowledge. Stenmark identified three major hurdles seen by organizations attempting to utilize tacit knowledge: 1. Unawareness that the knowledge exists, 2. Those individuals having tacit knowledge do not need to make it explicit in order to use it, 3. Those having tacit knowledge may not want to give up a valuable competitive advantage (Stenmark, 2000). Based upon my professional experiences within the public sector, Stenmark's challenges appear to be valid.

Sedera et al further synthesized previous conclusions contrasting the differences in knowledge found inside or outside of an organization and defining its importance (Zack, 1999). In order to better define a 'disconnect' between large IS investments and organizational performance, this study aimed to develop a comprehensive measurement model for understanding the success of ERP systems in public sector organizations. As a result an ERP-knowledge model was proposed, see figure 1. This model illustrates the compartmentalized nature of knowledge and categorizes knowledge as either internal or external. Internal knowledge resides within the organization and tends to be tacitly held whereas external knowledge resides outside the organization with consultants and software vendors. The study ultimately indicated a strong correlation with ERP success and internal knowledge and a weak

correlation with external knowledge (Sedera et al., 2003) thus solidifying the importance of effective knowledge management.

Figure 1

ERP Knowledge model

	Internal Knowledge	External Knowledge
Software Specific Knowledge		
Organization Specific Knowledge		

Additional research provides insight as to how knowledge is created within an organization. Nonaka indicates the importance of an organization's action of promoting continual dialogue between explicit and tacit knowledge, thus driving the creation of new knowledge (Nonaka, 1994). This concept of creating new knowledge appears to align with the creation of social capital.

Knowledge Extraction

ERP projects are likely to encounter knowledge barriers throughout the implementation. Soh et al suggested specific knowledge obtained from diverse organizational personnel would be required to resolve 'misfits' between as-is and to-be differences (Soh et al., 2000). Other research states the primary obstacle to implementing an ERP system was the firm's knowledge of existing systems and business processes (Robey, 2002). Robey's study proposed methods to avoid knowledge barriers however; the study concluded that firms had ongoing concerns with overcoming knowledge barriers (Robey, 2002). In later research Paradauskas et al continued to

explore the knowledge extraction problem and ultimately proposed an eight-step systematic data reverse engineering process in order to extract key data from an organization's 'as is' state (Paradauskas et al., 2006). This ongoing pursuit to streamline the process of obtaining deep organizational knowledge indicates there may be an opportunity for additional improvements.

Social Capital

Recent literature has cited the importance of incorporating a knowledge extraction strategy in large scale ERP project teams in order to obtain the required knowledge of the existing information systems and business processes. Social capital can be defined as the sum of actual and potential resources within, available through, and derived from the network of relationships possessed by an individual or social unit (Nahapiet & Ghoshal, 1998). Further, social capital can be interpreted as an intangible asset held by an individual which is essentially non-transferable. Bourdieu describes social capital as a membership within a group which in turn provides the member a 'credential' entitling them to credit (Bourdieu, 1986).

Pan et al indicated the significance of social capital when implementing a large-scale ERP system involving a large number of stakeholders dispersed geographically and functionally across an organization (Pan et al., 2001). Newell et al affirms, "In the context of an ERP project, social capital is, thus, a vital ingredient to facilitate the access and integration of knowledge that is needed for designing and implementing an ERP system." (Newell et al., 2006). The depth and conclusions of this evidence suggests the clichéd critical success factors often attributed to the success or failure of an ERP project may be too general to derive greater ERP success rates.

Chapter 3 – Methodology

Introduction

This chapter will discuss the methodology used to obtain primary research data. The research began with an introduction to the area of research and a review of current literature. The literature review addressed attributes of the ERP implementation process including critical success factors and also presented the value of organizational knowledge, thus supporting further research into social capital as it relates to knowledge extraction in information systems. The primary research was conducted via one-on-one interviews to obtain data from information technology professionals having experience in public sector ERP implementation within a single large-scale public sector organization. The research concluded by analyzing the results obtained through the interviews in order to assess the value of social capital during knowledge extraction tasks in ERP implementation projects and further evaluate its impact to project success.

This area of research was chosen as a result of my career interests and past and present professional experiences. My professional experiences as they relate to this study have accumulated from performing relevant information technology functions in a public sector organization. These functions include work on ERP implementation initiatives from multiple perspectives. Key perspectives include serving in the capacity of a subject matter expert on legacy information systems and business processes while another perspective includes having minimal subject matter expertise, performing data cleansing, integration, and migration tasks. Both key perspectives involve functional work on different ERP implementation initiatives having unrelated business processes. While these experiences are relevant to ERP implementation, the results of the study will be minimally influenced with personal or professional biases.

Interview Methodology

Qualitative research was conducted utilizing ethnographic and action research methods. Individual interviews were used as the data collection instruments for this study. The study targeted professionals currently working on the implementation team of an ERP project in a public sector organization. The large scale ERP project in which the participants were assigned encompassed many knowledge extraction tasks as numerous legacy processes were transformed and integrated; further the project was nearing a successful completion. The participants were ultimately selected based upon their varying degrees of experience in system implementation, current role on a large scale ERP project, project management, and knowledge extraction. Personal observations made from relevant experience in the ERP implementation process were also included in this study.

The interviews were conducted in-person, in a controlled environment. No uniquely identifying information about the participant or organization was stated or implied in the results of this study. In order to participate, participants were required to give their consent in acknowledging the purpose of the interview and how their responses will be used in conjunction with other responses in the study. The interview setting was standardized to the maximum extent possible in an office environment workspace. Participants were advised of their rights to view the results of this study upon completion, at their request.

The study consisted of five interviews with individuals in a large public sector organization. The individuals interviewed were a mixture of project managers and functional team members, all having a diverse array of experience in differing projects or functions throughout the organization. At minimum, all participants held a bachelor's degree in a business

related field, had an average of twenty-six years of public sector experience, and had participated in at least one enterprise system implementation.

Interview Objectives

The interview objective was to challenge the hypothesis of this study. The interviews consisted of two different sets of questions; while both similar, one set of questions was geared towards obtaining information from a project manager's perspective whereas the second set of questions was geared towards capturing information from a functional project team member's perspective. The interview for the project managers consisted of seven questions while the interview for the functional project team members consisted of six questions. In addition to using an audio recording device, detailed notes were taken during the interview in order to later consolidate and transcribe responses into narrative format. The notes taken during the interview were compared with each participant's recorded interview to validate accuracy prior to and during the transcribing process.

Both sets of interview questions were designed to gather information related to current knowledge extraction methods and further assess the value of social capital and its usage as it applies to knowledge extraction during ERP implementation. In addition, questions were included to measure the participant's relevant experience and depth of knowledge as it relates to ERP implementation. Obtaining this information enabled further analysis in determining the relevance and value of social capital during ERP implementation. The project manager interview template can be found in appendix A, the functional team member interview template can be found in appendix B. During the interview, the participants were verbally read the definition of social capital and tacit knowledge as both terms are defined in this study. The interview addresses the following elements:

Table 1

Interview questions

Question	Interview	Objective
How many years of professional information technology experience do you have? What is your area of expertise? Do you have formal education in Information technology?	Project manager & Functional team member	The objective of this question is to measure the participant's cumulative professional experience in the information technology field and determine their area of expertise and level of information technology education.
Briefly explain your past information technology experience as it relates to ERP implementation. Identify specific successes or failures you consider to be noteworthy.	Project manager & Functional team member	The objective of this question is to adjust the focus of the interview to measure and include only ERP implementation experience.
How do you currently approach tacit legacy information system knowledge extraction tasks during ERP implementation? Identify any specific strategies, methods or systems utilized for archiving or procuring intangible assets.	Project manager & Functional team member	The objective of this open-ended question is to engage the participant in sharing current methods used to extract knowledge.

Question	Interview	Objective
Do you feel a knowledge management system would provide more or less value than social capital during ERP implementation? If they were mutually exclusive, which would you desire?	Project manager & Functional team member	The objective of this question is to determine how much value the respondent places on a knowledge management system in comparison to social capital.
In past or present ERP implementation tacit knowledge extraction tasks, have you acquired and utilized valuable and relevant information using social capital? Have you observed team members engage in such activity?	Project manager & Functional team member	The objective of this question is to determine the degree of which the participant has personally or observed team members utilizing social capital to acquire relevant and valuable information for system implementation tasks.
When staffing project team members, do you consider the value of a potential candidates' accumulated social capital as a potential asset to your team?	Project manager only	The objective of this question is to measure the respondent's value placed on social capital when making hiring decisions.
Do you foresee value in applying the concept of social capital in future ERP implementation projects? Do you feel social capital impacted the successes and failures noted in your previous ERP implementation experience.	Project manager & Functional team member	The objective of this question is to measure whether the participant sees value in applying social capital to future ERP implementation projects. This question further seeks to gauge the participant's perception as to whether social capital may have impacted their past experiences.

Milestones and deliverables

This project was to be completed in accordance with the following schedule developed during the initial proposal.

- Week 1: Submit initial draft of thesis proposal.
- Week 2: Obtain approval for proposal. Submit IRB request.
- Week 3: Obtain IRB approval. Initiate primary research.
- Week 4: Analyze research findings, begin drafting body of thesis.
- Week 5: Complete main body of thesis; submit initial draft to thesis advisor for review and comments.
- Week 6: Draft abstract and make revisions based upon advisors feedback.
- Week 7: Submit final draft to thesis advisor; finalize all revisions.
- Week 8 Present completed thesis for final approval.

The weekly project milestones outlined above were accurate with respect to the chronologic order of which each action was executed. However, the eight-week time line was adjusted to accommodate additional time requirements mainly for the IRB approval process, participant interviews, and transcribing process in weeks three and four. In retrospect, a ten to twelve week time line would have been more realistic to complete the requirements for this project.

Summary

The methodology incorporated in this study aligned with the research objectives enabling me to capture and analyze conclusive information needed to assess the value of social capital. The breadth and depth of experiences brought forth in the participant pool was suitable for this

study. Each participant interview went as expected, lasting an average of forty-five minutes. Carefully constructed open-ended interview questions permitted me to concisely communicate the question's objective to obtain focused and detailed participant responses. It should be noted that the responses of each participant were subjective based upon individual perception of their experience.

Initially each participant appeared somewhat aloof upon starting the audio recorder however; I was quickly able to shift the tone of the interview to more of a relaxed conversation by briefly discussing the project and establishing some common ground with the participant. The relaxed tone seemingly allowed each participant to openly volunteer their experiences in addition to providing short anecdotes relevant to some questions. Although the presence of the audio recorder during the interview may have potentially suppressed some information from being shared, I feel its use was essential in accurately capturing all information as handwritten notes alone were insufficient.

Chapter 4 – Results and Data Analysis

Introduction

Once all raw interview data was gathered and consolidated, qualitative data analysis was performed to illuminate the value and relationship of social capital with successful or unsuccessful experiences in knowledge extraction tasks during an ERP implementation. The collected data was transcribed using recorded audio and notes taken during the interview. The transcribed data was summarized by each participant in a detailed narrative. Once all participant responses were transcribed, the data was then analyzed to identify relevant trends and/or correlations.

Consolidated interview findings

Participant 1

Participant one was a female functional team member currently working on an ERP implementation initiative. Her experience consisted of twenty-seven years with the federal government of which twenty years had been in an IT function. She possessed a breadth and depth of relative experience in implementing enterprise level systems for the federal government within multiple agencies having differing objectives and strategies. Some of the past IT projects in which she has participated include many ERP initiatives in addition to several smaller scoped enterprise IT initiatives. Of these IT projects, her role and function has varied based upon her experience at that given timeframe. Participant one had no formal IT education.

Some of her early work in ERP implementation included interfacing existing legacy applications to the evolving ERP system. To date, this participant indicated she had not participated in any successful ERP implementations; mainly as these implementations are multi-

year projects and have not fully matured. However, participant one speculated these ERP projects will eventually yield success. She cited the biggest challenge inhibiting a more rapid success rate is the ability for the organization to adopt prescribed ERP processes and transition away from legacy processes. She further suggested the politically driven budget and fund allocation process often extends projects of this size and scope, thus further delaying success.

Participant one stated when approaching tacit knowledge extraction tasks to obtain information for ERP implementation, she primarily utilizes a traditional method of interviewing multiple subject matter experts currently executing the function or process in question while documenting and archiving the information accordingly. In addition, participant one had firsthand experience in developing and utilizing a knowledge management information system for the purpose of capturing corporate history for future enterprise system implementations and internal standardization initiatives. Participant one stated that while undergoing knowledge extraction tasks in effort to populate the knowledge management system, there were numerous occasions where unrelated valuable information and additional points-of-contact surfaced as a result of deep discussion in a targeted process, further enabling the team to obtain additional knowledge which may have otherwise been overlooked.

Upon reading Napaiet and Ghoshal's definition of social capital to participant one, she indicated she was unaware of a formal definition of social capital however, she felt it is relevant and she had unconsciously relied on social capital during knowledge extraction tasks. However, participant one also disclaimed the use of social capital to a certain degree, indicating some information obtained via this method may be inaccurate or biased, given the actual experiences, process involvement, or credibility of the information provider.

Participant one cited pros and cons to social capital and the use of a knowledge management system. She specified a knowledge management system can be an extraordinary asset to an ERP implementation team however, not all relevant or tacit knowledge is always captured and archived in the system; and sometimes incorrect information is captured. Participant one further stated that heavily relying only on social capital to capture knowledge may result in a skewed view of the actual process when considering individual or group biases. When asked to contrast the value of a knowledge management system versus social capital, participant one allocated more value to social capital with the argument that the quality of information contained within the knowledge management system is limited to the effort put forth by the individuals tasked to initially capture the data.

Participant one believes consciously utilizing social capital in future ERP implementation projects will add value. Although participant one did not cite any specific ERP implementation successes, in retrospect she feels the use of social capital attributed to the previous success of activities to capture tacit knowledge from within public sector organizations which she has been involved.

Participant 2

Participant two was a male functional team member currently working on an ERP implementation initiative. His experience consisted of nineteen years with the federal government of which three years had been in an IT function. He possessed a broad depth of knowledge in a specific process within a public sector organization. He has spent the majority of his career working on and developing knowledge in this particular function. During the past

three years, participant two had been reassigned to an ERP implementation team tasked to integrate the process in which his career-long expertise lies.

Although participant two had no formal IT experience or education prior to his reassignment to the ERP implementation team, it should be noted that he had accumulated pertinent knowledge in information systems and relational databases as he participated in the capacity of a subject matter expert in many legacy system improvement initiatives throughout his career. In addition, using his functional expertise he developed several offline database micro-applications to bridge gaps between legacy applications and management requirements for data reporting. He considered these micro-applications and previous legacy system enhancements to be successful as they are still being utilized in a production environment to date.

Participant two suggested his current approach to obtaining tacit knowledge was heavily reliant on one-on-one interviews with those individuals currently engaged in performing the function in question. Additionally, given his personal expertise and knowledge of the function, participant two expressed his ability to leverage his own knowledge in analyzing raw data from existing legacy applications to satisfy further knowledge requirements for the ERP implementation.

When directly asked about the usage of social capital for knowledge extraction tasks, participant two indicated he heavily utilized his own social capital to address knowledge extraction tasks as needed or when he felt confident another individual in his social network may be more capable of providing higher quality information quicker than obtaining the information via interviewing personnel currently executing the function. Participant two further cited a specific individual whom he interned with at the beginning of his government career; he stated

this particular individual has been an invaluable resource in providing quality information and knowledge as both of their careers evolved from the same origin yet gradually grew to a different focus. Participant two referred to the information provided by this individual as ‘leads’ in the sense that the individual may not have the exact answer to a specific question but knew of someone within his/her network that would be capable of providing the answer.

Participant two allocated more value-adding potential to social capital in comparison to a knowledge management system. He indicated that his ability to obtain information from his own social capital is much quicker and more efficient than querying a knowledge management system and subsequently having to validate the information obtained. Participant two also noted that the knowledge management system may be more effective in documenting and archiving negative or unfavorable information documenting personnel errors or poor decisions which may not always surface when utilizing social capital.

Although participant two’s ERP implementation is not complete, he feels utilizing social capital has played a critical role in successfully reaching milestones thus far in the implementation. He provided a brief anecdote by stating that upon initiating a project, he was not handed a ‘play-book’ or blueprint of how all the existing information systems and business processes worked but rather had to rely on his social capital and the social capital of others to achieve success. Participant two further stated that he feels consciously using social capital in future ERP implementations will add value.

Participant 3

Participant three was a female functional team member currently working on an ERP implementation initiative in the public sector. Her experience consisted of twenty-eight years

with the federal government of which the last three years had been in an IT function. The majority of her public sector experience was in the accounting field. She had participated in a major legacy accounting system enhancement earlier in her career. This enhancement involved the development and deployment of a standardized general ledger and new methodology to generate a trial balance. She initially participated in this project in the capacity of a subject matter expert accountant and eventually accumulated enough accounting system knowledge to shift the focus of her career to IT. Participant three had no formal IT education.

Although the current ERP project which participant three is engaged was still in progress, she noted experiences in success and failure with respect to major milestones. While most milestones have been achieved successfully, one was initially written-off as a failure and later restarted with a different strategy. This particular failure was attributed to inadequate human capital staffed to facilitate project demands in conjunction with routine work required to execute the function in the legacy environment. When the project was restarted, a liaison team was established to bridge the gap between the project management office and functional staff. This dedicated team was strategically staffed with resources knowledgeable of the business process and an established network of other resources applicable to this function. This enabled the functional team to allocate the majority of their time to executing the as-is function with minimal interruption from the ERP implementation.

Participant three suggested her team's current approach to obtaining tacit knowledge of business process was to strategically recruit individuals in hiring practices whom already possess a significant depth of knowledge in the applicable process. She cited instances where specific individuals working on a specific functional team were targeted, solicited, and sometimes promoted to join the ERP implementation team – giving minimal consideration to their overall

IT and/or ERP experience. Participant three indicated the practice of recruiting individuals with specific process knowledge was synonymous with utilizing social capital; as social capital was often utilized by the project manager in order to solicit and recruit the individuals to their team. She further stated that in addition to recruiting individuals already possessing a large portion of the required knowledge, other techniques for obtaining knowledge were utilized to fill in the 'missing pieces'. These techniques mainly consisted of one-on-one interviews, shadowing, raw data analysis, and analysis of legacy system source code.

Participant three also noted a specific instance where her team encountered problems with a subject matter expert on a functional team which was unwilling to share vital information. This particular subject matter expert had a significant amount of knowledge of the legacy process however was not on-board with the ERP implementation; she consequently refused to comply with the ERP implementation team's requests for knowledge. Ultimately the ERP implementation team was able to procure the required knowledge without using this particular resource but rather using their social capital with others in addition to the other knowledge extraction techniques previously noted. Participant three speculated employing an individual on the ERP implementation team having established rapport with the subject matter expert withholding information may have made the knowledge extraction task easier and more effective. Participant three agreed that social capital was an essential element in her team's success thus far.

When participant three was asked to allocate the value of a knowledge management system versus social capital, she indicated social capital would add more value to a project over the use of a knowledge management system. Participant three also indicated she had experience in obtaining information from a knowledge management system for the purpose of ERP

implementation. She expressed her opinion that the knowledge management system was a good concept however, the information contained within was not sufficient to satisfy the requirements for her project. She further highlighted the challenge associated with capturing all essential information in a knowledge management system within a large enterprise organization.

Participant three ultimately stated she would prefer to use social capital instead of a knowledge management system and further expressed the value in consciously leveraging social capital in future ERP implementation projects.

Participant three also made note of her own social capital being somewhat suppressed as a result of relocating to a different geographic region within the organization; however she promptly began establishing new relationships which ultimately led to increased social capital within the new region. She further contrasted her social capital with her project managers' social capital as the project manager had spent her entire professional career in one geographic location. Participant three felt her project managers' social capital was an invaluable asset to the ERP implementation team and largely contributed to past successes.

Participant 4

Participant four was female project manager currently leading an ERP implementation initiative in the public sector. Her experience consisted of 22 years with the federal government of which the last 1 year had been in an IT project management role; she had no formal IT education. She considered her overall IT project management experience to be minimal however; the majority of her public sector experience was in field-level accounting with a heavy focus in legacy system enhancements and some ERP implementation initiatives.

When asked to explain her experiences as they relate to ERP implementation, participant four highlighted a high-level observation on the overall strategy of her organization's information system architecture. She suggested the current approach to implementing multiple ERP systems throughout her organization, mainly at the sub agency level, may ultimately fail to provide the level of data visibility and integration as expected from the standard single instance ERP system. She felt these processes and data should be integrated at the parent agency level rather than the sub agency level to realize the full potential value of ERP investment. Additionally participant four noted the associated 'fall-out' of prematurely going live with an ERP system simply to 'check-the-box' stating it has been officially deployed. While she did not attribute this as a failure, she specified politically driven decisions such as this eventually result in bigger clean-up challenges as the system is now operating in a production environment.

When participant four was asked how she led her team to approach knowledge extraction tasks in order to obtain essential information for ERP implementation, she provided a slightly different perception than the other participants. Participant four emphasized the importance of first building a relationship and establishing common ground with the knowledge holder. Upon building a reasonable level of rapport, she indicated the next step is to obtain full ERP buy-in via diplomatically communicating the ERP system's value and how it will improve the overall process. Lastly the knowledge holder must have complete clarity of the 'to-be' perspective to ensure the ultimate goal is understood. Once this is achieved, the next phase of one-on-one interviews to extract the required knowledge begins.

Participant four indicated she had heavily used her own accumulated social capital to obtain information or other resources relevant to her current project. She also suggested her team members regularly utilize their own social capital in obtaining required knowledge for the

implementation. Participant four additionally stated the importance of having diverse social capital within the team, in other words, ensure the team possesses a breadth of social capital in all processes relevant to the ERP implementation. She undoubtedly relies on her own social capital and the social capital of her team to complete her mission.

Participant four did not have any direct experience in utilizing a knowledge management system to aid in her team's ERP implementation. She speculated the use of a knowledge management system may be beneficial to her team however; participant four allocated more value to her team's social capital than the value she speculated a knowledge management system could provide.

Although participant four was unable to share any noteworthy successes or failures with respect to ERP implementation, she felt that consciously utilizing social capital in future ERP implementation projects would add value to any project. She further indicated when staffing a project team, it is essential to maintain a balance of social capital and functional experience relative to the implementation. Participant four again emphasized the importance of diversity with respect to these elements.

Participant 5

Participant five was a female project manager currently leading an ERP implementation initiative in the public sector. Her experience consisted of thirty-seven years with the federal government of which the last ten years had been in an IT management function. The majority of her public sector experience consisted of accounting operations. For the entire duration of participant five's career, she has worked in the same geographic location within the same organization. Participant five had no formal IT education.

Participant five had extensive experience in IT management and enterprise system implementation. She was currently serving as project manager for an ERP initiative; she had previously participated in numerous legacy system enhancements and enterprise system implementations. Participant five was able to recollect multiple IT successes throughout her career. One of the most noteworthy successes involved a recent implementation in which her team was staffed with a diverse array of resources having extraordinary knowledge of the business process and legacy system to be retired; in addition these resources also possessed a reasonable degree of technical knowledge which helped bridge the functional/technical gap. Although participant five did not cite any failures, she discussed an observation in which her team struggled to obtain the knowledge necessary for the implementation. She attributed this struggle to the lacking relationship with the functional team containing the required knowledge.

When asked about tacit knowledge extraction, participant five suggested the best method she had incorporated was to recruit staff to her team whom already possessed a significant depth of knowledge in the applicable business process. She had utilized this strategy in multiple projects and consistently yielded success. She indicated that team members who have extensive knowledge in a business process also tend to have a large network of other resources at their disposal; thus better enabling them to easily obtain knowledge required for a given project. Participant five commented that this strategy is also difficult to maintain as retaining these valuable resources often ends up being the biggest challenge of the project.

Upon reading Nahapiet and Ghoshal's definition of social capital to participant five, she immediately drew a correlation with her overall strategy and admittedly indicated she had never considered the term 'social capital' however, she suggested it made perfect sense. Participant five further reflected on several occasions in which she was able to leverage her own social

capital to achieve success. She provided a brief anecdote in which she was able to quickly obtain the solution to a problem by calling on the executive director of another agency, who she had previously supervised earlier in his career. Participant five indicated that this action would not have been possible absent their previous working relationship. Participant five also confirmed she has encouraged and observed the use of social capital throughout her team to obtain knowledge; she stated this tactic was heavily relied upon.

When participant five was asked to evaluate the value of social capital versus a knowledge management system, she allocated more value to her team's social capital. She suggested the concept behind a knowledge management system was excellent however, there are known constraints such as the quality and completeness of the data within. Participant five further stated she would undoubtedly opt to have well established social capital on her team if hypothetically faced with the choice to have a knowledge management system at her disposal. Participant five had no first-hand experience in using a knowledge management system; however noted that she was able to derive repeated success in knowledge extraction using other methods.

Participant five acknowledge she had never consciously considered the definition of social capital, yet she subconsciously acted upon social capital in many of her past decisions. As previously suggested, participant five confirmed she considered the value of potential candidate's social capital when making staffing decisions. She advocated social capital is often synonymous with most subject matter experts in which she recruits and accordingly social capital was a significant factor in previous successes. Participant five further indicated she could foresee future value in consciously utilizing social capital in future ERP implementation projects. To conclude, participant five said, "While I've never really thought of it from this perspective, our successes are where we have social capital."

Table 2

Summarized participant responses.

<u>Question</u>	<u>Participant 1</u>	<u>Participant 2</u>	<u>Participant 3</u>	<u>Participant 4</u>	<u>Participant 5</u>
	Functional team member	Functional team member	Functional team member	Project Manager	Project Manager
1	27 years government, 20 years IT, no formal IT education.	19 years government, 3 years IT, no formal IT education.	28 years government, 3 years IT, no formal IT education.	22 years government, 2 years IT, no formal IT education.	37 years government, 10 years IT, no formal IT education.
2	ERP Interface development and management. Assisted in development of knowledge management system.	Served primarily as a functional SME with extensive information systems knowledge.	Served primarily as an SME in the accounting field; gained IT experience through legacy system enhancements.	Served primarily as an SME in the accounting field; gained IT experience through legacy system enhancements. Recently appointed PM.	Served primarily as an SME in the accounting field; gained IT experience through legacy system enhancements. Has managed several IT projects.
3	Interview SME's and/or individuals currently executing the function or process.	Interview SME's, Raw data analysis in conjunction with existing expertise of the function.	Interview SME's, raw data analysis, legacy source code analysis, permanently recruit SME's to project team.	Interview SME's, build rapport, establish common ground with historical operational experiences, obtain buy-in.	Interview SME's, raw data analysis, legacy source code analysis, permanently recruit SME's to project team.

<u>Question</u>	<u>Participant 1</u> Functional team member	<u>Participant 2</u> Functional team member	<u>Participant 3</u> Functional team member	<u>Participant 4</u> Project Manager	<u>Participant 5</u> Project Manager
4	Has utilized social capital to obtain required information, has observed others, and moderately relies on social capital.	Has utilized social capital to obtain required information, has observed others, and extensively relies on social capital.	Has utilized social capital to obtain required information, has observed others, and extensively relies on social capital.	Has utilized social capital to obtain required information, has observed others, and extensively relies on social capital.	Has utilized social capital to obtain required information, has observed others, and extensively relies on social capital.
5	Social capital more valuable than knowledge management system.	Social capital more valuable than knowledge management system.	Social capital more valuable than knowledge management system.	Social capital more valuable than knowledge management system.	Social capital more valuable than knowledge management system.
6	Sees value in consciously utilizing social capital in future ERP implementations.	Sees value in consciously utilizing social capital in future ERP implementations.	Sees value in consciously utilizing social capital in future ERP implementations.	Sees value in consciously utilizing social capital in future ERP implementations.	Sees value in consciously utilizing social capital in future ERP implementations.
7	N/A	N/A	N/A	Equally weighs social capital with specific functional experience on applicable information systems.	Does consider the value of social capital when staffing project teams.

Qualitative data analysis

Upon completing all participant interviews I recognized several thesis supporting elements, though some findings were not supportive. In addition, there were several new and relevant findings throughout the interview process. This section employs an unbiased approach in comparing, contrasting, and analyzing the raw data obtained through each participant interview.

Each of the participants had more than twenty years of experience within the public sector however; with the exception of participant one and five, all had less formal IT experience than was initially expected based upon their current function. In fact none of the participants had any formal IT education; their careers each evolved into the IT field based upon their accumulated knowledge and expertise of a certain business process and/or legacy system. Participant one's response suggested she had the most IT related experience throughout her career primarily in legacy system enhancements and ERP interfaces. Of the two project managers interviewed, participant five had fifteen years more IT project management experience than participant four. All participants affirmed they were currently engaged in the same large-scale public sector ERP implementation project.

In general, the participant responses referencing past successes and failures were as expected. Some of the participants were able to cite compartmentalized successes with respect to ERP implementations; none of the participants indicated they had participated in a completely successful ERP implementation - mainly as none of their ERP implementations have reached full maturity. The compartmentalized successes were mostly attributed to reaching major milestones throughout their project. Participants having less experience in ERP implementation were able to note some successes related to previous enterprise IT initiatives. Participant three cited a

noteworthy failure which involved a failed attempt to absorb a specific business process during the ERP implementation; this failure appeared to align with the findings of Krasner's implementation complications resulting from insufficient project planning and resource management (Krasner, 2000). Participant four cited a noteworthy observation regarding the 'to-be' IT architecture once complete; she suggested the end result may not provide the level of data visibility and integration expected from an ERP implementation as much of the IT architecture will remain decentralized. This observation aligns with the argument that to achieve the maximum benefit of an ERP system, the organization must fully adopt the prescribed methods and centralized processes.

When discussing tacit knowledge and knowledge extraction tasks with each of the participants, they fully understood Polanyi's definition of tacit knowledge (we know far more than we can tell), and indicated they had previously been involved in tacit knowledge extraction tasks during ERP implementation. However, none of the participants were familiar with the term 'tacit knowledge' when it was initially discussed in the interview. Similar to conclusions of Marilena & Elena-Mihaela, all participants suggested their organization struggled with effective knowledge management methods (Marilena & Elena-Mihaela, 2008). Additionally, participant three cited an instance where a subject matter expert intentionally withheld essential knowledge; similar to Stenmark's conclusions regarding knowledge hoarding (Stenmark, 2000). The strategies for extracting tacit knowledge somewhat varied between each participant. Each participant indicated they had utilized one-on-one interviews as a primary method of procuring tacit knowledge however, participants two and three indicated they also performed raw data analysis to reconstruct the knowledge necessary for their project. Participant five suggested legacy system source code analysis as a method of creating knowledge among the

implementation team. Both of these tactics appears to be legitimate assuming the team already has a baseline understanding of the process in order to ‘back into’ solutions with raw data and/or source code.

Participants four and five (the two project managers) plus participant three indicated the best strategy for obtaining tacit knowledge was to strategically recruit individuals already possessing a significant portion of the tacit knowledge needed for the project. This practice appears to align with the concept of ‘staff poaching’ suggested in previous research (Gable et al, 1997). These participants further suggested promotions and/or monetary bonuses were often used to entice those individuals possessing process specific knowledge to permanently join the implementation team. Participants also noted this practice resulted in significant resource retention challenges as many other teams and/or organizations were constantly soliciting knowledgeable resources. While this practice may greatly benefit the implementation team, the overall impact of realigning these resources may not be as favorable to the organization as a whole. Similarly, these resources could later be solicited and ‘poached’ from the implementation team, thus destabilizing the ERP project.

Upon reading Nahapiet and Ghoshal’s definition of social capital, all participants were familiar with the concept however, similar to tacit knowledge, they were unaware of the term ‘social capital’ prior to the interview. After understanding the definition of social capital, all participants unanimously agreed they had utilized and heavily relied on social capital in conjunction with their previously noted knowledge extracting methods in order to obtain essential tacit knowledge. It should be noted that participant one and two disclaimed the use of social capital to a certain degree, citing some information obtained via this method may be inaccurate or biased, given the actual experiences, process involvement, or credibility of the

information provider. Further, all participants suggested they had observed other team members utilize their own social capital to obtain tacit knowledge. While this subconscious usage of social capital appears to often result in successfully obtaining essential knowledge, there may be additional unrealized value by proactively and consciously utilizing social capital during ERP implementation.

When discussing the value of a knowledge management system, all participants indicated they were familiar with the capabilities and functionality of a knowledge management system however, not all participants had firsthand experience in using one. Participant one had the most experience with knowledge management system as she helped develop one and further had experience in data extraction as an end-user. All participants unanimously agreed social capital would ultimately yield more value than a knowledge management system. This assessment must be cautiously observed as all but one participant had no direct experience with this type of system. Most of the participants speculated concern with the quality of data being populated in the knowledge management system; they further indicated concerns associated with re-validating data to ensure completeness and correctness. Although the availability and usage of a knowledge management system may add value to an ERP implementation, the participants in this study mutually felt their social capital would ultimately provide more value.

Participants four and five (the two project managers) were each asked if they considered the value of a potential candidates' accumulated social capital when making staffing decisions for their team. Both of the project managers indicated they unconsciously consider social capital when reviewing a pool of potential candidates. However participant four, the project manager with considerably less project management experience suggested she would equally weigh social capital with relevant experience on the system and business process. Participant five indicated

she would allocate much more value to a candidate having more social capital. It should also be noted that participant five has more project management experience than participant four and personally possesses a considerable amount of social capital as a result of her career-long endeavors within the same organization. In contrast, participant four has not spent her entire career in the same organization. The differences in participant four and five's value allocation to social capital may be the result of some bias given they each personally possess different levels of social capital.

All interview participants mutually agreed that consciously utilizing social capital in future ERP implementations would add value. While participant one was unable to cite a specific success, participants two through five each cited different successes and further indicated social capital was a contributing factor. These participants also provided a brief anecdote of a time where a specific individual was able to add significant value towards achieving success in knowledge extraction as a result of that individual's social capital. This specific evidence suggests social capital may be an essential element in achieving success in ERP implementation.

Chapter 5 – Conclusion

Each of the participants in this study illuminated the value of social capital in sharing their personal experiences encountered in ERP implementation. Correlations could undoubtedly be drawn from the ERP successes and positive experiences with social capital cited by the participants. In addition, there were a few unforeseen discoveries which also solidify the importance and value of strong social capital in ERP implementation.

While all of the participants in this study were currently participating in an ERP implementation project, it appears most of the participants did not obtain their current position based upon IT education but as a result of their own social capital and expertise on a particular business process. This is an interesting finding which highlights the notion that this generation of the workforce may not generally possess enough formal IT education to effectively engage in strategic IT management; most of their IT knowledge may result from on-the-job experience and accumulated expertise in a particular business process. This discovery suggests there is a deficit for human resources having formal IT education.

Another conclusion that can be drawn from this study is that social capital generally seems to be synonymous with subject matter experts. In other words, subject matter experts possessing significant knowledge in a specific business process will usually also possess significant amount of social capital relevant to that business process. The caveat is that an individual possessing a high degree of social capital may not always possess relevant business process knowledge. Participant two's information 'leads' obtained from a fellow intern he worked with many years ago suggests that as an individual's social capital grows, value is exponentially added. This conclusion can be further solidified by participant four's method in balancing social capital with process knowledge when making staffing decisions.

The most significant finding in this study is that all participants indicated they utilize social capital regularly, but were unaware of the term 'social capital'. Each participant had a revelation of social capital during the interview. Upon this realization, most of the participants were able to identify an individual they had worked with which had a considerable amount of social capital, and had also provided valuable information in past or present knowledge extraction tasks. This finding reemphasizes Newell et al's conclusions which imply social capital is a vital ingredient to derive ERP success (Newell et al., 2006); further this strongly indicates social capital may be overlooked in the public sector and not be consciously and proactively utilized in all relevant circumstances. This discovery may provide another niche for public sector organizations to further derive successes during ERP implementation.

Summary

This study has revealed a great deal of supporting information through primary research. The participants interviewed were able to positively correlate past successful knowledge extraction experiences with social capital during ERP implementation. Boynton and Zmud (1984) defined critical success factors as the things which must go well to ensure success. Based upon this definition, the findings in this study confirm social capital is a critical success factor of the knowledge extraction process and should be utilized in conjunction with other knowledge extraction methods during ERP implementation in the public sector.

Lessons learned

The primary data collection method for this study consisted of one-on-one interviews with functional team members and project managers. Interview guides were developed to help structure the interview; these guides consisted of specific questions and the definitions of some terminology I felt may need better explanation to ensure the participant fully understood the

questions. To better ensure the participant had full clarity of the interview questions and terminology, I adjusted the formal interview format to a two-way dialogue which enabled me to confirm the participants' understanding. I found during the interview, rather than reading all the questions verbatim from the guide, I obtained higher quality responses from the participants by keeping a more casual, conversational tone. Although the same questions were presented to all participants equally, I was able to integrate the questions into the conversation along with some feedback. I believe this approach enabled the participant to become more relaxed, ignore the audio recorder, and share more information about their relevant experiences.

In addition I feel this experience enabled me to hone my organizational, communication, and collaboration skills in independently completing a project of this scope. When initially beginning the project I was somewhat intimidated by the size and scope. However, upon mapping out deliverables and milestones I was able to tackle each portion of the project with more confidence. Personally managing every detail of this study from beginning to end was somewhat different and more involved than previous similar but smaller projects which I was part of a team.

Additional research

While the ERP implementation process is generally transparent to public and private sector organizations, the results of this research may only be applicable to public sector organizations. Consequently, the results of this study may not be applicable to smaller-scale and less mature private sector organizations which have not faced comparable knowledge management challenges. Further, the conclusions pertaining to the value of social capital may only be applicable to the knowledge extraction process of public sector ERP implementation. Additional research in a smaller-scale and less mature private sector organization having fewer

knowledge management challenges may provide additional insight to the value of social capital as it applies to knowledge extraction during ERP implementation.

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Doi:10.1016/j.knosys.2008.04.001

Zack, M. H. (1999). Developing a knowledge strategy. *California Management Review*, 41(3), 125-145.

Appendix A: Project manager interview template

Project Manager interview template

1. How many years of professional information technology experience do you have? What is your area of expertise? Do you have formal education in Information technology?
2. Briefly explain your past information technology experience as it relates to ERP implementation. Identify specific successes or failures you consider to be noteworthy.
3. *Tacit knowledge within an organization can be described as knowledge that is subconsciously understood and applied, difficult to articulate, developed from direct experience or action, and usually shared through highly interactive conversation and shared experiences (Sedera et al., 2003).*

How do you currently approach tacit legacy information system knowledge extraction tasks during ERP implementation? Identify any specific strategies, methods or systems utilized for archiving or procuring intangible assets.

4. *Social capital can be described as the sum of actual and potential resources within, available through, and derived from the network of relationships possessed by an individual or social unit (Nahapiet & Ghoshal, 1998).*

In past or present ERP implementation tacit knowledge extraction tasks, have you acquired and utilized valuable and relevant information using social capital? Have you observed team members engage in such activity?

5. Do you feel a knowledge management system would provide more or less value than social capital during ERP implementation? If they were mutually exclusive, which would you desire?

6. Do you foresee value in applying the concept of social capital in future ERP implementation projects? Do you feel social capital impacted the successes and failures noted in your previous ERP implementation experience.

7. When staffing project team members, do you consider the value of a potential candidates' accumulated social capital as a potential asset to your team?

Appendix B: Functional team member interview template

Functional team member interview template

1. How many years of professional information technology experience do you have? What is your area of expertise? Do you have formal education in Information technology?
2. Briefly explain your past information technology experience as it relates to ERP implementation. Identify specific successes or failures you consider to be noteworthy.
3. *Tacit knowledge within an organization can be described as knowledge that is subconsciously understood and applied, difficult to articulate, developed from direct experience or action, and usually shared through highly interactive conversation and shared experiences (Sedera et al., 2003).*

How do you currently approach tacit legacy information system knowledge extraction tasks during ERP implementation? Identify any specific strategies, methods or systems utilized for archiving or procuring intangible assets.

4. *Social capital can be described as the sum of actual and potential resources within, available through, and derived from the network of relationships possessed by an individual or social unit (Nahapiet & Ghoshal, 1998).*

In past or present ERP implementation tacit knowledge extraction tasks, have you acquired and utilized valuable and relevant information using social capital? Have you observed team members engage in such activity?

5. Do you feel a knowledge management system would provide more or less value than social capital during ERP implementation? If they were mutually exclusive, which would you desire?

6. Do you foresee value in applying the concept of social capital in future ERP implementation projects? Do you feel social capital impacted the successes and failures noted in your previous ERP implementation experience.

Appendix C: Informed Consent form

INFORMED CONSENT FORM FOR INTERVIEW PARTICIPANTS

RESEARCH PROJECT

Title of Research Project: **ERP IMPLEMENTATION: AN INVESTIGATION INTO SOCIAL CAPITAL AND KNOWLEDGE EXTRACTION IN THE PUBLIC SECTOR.**

You are invited to participate in a study that will measure the use of social capital as it relates to ERP Implementation success. The results of the study will be used to determine if the use of social capital during knowledge extraction tasks is positively correlated with project success. In addition, this study is being conducted to fulfill the requirements of a Thesis Project. The study is being conducted by Corey Jensen can be reached at 303.218.8510 or e-mail jensen.corey@gmail.com. This project is supervised by the student's Thesis Advisor, Phil Hoffer, Regis University, 3333 Regis Boulevard, Denver, Colorado 80221-1099, phoffer@regis.edu, (303) 884-9448.

Participation in this study should take about 30 minutes of your time. Participation will involve responding to 7 open-ended interview questions about relevant ERP implementation experiences and knowledge extraction. Participation in this project is strictly voluntary. If, however, you experience discomfort you may discontinue the interview at any time. We respect your right to choose not to answer any questions that may make you feel uncomfortable. Refusal to participate or withdrawal from participation will involve no penalty or loss of benefits to which you are otherwise entitled.

Risks involved for project participants are minimal. They include the confidentiality of their answers. Only the researcher, the researcher's faculty supervisor and the Regis IRB will have access to the names of the participants. The names of the participants in this project will not be divulged by the researcher other than as required by legal directive. Any publication of the results of the study will not mention individual participants' by name. Only aggregate data will be used.

Your responses will be identified by code number only and will be kept separate from information that could identify you. Records will be stored in a locked file cabinet. Only the investigator and others authorized by regulation will have access to the material. The data will be saved for three years and then shredded. This is done to protect the confidentiality of your responses. Only the researcher will have access to your individual data and any reports generated as a result of this study will use only group averages and paraphrased wording. The information collected may not benefit you directly, but the information learned in this study should provide more general benefits.

If you have any questions about your rights as a research subject or if you feel you've been placed at risk, you may contact the Regis University Institutional Review Board (IRB) by mail at Regis University, Office of Academic Grants, 447 Main, Mail Code H-4, 3333 Regis Blvd., by

phone at (303) 346-4206, or by e-mail at emay@regis.edu I have read and understood the foregoing descriptions of the study entitled: ERP IMPLEMENTATION: AN INVESTIGATION INTO SOCIAL CAPITAL AND KNOWLEDGE EXTRACTION IN THE PUBLIC SECTOR. I have asked for and received a satisfactory explanation of any language that I did not fully understand. I agree to participate in this study, and I understand that I may withdraw my consent at any time. I have received a copy of this consent form.

Note: If this document is being sent electronically, your typed signature will be considered your signature.

Printed Name of Subject _____

Signature _____ Phone Number _____

Date _____

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

Printed Name of Researcher _____

Signature of Researcher _____

Appendix D: IRB approval



Academic Affairs
Academic Grants

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IRB – REGIS UNIVERSITY

June 13, 2011

Corey Jensen
10370 Lakeland Drive
Fishers, IN 46037

RE: IRB #: 154-11

Dear Corey:

Your application to the Regis IRB for your project "ERP Implementation: An Investigation into Social Capital and Knowledge Extraction in the Public Sector" was approved as exempt on June 13, 2011.

The designation of "exempt," means no further IRB review of this project, as it is currently designed, is needed.

If changes are made in the research plan that significantly alter the involvement of human subjects from that which was approved in the named application, the new research plan must be resubmitted to the Regis IRB for approval.

Sincerely,

A handwritten signature in cursive script that reads "J. Stephen Jacobs".

J. Stephen Jacobs
Assistant Vice President for Academic Affairs

cc: Phil Hoffer

Annotated Bibliography

Anquetil, N., de Oliveira, K. M., de Sousa, K. D., & Batista Dias, M. G. (2007). Software maintenance seen as a knowledge management issue. *Information & Software Technology*, 49(5), 515-529. doi:10.1016/j.infsof.2006.07.007

This paper explores ideas behind extracting knowledge from legacy information systems and processes in effort to supplement software maintenance. The authors cite that most of the essential knowledge is stored inside an employee's head rather than formally documented for later retrieval purposes. The paper reiterates the concept: 'people usually do not know what they know.' The study presents a knowledge extraction technique designed to capture knowledge from software maintainers.

Bourdieu, P. (1986). The forms of Capital. *Handbook of theory and research for the sociology of education*. 241-258. New York: Greenwood.

This paper provides good insight to many forms of capital from a sociological perspective. Many attributes of social capital are identified and explored in depth.

Brown, W. (2004). Enterprise resource planning (ERP) implementation planning and structure: a recipe for ERP success. In *Proceedings of the 32nd annual ACM SIGUCCS conference on User services* (pp. 82-86). Baltimore, MD, USA: ACM.
doi:10.1145/1027802.1027824

This study compares the methodology used in a prior unsuccessful ERP implementation versus the methodology found in current literature. The purpose of the study is to further define the elements which will ensure a successful ERP implementation. The paper is well structured and outlines several critical success factors and lessons learned from the analysis.

Gable, G., Heever, R. V. D., Erlank, St., Scott, J. (1997). Large package software: the need for research. *Proceedings of the 3rd Pacific Asian Conference on Information Systems*, Brisbane, Australia

This work identifies the concept of 'staff poaching' and internal 'knowledge drain' as it relates to knowledge shortage in ERP experience and expertise.

García-Sánchez, N., & Pérez-Bernal, L. E. (2007). Determination of critical success factors in implementing an ERP system: A field study in Mexican enterprises. *Information Technology for Development, 13*(3), 293-309. doi: 10.1002/itdj.20075.

This paper presents a consolidated list of 14 critical success factors defined from previous research. The aim of the study was to validate this list of CSFs to further determine their relevancy and priority. The study was conducted using the input of medium to large scale enterprises in Mexico. A survey was administered to managers, consultants, and IT professionals all having been heavily involved in the ERP implementation process. The results of the study ultimately imply that the list of 14 CSFs is indeed relevant to deriving ERP success; the study also concluded that participants added no additional CSFs to the predefined list of 14. The results of the study intend to provide a clear set of convenient guidelines to successfully implement an ERP system.

Grabski, S. V., Leech, S. A., & Schmidt, P. J. (2011). A Review of ERP Research: A Future Agenda for Accounting Information Systems. *Journal of Information Systems, 25*(1), 37. doi:10.2308/jis.2011.25.1.37

This paper provides a good high-level review of ERP implementation related literature, focusing mainly on accounting information systems. The study highlights a breadth of key implications for an organization undergoing ERP implementation. The author's analysis of critical success factors encompasses a wide array of existing literature.

Kansal, V. (2006). Enterprise Resource Planning Implementation: A Case Study. *Journal of American Academy of Business, Cambridge, 9*(1), 165-170. doi: Article.

This paper presents a case study of an organization which demonstrated great success in ERP implementation. Although the implementing organization suffered many of the common problems seen in ERP implementation, the research highlights how many critical success factors were adhered to in order to derive project success.

Krasner, H. (2000). Ensuring E-Business Success by Learning from ERP Failures. *IT Professional*, 2(1), 22-27.

This paper explores the different problems which have attributed to past large-scale ERP implementation projects. The author highlights problems associated with management, users, and technical issues while further attempting to draw conclusions responsible for driving successful implementations.

Loh, T. C., & Koh, S. C. L. (2004). Critical elements for a successful enterprise resource planning implementation in small-and medium-sized enterprises. *International Journal of Production Research*, 42(17), 3433-3455. doi: 10.1080/00207540410001671679.

This article reviews and summarizes the work of other researchers which have previously studied and defined critical success factors (CSFs) for ERP implementation. The authors present a framework in which critical elements categorized and collated with each phase of the ERP implementation process. This framework groups the critical elements into three categories: CSFs, critical people, and critical uncertainties. The authors expect this framework to help small to medium size enterprises lookout for critical before and during implementation.

Marilena, C., & Elena-Mihaela, I. (2008). KNOWLEDGE MANAGEMENT IN THE PUBLIC SECTOR. *Annals of the University of Oradea, Economic Science Series*, 17(4), 164-168.

This paper identifies some of the specific challenges faced by public sector organizations in knowledge management. Authors explore the importance of progressing towards a method or IT tool to ensure knowledge is identified when created and captured for future use in order to benefit the organization.

Nahapiet, J., & Ghoshal, S. (1998). SOCIAL CAPITAL, INTELLECTUAL CAPITAL, AND THE ORGANIZATIONAL ADVANTAGE. *Academy of Management Review*, 23(2), 242-266.

This paper defines social capital as “the sum of actual and potential resources within, available through, and derived from the network of relationships possessed by an individual or social unit.” The authors provide a valuable literature review of social capital and how the concept has evolved to include different attributes.

Newell, S., Huang, J., & Tansley, C. (2006). ERP implementation: a knowledge integration challenge for the project team. *Knowledge & Process Management*, 13(4), 227-238. doi:10.1002/kpm.262

This paper identifies via two case studies that knowledge integration is a key success factor that needs to be considered during an ERP implementation. Knowledge integration is heavily dependent upon social capital; i.e. social networking activity. The author concludes that in order for large scale enterprise implementation to be successful, PMs must combine and deploy knowledge generatively.

Nonaka, I., (1994) "A dynamic theory of organizational knowledge creation" *Organization Science*, vol 5. pp 14-37

This paper explores the knowledge creation process within an organization. The research seeks to define the essential elements of organizational knowledge creation. The author indicates the importance of continual dialogue between explicit and tacit knowledge which further drives the creation of new knowledge. Organizations play a vital role in promoting knowledge creation.

Pan, S. L., Newell, S., Huang, J., & Galliers, R. D. (2007). Overcoming knowledge management challenges during ERP implementation: The need to integrate and share different types of knowledge. *Journal of the American Society for Information Science and Technology*, 58(3), 404-419. doi:10.1002/asi.20523

This article presents the theory that social capital and social networking can positively impact an ERP implementation. The author cites a case study to examine how different types of knowledge become important to share and integrate over different phases of the project lifecycle, requiring different social networking practices.

Paradauskas, B., & Laurikaitis, A. (2006). Business knowledge extraction from legacy information systems. *Information Technology And Control*, 35(3), 214-221.

This article identifies the challenges associated with extracting legacy information system data in order to retire a legacy application, and implement a new application. The authors propose an eight step systematic data reverse engineering process in order to extract key data and information from an organization's legacy information systems and business processes. This process incorporates an algorithm designed to identify key and critical elements from electronic objects such as system tables, corporate memos, and other electronically stored correspondence. These key elements are then utilized to develop requirements for the new application and aid in BPR efforts.

Polanyi, M. (1968). Logic and psychology. *American Psychologist*, 23(1), 27-43.

doi:10.1037/h0037692

This paper is early work of Michael Polanyi and his effort to build upon the foundation and definition of tacit knowledge. He suggested the idea 'we know far more than we can tell' as tacit knowledge. The paper summarizes his work leading up to the current point in time which he identifies the composition of tacit knowledge.

Robey, D. (2002). Learning to Implement Enterprise Systems: An Exploratory Study of the Dialectics of Change. *Journal of Management Information Systems*, 19(1), 17-46.

This paper identifies knowledge barriers organizations are likely to encounter when implementing an enterprise system. A study is conducted to collect data from multiple firms implementing enterprise systems. The author identify methods in which to avoid knowledge barriers however states that firms within their study had ongoing concerns with overcoming knowledge barriers. The author suggests further research should investigate additional methods for overcoming knowledge barriers.

Scheer, A., & Habermann, F. (2000). Enterprise resource planning: making ERP a success.

Communication. ACM, 43(4), 57-61. doi:10.1145/332051.332073

This article reviews the relationship of business process redesign (BPR) and successful ERP implementation. The author outlines the high costs and failure rate of highly customized information systems versus a standardized system. It is further stated that BPR should be integrated with ERP solutions in order to standardize business processes. Modeling techniques are suggested for BPR and ERP integration. The author provides valuable concepts which may be applicable to many organizations however; highly specialized business processes may not easily adapt to this methodology.

Sedera, D., Gable, G., & Chan, T. (2003). Knowledge management for ERP success. In Proceedings of the Seventh Pacific Asian Conference on Information Systems (pp. 10–13).

This paper presents a study conducted in the public sector in effort to investigate the impact of knowledge towards the success of an ERP system. The study identified a strong correlation of ERP success with four dimensions of knowledge: 1.Internal software specific knowledge, 2.External software specific knowledge, 3.Internal organizational knowledge, and 4.External organizational knowledge.

Simon, J., Shepherd, J., D'Aquila, M., Carter, K. (2007). The ERP Market Sizing Report, 2006-2011. AMR Research. Retrieved from: http://www.sap.com/belux/solutions/business-suite/erp/pdf/AMR_ERP_Market_Sizing_2006-2011.pdf

This report summarizes quantitative findings derived from the ERP market. The statistics found in this study indicate the past growth, market revenue, and further speculate future growth in ERP demand.

Slevin, D.P., & Pinto, J.K. Balancing Strategy and Tactics in Project Implementation. Sloan Management Review, Fall 1987, 33-41.

This paper is the first to introduce a list of 'critical success factors' that are essential to deriving success in project management. Many of the critical success factors identified in this research continue to be acknowledged today in literature surrounding IT project management.

Soh, C., Kien, S. S., & Tay-Yap, J. (2000, April). Enterprise resource planning: cultural fits and misfits: is ERP a universal solution? *Communications of the ACM*, 43, 47–51.

This paper describes ‘types of misfits’ in respect to ERP implementation. The authors describe data misfits as incompatibilities between organizational requirements and ERP package in terms of data format or data relationships. Functional misfits occur when there are incompatibilities between organizational requirements and ERP packages in terms of processing procedures required. The authors further conclude the severity of knowledge gap between key users, IS dept. personnel, and the ERP vendor. Each party contains very different and specific knowledge (organizational requirements, existing IT infrastructure, & package functionality), which is ultimately difficult to transfer to one another.

Stenmark, D. (2000). Leveraging tacit organizational knowledge. *Journal of management information systems*, 17(3), 9–24.

This paper identifies the value of tacit knowledge and the need for an organization to utilize it as an asset. Arguments have been made that tacit knowledge should be made explicit in order to derive value; this study indicates three major hurdles in that process: 1. Unawareness of tacit knowledge, 2. those having tacit knowledge do not need to make it explicit in order to use it, 3. Those having tacit knowledge may not want to give up a valuable competitive advantage. The author proposes a method of utilizing information technology to exploit tacit knowledge without making it explicit, thus adding organizational value and suppressing concerns of those possessing tacit knowledge.

Tilley, S. R., & Smith, D. (1995). Perspectives on legacy system reengineering. Retrieved from <http://www.cis.uab.edu/softcom/GenParse/reengineering.pdf>

This paper illustrates the many challenges seen in software engineering. The age of this work highlights the attention given to organizational knowledge of information systems nearly two decades ago as the IT industry moved towards evolving dated systems and processes.

Vandaie, R. (2008). The role of organizational knowledge management in successful ERP implementation projects. *Knowledge-Based Systems*, 21(8), 920-926.

doi:10.1016/j.knosys.2008.04.001

This paper identifies two critical areas of concern regarding knowledge management with respect to ERP implementation: Managing tacit knowledge & processed based knowledge from organizational memory. The author concludes that adequately managing these areas will likely yield more competitive advantage for the organization.

Zack, M. H. (1999). Developing a knowledge strategy. *California Management Review*, 41(3), 125-145.

This paper contrasts the differences in internal knowledge versus external knowledge. The author highlights the importance and value of internal, tacitly held knowledge as it relates to strategic advantages for the organization.