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Project Risk Management Strategies for IT Project Managers

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This is to certify that the doctoral study by

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Abstract

Project Risk Management Strategies for IT Project Managers

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MS, George Washington University, 2009

BS, Eastern Connecticut University, 1991

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Utilizing information technology (IT) to enable new organizational capabilities to achieve near-term objectives and long-term sustainability is a top priority for many business leaders seeking to maintain or increase market share. However, organizational leaders face significant challenges to their strategy execution because the percentage of challenged IT projects has remained relatively static for decades. The purpose of this qualitative case study was to explore risk management strategies used by 7 purposely selected IT project managers (PMs) from a pharmaceutical company located in the northeastern United States who have effectively managed IT project performance by using risk management strategies, leading to the successful delivery of an IT project. The conceptual framework that guided the research was actor-network theory. The data collection included semistructured interviews and the collection of internal organizational risk registers and other project risk management documentation. An inductive content analysis followed the procedures outlined in Malterud's systematic text condensation strategy, yielding the following major strategies to increase IT project performance: performing knowledge management, promoting a positive risk culture, utilizing an existing risk management framework, and performing risk-related communication. The implications for positive social change include the potential to help IT PMs deliver the expected business value on time and within budget, which, in turn, may enable pharmaceutical companies to improve the quality of life of afflicted individuals and populations in need of safe, economical, and innovative therapies.

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Dedication

To my loving wife for her endurance, sacrifice, and support that has allowed me to complete a dream. I also want to dedicate this to my children who over the years have never complained about having to share my attention with my lengthy academic pursuits without their consent. I would also like dedicate this work to my mother for her love and devoted defense during my childhood of my unfettered creativity in what I am sure were many interesting parent teacher conferences. Finally, I want to dedicate this challenging journey to my late father. While I attribute my resolute work ethic to him, it was also his enduring patience and support for my numerous and eclectic interests growing up that he instilled in me the confidence to try anything. I thank you and love you all.

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Thank you to my committee members, Dr. Alexandre Lazo chair; Dr. Jaime Klein, committee member; and Dr. Richard Snyder, university research reviewer. Without your guidance, patience, and support this process would not be possible. I would also like to acknowledge the leaders at my workplace who have supported me in all my academic pursuits over the years.

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Section 1: Foundation of the Study

The *projectification* of organizations, as described by Packendorff and Lindgren (2014), is becoming more prevalent as senior executives increasingly utilize IT projects to achieve strategic objectives and maintain a competitive advantage (Giannakopoulos, Sakas, Vlachos, & Nasiopoulos, 2014; Wu, Straub, & Liang, 2015). Globally, organizations lose on average $109 million for every $1 billion invested in organizational projects because of poor project performance (Bronte-Stewart, 2015; Project Management Institute, 2014). In 2015 only 29% of 50,000 IT projects reviewed by the Standish Group successfully completed without encountering budget, schedule, or quality issues (Velayudhan & Thomas, 2016). A 2013 multi-industry survey of 875 chief executive officers (CEOs) from 67 countries indicated that the majority of CEOs' strategic plans included embracing new IT as a top priority, second only to increasing revenue (Berman & Marshall, 2014). However, organizational leaders face significant challenges to strategy execution without effective risk management strategies to increase IT project performance and success. Rodríguez, Ortega, and Concepción (2016) indicated that the particular characteristics of IT projects generate distinctive risks and consequently make IT projects susceptible to failure. These distinctive risks make effective risk management a key factor in increasing project performance and the chances of IT project success (Didraga, 2013).

Background of the Problem

After four decades of formal project management practice in the business world, the probability that the deliverables of an IT project will not meet expectations is as high

as 44% (Thakurta, 2014). Joseph, Erasmus, and Marnewick's (2014) study of the frequently referenced Chaos Report published by the Standish Group from 1994 to 2012 indicated that the percentage of challenged IT projects has remained between 42% and 53% since 1994, with a complete failure rate of between 18% to 40% for the same period. Although ineffective risk management is a key factor contributing to the poor performance and failure rates of IT projects (Altahtooh & Emsley, 2015), Bouras and Bendak (2014) found that 60% of the IT professionals surveyed believed that IT project managers (PMs) are ineffective at managing project risks.

A consistently low IT project success rate ranging between 16% and 39% from 1994 to 2012 (Joseph et al., 2014), along with the increasing importance of IT as a key strategy enabler (Berman & Marshall, 2014) highlights the need to investigate this business problem from a different perspective. Floricel Bonneau, Aubry, and Sergi (2014) indicated that historically project management research has predominantly focused on methodologically prescriptive practices and risk evaluations based on rational choice and probability theory. Floricel et al. suggested that social theories may provide insight into IT project issues. Therefore, when designing the study, I incorporated actor-network theory (ANT) to elucidate effective strategies IT project managers can use to manage IT project risks to increase IT project performance within the pharmaceutical industry.

Problem Statement

The success rates of IT projects from 1994-2012 ranged between 16% and 39%, with the remainder having performance issues or being complete failures (Joseph,

Erasmus, & Marnewick, 2014). Although risk management is one of the most important activities an IT PM can perform to increase project performance and the likelihood of success (Didraga, 2013), in 2013 only 40% of IT professionals believed that IT PMs effectively manage risks throughout the project lifecycle (Bouras & Bendak, 2014). The general business problem is that some IT PMs are not effectively managing risks to increase project performance and the likelihood of success. The specific business problem is that pharmaceutical industry IT PMs often lack risk management strategies needed to improve project performance for the successful delivery of an IT project.

Purpose Statement

The purpose of this qualitative case study was to explore risk management strategies that IT PMs within the pharmaceutical industry use to improve project performance for the successful delivery of an IT project. The participants were seven IT PMs from a pharmaceutical company located in the northeastern United States. The participants also had experience in effectively managing IT project performance by using risk management strategies resulting in the successful delivery of at least five IT projects with at least one of the projects completing in the last 3 years. This study's implications for positive social change include the potential to create new organizational capabilities through IT that improves the efficiency of the drug discovery and development processes. The broader implications of social change include potentially extending and improving the quality of life of people throughout the world, given that more efficient drug discovery and development processes of pharmaceutical companies may increase their

ability to provide innovative therapies that are efficacious, safe, and cost-effective from a health economics perspective.

Nature of the Study

There are three common research methods: quantitative, qualitative, and mixed methods (Punch, 2013). Patton (2015) described the qualitative method as a suitable method for investigating organizations or individuals to judge or improve effectiveness. Yin (2014) also indicated that a qualitative approach for inquiry is appropriate when no predetermined answer exists. In contrast, a quantitative research approach involves the objective statistical testing of variables, hypotheses, or the answers produced by previous research (Hoare & Hoe, 2013; B. Lee & Cassell, 2013). A mixed methods approach is appropriate when examining a business problem from both an objective and subjective perspective through a combination of quantitative numerical data and qualitative narrative data (Stentz, Plano Clark, & Matkin, 2012). However, the inclusion of a quantitative approach within a mixed methods approach made both methods inappropriate for my purposes because I did not perform any statistical testing to determine the causation or correlation between IT risk management strategies, project performance, and project success. Therefore, I selected a qualitative approach because I explored an unanswered business problem within the context of a pharmaceutical organization to identify IT risk management strategies to improve IT project performance.

Yin (2014) suggested that a case study design is suitable when a researcher intends to perform an in-depth study of a specific contemporary business problem within

a real-world context and a defined boundary. Flexibility is a valuable characteristic of the case study design because it provides researchers the capacity to deal with complexity and context (Yin, 2014). Previous researchers have identified the risks associated with the inherent complexity of IT projects. IT projects are particularly complex because they concern both technological complexity and the complexities associated with the organizational context (Thamhain, 2013; Whitney & Daniels, 2013). I selected a single case study design because the size of the case organization provided me ability to collect different perspectives from several IT PMs to achieve saturation, and a case study design provided the required flexibility to explore the complex business problem in the complex contemporary context of a pharmaceutical company.

I deemed four other research designs inappropriate based on the purpose of this study. Phenomenological researchers derive meaning from a collective experience or event in a common context (Henriques, 2014). Consequently, I did not choose a phenomenological research design because the risks, contexts, environments, and unique characteristics of each project were too diverse to represent a common shared lived experience or life event. Through the autobiographical storytelling of an individual, a narrative researcher explores how the individual derived meaning from an event or series of events in the broader context of the participant's life (Caine, Estefan, & Clandinin, 2013). A narrative research design was not appropriate for this study because I did not explore the broader context of a participant's life. Ethnographers explore the evolution of culture within a social group living or working together for an extended period (Jarzabkowski, Bednarek, & Le, 2014). An ethnographic research design was not

applicable because I did not perform a long-term study concerning organizational culture. Researchers undertaking grounded theory research seek to derive new theoretical insights (Corley, 2015). However, a grounded theory approach was not appropriate because I did not plan to develop new theoretical insights.

Research Question

What risk management strategies do pharmaceutical industry IT PMs use to increase project performance for the successful delivery of an IT project?

Interview Questions

- What knowledge and information do you require in the implementation of a risk management strategy?
- As an IT PM, what strategies do you use to manage IT project risks that could affect project performance regarding budget, schedule and delivery of the expected functional capability?
- What project success criteria do you consider when managing IT project risks?
- How do you use risk management strategies to manage project performance for the successful delivery of a project?
- How do you know when you have identified the major concerns of the project sponsor(s), stakeholders, team members, and other groups related to the implementation and execution of a risk management strategy?
- How do you identify the people, groups, technology, and processes that contributed to your ability to manage IT project risks?

- How do you evaluate the impact of project risks on IT project performance?
- As an IT PM, how do you assign roles and responsibilities regarding project risk management?
- What methods or strategies have you employed to evaluate if an individual or group has accepted their role in managing IT project risks?
- As an IT PM, how do you assess the effectiveness and success of a risk management strategy?
- As an IT PM, what role(s) do you play, concerning risk management, throughout the project lifecycle in relation to the project team members and stakeholders?
- In your experience, what barriers inhibit IT PMs from successfully implementing a risk management strategy?
- Based on your experience as an IT PM, is there any other information you would like to add that I did not address in the interview questions, which may be beneficial for the successful management of IT project risks?

Conceptual Framework

Actor-network theory is a social theory developed by Callon (1986), Latour (1987), and Law (1992) as a way to understand the social construction of science. The basis of ANT is the impartial treatment of human and nonhuman actors. The construct of the network in ANT is the summation of the interactions and inscriptions among the various human and nonhuman actors who translate into a social entity that has a unified focus (Latour, 1987). Three tenets of ANT address the equal treatment of both humans and nonhumans (Callon, 1986). The first tenet of *agnosticism* is the elimination of any preconceived notions regarding the network (Callon, 1986). The second tenet is known as *generalized symmetry,* in which human (e.g., IT PMs, stakeholders, and team members) and nonhuman (e.g., IT, risks, and risk management strategies) actors are both incorporated within the same framework with equal agency (Callon, 1986; Law, 1992). The third tenet is known as *free association,* in which Latour (1986) advocates abandoning any distinction between natural and social phenomena, as the distinction in the network provides no value.

Floricel et al.(2014) suggested project management researchers may benefit from insights derived from social theories like ANT that take into consideration what PMs essentially do and the social context in which a project organization operates. In defense of the value of ANT, Latour (1999) stated, “Actors know what they do, and we have to learn from them not only what they do, but how and why they do it” (p. 18). I used actor-network theory to gain insight into not only what risk management (RM) strategies IT

project managers used but how they did it, as why they did it was to increase IT project performance.

Operational Definitions

This section contains definitions of several terms used throughout the study. The definition of each term reflects an appropriate operational definition associated with the context of the study.

Challenged project: A project that exceeds the budget or schedule and does not deliver the expected functionality (Lech, 2013).

Iron triangle: A project management approach that focuses on the efficient delivery of project outcomes measured against the project constraints of time, cost, and quality in terms of delivering the expected functionality in relation to adherence to the design specifications (Chih & Zwikael, 2015; Xu & Feng, 2014).

Project management lifecycle: A life cycle that consists of the five phases including initiating, planning, executing, controlling, and closing (Parker, Verlinden, Nussey, Ford, & Pathak, 2013).

Project manager: A designated individual appointed by an organization that is accountable for leading the team that is responsible for achieving the project objectives (Reddi & Sai, 2013).

Project performance criteria: The key performance indicators of time, cost, quality, and functionality (Zavadskas, Vilutienė, Turskis, & Šaparauskas, 2014).

Project risk: An uncertain event that may have a positive or negative effect on project performance and success (Rodríguez et al., 2016).

Project risk management: The identification, assessment, and control of risks throughout the project lifecycle (Cagliano, Grimaldi, & Rafele, 2015).

Project success: A multidimensional construct consisting of efficiency regarding the iron triangle, effectiveness with respect to delivering the expected ongoing social or organization impact (Carvalho, Patah, & de Souza Bido, 2015), and the degree of satisfaction from the perspective of the stakeholders (P. Williams, Ashill, Naumann, & Jackson, 2015).

Project success criteria: The measures used to determine the success or failure of a project (Davis, 2014).

Assumptions, Limitations, and Delimitations

Assumptions

Assumptions are unverified facts and conditions that the researcher assumes to be true (Leedy & Ormrod, 2015). My first assumption in this study was that the participants' interview responses were truthful. I also assumed that the responses to the interview questions would elicit thick and rich descriptions. My first assumption was the truthfulness of the participants' interview responses. The second assumption was that the responses to the interview questions would elicit thick and rich descriptions (see Fusch & Ness, 2015), which provided an opportunity to explore common themes concerning IT project risk management. The third assumption was that the participants were truthful in reporting their previous project management and RM experience concerning the inclusion criteria.

According to Marshall, Cardon, Poddar, and Fontenot (2013), researchers need to understand that there are limitations to using sample sizes for predicting the achievement of data saturation. However, Ando Cousins and Young (2014) suggested that researchers may achieve data saturation even with small sample sizes when the population is homogeneous. Patton (2015) indicated that a small number of interviews can be sufficient to obtain data saturation when a researcher (a) uses semistructured interviews, (b) selects an appropriate number of questions, and (c) allocates an appropriate amount of time for the interviews. Therefore, my third assumption was that 60-minute semistructured interviews of seven purposely-sampled IT PMs from a small homogeneous population within the same organizational context would produce sufficient data to achieve data saturation. My final assumption regarding the inclusion criteria for participation in the study was that participants will be truthful in reporting their previous implementation of RM strategies.

Limitations

Limitations are potential weaknesses identified by the researcher (Babbie, 2014). The first limitation of this study was that the participants could withdraw at any time during the study, which according to Thorpe (2014) affects the research process. Another type of limitation to a research study can be researcher bias associated with a researcher's background (Roulston & Shelton, 2015). The second limitation of this study was the potential bias related to my professional background as a director of IT operations and a certified project management professional (PMP) potentially could influence the research design and analysis of the data. However, I bracketed my experiences to provide a degree

of objectivity for proper engagement during the interviews and the subsequent data interpretation. The third limitation of this study was that the results of the study may not apply to other industries or companies because the case was a single pharmaceutical company located in the northeastern United States. Therefore, any generalization of the results may require further investigation.

Delimitations

Delimitations are the self-imposed qualifiers that researchers utilize to set the boundaries and range of the study (Ruzow-Holland, 2014). The delimitations of this study included (a) sample size, (b) industry, (c) geography, and (d) PM experience. Additionally, the study was constrained to the area of IT project RM regarding IT project performance, and the focus was on RM strategies used by the IT PMs versus an organizational or a project management office (PMO) perspective. The sample size of the study was seven participants. The population for this study included IT PMs from a pharmaceutical company located in the northeastern United States who have effectively managed IT project performance by using RM strategies resulting in the successful delivery of at least five IT projects with at least one of the projects completing in the last 3 years.

Caley et al. (2014) examined what constitutes an expert and suggested the indicators that someone has a higher level of expertise is an individual's ability to make competent decisions and perform timely actions. Didraga (2013) indicated that effective IT project RM is a major factor in managing project performance and increasing the likelihood of project success. Therefore, the delimiter of successfully completing five IT

projects is a reflection of an IT PM's expertise in making competent and timely decisions concerning project risks. The delimiter of requiring that at least one project by the IT PM must have completed within the last 3 years reflects the contemporary nature of the case study design, and my initial intention to collect data concerning the business problem and research question within a contemporary context. The delimitations support the nature of the study, which was not to produce generalizable findings, but to perform an in-depth analysis of a small sample to identify the successful strategies IT PMs utilize for RM to increase IT project performance.

Significance of the Study

Contribution to Business Practice

Ekins, Waller, Bradley, Clark, and Williams (2013) described four disruptive strategies that may help the pharmaceutical industry overcome the barriers that inhibit the discovery of new therapies and reduce the speed of drug development. In all cases, IT is either at the core of the solution or a key enabler of the strategy (Ekins et al., 2013), which reflects similar findings regarding other industries (Berman & Marshall, 2014). However, a review of the literature concerning IT project performance and success indicated that the negative effect of inadequate RM strategies on IT project performance present a challenge to overcoming the drug discovery barriers. The gap between IT project RM research and practice identified by Taylor, Artman, and Woelfer (2012) and the historically low IT project performance rates identifies by Joseph et al. (2014) highlight the magnitude of the challenge. Therefore, the business value of this study rests

on the exploration of RM strategies that IT PMs can utilize to increase project performance.

Implications for Social Change

Fundamentally, the social change implications of the study are rooted in the discovery of RM strategies that IT PMs can utilize, which may lead to an increase in IT project performance. Increasing the IT project performance of pharmaceutical companies has broader social implications because the deliverables of IT projects provide new and innovative organizational capabilities that contribute to the enhancement of the drug discovery and development processes (Costa, 2013; Marx, 2013; Tierney, Hermina, & Walsh, 2013). By improving the efficiency of the drug discovery and development processes, pharmaceutical companies are in a better position to provide innovative therapies that are efficacious, safe, and cost-effective from a health economics perspective that may create social change by improving the quality of life for people around the world.

A Review of the Professional and Academic Literature

The literature review included academic and professional literature published over the past 20 years but primarily focused on contemporary research published between 2010 and 2016. The review of the literature indicated that the research community exemplified by the works of Floricel et al. (2014) is increasingly acknowledging the value of viewing project management issues through a social theory lens. Therefore, in the pursuit of the purpose of this study, I incorporated a social theory within the conceptual framework of the study to elucidate effective RM strategies that IT PMs can

use to increase IT project performance. Specifically, I utilized ANT in the pursuit of the purpose of this qualitative single case study, which is to explore strategies IT PMs within the pharmaceutical industry can use to manage project risks to increase IT project performance. Using keyword searches and the subsequent thematic review of the literature, I attempted to identify various perspectives and previous research concerning the purpose of the study. These perspectives included (a) the variations of IT project risk, (b) how IT PMs manage risk, (c) the notions of project performance and success, and (d) the use of ANT in similar research.

Based on the purpose of the study and the conceptual framework along with the various perspectives and themes regarding IT project risks, I examined the body of work concerning IT project RM in association with project performance and success. The literature search primarily included peer-reviewed scholarly journals concerning project and program management along with government and private sector publications related to project management practice. The identified literature was the result of keyword searches within several publication databases and search engines including SAGE Premier, Google Scholar, ProQuest Central, ScienceDirect, EBSCOhost, and IEEE Xplore digital library.

The primary search strategy of the publication databases utilized keyword searches that included the following: (a) *project risk*, (b) *project management*, (c) *risk management*, (d) *project failure*, (e) *project performance*, and (f) *project success*. After an initial review of the results for relevance, I utilized a secondary keyword search within each of the primary search results to identify IT project-related material utilizing the

terms (a) *IT, information technology*, (b) *technology*, (c) *information and communication technology*, (d) *software*, (e) *hardware*, (f) *pharmaceutica*l, and (f) *drug*. The literature review also included keyword searches related to the conceptual framework that included the terms *actor-network theory* and *ANT* in combination with the keywords previously stated. In all cases, I sorted the search results by relevance and subsequent keyword searches related to both the conceptual framework and research purpose. These subsequent searches utilized various derivations and Boolean operator combinations of the search terms until I concluded the database contained no new relevant literature. I also utilized chaining to identify relevant literature.

The majority of the sources within the doctoral study proposal have publication dates during or after 2013. This range of publication dates is an attempt to position the study in the current context and themes of the academic literature related to overall project management research and specifically IT project risk management. Of the 153 sources contained in the literature review, 140 will not be more than 5 years old in 2017. Overall, 232 of the 260 sources contained in the entire doctoral study proposal will also not be more than 5 years old in 2017 to maintain consistency with the literature review concerning the contextual and contemporary placement of the study. Additionally, in both the literature review and the entire doctoral study proposal, at least 91% of the sources are from government or academic peer-reviewed sources.

Figure 1 depicts the organization of the literature review and reflects the importance of the conceptual framework, the relevance of the study to the pharmaceutical industry, and the emerging themes related to the key elements of the purpose of the study.

Specific elements concerning the purpose of the study include the concepts of IT project performance, project success, and risks, along with the research related to the examination of strategies concerning project risk management. The research related to project RM includes RM frameworks, models, tools, and the various sources of IT project risks.

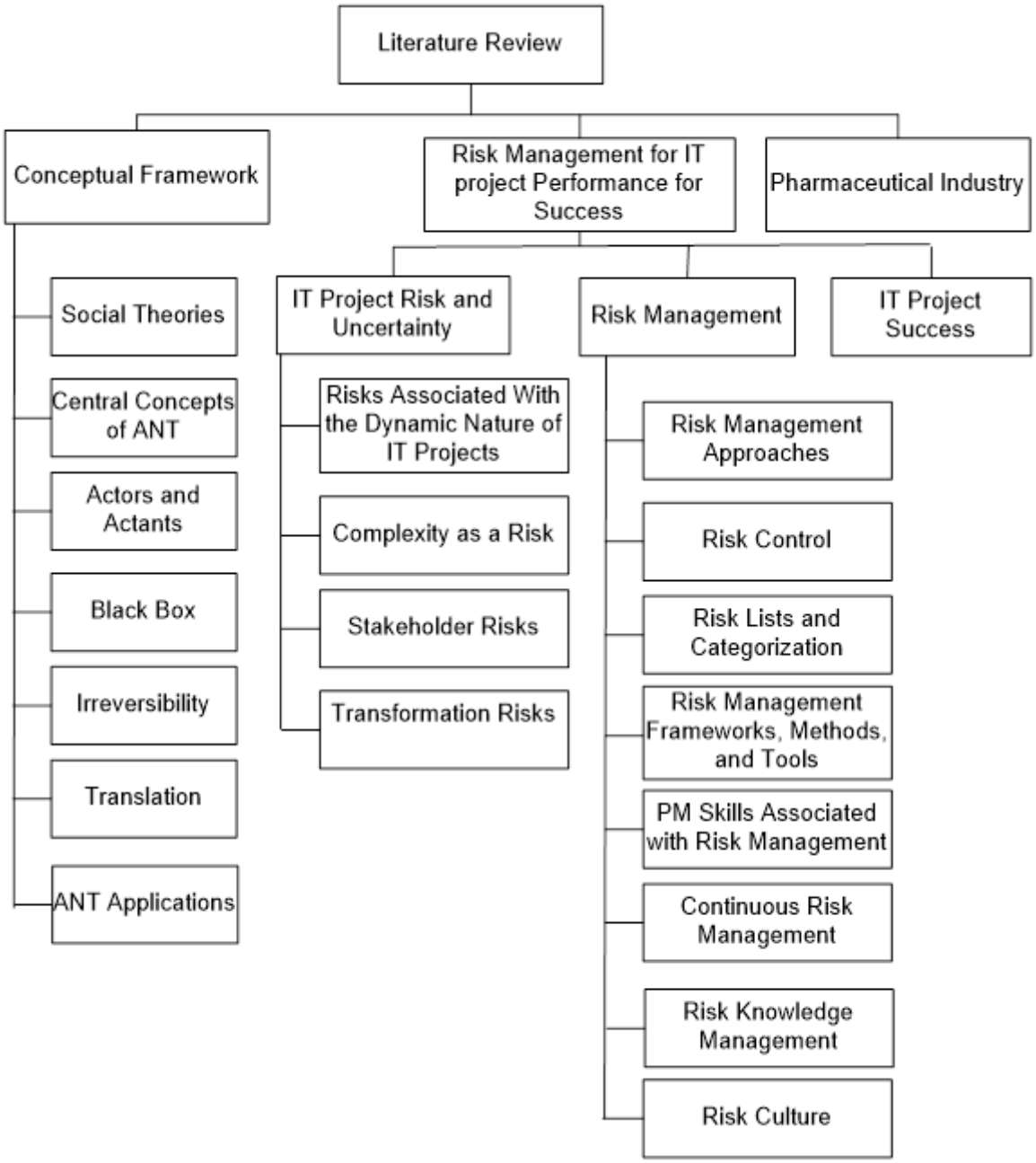

Figure 1. Literature review organization.

Conceptual Framework

Bredillet, Tywoniak, and Dwivedula (2015) examined what makes a good PM through a critical review of the existing literature and the three major project management standards from the Project Management Institute, the International Project

Management Association (IPMA) and the Global Alliance of Projects Performance (GAPPS). Bredillet et al. indicated that the upsurge in a postmodern view of project management research represents a change in perspective that is guiding how researchers conduct research from focusing on what project management is to what PMs do. Bredillet et al. further emphasized the pluralistic context of project management will benefit from research based on a social theory that reconnects theory and practice. Additionally, this new perspective on project management research positions relative practice and social theories in an action-oriented perspective in which identifying and understanding the actions and interrelations between the various human and nonhuman actors involved in a project is a facet of future research (Floricel et al., 2014).

Stoica and Brouse (2013) adaptive experimentation utilized a mixed methods approach to explore and validate reported IT project failures from a social lens perspective. Specifically, Stoica and Brouse incorporated the concept of intangible social factors (IFSs) into the analysis and categorization data concerning project failures derived from the combination of grounded theory research and multiple case studies of IT implementation projects. Stoica and Brouse highlighted the disconcerting failure rates of IT projects back to 1994 and posited that social theory is one possible lens for examining IT project failure rates. The adoption of Stoica and Brouse's premise provides the further support for using ANT as the foundation of the conceptual framework of this research, given the purpose of the research concerns RM strategies needed to improve project performance for the successful delivery of an IT project.

Social theories. Floricel et al. (2014) and Iyamu (2013) went further than

Bredillet et al. (2015) in suggesting the usefulness of social theories in IT project management research. Floricel et al. and Iyamu specifically suggested several theories that may provide different perspectives and be beneficial to project management researchers. Floricel et al. undertook research for the purpose of producing a toolkit for practitioners and researchers to use for the management of project issues that can create project risks. The design criteria for the toolkit included the ability to guide researchers and practitioners through the process of identifying and managing project complexity while leveraging the strengths of social theories as a lens to capture the nuances associated with project management issues (Floricel et al., 2014). The result of the research was a five-dimensional framework and the suggested companion use of a social theory such as ANT (Floricel et al., 2014).

Both Floricel et al. (2014) and Iyamu suggested that ANT along with a small number of other social theories may help project management researchers gain better insight into project management issues. Of the three social theories suggested by Floricel et al. (2014), Johnson, Creasy, and Fan's (2016) historical examination of project management research indicated that ANT was the only social theory in the top five most frequently used theories in project management research. Johnson et al. reviewed 273 articles from 1999 to 2013 published in seven of the foremost academic journals concerning project management, including the *Project Management Journal* and the *International Journal of Project Management*. The synthesis of the data collected from the literature indicated that the most frequently utilized theories in project management are (a) stakeholder theory, (b) utility theory, (c) fuzzy sets theory, (d) ANT, and (e)

theory of constraints (Johnson et al., 2016). Johnson et al. noted that the use of fuzzy set theory in project management research has remained unchanged. However, the use of stakeholder theory and ANT is increasing whereas the use of utility theory and the theory of constraints in project management research is declining.

Utility theory is a means of understanding an individual's preferences and choices regarding the utility of the decision (Browning, 2014). Concerning project risks, utility theory groups an individual's preference regarding risk attitude as (a) risk adverse, (b) risk neutral, or (c) risk seeking (Hartono, Sulistyo, Praftiwi, & Hasmoro, 2014). Johnson et al. also indicated that researchers commonly associate utility theory as a model of rational choice when evaluating decisions concerning risks. The use of utility theory in project risk assessment reflects a historically dominant view of project management rooted in rationalist and technocratic models and methodologies (Svejvig & Andersen, 2015). In contrast to the historically dominant view of project management, more recent thinking in project management research suggests project management practices should facilitate the consideration of (a) the organizational context, (b) the social and political aspects of the project, and (c) the elements of complexity and uncertainty (Svejvig & Andersen, 2015).

Miles (2015) stated stakeholder theory is essentially an amalgamation rather than a single theory. Researchers have described stakeholder theory in various ways, but fundamentally the theory is an organizational management theory that also addresses business ethics and economics (Miles, 2015). The premise of stakeholder theory is that organizational managers should strive to maximize stakeholder value (Miles, 2015).

Stakeholder theory expands the classic company shareholder view to include both internal and external groups that have concerns and interests related to obtaining the organizational objectives (Miles, 2015). Eskerod, Huemann, and Ringhofer (2015) explained that incorporating the views of both internal and external stakeholders into organizational goals may increase the likelihood of the organizational and project success. On the topic of project risks, the ability of PMs to identify and incorporate the concerns and views of the project stakeholders effectively has been a key concern for practitioners and researchers for over 25 years (Caron & Salvatori, 2014).

The basis of the theory of constraints rests on the fundamental assertion that even a single constraint can limit the output of a system and how a system will need to be modified to work around the constraints (J. Zhang, Song, & Díaz, 2016). A constraint usually manifests in one of three forms: (a) a policy constraint that represents formal or informal rules that constrain the system's productivity capacity, (b) a physical constraint concerning resource capacity in relation to demand needs, and (c) and market constraints based on demand versus resource capacity (Naor, Bernardes, & Coman, 2013). Regarding project management practice and research, critical chain project management (CCPM) is the application of the theory of constraints related to project scheduling analysis concerning resource availability, task interdependencies, and the notion of scheduling buffers (Shurrab & Abbasi, 2016).

In classical set theory, an element either meets the condition to be a member of the set or does not meet the condition to be a member of the set (Ökmen & Öztaş, 2014). However, the basic premise of fuzzy set theory allows the elements to be a member of the

set based on the degree the element meets the conditions that allow for set membership (Johnson et al., 2016). Fuzzy set theory is a technique that researchers may use to capture subjective information (Kuo & Lu, 2013). The collection of subjective information and the use of fuzzy set theory is useful in dealing with imprecision and uncertainty (Dixit, Srivastava K., & Chaudhuri, 2015; Kuo & Lu, 2013) and risk and uncertainty (Elzamly & Hussin, 2014; Kuo & Lu, 2013; Rodríguez et al., 2016).

In addition to ANT, Floricel et al. (2014) also suggested that structuration theory, another social theory, is useful in exploring the social networks and structures in projects. Giddens's (1986) seminal work on structuration theory provided a preliminary discourse on the fundamental concepts of the theory. Giddens described several elements of structuration theory that included the key concept of studying social practices at the intersection of agents and structures from both the macro and micro level. Giddens suggested the usefulness of structuration theory in examining an agent's replication of social structures concerning institutional traditions, organizational values, and accepted practices. Giddens also associated the concept of structuration with organizational rules, resources, and values along with the properties they represent in the binding of time and space in structuring a social system. Giddens suggested that agents consisting of individuals or groups use these social structures to perform actions through embedded memory. Additionally, structuration theory is useful when researchers are examining what happens when organizational actors ignore traditional values and accepted practices (Giddens, 1986).

Similar to Floricel et al., Söderlund, Hobbs, and Ahola (2014) suggested that structuration theory might be useful in highlighting the dynamics and interactions throughout the organization and how project teams construct projects and projects construct teams. However, Floricel et al. noted that unlike ANT, structuration theory assumes that only human actors are capable of overseeing and rationalizing their actions and nonhuman actors take on a more nonreactive role in the network. Stoica and Brouse (2013) also specifically noted the value of the insights that social theories provide about IT and project management issues and understanding IT project failures. Therefore, the conceptual framework of this study includes ANT because ANT used as the conceptual lens also positions the researcher to view the data from a primary actor's perspective, which is the IT PM.

Bresnen (2016) examined the institutionalization of project management as an academic discipline and professional body of knowledge. Bresnen utilized previous contributions to project management practice and theory by Peter Morris along with Morris' most recent work *Reconstructing Project Management* (2013), the Project Management Institute's project management body of knowledge (PMBOK), and a review or the relevant literature as the key data sources for the research. Bresnen concluded that there is a substantial amount of differentiation and fragmentation within the field of project management. The main principle of structuration theory is that human agency and social structure are not two separate concepts or constructs but are two ways of considering social action (Bresnen, 2013). Bresnen suggested any research concerning

the consolidation of knowledge and practices will benefit from the use of structuration theory.

The use of ANT as a theoretical lens does not come without criticism, especially concerning the agency of nonhumans (Sayes, 2014). Elder-Vass (2015) provided a critical review of ANT entitled “Disassembling Actor-Network Theory,” in which Elder-Vass explained and criticized the assemblages of actor-network theory. Elder-Vass suggested the grouping of both human and nonhuman actors within the same framework of power and agency, which addresses the dualism, was not plausible. Elder-Vass suggested that the notion of dualism concerning nonhumans and human actors may require tempering with the idea that the natural phenomenon between the two entities existed before scientists labeled the construct and that there needs to be some acceptance of the differences between humans and nonhumans. Although Sayes (2014) also performed a critical analysis of ANT, the purpose of Sayes’s critical analysis of ANT was to gain a better understanding of the agency that nonhumans exercise. Sayes examined the past statements concerning the agency of nonhuman actors made by prominent thought leaders in the field. AlthoughSayes like Elder-Vass acknowledged the challenges in accepting the dualism associated with humans and nonhumans within ANT, Sayes indicated that the tracing of the power and agency of the nonhuman actors is more important than debating the dualism.

Baiocchi, Graizbord, and Rodriguez-Muñiz’s (2013) overview of the new literature concerning the criticisms of ANT as a lens of inquiry indicated that the novelty and utility of ANT override any concerns related to the fundamental aspects of the

theory. Specifically, Baiocchi et al. reported there is a recent trend in the articles that the conceptual elucidation provided by ANT ranks higher than other theories. Pollack, Costello, and Sankaran (2013), who studied the implementation of a project management information system (PMIS), suggested that ANT is a valuable lens for exploring project management processes. Specifically, the use of ANT by Pollack et al. highlighted that ANT is valuable when researchers are examining the social aspects of project management beyond the empirical measurement of the effectiveness of RM tools or processes.

Central concepts of ANT. ANT, also known as enrollment theory, emerged from the works of Callon (1986), Latour (1987), and Law (1992) concerning the sociological studies of science practices and technology. The development of ANT was an evolution of perspectives and observations related to the examination of the interactions between humans and nonhumans within the context of technology adoption (Callon, 1986; Latour, 1987). Callon's (1986) "Some Elements in a Sociology of Translation: Desertification of the Scallops of St. Brieuc Bay" is an account of the failed attempt by three researchers to convince the scallop fisherman the advantages of domesticating the scallops using new scientific-based methods that would provide a safe environment for the scallops to breed and grow. Callon described the process of bringing the fishermen and scallops together as translation, where translation is an artificial construct to help conceptualize the process, rationale, and purpose of why networks form. Callon also detailed how the researchers injected themselves between the scallops and the fisherman acting as an obligatory

information passage point that was intended to prevent the fishermen from using their traditional methods and overfish the scallop population.

Latour (1987) presented a formative framework for the exploration of the social considerations related to technology and science. Latour explained that the value of ANT in exploring the plurality of the context comes from the origin of the theory in examining the interactions between humans and technology. As ANT has no unified body of literature (Pollack et al., 2013), Law (1992) and several other researchers have revised or extended components of the fundamental aspects of the theory. Law's review of ANT contributed to the foundations of the theory regarding how researchers view power and social organization. Law suggested networks are essentially heterogeneous societies and that without power and organization, societies would not exist. Law suggested that ANT is an appropriate lens to view and interpret how actors come together and reproduce organizational patterns within the social network.

There are several fundamental concepts and elements that researchers need to consider when utilizing ANT as a lens of inquiry. The concepts include (a) the actor, (b) the actor-network, (c) translation, (d) black boxes, and (e) immutable mobiles. According to Callon (1986), the actor-network develops as the primary actors align other actors for an agreed upon purpose. Dery, Hall, Wailes, and Wiblen (2013) indicated that ANT represents a process versus a summarization, and the formation and subsequent reformations of the actor-network transpire through the iterative process of *translation.* Callon (1986) also indicated that translation is the vehicle of ANT, and the actor-network is a result of translation. In addition to concepts of the actor-network and translation,

ANT has several fundamental elements that include the concepts of irrevocability, black box, and immutable mobilization, along with the role primary actors may play as an obligatory passage point (OPP) concerning the flow of information and decisions.

Actors. Yin (2014) described the value of case study research as being, in part, due to the collection of primary data through the participation of contemporary actors. In ANT, an actor "is what is made to act by many others" (Latour, 2005, p. 46). The term actor can also represent a network, as an actor can be one element or many elements (Latour, 2005). An actor acts and grants action, and actors expect new modes of action from other actors because of the precipitating action (Sayes, 2014). The primary actors within a network execute translation (Callon, 1986). Actors can be groups, individuals, technology, texts, or other elements such as an organization or a process. Regarding project risks, the risks themselves can be actors and so can the risk register as an artifact that an IT PM interacts. From an ANT perspective, IT PMs, key subject matter experts (SMEs), project team members, and stakeholders are all actors who may become part of the actor-network with the common goal to address IT project risk management.

Another classification of an actor is an obligatory passage point. An actor is an OPP when an actor becomes indispensable and acts as an intermediary or mediation point related to information and decisions (Callon, 1986). The concepts of the OPP and the primary actor were central to the premise of exploring what RM strategies IT PMs can utilize to increase project performance. As the IT PMs, according to their functional role, are accountable for the successful execution of the overall project management processes including the RM processes (Kerzner, 2013; Project Management Institute, 2013). The

review of the literature indicated the concept of an actor also includes various social constructs such as gatherings, organizations, governments, department management, processes, and texts. Floricel et al. (2014) stated the project is an actor. Additionally, the RM process, the project deliverables, and the organizational constructs can all be actors.

Actor-network. An actor-network is a heterogeneous complex construct consisting of elements, which not only include the actors but the relationship and actions that bind the network (Callon, 1991; Müller & Schurr, 2016). The concept of translation associated with ANT incorporates the actions related to the bond between the actors (Callon, 1986). Callon (1986) also advocated that humans and technology play an equal role in the construction of the actor-network. Actor-networks consist of a combination of actors with mutual interests and purposeful alignments. For example, the actors identified by Iyamu and Sehlola's (2012) exploration of the factors that affect RM in IT projects included various actors such as the IT PM, project leaders, and stakeholders.

Translation. Translation is the process by which one actor recruits other actors into the network (Callon, 1986). According to Callon (1986), the process is never complete as some actors may disengage. In ANT, translation has linguistic meaning regarding one actor translating for other actors and a geometric meaning referring to the movement of one actor's interests in a different direction by offering new interpretations that compel other actors to engage with the network (Latour, 1987). Mpazanje, Sewchurran, and Brown's (2013) use of ANT in IT project research indicated that translation is the process of a primary actor, the IT PM, translating the actor-network into the primary actor's interests this is similar to Callon's view of translation.

Using ANT as the lens of inquiry, Mpazanje et al. explored the influences and risks associated with IT project stakeholders. Mpazanje et al. focused on the lived experience of IT project stakeholders versus IT PMs in the examination of the risks created or influenced by project stakeholders. The characteristics of ANT allowed the researchers to utilize a nonhuman actor as the focal actor, namely, a consultancy report stating the need and objectives of the development implementation of the IT system. Mpazanje et al. identified several key concepts concerning IT project performance, success, and risk management. These concepts included that (a) IT project scoping is complex, (b) the potential risk of scope creep may occur as stakeholders enroll into the network, (c) the degree of project success or failure depends on how well the project deliverables reflect the stakeholders expectations, (d) the perspectives of stakeholder group representing the actual system users was not critical to success, and (e) the experience of the PM plays a role in the selection of the project methodology and associated practices. In addition to the outcomes of the research, the use of ANT allowed the researchers to view a nonhuman actor, the consultancy report, as a focal actor inscribing other actors into the network. The ability of the consultancy report to enroll actors is analogous to the potential agency a project risk plan or risk register has in enrolling and mobilizing actors into RM activities. Mpazanje et al. also suggested that translation also entails translating the same interest into different perspectives that provide a universal view to gain stakeholder support.

Iyamu and Sechola (2012) utilized a case study design to investigate the organizational risks associated with an IT project. Iyamu and Sechola specifically

explored the factors that affect RM in IT projects. Iyamu and Sehlola selected ANT based on the premise that the actions of people within the network through the execution of processes contribute to project performance and success. Iyamu and Sechola stated that the use ANT also helps researchers recognize why actors categorize various factors as potential risks, risks or critical risks that may affect the success of the IT project. The findings of Iyamu and Sehlola indicated five factors that influence risk identification. The five factors Iyamu and Sehlola indicated are (a) career opportunity, (c) communicative scheme, (c) ownership, (d) standardization, and (e) roles and responsibility. Iyamu and Sehlola did not identify a particular focal actor, but Iyamu and Sehlola stated that the PM, or the departmental IT committees, are spokespersons for the focal actor.

The four moments of translation are problematization, *interessement,* enrollment, and mobilization (Callon, 1986). Problematization is the first moment of translation. During problematization, the focal actor defines the problem and recruits other actors to join the network (Callon, 1986). Problematization in relation to IT project risks can be when the IT PM identifies that RMs is required and engages with other actors concerning the need to identify and manage the project risks because the IT PM's interest is the success of the project (Mpazanje et al., 2013). Nguyen et al. (2015) conducted a case study focused on the implementation of a nursing information system using ANT as the lens of inquiry. Nguyen et al. concluded that ANT is a valuable theoretical lens to examine the implantation of disruptive and identify critical success factors for IT projects. Nguyen et al. also viewed problematization as the moment a specific actor becomes a primary actor and subsequently acts as an OPP.

The next phase of translation is *interessement. Interessement* represents the actions undertaken by a primary actor to align the actors within the network on the problem and test and the original premise of the problem. Callon (1986) elaborated on interessment as the actions taken by primary actors to align and assign an identity to the other actors. The alignment of the actors also includes negotiation with the nonhuman actors (Callon, 1986). In relation to exploring RM, *interessement* is analogous to an IT PM negotiating with and assigning roles to the project stakeholders and team members along with the nonhuman actors such as the risks, risk registers, and the RM method. From an ANT perspective, a PM could assign a risk the role of a problem or an opportunity.

Enrollment is the third moment of translation consisting of the inscription of other actors into the network by the focal actor along with the other actors assuming his or her designated role assigned during *interessement* (Callon, 1986). Using ANT Iyamu and Sehola (2012) identified that the IT PM is acting in the role of a focal actor and seeks to understand how the other actors accept their designated roles concerning risk management. The description of the role of IT PM enrolling other actors into the RM processes reflects Callon's (1986) description of a focal actor's role in enrollment. As Callon indicated that the focal actor defines and correlates the interactions of the other actors within the network so additional actors can understand their roles as the new actors join the network based on a shared interest (Callon, 1986).

The final element of translation is mobilization and is the point at which the entire network becomes a macro-actor. Mobilization implies that the actors are an aligned

collective that reflects the common interests of the collective (Callon, 1986; Lee, Harindranath, Oh, & Kim, 2015; Sayes, 2014). Iyamu and Sehlola (2012) suggested that mobilization is useful in understanding how the actors mobilize in dealing with the IT project risks. Mpazanje et al. (2013) described mobilization as when other actors act on behalf of the network based on guidelines and the shared purpose of the network.

Alexander and Silvis (2014) utilized design science research in the creation and recommendation concerning the usefulness of a graphical syntax in conjunction with ANT because the graphical syntax can reduce the weakness of ANT related to the vagueness of the boundaries of ANT and the iterative nature of translation. Alexander and Silvis described translation as never perfect because of the possibility that the iterative characteristics of the translation process may cause the loss of the original meaning and impetus for the initial network formation. Therefore, the graphical syntax and subsequent visualization are particularly useful to researchers in capturing the mutual understanding between the actors and the formation of other actor-networks as a result of translation.

Sarosa and Tatnall (2015) utilized a case study design in the examination of an IT application development failure where the risk of scope creep was the cause of the IT project failure. Sarosa and Tatnall stated that ANT is appropriate given the project failure involved both humans and nonhumans. Sarosa and Tatnall confirmed scope creep was the main reason for the project failure. Sarosa and Tatnall specifically elaborated on the concept of translation as a lens through which to view the data in the evaluation of the IT project risks concerning project scope creep. Iyamu and Sehlola (2012) specifically use

the four moments of translation as a framework to examine the impact of IT project risk from an organizational perspective.

Irreversibility. Irreversibility is how well the previous moments of translation lock the actors into their roles because irreversibility is the degree in which an actor may break out of the network and disengage (Callon, 1986). The degree of irreversibility also influences and shapes subsequent translations (Callon, 1991). In Callon's (1991) "Techno-economic Networks and Irreversibility" Callon (1991) examined the heterogeneous processes related to technical and social change. Callon's (1991) examination of the heterogeneous processes related to technical and social change focused on the processes concerning the dynamic relationships within a network consisting of technical and economic actors. Callon (1991) elaborated on the concept of irreversibility and indicated a high degree of irreversibility implies an actor must continue in their role.

Conversely, a weak bond suggests the actor can exit the network at little cost (Callon, 1991). Exiting a network at little cost is not necessarily a negative, as highlighted by de Albuquerque and Christ's (2015). de Albuquerque and Christ's examined the tensions between business process modeling and flexibility in the context of a German aircraft maintenance company that executed business process reengineering projects involving IT. de Albuquerque and Christ's analysis of the case study data using ANT as the lens of inquiry indicated that some networks are less likely to be irreversible than others, but weakly bonded networks are more adaptable to change through future translations. However, the ability for the network and associated actors to be flexible and

reconstruct a new network based on the dynamic nature of IT project risk is a positive attribute of a weakly bonded network.

In contrast to viewing a weakly bonded network as a positive, Kutsch, Denyer, Hall, and Lee-Kelley (2013) explored why some IT PMs disengaged from RM activities during the lifecycle of the project. Kutsch et al. utilized a multiple case study design that encompassed 21 projects across 10 organizations. The findings indicated five reasons why PMs may disengage from RM activities. The five reasons why PMs may disengage from RM activities include (a) legitimacy, (b) the value of the activities versus the benefits, (c) a diminished perspective on the real impact and probability of the risk, (d) competence regarding controlling the risk, and (e) a lack of assumed authority (Kutsch, Denyer, Hall, & Lee-Kelley, 2013). The findings of Kutsch et al. were an example of weak irreversibility regarding the IT PMs' disengagement from IT RM when the IT PMs perceive no value in the process.

Using a mixed methods research approach Ahmedshareef, Hughes, and Petridis (2014) explored the interdependent factors that throughout the lifecycle of an IT project may cause schedule delays. Ahmedshareef et al. used ANT as a lens of inquiry. Ahmedshareef et al. captured the perceived alignment and commitment to the project schedule by the various actors associated with the project, which included the PM and team members. Ahmedshareef et al. viewed a high degree of irreversibility as a weakness of alignment and the potential that an actor's commitment to the project is not a guarantee due to misaligned priorities.

Black box. According to Latour (1987), a block box is an entity comprised of several actors and is a single unit that acts as a unified entity. Iyamu and Sekgweleo (2013) utilized previous work performed by the primary author and a review of the pertinent literature in the creation of a positional paper on the use and value of ANT in the exploration of IT implementations. Iyamu and Sekgweleo highlighted that the primary purpose of forming a network is so disparate actors may collaborate with the purpose of constructing something or solving a problem (Latour, 1987). Additionally, Iyamu and Sekgweleo described black boxes as frozen networks that frequently exhibit the characteristic of irreversibility. Irreversibility is the degree a network and the actors can go back to a previous point of alternative common goals. Iyamu and Sekgweleo concluded that ANT is an appropriate lens to view an IT implementation, given the need to open black boxes and view both humans and nonhumans with an unbiased perspective.

Johannesen, Erstad, and Habib's (2012) case study research concerning the social and material agency of Norwegian educators and the virtual learning environment (VLE) that the educators were adopting included the use of actor-network theory. Johannesen et al. framed the study in terms of the social activities associated with the interactions between the educators and the VLE technology. Both the educators and the VLE technology are actors or an actor-network in regards to actor-network theory. Johannesen et al. suggested the VLE is a black box from the perspective of the educators. Johannesen et al. posited although a black box may be critical for the working of the network, the actors do not need to understand its internal workings. Not understanding the inner workings of a black box is analogous to an IT PM just following a prescriptive RM

process or analyzing a risk at face value and not seeking to understand the cause of the risk. Additionally, the RM process outlined in the PMBOK (Project Management Institute, 2013) could be a black box when viewed through the lens of ANT when PMs execute the RM process in a rote manner.

Other researchers have described black boxes in various ways. Sayes (2014) indicated that black boxes in some actor-networks are just placeholders representing artifacts that depict meaningful actors. Silvis and Alexander (2014) utilized a case study to test and present the use of a graphical syntax that researchers may use in conjunction with ANT to document the implementation of a health information system. Silvis suggested that the use of a graphical syntax improves the use of ANT by researchers. The findings indicated that use of a graphical syntax in conjunction with ANT is useful in conceptualizing black boxes through the decomposition and the subsequent visualization of the network elements contained within a black box. Silvis and Alexander also indicated black boxes reduce the complexity of the network by collapsing multiple actors that are consistently acting as one entity. These various descriptions and uses of black boxes reinforce the utility and flexibility of ANT as a lens to view the complex environment of managing IT projects risks and technology in concert with the associated actions of the actors.

Immutable mobiles. The concept of immutable mobiles implies that one actor is capable of moving another actor without the movement of the former actor (Latour, 1987). Spilker and Hoier (2013) employed the use of ANT in a historical comparison of the development and adoption of the moving picture experts group layer-3 (MPEG-3)

standard, also known as MP3 when referring to just the audio component, and DivX a brand name product from DivXNetworks as primary technologies of electronic piracy. Spilker and Hoier specifically focused on the translation and displacement of the technologies over time. Spilker and Hoier and suggested that standards are an example of immutable mobiles because it is too costly to overcome the inertia or the invested organizational capital to change. In the IT PM practitioner's network world, the RM practices of the PMBOK (Project Management Institute, 2013), projects in controlled environments version 2 (PRINCE2), or an organization's PMO can be immutable mobiles when viewing the constructs through the lens of actor-network theory. Johannesen et al. (2012) also suggested that established assemblages such as black boxes and OPPs and their associated agency are immutable mobiles in some situations.

ANT application. Besides the inherent technical complexity of IT, according to Leonard and van Zyl (2014), there are social aspects of an organization that contributes to the complexity of an IT project. Using grounded theory research and multiple IT project case studies, Leonard and van Zyl examined the relationships within a project network and the effect of the social relationships on the success or failure of IT projects. Leonard and van Zyl utilized ANT as a lens of inquiry and specifically highlighted the concept of an individual actor's power within the network as described by Law (1992). Leonard and van Zyl findings indicated that PMs and project team members primarily use their social relationships to resolve problems and to gain a certain level of control. The concept of coming together to solve a problem is the first moment of translation as described by Callon (1986).

Also, the social aspects of an organization and stakeholder knowledge can affect how an organization views IT project performance and success (S. Liu, 2016). Liu's quantitative research involved collecting data from 63 completed IT projects from various Chinese firms. Liu examined the effects of the social aspects of risks on project performance using ANT as a lens of inquiry. Specifically, Liu examined how the degree of user liaison knowledge affects project RM and ultimately project performance. The findings indicated that a higher level of process understanding by the stakeholder could weaken the negative effects of project risks on project performance.

The review of the literature indicated the concept of an actor also includes various social constructs such as gatherings, organizations, governments, department management, processes, and texts or the project itself Floricel et al., 2014)—all of which IT PMs may encounter during the management of IT project risks. Additionally, the RM process, the project deliverables, and the organizational constructs can all be actors with the common goal of increasing project performance from an ANT perspective.

In their study of the reconceptualizing of the agency of IT, Mahama, Elbashir, Sutton, and Arnold (2016) explored how IT agency has been articulated in previous IT research about accounting information systems. Mahama et al. used the lens of ANT to identify and understand the varying organizational contexts associated with IT implementations. Mahama et al. found that taking a technology centric and anthropocentric view of IT's agency without considering the current social context of an IT implementation may limit a researcher's understanding of the phenomenon or issue. Mahama et al. suggested that the unpredictability of IT as an agent within the

organizational context is a risk that is identifiable through the lens of actor-network theory.

Missionier and Loufrani-Fedida (2014) investigated stakeholder engagement analysis within the context of project management. Missionier and Loufrani-Fedida's research design included a longitudinal case study of an IT implementation project. Missonier and Loufrani-Fedida's undertook the investigation with the intent to develop and propose a relevant approach for IT PMs to use in their observations and interactions with IT project stakeholders within the project network concerning the roles the project stakeholders assume. Missonier and Loufrani-Fedida suggested that ANT provides a basis for viewing the various relationships and interactions among the human actors and nonhuman actors. The various relationships and interaction in IT projects might include the PM, sponsors stakeholders, and team members along with the technology, project processes, risk registers, and the individual project risks.

Cecez-Kecmanovic, Kautz, and Abrahal (2014) used a case study design to examine the general assumptions concerning the definition of IT project success within an Australian insurance company. Cecez-Kecmanovic et al. stated that the social and material practices of the IT project actors affects IT project success. Cecez-Kecmanovic et al. concluded that the assessment of success by different actors, which in ANT may be an individual or group of individuals, creates different realities concerning success. Cecez-Kecmanovic et al. also concluded that the assessment of project success might not be predetermined or fixed, and suggested the reframing of project success within each project may increase the likelihood of project success.

Pollack et al. (2013) conducted a multiple case study that incorporated ANT as the lens of inquiry when Pollack et al. examined the implementation of a project management information system (PMIS). Pollack et al. suggested that the PMIS was an actor-network that facilitated the stabilization of other networks. Pollack et al. also indicated that a PMIS and the RM aspects of the software tool are flexible in nature that allows the consideration of different contexts by the PMIS users. Pollack et al. suggested ANT as a useful methodology for the exploration and development of projects. Pollack et al. suggested that ANT approach promotes a different lens of inquiry to project management research because using ANT moves researchers away from the bias of exploring project management from a classical rational choice, prescriptive tools, and techniques perspective.

Dery et al. (2013) utilized a longitudinal single case study for examining the relationship between a human resources information system (HRIS) and the human resources (HR) organizational function. Dery et al. performed 32 semistructured interviews over the course of 4 years with the key HR functional leaders. The researchers utilized ANT in the interpretation of the data. The content analysis of the data revealed several themes that included (a) risks, (b) organizational structure, (c) IT management, and (d) IT skills. The identified themes represent actors from an ANT perspective. The researchers then viewed the actors in relation to the implementation process or the HRIS system. Dery et al. concluded that use of ANT in IT implementation research may significantly help researchers understand why IT projects do not always deliver the expected performance or expected organization capabilities. Dery et al. also indicated the

value of ANT given the variety of actors and the complexity of the technology. Although the researchers indicated that the ANT might be controversial and contested, Dery et al. reinforced that ANT provides a key lens in viewing the formation and evolution of the relationship between the human and the nonhuman. The rationale and subsequent use of ANT by Dery et al. also support the observations of Baiocchi et al. (2013) that indicated the value of using ANT as a lens for inquiry overcomes any concerns.

Bloome (2012) examined the concept of sensemaking concerning an organizational manager's role in a project or when an organizational manager is also the PM. Utilizing a perspective based on ANT and the specific concept of translation as described by Callon (1986), Blomme carried out a review of the literature concerning ANT and the concept of sensemaking. Specifically, Bloome examined the sensemaking role of the manager in relation to managing the changes and associated risks that come with project-induced change. An important aspect of change management is the realization by the manager that they are part of the change, and the change is not external to the manager (Blomme, 2012).

Sage, Dantey and Brook (2011) explored how social network theories, like ANT, can help understand project complexities. Utilizing a historical case study approach concerning a bridge construction project Sage et al. evaluated why the current thinking regarding project complexity ignores the agency and role of objects in the obtainment of social order and transformation. The findings indicated that by using an object-oriented approach in conjunction with ANT, researchers might be able to identify the effect of the varying roles of the nonhuman actors on the stabilization of project complexities (Sage et

al., 2011). Additionally, Sage et al. indicated that front-end planning and stakeholder analysis early on in the project lifecycle is one factor that contributes to the stabilization of the various risks associated with project complexities. Sage et al. suggested how ANT may help in understanding project complexities because the OPP is a construct in which all actors must engage. According to Sage et al., ANT also illuminates how the focal actor, as the OPP, recruits other actors to define the broader issue while also taking into consideration the social context. Heeks and Stanforth (2014) indicated that the OPP is indispensable to the other actors within the network. Iyamu and Sehlola's (2012) study utilizing ANT also illustrates the role of the IT PM as an OPP concerning the decisions related to IT project risks.

Rai, Khan, Chauhan, and Chauhan's (2014) review and synthesis of the pertinent literature concerning project management and ANT advocated the addition of ANT as an appropriate lens to the current qualitative research traditions. Specifically, Rai et al. contended that ANT is particularly useful when exploring IT implementation projects. Additionally, Rai et al. posited that ANT benefits the researchers by the flexibility ANT provides in considering alignments between humans and artifacts that otherwise might not be that obvious.

Ahmedshareef et al. (2014) utilized a mixed methods approach that incorporated a case study of multiple IT projects within a single company and used grounded theory in the exploration of IT project delays. Ahmedshareef et al. specifically focused on the interdependent factors that throughout the lifecycle of the IT project cause schedule delays. Ahmedshareef et al. also set out to understand to what extent is ANT a useful lens

in modeling the interactions between various actors involved in a software development project. Ahmedshareef et al. suggested the value of ANT as a lens of inquiry rests in the utility of ANT in exposing the risks within the social and technical domains of an IT project that influence the project schedule. Ahmedshareef et al. concluded that the actor-network dynamics associated with the ANT are valuable in identifying alignment and coordination among the actors within the network.

Vezyridis and Timmon's (2014) case study of the implementation of a clinical IT system for a university hospital included the researchers' use of ANT as the lens of inquiry. Vezyridis and Timmons based the use of ANT on the premise that the utility of ANT may provide insight on the achievement of project success regarding the intertwining of humans and technology. The findings indicated that the interplay of evolving technical and social factors affects the nonlinear processes of implementation and adoption. The researchers suggested that IT project success is more than the implementation of technology and is dependent on changing performance expectations in conjunction with the social and technical context. Although ANT is valuable in exploring IT project risks regarding context, the context cannot explain anything by itself but contributes to the explanation and analysis of phenomena (Latour, 2005).

IT Project Performance and Success

The origin of project management and the associated process of project RM in the literature frequently points to the defense and aerospace industry (Garel, 2013). Garel (2013) performed a historical review of project management practices in comparison to the more traditional management models such as accounting and marketing. Garel

indicated that project management started to develop into an institutionalized management model between the years of 1950 and 1960, but Garel concluded that the integration of project management practices into a more mainstream management model has not occurred. Various authors and organizations have described the purpose project management. Anyanwu's (2013) research on the role of the project manager and project management in Nigerian infrastructure projects contains a good description of project management that reflects the broadly published view of the purpose of project management. Anyanwu stated, "The purpose of project management is to minimize, contain or counter the risks and organize and direct the resources so that the project finnishes on time, within budgeted costs and with the functional or design objectives fulfilled" (p. 62).

A fair percentage of literature has adopted the paradigm that the determination of project success relates to the performance of the project measured against the iron triangle. The measurement against the iron triangle specifically relates to measuring project performance against schedule and budget compliance, along with the quality of the deliverables measured against the design (Carvalho & Rabechini, 2015). Lech (2013) utilized a mixed method approach in exploring the relevance of classic project success measures of enterprise systems implementation projects. The study included 28 email survey respondents and a case study of three enterprises that had undergone an IT implementation project. The analysis of the survey data indicated that organizations value both product and project management success criteria. Lech suggested that organizations are increasingly measuring project performance and success against the alignment of the

deliverable to the organizational goals and the quality of the deliverable in conjunction with classic iron triangle measurements (Lech, 2013).

Didraga (2013) examined how RM influences the success and performance of IT projects. Didraga analyzed the literature published in the primary journals of project management between 1978 and 2011. The evaluation of the literature identified that risk factors from previous projects impact the success and performance of current projects, but the knowledge of the risk factors alone are not enough to increase project performance and success. Didraga also conducted quantitative research on how the RM process affects the objective and subjective performance of IT projects within Romanian IT companies as part of the same study. The quantitative research included a survey instrument sent to 108 Romanian IT companies. The results indicated that RM is a very important component of the project management process. The findings also indicated that PMs have to look beyond managing risks related to the triple constraint and must consider stakeholder opinions regarding project performance and success (Didraga, 2013). Didraga concluded that not having a common understanding between the stakeholders on the success criteria of a project could have an impact on the effectiveness of the RM process.

Joseph, Erasmus, and Marnewick (2014) examined the critical success factors of 4,330 IT projects between 2003 and 2013 within in South Africa. The research included a comparison of the results of the Chaos reports from the Standish Group during the same period in relation to IT project performance and success. The Chaos report is an annual industry survey that includes the factors that affect IT project performance and success

along with the annual performance and success rate. Joseph et al. concluded that the project performance and success rates of projects in South Africa over the past 3 decades have not significantly improved. Additionally, comparisons by Joseph et al. to the annual global survey indicated that performance and success rates of IT projects in South Africa are consistent with the global rates.

Berman and Marshall (2014) analyzed data collected from 850 executives representing various industries throughout the globe as part of a 2013 IBM digital reinvention study. The results of the analysis indicated that the use of projects as strategic enablers of organizational goals and new capabilities is a top priority for organizational leaders (Berman & Marshall, 2014). The high failure rate and poor performance of IT projects highlighted by Joseph et al. (2014) and the findings of Berman and Marshall's research are two reasons key reasons why there is a need to understand what can be done to increase project performance.

Taherdoost and Keshavarzsaleh (2015) examined the importance of understanding IT project success, failure, and risk factors for the successful management of an IT project. Taherdoost and Keshavarzsaleh performed a cluster analysis using over 120 literary sources concerning project management. Subsequently, Taherdoost and Keshavarzsaleh proposed the five preventative and proactive measures of (a) presiding, (b) people, (c) pragmatic, (d) process, and (e) performance that IT PMs could utilize in developing sustainable project management processes for project success.

Sundqvist, Backlund, and Chronéer's (2014) exploratory study examined the application of the concepts of efficiency and effectiveness with respect to project

performance among project management practitioners and academics. The qualitative research design included a literature review and two sets of interviews. The first set of interviews consisted of seven short interviews with participants from Swedish construction and engineering firms. The second set of in-depth interviews included nine individuals from a single firm that was part of the initial interview population. The findings from this study indicated that concepts efficiency and effectiveness among project management practitioners and academics are inconsistent. Sundqvist et al. also indicated that the other practices, such as quality management, have more refined and consistent definitions of efficiency and effectiveness that the practitioners use for process evaluation and improvement.

The need to understand what project success represents to the project stakeholders and the broader organization is pertinent to project management research (Davis, 2014; Dwivedi et al., 2015). Ultimately, understanding the measurement of a project performance and success is relevant to RM (de Bakker, Boonstra, & Wortmann, 2014). Lech (2013) also suggested that when determining the success of an IT project the near-term and long-term business impact from a strategic and sustainability perspective should be taken into consideration (Lech, 2013). Davis (2014) presented a review and the current state of the evolving meaning of project success. Davis reviewed the literature since 1970 concerning the evolution of project success using inductive thematic analysis. Davis identified the importance of understanding the perceptions of project success by senior management, project teams, and user stakeholder groups. Davis suggested the need for

further clarification of stakeholder groups and a future investigation into the perceived importance placed on project success factors by different stakeholder groups.

In their positional paper, Dwivedi et al. (2015) highlighted that IT project failure rates remain high despite the efforts of researchers over the past several decades to understand the underlying factors of IT project failures. Dwivedi et al. used a panel of IT project management experts to identify factors that affect IT project success. Several key issues emerged from the expert panel, such as the need to study problems from multiple perspectives, to move beyond narrow considerations of IT as an artifact, and to venture into underexplored organizational contexts (Dwivedi et al., 2015).

Alfaadel, Alawairdhi, Al-zyoud, and Ramzan (2014) examined the main reasons for IT project failures and successes in Saudi Arabia. Alfaadel et al. also examined the critical success factors and components of IT projects in Saudi Arabia. The mixed-methods research included an analysis of 308 survey responses and eight semistructured interviews if IT project managers. The results of the study indicated that the common reasons for IT project failures are organizational culture, conflict of interest, instability, and a lack of clarity in regard to delivery requirements.

Allen, Alleyne, Farmer, McRae, and Turner (2014) examined the roles that various factors play in the success or failure of a project. The qualitative research included the examination of factors such as budget structures, success factors, PM's characteristics, and the importance of schedule, budget, and scope. The researcher examined two cases: one was a successful project, and the other was a failed project. Allen et al. suggested that managing the external influences, having a PM capable of

managing stakeholder partnerships, and managing project performance can increase the likelihood of achieving project success.

In the context of implementing innovative technologies, an IT PM is also a change agent when managing the project (Hornstein, 2015). Hornstein (2015) conducted a review of the relevant literature and analyzed the bodies of knowledge from the major project manager certifying agencies, such as the Project Management Institute, the IPMA, and the Association of Project Managers (APM) concerning the degree in which the bodies of knowledge address change management practices. Hornstein found that educating PMs in organizational change management practices increases the likelihood of project success. In the dual role of PM and change agent, an IT PM is accountable for not only identifying and managing the implementation risks that may affect a project performance but the risks that may have broader and longer-term organizational implications.

The benefit to the customer and the organization is another way to measure project success (Lech, 2013; Ramos & Mota, 2014). Ramos and Mota (2014) used a mixed method research design to examine the perception of project success and failure by PMs. Ramos and Mota used purposeful sampling to enroll 11 IT PMs to participate in the semistructured interviews. The quantitative portion of the research included a survey of 33 companies within the Brazilian IT industry concerning project success factors. The qualitative analysis of the interview data indicated the importance of effective communication in aligning management's perception about the determinant factors of project success and failure. The quantitative analysis of the survey data reviled the

surprising result that culture has minimum effect on determining project success (Ramos & Mota, 2014).

IT Project Risks and Uncertainty

The commonly accepted view of a project risk is an uncertain situation or event that if the event did occur it can be either a threat or an opportunity to the successful completion of a project (Project Management Institute, 2013; Rodríguez et al., 2016). The analysis of a project risk includes the dimensions of the likelihood of the risk occurring and the consequences when the risk does occur (Project Management Institute, 2013). Rodríguez et al. (2016) addressed project uncertainty and risk by proposing a risk assessment method based on a combination of fuzzy analytic hierarchy process (FAHP) and fuzzy inference system (FIS). Rodríguez et al. utilized a case study to evaluate the value of the model. The researchers concluded that the ability to deal with hierarchy and the integration of expert knowledge into the risk assessment make the model suitable for IT project management.

Kinyua, Ogollah, and Mburu's (2015) quantitative study examined the effects of RM on project performance within the technology enterprises located in Nairobi, Kenya. Kinyua et al. received 48 usable surveys from the 108 surveys distributed to IT subject matter experts working in the Nairobi, Kenya technology industry. The results of the study indicated that there is a positive effect on project performance and subsequent organizational performance when the PMs utilized RM strategies.

Besner and Hobbs (2012) examined the utilization level of RM practices by project managers in relation to project complexity while taking into consideration the

moderating effect of organizational and project context on the use of project management practices. Besner and Hobbs's review of the project management literature indicated that researcher's use the concepts of risk and uncertainty interchangeably in the majority of the literature. Besner and Hobbs collected information from1296 project managers and practitioners from various industries across the globe. All the participants were members of a project management professional association. The results supported the common assumption that project managers implement more RM practices when a project is more complex, innovative, or large. The results also indicated that improper project definition increases project uncertainty. Besner and Hobbs stated that some researchers believe there is a distinction between risk and uncertainty. Specifically, the belief is that uncertainty links to the source versus the common understanding that risk is a quantifiable event (Bresner & Hobbs, 2012).

Sanderson's (2012) undertook a critical discussion of the different explanations for the poor performance of megaprojects with a focus on risks and uncertainty. Additionally, Sanderson proposed a megaproject governance solution. Sanderson identified three categories of cognition related to decision-making concerning risks and uncertainties. Sanderson also highlighted three categories of risk reflecting the degree in which the decision maker can evaluate the probability of the future impactful event occurring. Sanderson proposed three reasons for poor project performance: risk-seeking behavior, diverse project cultures, and underdeveloped governance. Sanderson suggested the distinction between risk and uncertainty depends on the decision-makers view of the future and the availability of information.

Dynamic nature of IT projects. Organizational transformation regarding new and enhanced capabilities is increasingly an expectation of IT projects (Berman & Marshall, 2014; Bilgihan & Wang, 2016; Wu et al., 2015). Bilgihan and Wang (2016) explored the use of IT as a key enabler of an organization's strategy. The case study of the hospitality industry included interviewing senior leaders of hotels and hospitality IT vendors. The findings indicated that the implementation and the utilization of IT is a key enabler of an organization's competitive advantage. Bilgihan and Wang indicated that the competitive advantage gained by IT is more like when there is a high degree of integration of IT throughout the organization. Understanding how and why IT the integration of IT is critical to an organization is a factor that IT PMs should consider when identifying and analyzing project risks (Lech, 2013).

Lin and Parinyavuttichai (2015) examined the phenomena of risk escalation in IT projects and a need for a dynamic model for risk management. The specific case selected by Lin and Parinyavuttichai was a university IT development project because of a perceived lack of attention to risks and associated inadequate RM and escalation. The data collection by Lin and Parinyavuttichai included semistructured interviews of the project team members and the review of project documentation. The findings indicated that because of the dynamic nature of the IT projects not all project risks may be identifiable at the beginning of a project. Lin and Parinyavuttichai suggested practitioners should view risks from a social perspective as managing risks involve people versus solely looking at risks from a system or technical perspective. Additionally, there is an assumption that when project team member, stakeholder, or IT PM identifies a risk, the

risk escalation occurs promptly, as not escalating risks in a timely fashion create new risks or compounds existing risks. Overall, the findings indicated there is a need to evaluate the risks continually throughout the project's lifecycle to keep pace with the dynamic nature of an IT project.

Complexity. Kerzner (2013) highlighted that managing complex projects require more flexibility than managing traditional projects in a linear and prescriptive manner. According to Kerzner some aspects of complexity are the result of the essential need for a PM to delegate and empower others in the accomplishment of the project, which is comparable to the concept of translation associated with actor-network theory. Liu (2015) utilized complexity theory concerning the evaluation of the project's complexity and risks associated with the schedule, budget, and ensuring that deliverables meet organizational expectations. Liu examined the effects of control on project performance regarding complexity risk, and the relationship between control and performance. The study data were from 128 information systems projects from various Chinese industries. The findings indicated that complexity risk is a double-edged sword concerning control as too much control may create unintended risks, and too little control may limit a PMs' ability to manage risks (Liu, 2015)

According to Liu (2015), complexity itself is a risk to the performance and success of an IT project. Botchkarev and Finnigan (2015), Thamhain (2013), Klein, Biesenthal, and Dehlin (2015), and Piperca and Floricel (2012) all have recognized the need to address project complexity. Botchkarev and Finnigan evaluated the concept of complexity from a systems approach to project management and developed a framework

to evaluate and manage risks associated with project complexity. The outcome of the research was a complexity reduction framework that the researchers successfully tested on two projects. According to Botchkarev and Finnigan, the value of the framework comes from the ability to reduce project complexity risk into identifiable and manageable objects because PMs usually face a combination of complex project characteristics and elements.

Klein et al. (2015) reviewed the existing theoretical knowledge and the need for improvisatory practices concerning project management practices because of project complexity. Klein et al. also presented a conceptual model of resilient project management. Specifically, the researchers posited a meta-theory of resilient project management practices based on the logical implications of choice and preference. Klein et al. concluded that projects are also social systems that incorporate the non-linear and dynamic aspects of human actions. Therefore, Klein et al. suggested that the blind application of routine project management measures, which includes RM, might be counterproductive.

Thamhain's (2013) research examined project RM practices and team leadership in complex situations. Thamhain's field research included collecting data on the team performance of 35 technology-based project teams within 17 companies that provided a population of 535 professionals associated with the 35 projects. The exploratory field study design focused on four interrelated sets of variables: (a) risk, (b) teams, (c) the team leader, and (d) project environment. Thamhain identified three interrelated variables that affect RM; the variables are (a) the degree of uncertainty, (b) project complexity, and (c)

the impact of the risk to the project. Thamhain also illustrated the dynamics and cascading effects on contingencies because project leaders and senior managers might differ in their true cause assessment of performance problems. The findings indicated that a large number of the identified performance factors related to the human aspects and organizational context had a significant effect on RM, commitment, cooperation, and overall project performance (Thamhain, 2013).

Piperca and Floricel (2012) examined the origins and nature of unexpected events that affect complex projects from the perspective that projects are social systems. The multiple case study approach included 17 complex projects in the IT, construction, and pharmaceutical industry. Forty-five respondents identified 106 unexpected events. Piperca and Floricel identified nine categories of unexpected events that were from the intersection of the event predictability and the source of the risk. Of particular interest was the identification of the role that stakeholders play in unpredicted events, as the findings show that PMs tend to underestimate certain risks in complex projects (Piperca & Floricel, 2012).

Floricel, Michela, and Piperca (2016) indicated that traditional project management research reflects a view of project management that mainly focuses on classical rational choice, prescriptive tools, and rote techniques. Floricel et al., Pinto and Winch (2016), and Sage et al. (2011) suggested that researchers exploring the complexity of IT projects may benefit from the insights that may develop by using social theories rather than just relying on the traditional view of project manaagement. Floricel et al. investigated how project complexity influences project performance. The multimethod

research design included the use of a global survey of 81 projects from various sectors and the use of 17 qualitative case studies of complex projects within the transportation infrastructure, biopharmaceutical, and information and communication systems sector. The case study data included the results of 47 interviews and numerous documents initially collected in Piperca and Floricel's previous 2012 study concerning the origins and nature of unexpected events that affect complex projects (Floricel et al., 2016). The findings indicated that a higher perceived level of complexity reduces the risk of complexity affecting project performance. It is the heightened awareness of the situation by the PMs that facilitates the development of special strategies to mitigate the complexity (Floricel et al., 2016). The authors' quantitative analysis evaluating various facets of complexity in relation to project performance indicated that organizational and technical complexities have a negative effect on project performance.

Stakeholder associated risks. The project risks associated with stakeholders have been a top issue for researchers and practitioners since the early 1990s (Caron & Salvatori, 2014), given the varied perceptions, expectations, and implicit power of the stakeholders (van Offenbeek & Vos, 2016). Caron and Salvatori (2014) proposed a risk-based approach to obtaining quantitative risk estimates of the significant stakeholder's involvement in a project. Specifically, Caron and Salvatori suggested the integration between the stakeholder management and RM processes within the overall project management framework. The proposed system allows for a quantitative estimate of each stakeholder regarding the stakeholder's impact and the dynamics of the risks generated by each stakeholder. Caron and Salvatori's tested the proposed approach utilizing a case

study of an international oil pipeline project. The case study included more than 1500 singular stakeholders associated with one major project. Caron and Salvatori's test and analysis of the approach indicated that the evaluation of the risk dynamics generated by each stakeholder represents a systematic approach for PMs to identify risk mitigation actions and subsequently an appropriate strategy to influence the stakeholders' to increase project performance and success.

Van Offenbeek and Vos (2016) examined and developed a framework to link projects stakeholders to the concerns they articulate. Van Offenbeek and Vos used a case study approach and selected a case that concerned the implementation of an electronic health record (EHR) system in a large teaching hospital. By using a case study, the researchers verified the usefulness of the framework in mapping the issues to the stakeholders. Mapping the issues to specific stakeholders provides insight into the project management challenges and risks associated with managing each stockholder's interests and associated risks (van Offenbeek & Vos, 2016).

Hung, Hsu, Su, and Huang (2014) considered the end users of IT project deliverables as key project stakeholders. Hung et al. examined the impact of user related risk on overall project performance. Hung et al. subsequently proposed possible tactics to reduce and manage the potential negative impact of user related risk on project performance. The statistical analysis of the survey results collected from 240 practitioners confirmed their hypotheses. The analysis confirmed that (a) user risk negatively impacts project performance, (b) a relationship between the users and the project team along with

the development team reduces user risk, and (c) a developer's task based knowledge and coordination can reduce the negative impact of user risk on project performance.

Alotaibi and Mafimisebi (2016) reviewed existing literature from the perspective of whether or not the current project management approaches can derive benefits from examining 21st century organizations. Additionally, Alotaibi and Mafimisebi presented the theoretical challenges for project management in the 21st century. The impetuses for Alotaibi and Mafimisebi's research were the noticeably persistent risk related project failure rates and overruns. The findings indicated that project management is not just about managing a project from beginning to end, but it involves the creation of stakeholder relationships to understand the value of the deliverables to the stakeholder. Additionally, Alotaibi and Mafimisebi specified that using an existing project management framework can save time and money. The study findings also indicated that employing a project management approach could help eliminate wasted time and effort on irrelevant tasks. Alotaibi and Mafimisebi also suggested that using a project management approach from a strategic organizational level aids in justifying investments.

Disagreements between the senior organizational stakeholders and project team members concerning risk impact and allocation is also a source of risk that needs to be identified and managed (Papadaki et al., 2014). Papadaki et al. (2014) explored the effectiveness of RM in relation to the organizational context. The case study involved the Rolls-Royce aerospace division and two projects lasting more than five years. The findings indicated there is a need for (a) risk training designed for senior leadership (b) a dedicated risk manager, (c) using RM data for risk decisions, and (d) increased

communication. Papadaki et al. suggested by implementing the findings organizations may experience an increase in RM effectiveness because the implementation of the findings can create a more risk aware culture.

Effectively identifying and managing the risks associated with project stakeholders and overall stakeholder management are fundamental activities that positively affect project success (Eskerod & Huemann, 2013). Eskerod and Huemann (2013) examined the various approaches to stakeholder management and sustainable development practices incorporated within the commonly used international project management standards. Eskerod and Huemann's desk research included the analysis of the (a) individual competence baseline (ICB) from the IPMA, (b) PMBOK, and (c) PRINCE2 project management standards. Eskerod and Huemann observed a superficial treatment of practices related to stakeholder issues within each of project management standards reviewed.

Given the transformational and strategic nature of IT projects, there are potential project risks that PMs need to identify concerning the broader organizational project portfolio. Beringer, Jonas, and Kock's (2013) examined project related portfolio risks associated with stakeholder behavior along with the organization's management engagement. The quantitative study of Beringer et al. included 197 participant pairs of project portfolio managers and senior managers from Germany, Austria, and Switzerland. The majority of the data represented survey responses related to mainly internal IT projects along with research and development projects. The results indicated that only two stakeholders have a significant impact on project portfolio success. The two

stakeholders that have a significant impact are the line managers that supply resources to the projects and the project managers (Beringer et al., 2013). Beringer et al. also identified PMs as stakeholders, which is unusual if not unique within the reviewed literature. Beringer et al. suggested that PMs are also project stakeholders in non-project organizations because the PMs are competing for organizational resources. The completion for organizational is a common risk in functional organizations simultaneously executing multiple projects (Beringer et al., 2013). The results indicated that within a multi-project environment irrespective of the organizational construct, the alignment of the all PMs within an organization is a strategy to reduce competing resources and interdependency risks.

Another type of stakeholder that can introduce risk is the actual end users of the project deliverables; as a group, end users have expectations on the usability, functional ability, and applicability of the IT project deliverables (Keil, Rai, & Liu, 2013). For example, the end users can be the application users, wireless network users, or users of any technology from phones to personal computers. Liu, Yang, Klein, and Chen (2013) examined the risk factors related to end-users and found that they were a major threat to a project's success. The quantitative research included a survey of 202 IT system developers with the purpose of understanding how user and developer collaborating could benefit IT project risk management. The results indicated that management should explore more preemptive management interventions to avoid IT project risks (Liu et al., 2013). The researchers indicated that user-developer collaboration is an efficient method for risk management. Liu et al. examined the relationship between the user liaison and the

IT systems developers during the development phase of the project and the project risks attributed to the eventual system users that the user liaison represents.

Given the need to manage stakeholder-related risks, Mazur, Pisarski, Chang, and Ashkanasy (2014) developed and tested a model that evaluates a PM's personal attributes that may contribute to the success of a project. The survey data for the research came from a previous study concerning the employees and contractors who contributed to Australian Defense Projects. The researchers evaluated the personal attributes of emotional intelligence, cognitive flexibility, and system thinking of PMs. Mazur et al. posited some personal attributes help PMs recognize and mediate the risks to project success associated with internal and external stakeholder relationships. Mazur et al. concluded emotional intelligence and cogitative flexibility are factors in the developmental quality and effectiveness of PMs regarding project stakeholder relationships and project success. However, Mazur et al. stated that there was no identified relationship with the system thinking capability of a PM in combination with project stakeholder management to project success.

Qu and Wang (2015) examined project RM concerning the chaotic characteristics of an IT project. Qu and Wang utilized the Lyapunov exponent method to develop a framework to study risks from a systems perspective. Qu and Wang employed chaos theory as a lens to understand the interactions between risk factors and the system containing the risks. The Qu and Wang concluded that a project is more sensitive to risks and uncertainties during the development phases of the project because the initial phases

of a project are the phases where stakeholder influence can create a higher level of uncertainty and risk.

Islam, Mouratidis, and Weippl (2014) designed, implemented, and evaluated an RM model for software development. The research design also included a case study involving the Republic of Bangladesh Ministry of Planning and an action-oriented approach concerning the RM model. The findings supported the assumptions of Islam et al. that applying formal RM during the early stages of a project provides the PM early indications of problems that may affect the project performance and contribute to the likelihood of projects success. Islam et al. also indicated that not being able to achieve the expected goals of the stakeholders is a risk.

Internal and external environmental risks. Overall, IT project risks originating from environmental and organizational contextual complexities may come from both internal and external sources. Utilizing a quantitative research design, Liu and Deng (2015) examined the moderating effect of internal and external environmental risks on the overall performance of IT projects. Liu and Deng surveyed 128 senior IT executives from a wide range of Chinese companies. All the survey participants had experience dealing with at least one IT project with a budget greater than $15,999. Liu and Deng suggested that IT PMs should be more concerned with the management of internal risks while planning for external environmental changes. The results of the research also indicated that PMs have more control over the internal environment concerning RM, which implies that PMs should focus their risk-related efforts and resources internally. According to Liu and Deng PMs have little control over external environmental changes;

therefore, PMs should just plan on how to react to external environment changes versus any attempt to control the external risks as controlling internal risk has a positive effect on project performance.

Transformation risk management. IT projects are usually large-scale initiatives, and there is usually an awareness of the transformational intent of executing an IT project (Fridgen, Klier, Beer, & Wolf, 2014; Sidhu & Gupta, 2015). Fridgen et al. (2014) examined if the probability of IT project failures diminishes with the early detection of value and cash flow issues. Fridgen et al. utilized an action research model to design, apply, and evaluate a practical technique for value-based IT project steering throughout the project lifecycle. Fridgen et al. suggested that measuring the performance of a project in regards to meeting the desired specifications throughout the project lifecycle using the proposed continuous control technique may decrease the risk of an IT project failing to meet it expected business value.

Sidhu and Gupta (2015) examined the different predominant IT transformation practices and the major factors that influence IT and business objective alignment. Sidhu and Gupta conducted a survey of 100 IT and management professionals from various Indian organizations concerning project risks and risk factors. The results of the survey indicated that standard project and RM practices were key practices that the survey participants deemed necessary for a PM to use for the successful delivery of the expected organizational transformation.

The realization of the planned benefits of an IT project goes beyond just managing the risks associated with the schedule, cost, and quality of the project

deliverables (Coombs, 2015). Coombs (2015) investigated why despite substantial IT investments organizations fail to obtain the full benefits of the investments. Coombs research design included a case study of a local UK government council. Coombs highlighted that many organizations fail to realize the expected benefits from their IT projects because of narrow realization measures. Coombs suggested that in relation to risk analysis there was very little consideration by the project team concerning possible barriers to the delivery of the expected benefits from the project. Overall, Coombs concluded that existing benefits evaluation methods do not adequately address the role of organizational transformation in relation to the realization of benefits.

Several researchers have suggested that some PMs lack the ability to understand the role of the project within a larger organizational transformation effort. This inability is not only a risk in itself but failing to identify the risks associated with the expected transformation will significantly affect the project and overall program success (Coombs, 2015; Sato & Hirao, 2013; Teller, 2013; Teller & Kock, 2013). Teller (2013) examined RM at the project level in conjunction with RM at the project portfolio level. Teller's review of the literature indicated that research on the simultaneous exploration of RM at the project and project portfolio level is limited. The outcome of Teller's research was a framework for future empirical research on the influence of project and portfolio level risk on overall portfolio success. Teller and Kock (2013) utilized the research framework created earlier in 2013 by Teller and examined how project and portfolio RM influences project portfolio success. Teller and Kock's quantitative study included a sample of 176 midsize and large German firms. The results indicated that portfolio risk identification,

RM process formalization, and risk culture all have a significant positive impact on risk transparency.

Risk Management

There are many definitions, elaborations, and explanations of RM by organizations such as the International Standards Organization (ISO), the Project Management Institute, and the government of the United Kingdom in regards to PRINCE2. The successful implementation of an IT project depends on effective project risk management (Bouras & Bendak, 2014; de Bakker et al., 2014; Didraga, 2013; Javani & Rwelamila, 2016; Kutsch et al., 2013). The fundamental goal of RM is to minimize the impact of negative risks while maximizing the potential of the positive risks, frequently referred to as opportunities (Chawan, Patil, & Naik, 2013).

According to the Project Management Institute (2013), the six process groups that span the lifecycle of the project are (a) initiating, (b) planning, (c) executing, (d) monitoring, (e) controlling, and (f) closing. The Project Management Institute (2013) recommends 10 knowledge areas that PMs should utilize throughout the project's duration and across the process groups. Relevant to this research is the knowledge area of RM, as this knowledge area is concerned with the process and associated activities related to identifying and managing project risks that may increase project performance and the likelihood of project success. The methodology to manage project risks includes (a) risk identification, (b) qualitative risk analysis, (c) quantitative risk analysis, (d) planning risk responses, and (e) monitoring and controlling risks (Project Management Institute, 2013). The ISO methodology for managing project risks includes (a) risk

identification, (b) risk analysis, (c) response planning, and (d) monitoring and controlling risks (Grau & Bodea, 2013).

de Bakker, Boonstra, and Wortmann (2014) examined risk identification, which is the first step in project risk management. de Bakker et al. performed experimental research to understand how risk identification influences the outcomes of a project. The experimental research of de Bakker et al. consisted of a set of 29 tasks that each group had to perform. The tasks were exercises that lead to a solution that could only be right or wrong. The experiment used three types of exercises (de Bakker et al., 2014). Fifty-three project groups participated in the experiment, representing 212 participants of which 18 project groups performed no risk identification, 18 project groups performed individual risk identification, and 17 project groups performed risk identification plus discussion before project execution. The results of the study indicated that RM does affect project performance and success in a positive way. de Bakker et al. also noted that the use of a prompt list of common risks to support risk identification improved the results of the project team significantly. The results of the experiment also indicated that performing risk identification positively influences the attainment of the project objective and perceived project performance and success (de Bakker et al., 2014).

Javani and Rwelamila (2016) examined the status of IT project RM within the modernization and technology divisions of public sector organizations in South Africa. Javani and Rwelamila's quantitative research included a survey of the sector that resulted in 102 useable responses. The findings indicated that risk identification is an essential component of IT project risk management. The findings also indicated that knowledge

sharing is important to mitigating IT project risks. Javani and Rwelamila indicated that risk identification is an iterative process that entails the identifying and documenting possible risk throughout the lifecycle of the project. The Project Management Institute (2013) suggested that a risk register is an appropriate tool to document risks and their associated characteristics throughout the lifecycle of the project. However, the findings of Banerjee, Banerjee, and Poonia's (2014) literature review of risk analysis and management research indicated that there are limitations to the sole use of risk registers and statistical methods in project risk management.

Yim, Castaneda, Doole, Tumer and Malak (2015) explored the relationship between a project's classification and the types of risk that project managers encounter during the lifecycle of the project. The case study included the collection of interview data and supporting documentation from 11 engineering design projects within a single organization. The findings indicated that the degree of innovation and the organizational context can increase the risk profile of project (Yim et al., 2015).

There are two high-level approaches to risk analysis. The first approach to risk analysis is qualitative risk analysis, which is descriptive evaluation and ranking of the risks (Project Management Institute, 2013). On the other hand, quantitative risk analysis utilizes analytical tools and methods to predict the impact and probability of the risk occurrences and effect on project performance and ultimate success (Project Management Institute, 2013; Purnus & Bodea, 2013). Unfortunately, not all of IT PMs sufficiently identify and address IT project risks (Bouras & Bendak, 2014; Kutsch et al., 2013), and without adequate risk identification, the remaining phases of project RM are immaterial.

Chawan, Patol, and Naik (2013) examined the approaches to managing software project risks. Chawan et al. reviewed the pertinent literature and summarized the various frameworks and archetypes used for software project risk management. Chawan et al. identified seven project RM frameworks. The seven RM frameworks are (a) software risk evaluation (SRE) project RM paradigm, (b) team RM process set, (c) project RM framework, (d) project RM process, (e) RM processes, (f) soft risk model, and (g) the risk information technology (RISKIT) framework. Chavan et al. concluded that these models or frameworks are valuable guides to follow for effective project RM but did not specify if one framework was better than the rest.

Sayegh's (2014) quantitative study examined project RM practices in the United Arab Emirates. Sayegh received 45 usable surveys from the 120 surveys distributed to construction professionals. Sections two through seven of the survey asked participants about their perceptions of the implementation of risk planning, risk analysis, risk response planning, and monitoring and controlling. Section eight of the survey focused on the barriers to implementing risk management. The results of the study reflected how the participants perceived the use of 39 RM activities or elements of the four major project RM processes. Based on the findings, Sayegh made several recommendations such as the use of a risk register for risk prioritization and the idea that everyone involved in the project needs to understand the RM process.

Hwang, Zhao, and Toh (2014) investigated the RM within small construction projects performed in Singapore. Hwang et al. specifically examined the effect of RM on the overall project status along with the barriers and impact of RM on project

performance. The research design included the use of a survey questionnaire. The researchers received 668 responses submitted by 34 companies. The results indicated that there was a low level of RM implementation in small projects. The barriers to implementing RM small construction projects included (a) a lack of time, (b) a lack of budget, (c) a low profit margin, and (d) the projects not being economical.

Irizar and Wynn (2015) developed an RM analysis framework to identify some of the weakness in the current RM practices. Irizar and Wynn used a case study approach to evaluate the developed framework and to examine the issue of IT project failures within the automotive sector based on Irizar and Wynn's assumption that RM issues are a contributing factor to IT project failures. Irizar and Wynn utilized the risk registers of four IT projects as a data source for the evaluation of centricity of IT project risks in organizations to improve IT project risk practices. Irizar and Wynn's model of centricity incorporates four centric constructs. The four constructs are (a) a person-centric view of risk identification versus object risk identification, (b) RM methodology centricity, (c) risk ownership centricity, and (d) a centric risk treatment versus a balanced risk treatment. If effectively used, Irizar and Wynn suggested centricity has the potential for significantly improving project outcomes when taking into consideration that risk identification is person-centric whereas risk assessment is methodology centric.

Most IT PMs and team members perform RM but Kutsch and Hall (2009) examined the rationale of not using RM in IT projects. The research design included a literature review, an exploratory stage, and confirmatory stage. Kutsch and Hall performed 18 interviews across 11 companies. Subsequently, the researchers developed

and sent survey to 750 IT PMs who were members of the Project Management Institute. The researchers revealed that a lack of ownership and expertise were reasons why individuals did not use RM when managing IT projects. Kutsch and Hall also indicated that problems of hindsight, cost justification, and anxiety were reasons for not performing risk management. The findings indicated that the predominant reason for IT PMs not engaging in RM was the problem of justifying the cost in terms of time and effort.

Risk management approaches. Carvalho and Rabechini (2015) examined the relationship between RM and project performance. Carvalho and Rabechini utilized a mixed methods approach to study the importance of a project manager's soft skills in managing risk and the impact of soft skills on project performance. The study included three phases, in the first phase Carvalho and Rabechini conducted a systematic review of the 3471 pertinent articles. The second phase was a survey research involving 415 project management professionals. The third phase included interviewing of 263 project management professionals, which were mainly project managers with more than five years of experience.

Menezes, Gusmão, and Moura's (2013) objectives were the identification and definition of project indicators to support the identification and analysis of software project risks. Menezes et al. performed an ad-hoc literature review. Through the systematic mapping of project reports, the researchers collected evidence related to metrics, indicators, and pertinent information needed to conduct risk assessments. Menezes et al. then combined the findings of the systematic mapping with the Software Engineering Institute's risk taxonomy to produce a set of categorized indicators for

software development projects. Menezes et al. identified the following risk indicators: (a) number of changes, (b) source code metrics,(c) complexity, (d) cost, (e) design customization, (f) organizational process maturity, (g) quality testing, (h) risk exposure indicators, (i) project size, (j) team size and skills, and (k) time constraints.

Carvalho and Rabechini (2015) stated there are two broad categories of RM approaches. These two approaches are a soft approach and a hard approach to risk management. The soft approach to RM includes the following variables: (a) context, (b) a strategic view of risks and uncertainties, (c) risk mediation information, (d) attitude, (e) assignment, and (f) the relationship with stakeholders (Carvalho & Rabechini, 2015). The hard approach to project RM includes (a) risk planning, (b) risk identification, (c) risk analysis, (d) risk monitoring, and (e) control (Carvalho & Rabechini, 2015). According to Carvalho and Rabechini, the two approaches to risk analysis are qualitative and quantitative assessments. The findings of Carvalho and Rabechini's research indicated that the adoption of a project management framework representing the hard side of RM is not sufficient for effective uncertainty management. The findings highlight the need for project managers to use their soft skills to engage project stakeholders when faced with unforeseeable uncertainties, as the use of intuition by a PM allows for the quick adaption to new risk environments. Carvalho and Rabechini concluded that the correlation of the hard and soft sides of RM have a moderating effect on project complexity and ultimately project performance and success. However, the hard side of RM is more effective in managing risks that may affect the schedule versus the soft side of RM that is adaptable to other types of risks.

Grant (2016) examined the use of business analysis methods in business process reengineering projects. The research design included 12 case studies of existing business reengineering efforts. Grant determined that problem analysis, activity elimination techniques, and business process analyses are the preferred techniques for the identification of issues and risks related to technical problem analysis and process improvement projects. Additionally, Grant determined that the use of activity-based costing and root cause analysis is infrequent because root cause analysis requires specific skills, and activity-based costing is limited to discrete business activities.

Osipova and Eriksson (2013) examined joint risk management (JRM), which is an approach to RM that emphasizes collaboration between the project actors. Osipova and Eriksson utilized a case study design and contingency theory to investigate how flexibility-oriented management systems and control-oriented management systems affect the use of JRM in two construction projects. Osipova and Eriksson concluded that JRM requires the use of flexibility for dealing with unforeseen events and control for managing identified risks.

In the form of a position paper, Dyer (in press)examined the assumptions concerning a unified approach to all project management risks including the risks related to social responsibility. Dyer indicated that viewing RM by using the lens of cultural sense making in megaprojects is a relatively new occurrence. Dyer's purpose was to identify gaps with RM practices within megaprojects. Dyer suggested the use of cultural sensemaking as a differentiator in the RM of social responsibilities in large public and private projects.

Control. The control processes within an RM framework are a sub-set of the overall RM process (Project Management Institute, 2013). The extent of control applied by a PM concerning the appropriate RM strategy depends on the PM's assessment of project complexity and a perceived level of personal accountability by the project manager (Liu & Deng, 2015; Liu & Wang, 2014; Zwikael & Smyrk, 2015). As perception is relative, the use of a structured approach for IT program and project RM may be an appropriate measure of control (Rasheed, Wang, & Lucena, 2015). According to Rasheed, Wang, and Lucena (2015) such frameworks include the Project Management Institute's version, or the use of risk leveling in program environments (RLPE), as these frameworks have a positive effect on projects within the program and the program overall. Although the RLPE framework addresses the issues at an organizational level, there is also a need for the effective management of risks by proceduralizing the RM process across all projects within the program. As the risks associated with a single project can influence the outcomes of another project in the program or portfolio (Teller, Kock, & Gemünden, 2014).

Lehtinen, Mäntylä, Vanhanen, Itkonen, and Lasseniu (2014) conducted an in-depth qualitative study on software project failure. The multiple case study design included four software companies. The data collection process utilized the root cause analysis (RCA) method. The outcome of the research is consistent with other research in reaffirming that there is no single cause of project failure. Lehtinen et al. also noted another common theme related to project failure concerns a lack of understanding of the context in which the execution of the project occurs. Lehtinen et al. suggested that there

is a need for IT PMs to focus on control and understand the internal processes that span an organization to reduce the risks associated with IT projects.

In contrast to focusing on just the need to control project risks, Acebes, Pajares, Galán, and López-Paredes (2014) proposed a framework for project control under uncertainty, which included the testing of the framework against three case studies. Acebes et al. incorporated the earned value management (EVM) technique into the project risk analysis and management. At the core of the framework is the integration of uncertainty and risk control. To evaluate the accuracy and value of the model Acebes et al. used a multiple case approach to compare the results of previous project network research concerning project evaluation and review technique (PERT). The outcome of applying the new method to three case studies demonstrated the model was capable of the identifying delays in both cost and time with specific percentiles of probability regarding planned value impact. Acebes et al. did acknowledge the proposed framework only captured data concerning earned value management (EVM). Additionally, Acebes et al. noted that the utilization of just the PERT may not be an effective technique, as the estimates, in general, are 30% under regarding the achievement of the stated time.

Risk lists and categorizations. The use of risk checklists that contain typical risks and risk categories is one approach to risk management. The premise of this approach is to provide PMs a guideline and baseline of potential risks the project may encounter (Altahtooh & Emsley, 2015). Altahtooh and Emsley (2015) explored the risk factors that contribute to IT project success and failure using a qualitative research method. Altahtooh and Emsley used the critical incident technique as the approach for

interviewing 15 IT PMs representing 30 projects within the Saudi Arabian IT industry. Altahtooh and Emsley identified 13 risk factors within the managerial context, three risk factors relating to technology, and two financial risk factors. Altahtooh and Emsley proposed a framework for risk factor classification along with a model based on the risk factors identified in the study to forecast the outcome of the project.

The results of various studies including Sweis (2015), Elzamly and Hussin (2014), and Shrivastava and Rathod (2015) identified various IT project risks that can provide practitioners a list of the most likely occurring IT project risks and risk categorizations. Sweis investigated the failures of IT projects in Jordanian organizations. Through the analysis of the previous literature on IT project failure, Sweis identified the prevailing factors that affect IT project success and failure. Sweis performed a quantitative study using a questionnaire instrument to collect information on the relative contribution of each factor to project failure. The sample population included individuals working in information technology departments within 17 public and private companies in Jordan. From the 62 usable returned questionnaires, Sweis identified five categories of risks that lead to IT project failures. These categories consisted of (a) a high degree of customization in the application, (b) changes in design specifications, (c) underestimation of the timeline, (d) poor internal communications, and (e) lack of user involvement from the outset. Sweis concluded that a practitioner's awareness of the common risk factors may reduce the likelihood IT project failure.

Emazaly and Huusin (2014) examined the ability to mitigate software development projects risks in the analysis phase of the project. Elzamly and Hussin

undertook quantitative research that included a questionnaire containing concerning the top 10 software risk factors and 30 RM techniques. The analysis of the data collected from 76 software project managers from Palestinian software development companies indicated that the IT PMs believed knowing all the software risks are important. The results also indicated that the majority of the times the PMs use RM techniques. Elzamly and Hussin concluded that project RM would greatly improve the likelihood of software project success.

Shrivastava and Rathod‘s (2015) intention was to develop a comprehensive listing of risk factors that affect IT projects managed by IT PMs who use an agile project management approach in distributed software development (DSD) projects. Shrivastava and Rathod also undertook the research to identify what RM methods practitioners frequently use for controlling the project risks. The researchers utilized a constant comparison method in the qualitative analysis of the interview data collected from 13 practitioners and the supporting project documents related to 28 projects from 13 separate organizations. Shrivastava and Rathod concluded that the traditional approaches to managing project risks associated distributed software development models may not adequately address the complexities created in a distributed development environment.

Risk management frameworks, methods, and tools. The literature on the use of frameworks like the Project Management Institute’s PMBOK (2013), Agile as advocated by Binder, Ailluad, and Schilli (2014), or PRINCE2, indicates there should be a rationale for the selection and utilization of a specific framework. Bouras and Bendak (2014) recommended the utilization of a systematic framework or methodology for RM to

increase project performance. Bouras and Bendak examined the causes of project disruptions, failures, or delays. The quantitative study included a questionnaire concerning the clarity of the vision, the triple constraint, human resource management, and risk management. The final data collected represented the responses from 30 experienced project developers and engineers working in the large IT department of a single public organization. The results indicated that (a) 60% of IT project managers do not fully evaluate the risks, (b) 30% of the survey respondents stated the quality of the project scope definition is an issue, and (c) 27% of the respondents indicated that poor schedule and costs issues are also problems that can cause disruptions or project failure.

Brookfield, Fischbacher-Smith, Mohd-Rahim, and Boussabaine (2014) set out to resolve a debate related to the possibility of empirically validating an RM framework. The quantitative analysis of the data collected from a large survey of 324 IT PMs indicated that it is feasible to identify and group project risks and link them to the various project life cycle phases. Brookfield et al. also suggested that utilizing a framework that guides the practitioner to take into consideration the contexts of the different project lifecycle phases may enhance a practitioner's understanding of the relationships between all the risk factors.

Lee and Baby (2013) developed and proposed an agile RM framework for IT projects based on a service-oriented architecture. The researchers carried out scripted interviews with four industry experts to validate the proposed framework. Lee and Baby indicated that the framework helps in the identification of the risks related to the dynamic interactions between the people, the processes, and technology.

The use of an integrative framework to manage project risk planning is another proposed solution used to reduce the impact of risk on IT project performance (Hu et al., 2013). Hu et al. (2013) undertook a research project to develop and recommend an integrative framework for software project risk planning. Hu et al. successfully demonstrated the value of the proposed model through use case testing. The framework proposed by Hu et al. includes three components, a risk database, a risk analysis module, and a risk-planning module. The risk database is a collection of factors and outcomes of previous projects. Although the model incorporates the many to many relationships among the project risks, the model does not account for the order of execution of the RM actions (Hu et al., 2013). Therefore, the compound effect of any risk identification or mitigation actions is only equal to the maximum effect of the individual actions, which is a limitation when dealing with the complexity and dynamic relationships associated with IT projects (Hu et al., 2013).

Browning (2014) presented a quantitative framework for managing project value, risk, and opportunity. The research gap Browning identified was that the conventional techniques based on earned value management focused on time and cost performance and did not address quality, uncertainty, risk, and opportunity. The framework developed by Browning included (a) desired value, (b) goal value, (c) likely value, and (d) actual value. Additionally, Browning's risk modeling used the average or expected loss from a set of potential outcomes that according to Browning is the expected cost of uncertainty. Browning highlighted that all the key attributes of uncertainty and value are the ones that are important to project stakeholders.

Marcelino-Sádaba, Pérez-Ezcurdia, Echeverría-Lazcano, and Villanueva (2014) created and presented a project management methodology based on RM for small businesses that do not normally include projects in their normal operations. The research design included the qualitative analysis of meeting and interview data from 72 Spanish companies from different industrial sectors. Validation testing of the methodology consisted of applying the method to five different, real projects of Spanish service firms or industrial companies. The projects included innovation, IT, and management systems implementations. The resulting methodology included risk checklists with recommended actions, risk indicators, templates, and basic tools.

Pinto and Winch (2016) reviewed the previous research streams influenced by the existing management of project (MoPs) framework. Pinto and Winch suggested that project management researchers should reassess the perspective of solely focusing on project management tools, frameworks or organizational impact and begin to examine the real benefit of the project deliverable. Pinto and Winch also suggested that various approaches that may benefit future project management research one of which was the use of actor-network theory.

Harding's (2014) positional paper was a basic review of the fundamental elements of project management that also included a suggestion related to risk management. Harding wrote the article with the intention to provide novice PMs or part-time PMs suggestions and tools for project success. The seven tools Harding presented included the use and creation of a (a) project scope document, (b) project budget, (c) project schedule,

(d) organization chart, (e) action-item list, (f) project execution plan, and (g) risk register. Harding also reinforced using the tools throughout the lifecycle of the project.

Ahern, Leavy, and Byrne (2014) examined complex project management from the perspective of a complex problem. Ahern et al. examined the pertinent literature and the previous findings and data from Ahern's (2013) thesis concerning project management capabilities in complex organizations. Ahern et al. stated that the use of traditional tools, skills, and frameworks in the management of projects assumes there is little learning beyond the application of prior knowledge. However, Ahern et al. suggested that project management is a form of complex problem solving throughout the duration of all phases of the project. Ahern et al. also highlighted the need to foster a mutual interest among the individuals involved in the project. The concept of fostering a mutual interest is a key element of translation as described by Callon (1986) in relation to actor-network theory.

The concept of looking at risk across multiple projects constitutes leveling, and it is important that PMs also understand how the risk of one project can affect other projects within the organization (Rasheed et al., 2015). Rasheed et al. (2015) investigated the implications of RM concerning the program management discipline and highlighted why programs are riskier than projects. The quantitative research design included the purposeful sample of Pakistani telecommunication 23 experts from various PMOs with 5 to18 years of experience. The survey design included questions concerning the prioritization of RM barriers. The findings indicated 13 barriers to project risk management. The top five identified barriers to project RM included, (a) monetary constraints, (b) schedule constraints, (c) organizational environment instability, (d) lack

of management's commitment to RM, and (e) an inadequate risk aware organizational culture. The lowest identified barrier to RM was the lack of knowledge of the RM process.

Ward (1999a) expanded on the application of a generic framework from a previous effort and highlighted that when applying a framework project-management, practitioners should consider both the nature of the actors performing the RM and the project context. Ward further indicated that the RM framework and the associated RM processes may need to be modified based on the work environment. Ward maintained that understanding the characteristics of the parties partaking in RM is also important. Ward specifically suggested that there is a need to understand an individual's (a) capability and experience, (b) perceived responsibilities, and (c) motivation when individuals are undertaking RM within a project.

Of all the proposed methods, there is still the classic risk evaluation of the probability and impact of the risk. López and Salmeron (2012) through convenience sampling consulted 12 experts on information technology projects and solicited their opinions on 46 IT project risks the researchers collated from the literature. Based on the findings, López and Salmeron suggested that practitioners should follow a strategy that eliminates the root causes of risks rather than the symptoms for the risks that have a high probability of occurrence and high-impact. López and Salmeron suggested practitioners should utilize a prevention strategy for risks that have a high impact and low probability. López and Salmeron also suggested that practitioners employ a practical approach to

risks based on probability and utilize an impact versus probability matrix to select the most appropriate risk response strategy.

Taylan (2014) proposed an analytical tool based on fuzzy logic to evaluate the IT project risks related to learning organizations. The IT project risks were categorized utilizing fuzzy sets and systems to mitigate or eliminate highly impactful risks. Taylan's premise was that IT project risks with incomplete or vague information bring about ineffective risk management. Taylan conducted a survey of the causes of IT project failure in a Turkish organization to verify the outcome of the fuzzy expert system. The participants included 10 staff members and 40 middle or senior managers. The results of the survey indicated that a lack of organizational learning is a major obstacle to successful IT implementations. Additionally, the findings indicated that risks concerning (a) change resistance, (b) end user's expectations and involvement, (c) insufficient training, and (d) lack of senior leadership are all potential obstacles to successful IT implementations (Taylan, 2014).

López and Salmeron's (2014) goal was to mathematically model enterprise resource planning (ERP) maintenance risks on project outcomes with a reasonable degree of accuracy. López and Salmeron built a fuzzy system, which incorporated fuzzy cognitive maps (FCMs) of ERP maintenance risks because FCMs facilitate the modeling of complex phenomena based on the subject matter experts' perceptions. Specifically, by utilizing FCM as an underlying tool, the researchers suggested that PMs are capable of modeling the outcomes and risk perceptions along with their obscure interactions. The

notion of modeling the obscure interactions is similar to the concept of actor agency associated with ANT as described by Dwiartama and Rosin (2014).

Zhang and Fan (2014) proposed a novel approach for the selection of a risk response strategy. The approach utilizes an optimal solution method to select a desirable RM strategy to cope with risk events. The mathematical model uses a zero-one integer programming technique to solve discrete optimization problems. The model allows for the selection of several RM pathways to support the PM's decision. The model functions on selecting the most desirable risk response strategies. Overall, Zhang and Fan's method produces a risk response strategy that requires balancing the project's cost, schedule, and quality of the project deliverables against the personal preferences and objective requirements of the PM, team members, and other stakeholders. According to Zhang and Fan, various actors can see the same risk situation in quite different ways that may limit the utilization of method. Zhang and Fan also indicated that another limitation of the model is an assumption that risk events are mutually independent.

In contrast to proposing an RM framework or a method to increase project performance, Kutsch, Denyer, Hall, and Lee-kelley (2013) examined why IT PMs disengaged from the RM activities during the lifecycle of the project. Kutsch et al. utilized a multiple case study design that encompassed 21 projects across 10 organizations. Kutsch et al. examined the phenomenon through the collection and assessment of project documentation and interviewing the PMs associated with 21 identified projects. The findings indicated five reasons why PMs may disengage from RM activities: (a) legitimacy, (b) the value of the activities versus the benefits, (c) a

diminished perspective on the real impact and probability of the risk, (d) competence regarding controlling the risk, and (e) a lack of assumed authority. The potential rationale for the disengagement is that some PMs perceive that rule-based, prescribed, and over-designed RM frameworks are sometimes not appropriate for the project environment (Kutsch et al., 2013). However, complete disengagement is not practical; therefore, some balance within routine-based RM may be a complementary approach (Kutsch et al., 2013).

Project manager skills. Araújo and Pedron (2015) identified RM as a PM skill that affects project performance and success. Araújo and Pedron performed an exploratory case study with the purpose of identifying project manager competencies that project managers should develop for project success. Araújo and Pedron conducted in-depth interviews with 16 Brazilian IT professionals whom all had 5 years of experience working on IT projects. The analysis of the interview data yielded 10 project manager competencies and 14 project success criteria that the participants referenced relating to the iron triangle. The top five project management skills, included alignment, resource utilization, time management, scope management, and risk management. All the respondents indicated the importance of the project manager role in project performance and success. Araújo and Pedron concluded there is a need for project managers to develop good communication skills for the successful communication with team members, stakeholders, and executives, along with business acumen, and people skills.

Effective communication is an identified key skill utilized by PMs in RM (Carvalho, 2014; de Bakker et al., 2014), as it is needed to facilitate a mutual

understanding of the project risk. The findings from the previously mentioned examination of the relationship between RM and project success by Carvalho and Rabechini's (2015) also indicated that both the hard and soft skills of a PM related RM has a positive effect on project success. Carvalho and Rabechini noted the primary influence of a PM's hard skills was on managing the risks affecting the compliance to the project schedule versus the soft skills of a PM concerning a PM's ability to adapt to various types of risks.

Keil, Lee, and Deng (2013) explored the critical skills needed for successful IT project management. Keil, Lee, et al. used the Delphi method a panel of 19 IT RM experts over the course of eight weeks to identify, consolidate, and evaluate critical PM skills. The results of the research initially identified 48 skills associated with IT project management. Then the panel of experts refined the 48 skills down to 19 critical skills. The top five critical skills identified by Kiel et al. include (a) leadership, (b) communications, (c) scope management, (d) listening, and (e) project planning.

Carvalho (2014) examined the communication management in IT projects and the barriers to communication from both an individual and organizational standpoint along with the specific perspectives of PMs, PMO staff, IT staff, and business line personnel. Carvalho's research included a case study of a large IT service provider that included 78 interviews of managers, IT personnel, and the PMO staff. Carvalho concluded that although the stakeholders considered communications important, project managers do not follow the communication practices endorsed by the PMO and incorporated within the organizational project management practices.

Zahra, Nazir, Khalid, Raana, and Majeed's (2014) positional paper was a review of the existing relevant literature concerning the desirable traits exhibited by PMs for successfully managing projects. Based on inputs from experts and a literature review, Zahra et al. identified hard and soft skills that PMs should possess. The specific skills that Zahra et al. identified were an organization, communication, change management, negotiation, interpersonal skills, and technical knowledge. Zahra et al. concluded that PMs need various key skills that they need to enhance periodically given the increasing complexity of the technology, scope, and associated technological and organizational change associated with IT projects

Mazur et al. (2014) primarily focused on the PM to stakeholder relationship in an examination of stakeholder associated project risks. However, Mazur et al. also evaluated cognitive flexibility and gauged the PM's emotional intelligence. The results indicated that emotional intelligence and cognitive flexibility are contributing factors to a PM's stakeholder relationship competency (Mazur et al., 2014). A PM's stakeholder relationship competency relates to the effectiveness of a PM in RM, of the risks associated with stakeholders and ultimately project success (Mazur et al., 2014).

Sarigiannidis and Chatzoglou (2014) examined the relationship between the three variables of project risk, process quality, and the quality of the people, and the individual and cumulative effect the of the three variables on software project success. The researchers utilized an online survey and asked the participants to evaluate 27 proposed risks according to their possibility of appearance and impact regarding cost, schedule, technical performance and the collaboration of the project team. The final sample of the

quantitative study consisted of 112 responses from 63 Greek enterprises. The respondents were mainly the project manager or project team member who worked on the IT project. The key results of the research indicated that people quality has a negative effect on project risk level (Sarigiannidis & Chatzoglou, 2014). However, there was no significant relationship between process quality and the project's exposure to risk. Sarigiannidis and Chatzoglou also found that a poor level of quality concerning the PMs' skills, along with staff experience, training, and motivation, had a negative effect on the risk environment. The findings of this research suggested that among people, process, and tools, the quality of the PM skills and the associated project staff is an important factor in reducing risk.

Improvisation and flexibility. Several studies suggested that improvisation and flexibility are appropriate ways to address complexity, risks, and uncertainty regarding the context and environment of a project (Besner & Hobbs, 2012; Klein et al., 2015). Besner and Hobbs' (2012) research indicated that a PM utilizes more improvisation concerning RM when the project is more complex, innovative, or large. Additionally, there is a shift in project management in which RM is moving from just tools and techniques to the evaluation of human behavior and interactions (Besner & Hobbs, 2012; Leybourne, Warburton, & Kanabar, 2014).

Leybourne, Warburton, and Kanabar (2014) examined the evolving nature of project management and compared it with the evolving nature of traditional management practices. Drawing from popular management literature and project management standards, Leybourne et al. compared the two constructs against six forces that are currently redefining the future of management. The six forces are (a) the virtualization of

work, (b) the rise of open-source work practices, (c) the decline of the organizational hierarchy, (d) the transcendence of Generation Y values, (e) global market turmoil, and (f) the imperative of business sustainability. The results of the research indicated that project management practices between 2004 and 2014 have been evolving comparatively in a similar manner as line management practices. Leybourne et al. suggested the similarity is because PMs are dealing with the same forces as line management but in a more focused manner. Leybourne et al. indicated that like traditional management, project management practices are relying less on traditional tools and techniques and evolving in a manner that can address the flexible and nuanced based behaviors associated with today's progressive organizations.

Klein et al. (2015) suggested that the application of a prescriptive project framework not be flexible enough to adapt to the context surrounding every project. Klein et al. also indicated that there is a need for a PM to understand the project's environment and surrounding context to implement an appropriate level of RM that is in line with the project's characteristics, related to complexity, the environment, and organizational alignment. Thamhain (2013) also indicated that the effectiveness of project RM in a complex project environment must augment the analytical methods with more adaptive and improvisational methods that rely on the gathering of a wide spectrum of factors and judgmental decision-making. The impact of contingencies and RM based on organizational conditions were found to have a positive effect on project performance (Thamhain, 2013).

Risk management and team culture. A project team's culture can have an effect on risk management from several perspectives. Ramingwong and Ramingwong (2013) specified that IT professionals who have a high power distance index have a tendency to avoid making straightforward estimations. Ramingwong and Ramingwong also indicated that the fear of consequences is one cultural factor that may explain why individuals may keep quiet about project issues. Hartono, Wijaya, and Arini (2014) understood that culture is an important aspect of a project team's maturity in relation to effectively managing risks. Rasheed, ChangFeng, and Yaqub (2015) identified that an inadequate risk aware organizational culture can be a barrier to implementing risk management.

The "mum effect" is a scenario where one or more individuals associated with a project decide not to report problems. Ramingwong and Ramingwong (2013) investigated this phenomenon from the perspective of software project teams. Ramingwong and Ramingwong's research included a review of three cases where the phenomenon caused a significant impact, as well as a survey of 38 software engineering students. The findings indicated that 33 out of 38 students had experienced the mum effect, but it only happened occasionally. Ramingwong and Ramingwong concluded that culture information asymmetry, time urgency, language barriers, and consequences are factors that influence the mum effect phenomenon.

Hartono et al. (2014) quantitative research developed and empirically verified a model of project risk management maturity (PRMM). Hartono et al. used a pilot study for content validity. The researchers subsequently administered a survey in the Indonesian construction industry. The quantitative results reflect the analysis of 35 valid responses

from respondents who were either top, middle, or first-line management. The results of the research produced an empirically verified maturity assessment instrument for project management. The theoretically derived model consisted of four dimensions: cultural and leadership; RM processes; organizational experience; and tools, methods, and application.

Keil, Smith, Iacovou, and Thompson (2014) identified five inconvenient truths about project status reports and provided recommendations to avoid the pitfalls associated with the inconvenient truths. Keil et al. (2014) used information from 14 studies that one or more of the authors participated in between 1999 and 2014 to produce the five recommendations. The five inconvenient truths about project status reporting are as follows: (a) Executives cannot rely on staff to speak up about problems. (b) A variety of reasons can cause people to misreport about project status. (c) An aggressive audit team cannot counter the effects of project status misreporting. (d) Executives often ignore bad news. Of particular interest is the inconvenient truth concerning the reasons that can cause people to misreport information in project status reports. Keil et al. (2014) noted that individual personality traits, cultural norms, and work climate can all be reasons why individuals may misrepresent information.

Rasheed, ChangFeng, et al.'s (2015) quantitative study included the purposeful sample of Pakistan 27 telecom experts from various organizational project management offices with 5 to 18 years of experience. The survey questions solicited responses concerning the prioritization of RM barriers utilizing a Likert scale response format. The results indicated 13 RM barriers. The top five barriers to project RM included (a)

monetary constraints, (b) schedule constraints, (c) organizational environment instability, (d) lack of management's commitment to RM, and (e) an inadequate risk awareness organizational culture. The lowest barrier to RM was the lack of knowledge of the RM process.

Continuous risk management. The use of continuous project RM is a useful technique to include in an RM strategy (Chawan et al., 2013; De Wet & Visser, 2013; Hu et al., 2013). As it is typically impossible to identify and mitigate all the project risks in one pass, Hu et al. (2013) suggested continuous risk management (CRM) throughout the project lifecycle. De Wet and Visser, (2013) identified the CRM method from the Software Engineering Institute as a tool PMs can utilize for continuously managing project risks. The CRM method provides a framework to facilitate decisions concerning IT project risks by continuously evaluating what could go wrong, assessing the impact of the risk, and mobilizing risk mitigations strategies. De Wet and Visser's research also included a survey of 35 South African software IT professionals, which showed RM positively affects IT project success. Specifically, De Wet and Visser's research indicated a mean project success rate of only 37% in South Africa is not significantly different from the project success rates outside of South Africa.

Knowledge management Neves, da Silva, Salomon, da Silva, and Sotomonte (2014) explored RM in software projects through knowledge management techniques. The research design included four separate case studies of Brazilian companies, a survey instrument, and semistructured interviews. Neves et al. identified 15 knowledge transfer techniques related to risk management. The list included the knowledge transfer

techniques of brainstorming, meetings, and narratives along with customer or stakeholder interactions. However, the results indicated that knowledge transfer was not endemic in the organizational culture of the firms evaluated, and RM was consistently more reactive than preventive. The Neves et al. suggested the reactive nature of RM may be indicative of the lack of a knowledge repository.

Serpella, Ferrada, Howard, and Rubio (2014) focused on creating a knowledge-based approach to risk management. The research methodology included a literature review and the subsequent creation of an assessment model and analysis tool to evaluate the maturity of organizational RM frameworks and processes. A panel of experts evaluated the prototype method and assessment tool. Serpella et al. suggested that the model and tool could assist organizations in the creation of a more formal approach to RM and provide organizations with a way to leverage their experience and knowledge.

Oun, Blackburn, Olson, and Blessner (2016) investigated the relationship between project management process and knowledge management at the enterprise level. Oun et al. initially sent out a survey to 1,118 project management practitioners and received 128 usable responses. The results indicated a significant relationship between the four pillars of knowledge management and the project management areas of knowledge such as risk management. Additionally, the results indicated that the stakeholder management and human resource management have a strong association with organizational knowledge management. Oun et al. also suggested that identifying skills and following up on who knows what is critical to the utilization of undocumented tacit knowledge.

Reich, Gemino, and Sauer (2014) evaluated the relationship between knowledge management and the performance of IT-enabled organizational projects. Reich et al. posited that knowledge management is a key factor to project performance when mediated with knowledge alignment. Reich et al. analyzed survey data collected from 212 IT-enabled organizational projects using structural equation modeling. The findings indicated that PMs who achieve knowledge alignment among the organizational change team, the IT team, and the project governance team could have a significant positive impact on obtaining the desired organizational value from the project.

Alkhuraiji, Liu, Oderanti, and Megicks (2016) investigated the impact of knowledge management processes on strategic decision-making concerning the implementation of innovative IT projects in Saudi Arabia's public and private sectors. Alkhuraiji et al. used an exploratory case study approach including the use of several theories relating to organizational culture, capacity, and strategy along with theories concerning knowledge management. Using thematic analysis, Alkhuraiji et al. identified that organizational factors, knowledge channels, networks initiation processes, and knowledge network environmental factors are four factors that may have an impact on structured knowledge networks related to IT innovation projects and other project implementations.

In the previously mentioned research by Javani and Rwelamila (2016) concerning the IT project RM within public sector organizations of South Africa, Javani and Rwelamila stated the value of knowledge management processes in the management of IT project risk information. Javani and Rwelamila also suggested that knowledge

management regarding the collection and dissemination of risks should include knowledge sharing beyond the IT PM and project team. Javani and Rwelamila concluded that the inclusion of the broader organization and the executive stakeholders in knowledge management and sharing would most likely increase project performance and success.

Pharmaceutical Industry

The general use and the value of IT in relation to producing efficiencies in the pharmaceutical industry span several functions from early research and development (R&D) to sales. Information technology project deliverables enable innovation or are the innovative capability or functions expected by an organization (Chatterjee, Moody, Lowry, Chakraborty, & Hardin, 2015; Cui, Ye, Teo, & Li, 2015; Dong & Yang, 2015).This innovation creates unique risks that IT PMs need to address given the high failure rate of innovation projects (Bowers & Khorakian, 2014). Specific examples of IT in the pharmaceutical industry include (a) ERP and human resource (HR) systems (Cheepchol, 2016; Hillisch, Heinrich, & Wild, 2015; Mustafa, 2013; Sultanow & Brockmann, 2013), (b) laboratory information management systems ((Machina & Wild, 2013), (c) manufacturing execution systems ;(Cheepchol, 2016; Leuenberger & Leuenberger, 2016; ShaemiBarzaki, Baharestan, & Akbari, 2014), (d) electronic batch records ((Soto, 2014), (e) sales force automation ((Maroofi, Rastad, & Amjadi, 2015), (f) clinical trial management systems ((Raptis et al., 2014), and (g) supply chain management (Sultanow & Brockmann, 2013; Tang & Zimmerman, 2013). Along with the various IT applications, pharmaceutical companies like most companies depend on

core IT services such as networking, storage, servers, database, desktop, and voice technologies. The pharmaceutical industry is similar to other innovative industries in relation to the complex environment that IT PMs need to address (Thamhain, 2013). Piperca and Floricel's (2012) research of IT projects from several industries also included the pharmaceutical industry. The findings of Piperca and Floricel's research indicated the underestimation of the risks may have on effective IT project RM and ultimately project performance and success.

Managing the risks to increase IT project performance is particularly important to the pharmaceutical industry because IT is an important enabler of key functions from discovery to patient safety (Ekins, Waller, Bradley, Clark, & Williams, 2013). Ekins, Waller, Bradley, Clark, and Williams (2013) reviewed the current state of drug discovery within the pharmaceutical industry. Ekins et al. utilized government databases from the United States and Canada containing the records reflecting the number of registered compounds and approved drugs, and reviewed the pertinent literature concerning the state of drug development. Ekins et al. indicated IT may help the pharmaceutical industry overcome the obstacles that are impeding an increase in the discovery of new drugs and the effectiveness and efficiency of the drug development process. In all cases, IT is either at the core of the solution or a key enabler of the strategy, which is also reflective of similar findings regarding other industries (Berman & Marshall, 2014).

Welter, Bosse, and Alvarez (2013) examined the interaction between managerial and technological capabilities and the effect on organizational performance in the context of small biotech alliances with large pharmaceutical firms. The sample included 72 small

biotech companies with current alliances with larger pharmaceutical companies. The results indicated that effective managerial capabilities positively affect the performance of the small biotech firms. However, the results also indicated the positive correlation of managerial capabilities to organizational performance exists for organizations with higher levels of IT capabilities, but the opposite is true for small biotech companies with lower levels of IT capabilities. Cheepchol (2016) examined the current state of pharmaceutical manufacturing in Southeast Asia. Cheepchol concluded that the industry needs to move away from manual practices and incorporate IT solutions to increase organizational efficiencies because of data integrity issues, greater regulatory requirements, and increased competition.

Berman and Marshall (2014) reported on the importance of IT to the overall goals and long-term sustainability of an organization. Additionally, Cheepchol (2016) and Elkins et al. (2013), and Welter et al. (2013) all elaborated on the importance of IT to the pharmaceutical industry. However, taking into consideration the increasing speed in which both IT and the competitive global marketplace is changing, a search of the pertinent contemporary literature between 2012 and 2016 indicated a void in the research concerning IT project RM in the context of a pharmaceutical company. Adding to the body of knowledge is not only warranted by the void in the literature but is also justified by the conclusions and suggestions of Besner and Hobbs (2013), Pinto and Winch (2016), and Svejvig and Andersen (2015) regarding the future direction of project management research, which includes risk management. Specifically, Pinto and Winch (2016) suggested the need to integrate RM and complex project management from an

organizational perspective. Besner and Hobbs' (2013) survey of 740 project practitioners and subsequent empirical analysis indicated that the application of project management practices varies based on industry and context. Finally, Svejvig and Andersen's (2015) review of project management literature from the 1980s onwards highlighted that addressing context is an important aspect of risk management.

Transition

Section 1, the foundation of the study, included the background of the business problem concerning the financial and organizational impacts that IT project failures have on organizations. The specific business problem reflects the need for strategies that IT PMs can utilize to increase IT project performance. The purpose statement indicated the target population of IT PM within the pharmaceutical industry. The design of the research is a single case study with a population of IT PMs within a single pharmaceutical company. I used purposeful sampling to enroll seven participants who had previous experience and knowledge in the selection and implementation of RM strategies that had increased project performance. The interview questions align to both the research question and ANT, which was the conceptual model for the study. I assumed that the participants would be truthful and provide rich data to achieve data saturation. I employed bracketing to address any limitations concerning bias. Regarding the significance of the study, I suggested that RM strategies leading to increased IT project performance may enhance a pharmaceutical company's capabilities to deliver new drug therapies that may improve the lives of people around the world.

The use if ANT was identified in the conceptual framework as the lens of inquiry because ANT provides a framework to address the social context in which a project organization operates and to view what IT PMs do and how and why they do it. In the conceptual framework, I described ANT as a theory that addresses humans and nonhumans with equal agency and does not differentiate the relationships between (a) the technical artifacts, (b) the knowledge garnered by the technical work, or (c) the associated social activities. When describing RM in relation to ANT, I noted that there are actor relationships between the RM processes, the risks, the PMs, stakeholders, team members, and the technology. According to ANT, the social and technical work along with the associated knowledge generated by the relationships between the actors within the network is a result of translation. Figure 2 depicts the combined view of (a) the conceptual framework, (b) the synthesis of the literature concerning ANT and project RM and (c) the interview questions developed to elicited data in support of addressing the research question. Specifically, Figure 2 depicts (a) the concept of translation from ANT, (b) the two commonly accepted project RM processes, and (c) the interview questions. The purpose of presenting Figure 2 is to summarize the key concepts of this section by illustrating the parallelism between the RM processes and the process of translation along with how the interview questions align the processes.

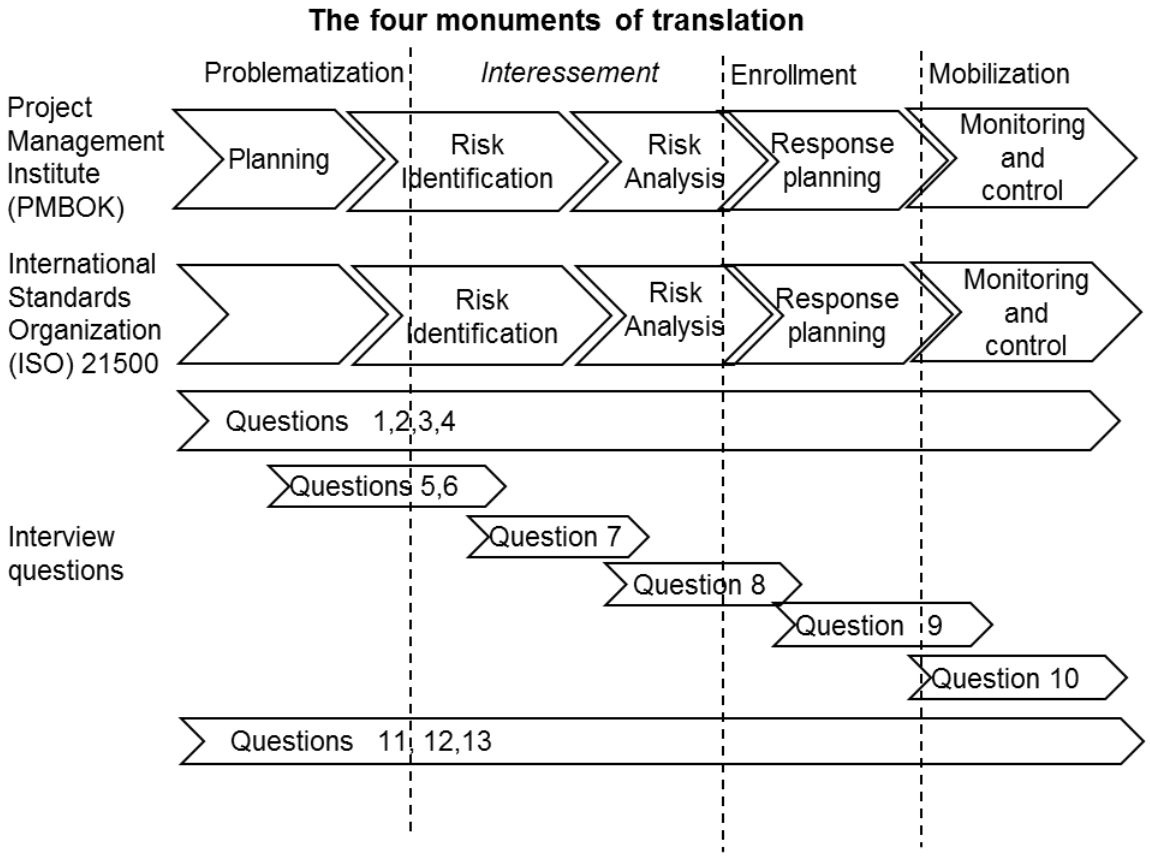

Figure 2. Combined view of ANT, RM processes, and the interview questions.

In this section, I conducted further exploration and synthesis of ANT and RM in the literature review. Specifically, I noted that the four steps of translation regarding RM start with the primary actor, the IT PM, (a) identifying the problem, (b) figuring out what knowledge is required, and (c) identifying the other actors needed in the network. Then in the second step of translation, the IT PM acting in the role of a primary actor negotiates with the other actors, who are the project team members, stakeholder, and the risks, what their role will be in the network and what the common goal of the network is. Once the negotiation is complete in the second step, the primary actor in the third step convinces the other actors to join the network based on the previously identified common goal,

which in this case is managing IT project risks. Then in the fourth step, the actors mobilize in support of the common goal of risk management. The results of the actions during the fourth step of translation also nominate the primary actor as the voice of the other actors. This nomination allows the IT PM to speak on behalf of the stakeholders, team members, the technology, and the actual project risks.

Section 2 contains key details of the study with specific sections on the method, design, and the selection criteria for study participants within the identified population. Additionally, Section 2 contains detailed descriptions of the data collection, organization, and analysis techniques, along with details concerning reliability and validity.

Section 3, the application for professional practice and implication of social change, contains the presentation of the findings and social change implications, along with other reflections and concluding statements.

Section 2: The Project

Effective RM can have a positive effect on IT project performance and success (Carvalho & Rabechini, 2015; de Bakker et al., 2014; Didraga, 2013; Teller et al., 2014). However, there is a business problem concerning the availability of RM strategies for IT PMs to increase IT project performance, given business leaders' increasing use of IT as a strategic enabler (Berman & Marshall, 2014), and the historically low IT project success rates since 1994 (Joseph et al., 2014). Therefore, the purpose of the study was to explore strategies that IT PMs within the pharmaceutical industry may use to manage project risks to increase IT project performance. After a restatement of the purpose of the study, the first portion of this section contains information concerning (a) my role as the researcher, (b) the participants, (c) the method and design, and (d) the population and sampling. The second portion of the section contains information regarding (a) data collection, (b) instruments, (c) data collection techniques, (d) data organization, and (e) data analysis techniques. The final portion of this section includes information concerning reliability and validity of the study and a summary.

Purpose Statement

The purpose of this qualitative case study was to explore risk management strategies that IT PMs within the pharmaceutical industry use to improve project performance for the successful delivery of an IT project. The participants were seven IT PMs from a pharmaceutical company located in the northeastern United States. The participants also had experience in effectively managing IT project performance by using risk management strategies resulting in the successful delivery of at least five IT projects

with at least one of the projects completing in the last 3 years. This study's implications for positive social change include the potential to create new organizational capabilities through IT that improves the efficiency of the drug discovery and development processes. The broader implications of social change include potentially extending and improving the quality of life of people throughout the world, given that more efficient drug discovery and development processes of pharmaceutical companies may increase their ability to provide innovative therapies that are efficacious, safe, and cost-effective from a health economics perspective.

Role of the Researcher

Although the position of the researcher as an instrument is a key component of ethnographic research (Draper, 2015), it is also vital for other types of qualitative research (Peredaryenko & Krauss, 2013). As the research instrument, I gathered data from the interviews and internal documents such as project plans, risk registers, and project status reports. I also organized the data and performed thematic analysis to look for patterns and themes. I possessed the knowledge and experience to function simultaneously as an instrument for data collection and analysis. My more than 20 years of IT project management, master's degree in project management, and a professional certification as a project management professional (PMP) from the Project Management Institute prepared me to take on several roles as researcher, including (a) a reflexive role, (b) an interpretive role, and (c) the role of a research instrument.

Reflexive Role

A reflexive role requires researchers to examine their involvement in the research and understand the limits of their knowledge. A reflexive role also requires self-awareness concerning how the researcher may have formed the collected data (Berger, 2015). Through reflexivity, researchers position themselves within the study (Berger, 2015; Darawsheh & Stanley, 2014). Although the reflexive role does not eliminate researcher bias, it gives the qualitative researcher the opportunity to identify and acknowledge bias. Ultimately, the reflexive role adds additional rigor to the research, given that reflexivity provides credibility and plausibility to the findings (Clancy, 2013). Within this role, I consciously bracketed my experiences because, according to Hoskins and White (2013), bracketing provides a degree of objectivity regarding what should be outside the bracket for proper engagement during the interviews and subsequent data interpretation. I kept a reflexive journal as part of my research log as suggested by Vicary, Young, and Hicks (2016). I used the reflexive journal to capture various thoughts, including but not limited to (a) why I selected this business problem, (b) my initial understanding of the business problem, (c) potential role conflicts, (d) other preconceptions, (e) my personal value system, and (f) thoughts related to how I maintained neutrality throughout the study.

Interpretive Role

While a reflexive role positioned me within the study, my interpretive role in this case study was primarily concerned with data analysis. Specifically, in an interpretive role, a researcher's focus is on making sense of the data (Stahl, 2014). Making sense of

what the study participant is saying requires an interpretive engagement for effective thematic analysis. Specifically, the concept of the double hermeneutic requires the researcher to gain a deeper understanding of the participant perspective based on their experience, as the participant is expounding on his or her experience (Clancy, 2013). Additionally, effective execution by the researcher as both interrogator and interpreter can add trustworthiness to the study (Rodham, Fox, & Doran, 2015).

Research Instrument Role

As the research instrument, I pragmatically executed the processes associated with the research in an ethical manner. I also treated each participant as an individual agent and sought to protect him or her from harm related to the research processes while enhancing the benefits and reducing the risk to the participants, as prescribed by the *Belmont Report* from the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1979). I had no direct or indirect influence that may have harmed the participants or influenced their responses. Specifically, in the role of research instrument, I assumed the role of the interviewer. The role of the interviewer as the instrument is to collect data through in-depth semistructured interviews that facilitated the exchange of questions and responses (Doody & Noonan, 2013; Janesick, 2014).

I used an interview protocol when conducting the semistructured interviews. Jacob and Furgerson (2012) suggested that an interview protocol (see Appendix A) should include such elements as a script so the researcher will not forget to convey key details and will reinforce the protection provided to the participants. During the data

collection process, I used an interview protocol that included (a) using an interview script, (b) selecting the appropriate location for the interview, (c) reconfirming that the duration and time are still convenient for the participant (d) reaffirming participant consent, (e) gaining consent to record the interview, and (f) the interview questions (see Appendix B). I also continued to build on the rapport established during the initial enrollment phone call and through a brief introduction and an ice-breaking question. Building rapport and trust with the participants is an important step in interview data collection because good rapport enhances the likelihood of collecting rich data (Roulston, 2014). The interviews consisted of 13 open-ended questions concerning IT project risk management. I asked follow-up questions when further prompting was required to facilitate the richness of the data (Jacob & Furgerson, 2012).

Participants

Yin (2012) indicated that qualitative researchers may design case studies using multiple participants within a single unit and homogenous context. Participants are also required to have experience with the phenomenon that is under examination (Yin, 2014). In their discussion on the expertise of PMs, Thomas, George, and Buckle-Henning (2012) indicated expertise is reliant on the context and the situation of an individual within his or her environment, and relies on "the strategies of organizational actors and their previous experiences of operating within similar situations" (p. 381). Caley et al. (2014) likewise noted the value of expert knowledge in research. They suggested that individuals that have a higher level of expertise are more likely to make competent decisions and perform timely actions. Making timely and competent decisions concerning the management of

project risks has a positive effect on project performance (Carvalho & Rabechini, 2015; Kinyua et al., 2015), which subsequently has a positive effect on the successful delivery of an IT project (Didraga, 2013; Xu & Feng, 2014).

Therefore, the key criterion for this study was that the participants needed to have had delivered five IT projects using RM strategies that maintained a high level of project performance or increased project performance to a level that concluded with the successful delivery of an IT project. The second criterion for the study was that the IT PM had completed one of the five projects within the last 3 years, given my intention of collecting data that reflects recently used RM strategies. The final criterion for participation in the study was that the participants were all employed by the same pharmaceutical company.

Suitable participant recruitment and initial engagement methods are ones that fit the population (Truong et al., 2013). I gained access to the potential pool of participants from a key organizational sponsor, who also signed the letter of cooperation. I established initial contact with the participants through an email recruitment letter. Email communication was a good fit for the population because the population consisted of professionals who were familiar with IT and used email in their daily professional activities. The initial contact email contained (a) an informal introduction, (b) an overview of the study, (c) a brief statement concerning confidentiality, (d) a statement concerning the voluntary nature of the study, and (e) my contact information if they were interested in participating in the study. I then scheduled telephone calls with the individuals who responded to the email and expressed interest in participation to initiate a

working relationship and begin to develop a rapport. Developing rapport with the participants was important because rapport aids in transmitting the meaning of the specific inquiry and comprehending the participant's response so that I could evaluate the level of interest and emotive response (Irvine, Drew, & Sainsbury, 2013).

During the initial telephone call, I explained the purpose of the study and the steps I planned to take to maintain confidentiality, and I described participants' ability to withdraw from the study without explanation or penalty at any time. I also exaplained to the participants my need to collect additional documnetaion and ask if they were willing to provide seconday any additional risk relatet documnetation. Additionally, during the initial call, I gave the participants the opportunity to ask questions about the processes and address any initial concerns. If they agreed to take part, the participants received a consent form, and I subsequently contacted the willing participants to set the times and locations for the interviews.

Research Method and Design

Research Method

The selection of a qualitative, quantitative, or mixed methods research method should take into consideration the research objectives (Harrison, 2013). The purpose, context, and research question are factors that also influence the selection of a research method. Using a qualitative method, researchers can perform an in-depth exploration of the phenomenon from the participants' perspective (Khan, 2014; Yilmaz, 2013). In a review of the literature from 2012-2016 related to IT project management, I found that researchers have regularly highlighted the contextual nature of the business problems

concerning project risks, performance, and success. The research of Carvalho and Rabechini (2015), Keil, Rai, et al (2013), Klein et al (2015), Lehtinen et al. (2014), Svejvig and Anderson (2014), and Thamhain (2013) is indicative of the need to consider context in relation to project performance, success, and risks. I selected a qualitative method because of the expected flexibility needed to address the context of the business problem and perform an in-depth exploration of IT project RM strategies that may improve IT project performance.

In contrast to a qualitative method, defined variables are fundamental to quantitative research such as quasi-experiments and randomized controlled experiments (Jackson, 2015; M. Williams et al., 2016). Quantitative researchers use statistical testing of variables, hypotheses, or previous research (Hoare & Hoe, 2013; B. Lee & Cassell, 2013). A quantitative research method is appropriate when the purpose of a study includes answering questions concerning how much or how many (McCusker & Gunaydin, 2015). A quantitative method was not suitable for this study because the organizational context associated with the business problem was not only complex but also an entangled social phenomenon that was not reducible to a set of isolated variables. Additionally, based on the purpose of the study and the associated research question, a quantitative method was inappropriate because I had no intention or need to test variables or previous knowledge.

Venkatesh, Brown, and Bala (2013) suggested seven possible purposes for the use of mixed-method research: (a) investigating complementarity views, (b) creating a more comprehensive picture of the phenomena, (c) building upon prior constructs and

hypothesis, (d) expanding on previous understandings, (e) collaborating or confirming a previous study, (f) compensating for a prior study weakness, and (g) providing a divergent view (Venkatesh et al., 2013). A mixed methods research method is applicable when investigating a business problem from an objective and subjective lens in conjunction, using both numerical data and narrative data (Stentz et al., 2012). However, the purpose of this study was to explore IT project RM strategies through thematic analysis of subjective narrative data. Therefore, a mixed-methods approach was not applicable because the purpose of the study does not align with any of the seven purposes of a mixed methodology and does not require the use of any quantitative methods.

Research Design

The five most common approaches that a researcher can consider when designing a qualitative study are (a) narrative research, (b) grounded theory, (c) phenomenology, (d) ethnography, and (e) case study (Petty, Thomson, & Stew, 2012). A case study design is appropriate when the researcher intends to answer how and why questions through the collection of in-depth data within a natural context (Houghton, Casey, Shaw, & Murphy, 2013; Yin, 2014). According to De Massis and Kotlar (2014), case study designs are appropriate when the researcher's goal is the creation of knowledge related to a management problem. A case study research design is also suitable when a researcher seeks to describe a complex phenomenon (Yin, 2014). Whitney and Daniels (2013) and Thamhain (2013) indicated that managing IT project risk and project performance and achieving IT project success are complex phenomena. I selected a case study design because the design aligns with the intent of exploring a complex business problem

through in-depth data collection within a natural context to capture the experience of the participants concerning the how and why of IT project RM strategies. I also selected a case study design because of the similarities in the value of ANT and one of the reasons why researchers select a case study. Specifically, Yin (2014) indicated that case study designs are appropriate for addressing how and why questions and ANT provides a lens to understand from the actors "how and why they do it" (Latour, 1999, p. 18). The combination of ANT and a case study design provided an appropriate means to explore what RM strategies do IT PMs need to increase project performance in the context of gaining an understanding how and why they do it.

Other qualitative designs I considered include narrative, grounded theory, phenomenology, and ethnography. Narrative researchers also combine the lives of the participants with the researcher's experiences (Makkonen, Aarikka-Stenroos, & Olkkonen, 2012). Narrative research is suitable when the researcher is exploring the experience of an individual or group of individuals from a biographical perspective (Petty et al., 2012). However, I did not intend to use biographical data or combine my experiences with the participant's lives concerning IT project RM strategies.

Researchers utilize a phenomenological design to derive meaning from the participant's lived experiences about a phenomenon (Finlay, 2013). Additionally, phenomenological research normally personifies the lived experience and perceptions of participants with a shared phenomenon (Yüksel & Yıldırım, 2015). The commonly accepted definition of a project is a unique endeavor (Livesey, 2016). Therefore, I did not

consider exploring the lived experiences of the participants, given the uniqueness of each project and the varied organizational and environmental contexts of each project.

Ethnographers explore a phenomenon in a natural setting, which is similar to case study research. The focus of ethnographic research is to understand and synthesize human behavior within a community or culture (Jarzabkowski et al., 2014). Ethnographers research culture that evolves from a social group that is living or working together for an extended period (Yüksel & Yıldırım, 2015). Additionally, the influence of a broader more dominant organizational culture concerning project performance and RM strategies was not the purpose of this research. Consequently, an ethnographic research design was not suitable because I did not intend to explore the cultural aspects of IT project risk management.

The intent of grounded theory research is to develop a theory derived from the collected data (Corley, 2015). The population sampling criteria for grounded theory research reflects the intent of theory development and not representativeness (Khan, 2014). A nonrepresentative population did not support the purpose of the study because the population needed to contain participants who had implemented RM strategies in order to gain insight into the research question and business problem. Therefore, grounded theory research was not appropriate, as the purpose of this research was not to generate a theory related to IT project risk management.

The study design included several techniques suggested by various researchers for achieving data saturation. According to Elo et al. (2014), the use of purposeful sampling facilitates theoretical data saturation. Therefore, purposeful sampling is a technique I

used in the selection of the participants for the study. Fusch and Ness (2015) indicated that using an interview protocol can increase the likelihood of saturation because by following the protocol a researcher will ask the same questions to all the participants. The interview protocol (see Appendix A) created for use in this study included a step that directed the researcher to the prescribed interview questions (see Appendix B). Ishak and Bakar (2014) indicated that qualitative researchers should continue to sample until the achievement of saturation. Although, data saturation did occur with the data collected from the initial seven participants, I was prepared to increase the sample size until saturation occurred if required.

Population and Sampling

Marshall et al. (2013) stated that depending on the sample size of the population, data saturation in qualitative research is attainable with as few as six participants. Dworkin (2012) posited that qualitative research methods frequently use smaller sample sizes in comparison to quantitative research because of the objective of capturing in-depth and rich information. Ando, Cousins, and Young (2014) suggested that a smaller sample size utilizing homogeneous participants with equivalent experience can be sufficient to produce data saturation when performing a thematic analysis. According to Trotter (2012), sample sizes in qualitative research based on experts sampling can be small as the total expert population is commonly small.

I used purposeful sampling to enroll a sample of seven IT PMs within a pharmaceutical company located in the northeastern United States based on the selection criteria and the following characteristics of the study: (a) the qualitative design of the

study, (b) the intent to collect in-depth information, (c) the homogeneity of the IT PM population bound by the case, (d) the use of social theory in the study design, and (e) the use of thematic analysis. The selection criteria address the idea that the participants have experience with the phenomenon that is under examination (Yin, 2014). Specifically, researcher use purposeful sampling to identify participants based on their relevant experience concerning the focus of research and the participants' potential to provide thick and rich data related to the research question (Patton, 2015).

The selection criteria for qualifying IT PMs for this study included the IT PMs' success in implementing RM strategies and their contextual experience concerning IT project management with in a pharmaceutical organization. Specifically, the eligible participants needed to have past success in the implementation of RM strategies that maintained a high level of project performance or increased project performance leading to the successful completion of an IT project. In addition the eligible participants were required to have completed one of the projects with the past three 3 years. The sample was appropriate for the research because the participants' experience and knowledge concerning the implementation of RM strategies that maintained or increased project performance leading to the successful completion of an IT project provided insight into addressing the research question. To avoid bias, I excluded participants with whom I had a daily working relationship.

Fusch and Ness (2015) specified prescriptive guidelines are usually inappropriate in the selection of sample sizes for qualitative case study research. However, Fusch and Ness also indicated that researchers rarely select sample sizes for the sole purpose of

achieving saturation, but indicated researchers should select a sample size that provides the greatest opportunity to achieve data saturation. Fusch and Ness (2015) also indicated researchers can use an interview protocol in the pursuit of data saturation. I used several approaches to address data saturation concerning the sample. The first approach was an interview protocol to ensure I asked all the study participants the same questions. Elo et al. (2014) suggested purposeful sampling as a technique to facilitate saturation. I used purposeful sampling within the bounds of the case. Although I did achieve data saturation, I was willing to collect more data if data saturation did not occur as a result of the thematic analysis of data collected from the initial seven participants and supporting documentation. Specifically, I was prepared to interview additional participants and collect more supporting documents until little or no new relevant information or themes appeared that required changes to the code book (see Tran, Porcher, Falissard, & Ravaud, in press).

Although not an actual participant selection criterion, the potential location of the face-to-face participant interviews was an integral element of the study. An appropriate interview location represents a setting that is conducive to collecting rich data, one where the participants feel comfortable discussing the topic (Meulenbroek, Bowers, & Turkstra, (2016). The interviews took place at the participants' preferred location while taking into consideration the need to avoid unexpected interruptions and provide the appropriate level of protection. As the intention was to conduct the interviews at the participants' workplace, the letter of cooperation, specifically requested the use of a meeting room at

the company location. However, if the participant preferred an offsite interview location, the interview took place at a mutually agreed upon location.

Ethical Research

The ethics of qualitative social research rest upon the key principles of not causing harm and promoting the interests of the participants (Badley, 2014). The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research further refined the ethical principles for research involving human subjects. The three fundamental principles outlined in the *Belmont Report* (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979) include respect for persons, justice, and beneficence. Additionally, the report highlights the application of the principles concerning informed consent, assessment of the risk and benefits, along with the selection of the subjects. The Walden Institutional Review Board (IRB) approval process ensures that research carried out under the institution's remit is compliant with U.S. federal regulations and university ethical standards.

Therefore, only after I received IRB approval to conduct the study in accordance with the aforementioned ethical principles I began the participant recruitment. The IRB approval number for this study is 11-18-16-039711. Based on the participant criteria and to the best of my knowledge I did not enroll any protected classes in the study or did I provided any incentives for participation. I initially made contact with the potential participants using the recruitment letter (see Appendix C) sent by email The goal of the initial contact was to introduce myself, generate interest, and provide the context and purpose of the study. Based on the potential participant’s interest I emailed an informed

consent form for their review and obtained the actual signature prior to starting the interview.

A signed informed consent form constitutes documentary evidence that study participants have received the pertinent information and consent to participate. However, a researcher needs to ensure a participant fully understands the meaning of the information so that they make a conscious decision about taking responsibility for any consequences they may endure (Hammersley, 2014). Therefore, I gave each potential participant a chance to ask either by email, phone, or in person, if convenient, clarifying questions related to (a) confidentiality, (b) study integrity, (c) the voluntary nature of the study, (d) the interview process, (e) member checking, and (f) the interview transcript. I reiterated to the participants their ability to withdraw from the study without explanation or penalty at any time by calling or emailing the researcher and stating their desire to withdraw.

Additionally, maintaining the confidentiality of qualitative research data, particularly interview data, is important in not only protecting the participants but also fostering rich data (Saunders, Kitzinger, & Kitzinger, 2015). Therefore, I used a coding system to protect the confidentiality of the participants. The coding system utilized nomenclature such as P1 for Participant 1, and P2 for Participant 2. This coding system also applied to any collected documentation data directly attributable to a participant. I have stored the electronic records on an encrypted hard drive placed in a locked fireproof box in my home. I will destroy all the information after 5 years through the reformatting of the hard drive and subsequent physical destruction of the hard drive.

Data Collection Instruments

As the primary data collection instrument of this case study, I conducted in-depth semistructured interviews. I utilized the interview protocol throughout the data collection process that started with confirming the interview and ended with member checking along with gaining permission to ask follow-up questions. In conjunction with the interview protocol (see Appendix A) and specific interview questions (see Appendix B), I utilized an approach proposed by (Bevan, 2014) consisting of imaginative variation. The concept of imaginative variation includes contextualization and clarification that the researcher accomplishes through active listening and reflexivity (Chan, Fung, & Chien, 2013). The practical application of imaginative variation includes probing questions and the use of follow-up questions as required. Additionally, by using Bevan's (2014) approach to data collection a researcher can provide additional consistency by maintaining the contextual boundaries, which can improve the credibility of the collected data. Member checking is a technique to address transactional validity (Patton, 2015). I used member checking to verify with the participants that I had captured the essence of the data provided by each participant (Koelsch, 2013). In addition to member checking, I asked the participants to review the transcription of his or her interview for accuracy.

Data Collection Technique

Yin (2014) suggested four principles of data collection for case study research: (a) the use of multiple sources of data, (b) the creation of a case study database, (c) the preservation of the chain of evidence, and (d) the exercise of care when using electronic sources. Yin also suggested that collecting data from multiple sources can increase the

reliability of the data collection process by enabling the subsequent use of triangulation. The primary data collection technique I used was semistructured face-to-face interviews, along with the collection of pertinent artifacts and supporting documents. The supporting documents and artifacts that I collected included risk registers, project status reports, and documents related to project management standards and procedures concerning risk management. I collected the supporting documents in person at the end of the interviews, or the participants sent the documents to us as email attachments.

Researchers use semistructured interviews to fulfill the requirement of addressing the research question during the interview while providing the flexibility to collect rich and thick data (Doody & Noonan, 2013). Mikkonen, Kyngäs, and Kääriäinen (2015) suggested that the use of face-to-face semistructured interviews allows researchers the flexibility to collect rich data. In addition, a face-to-face semistructured interview is useful in providing context (Doody & Noonan, 2013; Rodesiler & Pace, 2015). Nando and Platt (2016) also suggested that an advantage of performing face-to-face interviews is that they create a higher level of trust than phone interviews concerning confidentiality. Similarly, Doody and Noonan (2013) suggested that interviews allow the researcher to develop rapport with the participants. Another advantage of face-to-face, semistructured interviews over unstructured interviews is they are less likely to elicit irrelevant responses (Campbell, Quincy, Osserman, & Pedersen, 2013; Vaismoradi, Turunen, & Bondas, 2013).

Face-to-face, semistructured interviews also have several disadvantages: One of them is the required travel to and from the interview location. Another disadvantage is

the added efforts required to ensure confidentiality. Also, face-to-face interviews might increase social desirability bias when the research topic and interview questions concern personally sensitive topics (Szolnoki & Hoffmann, 2013). However, the research topic and the interview questions in this research did not cover personally sensitive topics or expected participants to provide any personally sensitive information.

Chenail (2011) indicated that pilot studies may be impractical when there are limited research participants as it is not desirable to lose valuable data to a pilot study. The data collection did not involve a pilot study because of the small population of participants within the case organization. However, Jacob and Furgerson (2012) suggested that reviewing the interview questions with a close population allows the researcher to gain insider feedback on the interview questions without squandering the target population. A panel of three IT PMs from the researcher's professional network who had similar experience to the participants reviewed the interview questions. The IT PMs did not answer the questions but provided feedback concerning the clarity, readability, and understandability of the interview questions.

Additionally, Donges (2015) suggested that reviewing the interview questions with a panel of SMEs is an alternative solution to reducing or eliminating any researcher bias a researcher might have conveyed within the interview questions. Subject matter experts are individuals with knowledge in certain domains gained through education and professional practice (Caley et al., 2014). A panel of three IT PM SMEs provided feedback concerning the interview questions in relation to the clarity of the interview questions and relevance of the questions to the research question. The panel of three

SMEs consisted of (a) a certified PMP who is also the director of a group of IT project coordinators and managers, (b) an IT project portfolio manager and past project management instructor with over 25 years of IT project management experience, and (c) a vice president (VP) of IT project management with 25 years of practitioner experience in successfully managing IT projects along with providing project management educational services.

Jacob and Furgerson (2012) indicated that flexibility and evolution of the design are key attributes of qualitative research. Doody and Doody (2015) suggested that pilot studies may not be essential in the context of qualitative research because researchers have the flexibility to learn as they go. Peredaryenko and Krauss (2013) posited that reflection is a method researchers can use to make improvements to their interviewing skills through self-adjustment. Therefore, I performed practice interviews with two peers to gain interview expertise. During the practice interviews, I followed the interview protocol, gained familiarity with the recording equipment, and received feedback on style. Additionally, after the first participant interview, I reviewed the interview notes and interview transcript before the next interview to improve the way I collected the data. I repeated this reflective process for all subsequent interviews.

Wyngaard and de Lange (2013) noted that interview probes can increase the comprehensiveness of the data. Wilson (2014) listed several types of interview probes, which included the (a) silent probe, (b) neutral probe, (c) clarification probe, (d) give more detail probe, and (e) the variation probe. During the interviews, I used probes as required to improve the comprehensiveness of the data.

The interviews took place in person because the use of email or phone interviews do not allow the researcher to capture and respond to visual or social cues (Bowden & Galindo-Gonzalez, 2015; Irvine et al., 2013). The time allotted for each interview was approximately 60 minutes, and each participant selected the date and time of the interview. The location of each interview was a small meeting room at the participant's work location that was agreeable and convenient to the participant. The meeting room was private, comfortable, and free from unnecessary distractions.

The specifics related to conducting the semistructured interview included the following:

1. In preparation for the interview, I wrote the interview script and set up the location, date, and time of the interview with the study participants. I also sent a follow-up email 48 hours before the interview to confirm the participant's availability.
2. I followed the interview protocol during the interview, and I communicated the details of the study. Specifically, I reminded the participant of the provided confidentiality and related data protection, obtained a signature on the informed consent form, and gained consent to record the interview for subsequent transcription.
3. I started the actual interview with a brief introduction. Then I proceed with an introductory ice-breaking question to build rapport.
4. Throughout the interview, I interacted with the participants, asking clarifying, follow-up, and probing questions in order to gain clarity and facilitate rich and thick data.

5. After the last question, I asked one additional follow-up question. I provided the participants a list of all the interview questions and then asked them to read the questions again and add any additional information they may have forgotten or thought of after answering a particular question.
6. After all the questioning was complete, I once again reminded the participants of the voluntary nature of the study and the confidentiality provided to the participants.
7. I described the process of sending the transcribed interview back to the participant for a review of the accuracy of the transcribed data and subsequent member checking concerning my summation of the information conveyed by the participant.
8. I provided a copy of the consent form to the participants for their records. The consent also had my contact information, in the event the participant had questions or at some point wanted to withdraw from the study.
9. Once the interview was complete, I immediately wrote up any additional observations and field notes, along with appropriately protecting and storing the collected data until I was ready to analyze the data.
10. After I had transcribed the interviews, I then sent each transcription to the respective participant for transcript review. Once I had identified themes within the data, I also performed member checking by sending a write up of the identified themes to the participants for their review and comments.

Data Organization Technique

As the researcher and data collection instrument, I collected, cataloged, categorized, analyzed, and archived the data associated with this qualitative study in

accordance with Walden University's IRB requirements. The data related to the study included the interview transcripts, relevant consent forms, supporting documentation, and a research journal. A research journal contains both a reflective component (Lamb, 2013a) and observations during the entire research process along with interview notes (Lamb, 2013b). I recorded each interview with the permission of the participants on a digital recorder and subsequently stored the recorded interview on an encrypted external drive. Additionally, all other electronically provided supporting documentation was also stored on an encrypted external drive. I also stored any non-electronic supporting documents in a fireproof safe during the research period and I will subsequently store the data for the required 5 years after the completion of the research.

Moylan, Derr, and Lindhost (2015) indicated that technology can enhance qualitative research. I utilized Dragon Speak software to transcribe the interviews. I transcribed the interviews into Microsoft Word document and stored the document on an encrypted external drive. Morse and Coulehan (2015) suggested codes to protect the confidentiality of the participants. I used a coding system to represent the study participants' transcripts and used the same nomenclature within the research log and any reference to the participants when presenting the data. All Microsoft Word documents were password protected because I used email during the transcript review and member checking process. The use of member checking by qualitative researchers increases the trustworthiness of the study (Kornbluh, 2015; Morse, 2015; Winter & Collins, 2015). I asked for confirmation via email that the participant is satisfied that my summation of the

interview reflects their stated experiences and that the transcript accurately reflects their statements during the interview.

Subsequently, I removed any identifying information, and I entered the transcribed data, the data from the collected supporting documents and any pertinent research notes into NVivo. NVivo is a valuable tool a researcher can use for the organization of the data and during the process of identifying themes and patterns (Sotiriadou, Brouwers, & Le, 2014; Woods, Paulus, Atkins, & Macklin, 2015). The research log contained interview notes and any reflections of bias or preconceived notions that I used in bracketing throughout the research study.

Throughout the research, the data were stored on an encrypted USB memory stick along with a duplicate copy for backup. I will act as the curator of the raw data, the research log, consent forms, and transcripts for 5 years after the completion of the study. During the 5-year period, the data will remain in a locked fireproof safe located in my home. After 5 years, I will (a) delete the electronic data, (b) destroy the physical USB drive, and (c) shred all paper documentation.

Data Analysis

Triangulation is essential in case study research to increase the confidence and credibility of the findings (Houghton et al., 2013). Yin (2013) contended that triangulation is useful in reducing bias and improving the validly of case study research. Yazan (2015) reinforced the so-called Yinian perspective of using multiple data sources to facilitate triangulation in case study research, which includes semistructured interviews and related documents. Yazan also reinforced that the quality of the research regarding

validity and reliability relies on prudently designed and organized procedures. I accomplished triangulation through the comparison and convergence of the multiple sources of evidence including the interview data from seven participants, organizational project procedures, related RM procedural documents, and risk registers.

Before coding the data, I reviewed the research and interview questions. I also reviewed the conceptual framework, the literature review, and performed a search of the literature to identify any new information concerning the research topic that was approriate to incorporate in the coding, thematic identification, and final synthesis. As ANT was the stated lens in the conceptual framework, I incorporated ANT concepts in the data analysis. In summary, the coding, pattern identification, thematic identification, and synthesis of the data incorporated concepts from the literature review and the conceptual framework with the objective of addressing the research question.

A researcher can use various techniques when coding qualitative data. Morse (2015) suggested using a transcript review before coding the data to ensure accuracy. After member checking Ando et al. (2014) recommended an initial review of the multiple sources of the data to get a general sense of the data. Elo et al. (2014) endorsed an analytical induction approach and subsequent pattern matching against the conceptual construct along with abstraction of meaning from the coded data elements. I incorporated all of these techniques to code the data.

The initial data analysis started with transcribing the interviews, I then checked that I captured the essence of the data through member checking. I then organized the data for analysis. Subsequently, I performed a cursory review of the multiple data sources

to get a general sense of the data regarding its richness and the identification of any obvious themes. The specific data analysis approach I used was systematic text condensation (STC), which is the framework to review transcript data and supporting text suggested by Malterud (2012). The high-level steps of STC are as follows:

1. The first step includes an initial overview of the data, and then a second pass to identify themes and patterns taking into consideration the conceptual framework of the study and the concepts identified from the literature review.
2. The second step starts with identifying meaning units in the form of remarks within the text that may elucidate the research question. Then the actual codification of meaning units takes into consideration the previous thematic identification. This step is an iterative process as the researcher refines previous codes and creates new codes to develop a deeper understanding of the data.
3. In the third step, the researcher begins to derive meaning from the data through the consolidation and convergence of the data by the systematic abstraction of the code groups into subgroups and categories.
4. In the fourth step, the researcher synthesizes the data from the previous data consolidations into descriptions and concepts.

To execute the STC process I used NVivo software. The NVivo concept-mapping feature created a visualization of the clusters and patterns. The coding process and the visualization then lead to descriptions and the refinement of the categories for the

narrative. The refinement of the categories, the subsequent interpretation, and conclusions drawn from the data provided the basis for the narrative presented in the findings section.

Reliability and Validity

Although reliability and validity associated with quantitative inquiry are not directly translatable to qualitative studies, they are vital concepts in academic research (Yin, 2014). The validity of a qualitative study concerns the rigor of the researcher in the application of the methods and how accurate the outcomes reflect the evidence collected (Noble & Smith, 2015). The objective reliability in research is to demonstrate the consistency and repeatability of the research (Baskarada, 2014). Lincoln and Guba (1985) suggested the establishment of rigor in qualitative research through the implementation of (a) credibility, (b) dependability, (c) confirmability, and (d) transferability, which Lincoln and Guba collectively called trustworthiness. Houghton, Casey, Shaw, and Murphy (2013) explained the value of Lincoln and Guba's approach to rigor in the context of case study research. In a broad context, the concept of dependability is analogous to reliability, whereas validity aligns to the constructs of credibility, confirmability, and transferability (Morse, 2015).

Dependability and Confirmability

According to Houghton et al. (2013), the techniques in establishing dependability and confirmability in a qualitative case study are similar. Whereas dependability is concerned with the reliability of all phases of the research including data collection, organization, and analysis, confirmability addresses the potential biases of the researcher

and the accuracy of the data in respect objectivity (Morse, 2015). The goal of dependability in qualitative research is to demonstrate that the findings are repeatable and are consistent with the methodological approach (Moon, Brewer, Januchowski-Hartley, Adams, & Blackman, 2016). Confirmability establishes the degree of a researcher's neutrality and representativeness of the findings regarding the data provided by the participants (Jauhar & Tajuddin, 2015). Jauhar and Tajuddin (2015) recommended keeping a research log to reflect any bias of the researcher.

The first technique I used to establish dependability and confirmability was an audit trail. The audit trail consisted of a research log that contained documentation of the research activities such as (a) an interview log that captured the environment and context during data collection, (b) a reflexive journal throughout the study, (c) research decisions, and (d) notes documenting any researcher bias. I also used the computer-aided qualitative data analysis software (CAQDAS) NVivo because NVivo provided an audit trail of my decisions throughout the data collection and analysis phase. The records of the queries also provide evidence and protect against unusual findings that may support any predisposed argument or bias. I also performed member checking of the interview data by each participant, as member checking is a critical validity technique highlighted by Lincoln and Guba (1985) in establishing trustworthiness.

Credibility

Credibility is concerned with the confidence in the overall findings of the study (Lincoln & Guba, 1985). I increased the credibility of the research through triangulation and member checking. Triangulation consisted of corroborating the findings through

multiple data sources. The specific data sources included (a) the semistructured interview data, (b) pertinent participant provided project documents, and (c) organizational documents concerning project management standards and procedures documents. According to Ando et al. (2014), the judicious management of the data also contributes to the reliability of qualitative research. Based on the Ando et al. premise, I used detailed steps, actions, and tools to capture, organize, and store the data, which contributed to the credibility of the data.

Transferability

In a case study research, transferability is the degree that the findings of the study can apply to a different context (da Mota Pedrosa, Näslund, & Jasmand, 2012). As the reader must ultimately decide the transferability of the findings, I provided thick descriptions of the case and the research process. Specifically, the thick descriptions within a narrative should include the elaboration of the context, participants, actions, and the environment (Yilmaz, 2013). I also provided a detailed description of the research processes as this added to the transferability of the study and conversely provided information about the limits of the study regarding transferability. The final narrative also includes the rationale for the case selection as it assists the reader in assessing the applicability of the findings to other contexts.

Saturation

I used several techniques to facilitate data saturation. The first technique, suggested by Fusch and Ness (2015), is an interview protocol in which I asked all the participants the same questions. Fusch and Ness also suggested that data triangulation

contributes to data saturation. Therefore, I cross-verified the data from the collected internal organizational documnetation and the interviews. Elo et al. (2014) also suggested purposeful sampling as a technique to facilitate saturation; therefore, I utilized purposeful sampling within the bounds of the case. Tran, Porcher, Falissard, and Ravaud (2016) suggested that if researchers do not achieve data saturation with the initial data collected, then the researchers should collect data until no new relevant information or emergent themes arise that necessitate changes to the code book. Although I achieved data saturation with the coded interview data from the initial participants and the supporting documents, I was prepared to gather more data until the achievement of saturation.

Transition and Summary

Section 2 included the rationale for the selection of a qualitative case study approach. The section also included descriptions and justifications of the population, sampling size, and the associated selection criteria of participants. Critical to the dependability, credibility, confirmability, and transferability of the research project, the section also contained details concerning the rigor and the role of the researcher, along with specifics relating to the execution of semistructured face-to-face interviews as the primary data collection technique. The section also addressed the trustworthiness of the study through the data cataloging process and an explanation of the steps used for the thematic data analysis. This section also contained assurances that I ethically collected and handled the data in compliance with the Walden IRB requirements. Lastly, the concept of saturation and the use of triangulation within several components of the

section reinforced the importance of ensuring the adequacy and quality of the data collected for the study.

In Section 3, I present the findings and describe the applicability of the results to professional practice. I reiterate the implication of social change in terms of tangible improvements and make recommendations for action and further research. Finally, I reflect on the experiences and conclude with a clear take-home message.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative case study was to explore RM strategies that IT PMs within the pharmaceutical industry use to improve project performance for the successful delivery of an IT project. The population included IT PMs that had histories of successfully managing IT project risks, resulting in increases in project performance that led to the successful delivery of IT projects. Using a semistructured interview format, I collected the primary data by presenting 13 open-ended questions (see Appendix B) to seven participants, who were IT PMs from a pharmaceutical company located in the northeastern United States. For methodological triangulation, I correlated organizational project risk registers and documents concerning the use of PM processes and tools with the data acquired from the interviews. I reached data saturation when no new themes emerged from the data obtained from the seven participants. The achievement of data saturation with seven participants supports the premise proposed by Ando et al. (2014) that data saturation is achievable with a small sample size when the participants are from a small homogenous population. Using the processes outlined in Malterud's (2012) STC strategy I identified four main themes representing RM strategies that may increase IT project performance through inductive content analysis. The four main themes are (a) knowledge management, (b) a positive risk culture, (c) utilizing an existing RM framework, and (d) RM communications. The analysis of the data through the lens of ANT also elucidated that the themes are reflective of translation and several other key constructs within actor-network theory.

Presentation of the Findings

The research question used as the basis for the thematic analysis was as follows: What RM strategies do pharmaceutical industry IT PMs use to increase project performance for the successful delivery of an IT project? A review of the peer-reviewed literature concerning project RM research and ANT provided the basis for the interview questions that I used to address the research question. I used ANT for the conceptual framework of the study and lens during the thematic analysis and the final synthesis of the data. The thematic analysis of the data collected from the interview questions, a review of risk registers, and a review of documents that exemplified and described the RM tools used by several of the participants yielded four major themes, each comprising of two or three subthemes.

The four main themes represent the key strategies that the participants used for the successful management of IT project risks to improve project performance for the successful delivery of an IT project. As the context of each project is unique, the first theme reflects the need to understand the project context for effective risk management. The second theme reveals the need to promote a positive culture that encourages risk identification and ownership. The third theme represents the participants' appropriate utilization of a previously existing RM framework. The fourth theme highlights the importance of communications throughout the project lifecycle in relation to risk management. Using the lens of ANT also yielded several insights and the identification of the IT PM soft skills of negotiation and communication. The other study findings included the identification of several barriers to the implementation of an IT project RM

strategy, and how each participant measured the effectiveness of their respective RM strategies. Table 1 displays the frequency of the identified major themes representing the identified RM strategies.

Table 1

Major Themes Representing Risk Management Strategies

Major Themes	Number of participants that offered this perspective	Percentage of participants that offered this perspective
Implement knowledge management	7	100%
Promote a positive risk culture	7	100%
Utilize an existing risk management framework	7	100%
Perform risk-related communications	7	100%

Implement Knowledge Management

The thematic analysis identified the emergent theme of knowledge management. Knowledge management is the shared understanding of the knowledge concerning the technical and organizational solution along with knowledge concerning the expected business value (Reich et al., 2014). The growth of an actor network requires the negotiation among the actors and the primary actor to come to align with the focus of the network (Latour, 2005). Knowledge plays a key role in the power dynamics within the actor-network (Callon, 1986). Without knowledge and the associated power enabled by knowledge the IT PM who is acting in the role of the primary actor may lack the influencing power to negotiate with the other actors. The ability of an IT PM to negotiate with the other actors is a key factor in building, rebuilding, or maintaining an actor-network focused on overall RM or a particular risk. Knowledge is required to grow the

actor-network, and it helps prevent its disintegration when actors lose focus of their role in the network (Callon, 1986). Numerous researchers (e.g., Javani & Rwelamila, 2016; Neves et al., 2014; Oun et al., 2016; Reich et al., 2014; Serpella et al., 2014) have corroborated the positive effect of knowledge management on risk management.

Knowledge management, which facilitates a shared understanding among team members and stakeholders, has a positive effect on project performance and value creation (Reich et al., 2014). According to Serpella et al. (2014), unmanaged knowledge is a major contributing factor to RM failure. Neves et al. (2014) stated that knowledge is one of the most powerful tools for managing project risk.

All seven of the participants indicated that they managed knowledge related to the organizational context and stakeholder expectations as part of their RM strategies. The participants also indicated they organized the information for use by all the project actors throughout the RM process (P1, P2, P3, P4, P5, P6, P7). A review of the documentation provided by P1, P2, P4, P5, and P6 revealed that the IT PMs used electronic data repositories to store and share information about risks and other project information. The organizational document provided by P4 contained the steps that IT PMs and team members should follow to create and manage changes to project related documents within the organization's electronic library. The version management of the project requirements, scope, schedule, and budget documents is not only a method of knowledge management but also a method of risk control in the form of change management throughout the project lifecycle (P3, P4). Specifically, P4 stated that without document version control "You get three-fourths of the way through the project, and then something

changes . . . . Then it's an argument or a debate of what version of the document I am supposed to be using." P2 also indicated that the risk log is "built in SharePoint, so we have a tool that actually utilizes it [SharePoint], and the nice thing about the tool is it allows a whole host of people access to see where we may be currently on any given risk or issue." Concerning risks that could affect the project schedule, P4 stated, "I tried to do as much as I could from a central SharePoint site . . . . I would always have the Microsoft Project schedule posted so that anybody at any time could go and look at the schedule." P5 also indicated that their organization's project management community of practice utilizes an online repository to share information so IT PMs can gain RM knowledge from the other "approaches that people are using to identify and manage risks." The use of repositories and their reported usefulness in IT project RM aligns with the findings of Neves et al. (2014), who indicated that unsuccessful RM may be a result of a lack of a knowledge repository. In addition, Reich et al. (2014) indicated that the alignment of knowledge positively affects project performance and the successful completion of an IT project.

Knowledge sharing is another element of knowledge management. A popular method of knowledge sharing is a process known as lessons learned (Foote & Halawi, 2016). The process of lessons learned is when the IT project team and IT PMs incorporate previous knowledge from other similar projects or recently gained information that the team captured during the periodic review sessions of a current project about the RM processes. The majority of the participants indicated that they performed some form of lessons learned as part of their RM strategy (P1, P3, P4, P5, P6).

P5 stated, “Retrospectively, we definitely do lessons learned. We go back and look at some of those risks, and identify realized risks and their impact.” Preforming lessons learned sessions retrospectively to capture and gain knowledge from a recently completed project to carry forward to a future project was how P1, P5, and P6 described their use of lessons learned. However, P3 and P4 also indicated that performing lessons learned periodically during the project was part of their risk management strategies. P3 stated not to “wait until the end to get lessons learned.” P4 stated that a lesson learned session could be as informal “as we sit down and have a coffee and figure out what they're doing.” This finding aligns with the research of Marcelino-Sádaba et al. (2014), who indicated that lessons learned are a key element of proper risk management. Although all of the participants noted the use of some form of knowledge management within their respective RM strategies, there are three subthemes that reflect the specific areas of knowledge that each of the participants utilized throughout their RM activities and decisions. Table 2 shows the three tactics the participants incorporated into their RM strategies that were important in managing the IT project risks to maintain performance for project success.

Table 2

Subthemes Representing Tactics for Knowledge Management

Subthemes	Number of participants that offered this perspective	Percentage of participants that offered this perspective
Examining the business context	7	100%
Understanding the stakeholders’ interests	5	71%
Assessing the knowledge stock	7	100%

Examining the business context. The first subtheme of knowledge management is the obtainment and use of knowledge related to the business context for the purpose of RM. As noted in the literature review, several researchers have explored the relationship between the business context in which a project exists and how PMs address risk management (Besner & Hobbs, 2012, 2013; S. Liu & Deng, 2015). According to Keil, Rai, et al. (2013), an effective IT PM needs to understand the overall context of the project in relation to how the project will affect the business and stakeholders and collect information concerning risks that may impact project success.

Information about the business context is an element of the successful RM strategies used by the all the participants (P1, P2, P3, P4, P5, P6, P7), as the IT PMs and the other project actors use this information for risk identification, analysis, and mitigation-related decisions. In relation to why they collect business-related information, P5 stated, “I was very familiar with project management, program management, but this was a new business area, and that brought with it new risks that I wouldn't necessarily be aware of.” There were several aspects of the business context that the participants addressed, such as relevant business processes (P2), organizational goals (P1), political climate (P4), and relevant industry standards and regulations (P3). P6 summed it up best: “Part of my strategy is getting the lay of the land and understanding what's happening.” P6 noted that they get the lay of the land by gaining knowledge related to understanding what other groups are doing that may impact the project or that their project may be dependent upon. P6 also indicated that they try to understand what is generally happening

within the business. Additionally, P6 highlighted the need to understand the specific business drivers that are behind the expected deliverables.

This finding aligns with the research of Lehtinen et al.(2014), Thamhain (2013), and Lech (2013). Lehtinen et al. found that a common theme related to IT project failures was that IT PMs failed to examine the context in which the execution of the project occurred. Thamhain indicated that a significant number of risks to project performance concern organizational context. Additionally, by understanding the broader organizational goals in the context of RM, as noted by P2, the findings support Lech's premise that organizations are increasingly measuring project performance and success against the alignment of the deliverable with the organizational objectives.

Besides indicating what information they collect as part of their RM strategy, P5 described a valuable method for the collection of the information. P5 indicated that running a workshop or, at a minimum, having a meeting with the organizational sponsor(s) is a useful strategy for acquiring organizational information. The value of the workshop, according to P5, is the identification of the “environmental risks or organizational risks that you wouldn't necessarily identify from other folks on the project but that could have an impact on the project.” This type of meeting is one of the five knowledge transfer techniques Neves et al. (2014) identify for using knowledge management as a component of risk management.

Understanding the stakeholder interests. The second subtheme concerns obtaining knowledge about the project stakeholders, which is a frequently explored topic in project management research. Understanding stakeholder influence provides PMs with

insight into how organizational members and other actors that have an interest in the project might influence the PMs' ability to manage project risk (Caron & Salvatori, 2014). Another aspect of stakeholder influence is the social aspect of stakeholder engagement in the controversies that may arise (Missonier & Loufrani-Fedida, 2014), such as disagreements among organizational players in terms of risk impact and allocation (Papadaki et al., 2014). P4 indicated that understanding stakeholder influence is important because there is a need to understand how organizations work. This statement aligns with a technique suggested by Missionier and Loufrani-Fedida (2014) and Papadaki (2014) to gain an understanding of interstakeholder dynamics, which, according to them, PMs need to have.

P4 described the process of understanding the stakeholder dynamics in terms of understanding the relationships among the stakeholders and other project actors. Specifically, P4 noted that they capture information related to "who runs that part of the organization" and who has the technical capability or has control of the technical resources to resolve an issue. All the participants indicated the need to identify and develop a relationship with stakeholders who can sponsor and facilitate organizational changes and have the capability to redirect technical resources for risk mitigations (P1, P2, P3, P4, P5, P6, P7). P4 summed up the need for an IT PM to form a relationship with the business leader because relationships are important in identifying "who's got the real power" to influence organizational change and commit project resources. In this context, P6 indicated there is a need to identify the right stakeholder to help influence organization change because "they [IT projects] have a change management component

to them, and actually sometimes a lot of the big projects I've been involved in have really been [business] change management projects supported by technology.

P5 described another element of stakeholder dynamcs in terms of the ability of a stakeholder to resist the change caused by the IT project deliverables. The information needed to understand if a stakeholder may use their power and resist the change is another aspect of getting a lay of the land, which the case organization associates with stakeholder analysis. A document obtained as part of the data collection outlined the case organization's best practices concerning project stakeholder analysis. The best practice document included six questions that may help an IT PM understand if a stakeholder might have reason to resist the project deliverables. The six questions are as follows: (a) Will the project deliverables resolve or exacerbate the stakeholder's key business issues? (b) Are the stakeholder's needs included in the project deliverables? (c) Are the needs of one stakeholder in conflict with the needs of other stakeholders? (d) Does the success of the project create any negative impact for the stakeholder? (e) Will the project expose the stakeholder to any risks? (f) What level of risk will the stakeholder tolerate?

All the participants reinforced the need to understand stakeholder expectations and influence as part of an effective RM strategy (P1, P2, P3, P4, P5, P6, P7). A primary tactic for capturing the project stakeholders' expectations is by facilitating the initial project definition and scoping meetings. In addition, the participants indicated that they held meetings specifically designed to continually engage the project sponsors and stakeholders (P1, P2, P3, P4, P5, P6, P7). All the participants specified that they had at least monthly meetings with the sponsors and key stakeholders (P1, P2, P3, P4, P5, P6,

P7). During these meetings, each participant indicated they reviewed the risks and then captured the stakeholder's expectations concerning a risk's impact on project performance and the resources required for the mitigation of a risk. In these meetings, the participants also indicated that they used a project status report and a risk register as tools to elicit feedback from the stakeholders. Having frequent stakeholders meetings that include reviewing the risk register throughout the project lifecycle is a useful tactic for maintaining an up-to-date understanding of a stakeholder's expectations concerning project risks. However, P5 indicated that there is a more fundamental tactic to capturing stakeholder expectations. P5 stated, "it may sound simple, but you ask them."

In addition to collecting several risk registers from the case organization, the data collection also included several project status reports. The participants used these status reports during stakeholder meetings to solicit additional feedback from the stakeholders in relation to the overall risks to project performance (P1, P3, P5, P6, P7). The collected project status reports used by participants have four key elements in common. The first common element is a section reporting on the high-level status of the project's budget, schedule, resourcing, and scope. The second common element of the project status reports is a section used to report the upcoming key milestones or critical path items; this section contains a list of the key milestones and expected completion dates along with the status of the milestone. The first two sections of the status report use the same status indicators; the status of an item is on either target, at risk, or slipped. The third common element of the project status reports is a section that lists any key decisions the project team needs the stakeholders to make, which can include decisions on risk mitigations and

prioritization. The fourth common element of the project status reports is a key issues and risk section; this section includes a description of each risk or issue and the severity and probability assessment. The IT PM and team members evaluate and denote the severity and probability of the risks in this in terms of low, medium, or high. In addition, this section also requires that each documented risk or issue have a mitigation or remediation plan.

The predominant types of stakeholders noted by the participants were the business or project sponsor (P1, P2, P3, P4, P5, P7). In relation to gaining knowledge to mitigate "the human risks," as denoted by P5, P5 appropriately summed up the situation in terms of an engagement strategy that "starts at the very beginning of the program, and it starts with the sponsors." Although all the participants indicated they purposely sought out stakeholder related knowledge (P1, P2, P3, P4, P5, P6, P7), P1 indicated that the initiation of stakeholder engagement is not necessarily for the sole purpose of RM and can just be part of a broader project framework. This finding aligns with the suggested practices supported by the Project Management Institute or advocated as part of the Prince2 framework concerning the practice of stakeholder engagement. Overall, the findings indicated that all seven participants included acquiring organizational data and information about the expectations of the stakeholders' as part of their RM strategy. These findings align with the outcomes of previous studies indicating that gaining an understanding of the stakeholders' expectations and influence by the PM can have a positive effect on project RM outcomes (Islam et al., 2014) and project performance (Mazur et al., 2014).

In addition to engaging internal stakeholders, P1, P2, P3, P4, and P5 mentioned external vendors in the context of a stakeholder. This finding is in alignment with the stakeholder theory. The stakeholder theory expands the common view of what constitutes an organizational stakeholder to include both internal and external individuals and groups that have interests and concerns related to the likelihood of obtaining the organizational goals (Miles, 2015). Eskerod et al. (2015) posited that also incorporating the views of external stakeholders concerning the goals of an organization may increase the likelihood of organizational and project success.

Furthermore, P5 and P6 extended the scope of project stakeholders to include the end users, which, according to Liu (2016) and Keil, Rai, et al. (2013), is a critical group to include early on in the project as stakeholders because of the significant influence the end users can exert and potential risks they may create. Additionally, P2 indicated the there is another set of stakeholders that IT PMs should engage in an effort to gain an understanding of the scheduling and resource interdependencies and conflicts among multiple projects. These stakeholders are other PMs. This finding is consistent with the observation of Beringer et al. (2013) that indicated that PMs are organizational stakeholders in non-project organizational structures.

Assessing the knowledge stock. Knowledge stock is the pertinent domain knowledge, also known as subject matter expertise, of the project team members and the extended business and technology resources available to the project (Reich et al., 2014). The successful delivery of an IT project requires both business and technical domain knowledge to convert business requirements into IT system capabilities (Hung et al.,

2014). All seven of the participants referred to the assessment of the knowledge stock within the team and the extended resources as part of their RM strategy (P1, P2, P3, P4, P5, P6, P7).

Assessing knowledge stock starts during the initial project planning meetings and is a continuous activity throughout the project (P7). P6 stated that one aspect of assessing the project knowledge stock is "almost like an interview process" where the IT PM asks questions to the stakeholders and team members concerning an individual's certifications and qualifications. Other participants also identified specific knowledge areas that require assessment such as an individual's knowledge of (a) industry regulatory guidelines (P3), (b) organizational processes or process owners (P1), (c) technical expertise (P5), (d) procurement, and (e) domain knowledge of the project deliverables (P7). Taking knowledge stock also entails some aspects of resource planning (P7). Resource planning is an important element of taking knowledge stock because it is also a risk to the project if an individual is not available to commit and contribute their knowledge to the risk RM process throughout the project. Besides assessing the knowledge stock of an individual actor associated with the project, there is also the need to perform a knowledge stock assessment of any vendors associated with an IT project (P2). Methods to perform knowledge stock assessments of vendors include having vendors respond to requests for proposals and produce statements of works. These two types of documents were not included in the data collection because of confidentiality agreements between the case organization and the vendors who provide IT project resources and services to the case organization. P3 indicated that knowledge stock assessments are an ongoing process. P5

described a technique of assessing the ongoing knowledge of the team and stakeholders during the weekly and monthly meetings. P5 indicated that when they hear statements like “it should" or “we hope” during project and risk review meetings, this indicates that there may be a gap in the required knowledge to identify or mitigate a risk. According to P5, assessing whether someone on the project team has the knowledge to resolve the risk “can be as simple as asking ‘Who knows how to resolve this?’”

In regard to identifying risks that may affect project success, P7 indicated that there is a need to have subject matter expertise and domain knowledge available within the team. P3 stated, “you would want the experts of the product to mitigate the risk of having anyone learn that [product] from scratch. In itself, that's a risk mitigation strategy.” P6 stated,

> I use the expertise around me as much as I can, and I'll put the question to the right people. For example, if we've identified a risk that potentially this event that we're dependent on technically might not happen in the timeline that we need it, what would we do?

The statement by P6 is also indicative of P2, P3, P4, and P5's stated reasons for the need to understand the technical stock available to the project for RM-related activities. These findings align with the previous research of Oun et al. (2016), who indicated that identifying, accessing, and acquiring the appropriate knowledge stock is a key component of the information needed for proper risk identification, assessment, and response planning.

Although taking stock of the pertinent domain knowledge needed to manage the project risks in an effort to manage project performance is a factor in the RM strategies (P1, P2, P3, P4, P5, P6, P7), according to Reich et al. (2014), having the knowledge is not necessarily valuable to the RM process unless the knowledge is shared. Reich et al. posited that knowledge sharing among the project actors facilitates the value realization of the domain knowledge. Although the findings indicated that the IT PMs incorporated the assessment of the domain knowledge in support of the RM activities, there was no evidence of the purposeful design of a knowledge management or sharing framework. However, the use of knowledge management and sharing by the participants is evident within the themes concerning culture and communication.

Promote a Positive Risk Culture

Although this research was not ethnographic in nature, the identification of an RM culture did emerge as a theme. A strong RM culture creates the basis for effective risk management (Teller, 2013). When examining risk in terms of culture, researchers like Teller and Kock (2013) acknowledged the effects of the broader organizational culture on project performance. Specifically, the findings of Teller (2013) along with Teller and Kock (2014) indicated that utilizing some RM processes has a significant positive impact on an organization's coping ability and a moderating effect on project and portfolio performance. Surprisingly, only one of the participants shared any perceptions concerning the need to address or incorporate the broader organizational culture concerning risk tolerance or coping into their RM strategies (P2). P2 stated, “we are not going to be jerks,” when describing a project team culture of encouraging project actors

to raise risks. A review of the case organization's internal website indicates that this attitude reflects the broadly promoted organizational norm of not tolerating jerk-like behavior as part of the organization's culture. The finding that P1, P3, P4, P5, P6, and P7 did not explicitly address the broader organizational culture within their RM strategies might point to some type of halo effect. As all of the participants are from the same successful case organization, and the participant selection criteria required the participant's success in managing projects' risks within his or her own broader organization. These facts may have contributed to a possible halo effect in addition to one of the stated fundamental tenets of the case organization's organizational culture, which is seizing opportunities with thoughtful risk-taking. During member checking, all the participants confirmed that the organizational culture embraces risk and thoughtful risk-taking (P1, P2, P3, P4, P5, P6, P7).

Although only one of the participants addressed the broader organizational culture in their RM strategies (P2), all of the participants touched upon various aspects of a risk culture within their respect project teams (P1, P2, P3, P4, P5, P6, P7). In the context of promoting a project culture that embraces and values RM, P5 stated, “I think setting the whole ethos of why risk management is important upfront can help.” P3 appropriately summed up the importance of promoting a team culture that embraces RM by stating, “if you don't drive the culture, you're not going to have a successful risk management process.”

Schein (2017) indicated there are three elements that contribute to organizational culture. The first element concerns organizational characteristics such as (b) meeting

structures, communications frameworks, organizational configurations, and status indicators of organizational members. Although this study did not include direct observations, the data collected from the participant interviews did broadly describe some of the project team characteristics and the structure of project meetings and communications. The second element of an organization's culture is the shared learnings that consist of the values and behavior norms of the organization. The third element of organizational culture is the fundamental assumptions of an organization. Table 3 contains the elements of a positive risk culture elucidated from the data analysis in terms of Schein's three fundamental elements of organizational culture.

Table 3

Fundamental Elements of a Positive Risk Culture

Fundamental elements of organizational culture	Elements of a positive risk culture
Organizational characteristics	The project manager holds the highest status in the team in regards to risk management accountability.
	The project manager is accountable for encouraging a positive risk culture.
	The structure of the meetings concerning risk management includes the review of the risk registers.
	The team participates in weekly risk review meetings and the meetings are daily if using an agile methodology.
	The project manager and the project stakeholders participate in monthly risk review meetings.
	Risk communications span all organizational levels.
	All the project actors have access to a centralized risk reporting system and risk register.
	Risk management is a standing agenda item at all meetings.
	All attendees of a project meeting discuss risks.
Shared learnings	The reporting of bad news elicits positive responses.
	Risk reporting is everyone's responsibility.
	Risk management is a continuous activity.
	There are no personal consequences for identifying risks.
Assumptions	The early identification of a risk increases the likelihood of risk mitigation before the risk affects project performance.
	The consistent use of risk management methods keeps the team aligned and engaged in risk management.
	Providing clarity to all the team members concerning their roles and responsibilities encourages risk ownership.

These findings indicate the emphasis the participants placed on ensuring that a positive risk culture within the project team is part of their successful strategy in

managing IT projects for increasing or maintaining project performance for the successful delivery of the project. The study's findings were in alignment with the findings of Rasheed, ChangFeng, et al. (2015), which indicated that the lack of a risk-aware culture is one of the top five barriers to effective RM. The theme of promoting a positive risk culture comprises three subthemes that reflect the various aspects of a tactics the participants used to promote a positive risk culture. Table 4 shows three tactics the participants indicated they used in promoting a positive risk culture.

Table 4

Subthemes Representing Tactics for Promoting a Positive Risk Culture

Subthemes	Number of participants that offered this perspective	Percentage of participants that offered this perspective
Encourage the reporting of bad news	7	100%
Promote risk management by all the actors	7	100%
Apply risk management practices consistently	7	100%

Encourage the reporting of bad news. The need to encourage a culture that views the reception of bad news as a positive and encourages the reporting of any risk can reduce the delay in identifying risks or issues before they become serious (Keil et al., 2014). Rasheed, ChangFeng, et al.(2015) identified that an inadequate risk-aware culture is a factor that needs to be addressed when applying a program or project RM strategy. Many of the IT PMs revealed the various ways they try to promote a culture that embraces safe and open conversations about risks. P5 explained, “What you're trying to do is encourage people to come forward with risks that they see, and you want to encourage people to do that as openly as possible.”

In respect to reinforcing why reporting bad news is positive in their project teams, P7 stated, “I think change and risk are good. People shy away from identifying risk because it's a bad reflection on them, but if you identify risk early and you mitigate it, that's success.” According to P6, IT PMs need to overcome the barrier that reporting bad news is a reflection upon the person reporting the bad news, and there is a need to overcome the “hesitation to have courageous conversations.” The analysis of the data indicated several factors that may help IT PMs and other project actors overcome their hesitation to have courageous conversations. One factor that can help IT PMs and other project actors to overcome their hesitation to have courageous conversations is having a clear and common understanding of how to analyze and categorize a risk regarding overall project performance (P6). Another factor is the level of encouragement provided by a project manager to come forward with bad news by emphasizing that there may be other project capable of resolving the a risk. P2 suggested that collecting facts about the risks may help reduce individual’s hesitation to report risks as the facts may help reduce some of the emotional ties an individual may have with a project risk. In addition, both P3 and P4 reinforced the value of developing a positive risk culture that embraces bad news versus a culture in which individuals feel there will be an angry or punitive responsive for bringing up bad news. P1 summed up the value of overcoming the hesitation of reporting bad news and the timely reporting of projects risks by stating, “bad news never goes away by waiting.”

This finding indicates that IT PMs have created a culture that encourages risk reporting and promotes the early reception of bad news, which is consistent with the of

findings of Ramingwong and Ramingwong (2013), who concluded that the fear consequences is one reason why one or more persons keeping quiet about problems can contribute to the failure of IT projects. Additionally, the findings of this research align with those of Keil et al. (2014) and Islam et al. (2014), which indicate that the early identification of risk increases the likelihood that a risk will be mitigated before it impacts project performance.

Promote risk management by all actors. Without alignment and common purpose among the actors, an actor-network can become weak (Callon, 1986). One aspect of a project team's culture noted by Dyer (in press) is that everyone should practice risk management. The participants were unanimous in their view that RM is part of everyone's role in the project team (P1, P2, P3, P4, P5, P6, P7). P5 noted that the active participation of the project sponsor or senior-level stakeholders in RM is essential when identifying and mitigating the risks related to the organizational or operational changes the project deliverables may induce. This finding aligns with that of Taylan's (2014) fuzzy logic research regarding highly impactful risks, indicating that the lack of senior leadership is a contributing factor to the failure of IT projects.

In relation to integrating RM into what everyone in the project team is doing, all of the participants explained the frequent meeting cadence required to include all levels of the various actors associated with the project into the RM process throughout the project lifecycle. P3 explained, “The risk question still comes up, so the cadence is how many times you meet, how often do you want to meet but you incorporate the common questions as part of that.” P3's explanation reflects similar statements from P1, P2, P3,

P4, P5, P6, and P7 indicating that their RM strategies require frequent meetings with the project team and sponsors. P3, P5, and P7 also indicated daily meetings with the team if it is necessary, and P1, P2, P3, P4, P5, P6, and P7 indicated the need for weekly meetings with the team and monthly meetings with the sponsors and stakeholders. In these meetings, RM becomes part of the standing agenda, as denoted by the majority of the participants (P1, P2, P3, P4, P5, P6). In terms of promoting a culture that all the actors are continuously engaged in RM, P5 stated, "Engaging them all along the way I think is the best thing . . . . it's really everybody that's involved in a project that contributes to the ability to manage risk." Table 5 displays the key tactics used by the participants to encourage and facilitate RM by all the actors associated with a project.

Table 5

Key Tactics to Encourage Risk Management by all Actors

Tactics	Participants
Perform risk reviews in daily project team meetings.	P3, P5, P7
Perform risk reviews in weekly project team meeting.	P1, P2, P3, P4, P5, P6, P7
Perform monthly engagement meetings with the project sponsors or senor level stakeholders to review risks to project performance.	P1, P2, P3, P4, P5, P6, P7
The integration of risk management responsibilities into the roles of all the actors associated with the project.	P1, P2, P3, P5, P7
Provide easy and transparent access to all risk related documentation.	P2, P4, P5, P6
Preform continual risk management engagement with the project team, vendors, and stakeholders thought the project lifecycle.	P1, P2, P3, P4, P5, P6, P7

This finding reflects the emphasis the participants put on the continuous review of the project's risk by all the project team actors. The finding is consistent with the findings

of several previous studies that indicated performing continuous RM is a useful technique to include in a RM strategy (Chawan et al., 2013; De Wet & Visser, 2013; Hu et al., 2013). Hu et al. (2013) suggested continuous RM throughout the project lifecycle because it is usually difficult to identify and mitigate all the project risks in one pass. De Wet and Visser's (2013) research showed that ongoing RM positively affects an IT project's success.

Apply risk management practices consistently. The consistent application of RM practices relates to the concept of mobilization, the fourth moment of translation within actor-network theory. Mobilization is predominantly about keeping the actors aligned over a period of time and acting in agreement with the interests of the initial actors (Callon, 1986; Latour, 1987). The primary actor in this context is the IT PM, who creates institutionalized action by ensuring the consistency of the utilization of RM practices. The normalization of the RM practices occurs when the project team accepts the RM actions and processes as common practice (Kutsch et al., 2013). P3 stated, “a good project management culture is consistency.” P3 defined consistency in terms of “what is the approach we're going to take, what are the processes we're going to use?” In the context of how IT PMs should use an RM strategy to manage project performance for the successful delivery of a project, P7 stated, “along with the process, it is essentially consistency.” The finding that the consistent application of RM practices is an element of the RM strategies of P2, P3, P5, and P7 is consistent with the findings of Kutsch et al. (2013). The findings of Kustch et al. indicated that the lack of the legitimacy of the RM practices is one of the top five reasons actors disengage from performing RM activities.

The disengagement from performing RM activities is analogous to the concept of irreversibility associated with the actor-network theory. Irreversibility represents the strength of the bonds within the network for the actors to stay associated with the network, and weak irreversibility suggests that an actor can break from the network at little or no cost (Callon, 1991). Based on the findings of (Kutsch et al., 2013), without a project team with a culture of consistency, as stated by P3, an IT project actor could break away from a network formed for the purpose of RM with little social or personal consequence. Although P3 was the only participant within the study that explicitly associated consistency with culture, all the participants associated the need to (a) utilize a standard process, (b) meet consistently, and (c) make sure there is an understanding of how the RM processes work with the characteristics of the team (P1, P2, P3, P4, P5, P6, P7).

Utilize an Existing Risk Management Framework

Brookfield et al. (2014) suggested that utilizing a framework that guides the PM to take into consideration the contexts of the various phases of the project lifecycle may increase the PM's understanding of the relationships between the various risk factors. All of the IT PMs noted the use of an existing PM or RM framework in the context or risk management. Six out of the seven participants referenced the Project Management Institute's body of knowledge (P1, P2, P3, P4, P5, P7). P2 also mentioned the existence of an in-house RM framework that capture, risks, actions, issues, and decisions. P1, P2, P3, P4, P5, and P6 provided screenshots reflecting online tools and risk registers they used in conjunction with their RM framework.

P3 proclaimed, “Right off the bat; I try not recreating the wheel.” All of the participants elaborated on their use of an existing project management framework and the associated RM process in the successful management of IT project risks. The majority of the participants referenced the use of the Project Management Institute’s framework described the PMBOK (2013). P4 provided documentation related to an in-house framework that included specific steps for the reporting of risks within a broader program. This documentation outlined seven steps to record the (a) description, (b) category, (c) impacted work streams, (d) origin, (e) owner, (f) probability, and (g) mitigation of a project risk. In addition, P3 indicated the use of a broader solution delivery lifecycle (SDLC) framework that includes risk identification and management processes. The collected documentation associated with the SDLC framework note only included the fundamental steps of RM similar to the PMBOK but highlighted and described the organizational requirements to assess a risk in terms of regulatory compliance.

The finding that all the participants recommended the use of a previously existing RM process for the successful management of IT project risks to increase project performance and, ultimately, project success supports the previous research of Chawan et al. (2013). Chawen et al. concluded that models or frameworks are valuable guides to follow for effective project RM. The finding that the participants use preexisting RM methods and did not use ad-hoc methods or were not just trying out various methods but were using repeatable processes indicates a high project risk maturity level. The repeatable use of a preexisting process suggests a RM maturity level of at least a three

when evaluated against the risk management maturity model (RMMM) described by Hartono, Wijaya et al. (2014). The significance of the finding is that according to the empirical research of Hartono, Wijaya et al., the higher the project RM maturity, the better the overall project performance. The findings indicating the use of the RM process framework support the findings of Kinyua et al. (2015), which indicated that the use of RM processes positively affects project performance.

The use of a preexisting RM framework by all the participants also indicated that each of the participants incorporated the four main RM processes within their RM strategies (P1, P2, P3, P4, P5, P6, P7). Table 6 shows the summation of the NVivo reference counts from the four nodes representing the four RM processes in respect to the coding of the participant interview data. The coded references represent each time a participant suggested or described an activity related to risk (a) identification, (b) analysis, (c) response planning, and (d) monitor and control.

Table 6

Frequency of Participants Referring to a Risk Management Process

	Frequency of references			
Participant	Identification	Analysis	Response planning	Monitor and control
P1	3	6	3	7
P2	4	9	4	22
P3	6	6	12	18
P4	3	7	2	13
P5	12	6	5	14
P6	5	3	2	7
P7	5	4	2	11
Total	38	39	31	92

The finding that all the participants expressed their use of the four RM process was not surprising, but the number of times the majority of the participants referred to monitoring and controlling related activities was significant in comparison to the other three processes (P1, P2, P3, P4, P5, P6, P7). Risk monitoring and controlling are (a) the continuous tracking of previously identified risks, (b) the identification of new risks, (c) the monitoring of enduring risks, and (d) the executing and evaluating of risk response plans (Project Management Institute, 2013). In relation to monitoring, P4 stated, “it's good to check in, and make sure that somebody's actively doing something, or monitoring whatever you said the trigger might be.” In discussing control, P1 indicated, “the only reason we're going to deviate from our commitments on the cost, schedule, quality, would be things that we need to manage and keep those under control”. P5 indicated the reason for monitoring and control “is to make sure that it [the risk] doesn't occur. If it looks like the probability is increasing that it's [the risk is] going to occur, then maybe you take some action.” P7 emphasized that “you need to manage those [risks] throughout the life cycle of the project. The risks are different across each life cycle.” This finding is consistent with the findings of Allen et al. (2014) Allen et al. (2014), which indicated that successful projects are a result of PMs utilizing monitoring and controlling with respect to the earned value management of the expected technology, schedule, and budget. During member checking, the participants reviewed the information in Table 6 and confirmed the numbers directionally reflect the time spent on those activities. During member checking, P1 offered a view on why the incidents of mentioning risk identification activities were low even though the activity is important to risk

management. P1 stated that they did not focus on discussing risk identification in their responses during the interviews because “risk identification is free” and explained, “it happens even if you are not looking for risks.”

The theme of utilizing an existing RM framework consists of three subthemes that reflect the various tactics that the IT PMs said they used in the application of the RM strategy. The three tactics that the IT PMs employed include (a) the use of a risk register, (b) the promotion of the idea that RM is everyone's role, and (c) the consistent application of RM practices. Table 7 shows the three subthemes that represent the tactics the participants indicated when they selected and utilized an existing RM framework.

Table 7

Subthemes Representing Tactics for Using an Existing Framework

Subthemes	Number of participants that presented this perspective	Percentage of participants that presented this perspective
Appropriately rightsize the framework	7	100%
Use a risk register	7	100%
Clarify roles and responsibilities	5	71%

Appropriately rightsize the framework. The use of an RM framework is valuable in increasing the likelihood of positive RM outcomes (Chawan et al., 2013). However, Kutsch et al. (2013) indicated that prescriptive, over-designed, or rule-based RM frameworks are sometimes not appropriate for the project environment and may lead to RM disengagement. The participants expressed there is a need for the appropriately sizing of the RM processes and tools to fit the characteristics of the project such as (a) size, (b) scope, (c) complexity, and (d) duration strategy (P1, P2, P3, P4, P5,P6, P7). P1

stated there is the “PMBOK [Project Management Institute's body of knowledge] way, and then there's the way we implement things in real life. Somewhere in between, you have to find the balance.” In relation to blindly applying an RM methodology, P6 stated, “Look at the project management body of knowledge, it's everywhere. How you carry that out is not so black and white I think a lot of times.” P7 summarized the need to be flexible in what and how RM is applied, “it's really having that process and essentially rightsizing it to your project and to your stakeholders.” This finding aligns with those of Klein et al. (2015), who indicated the blind utilization of standard project management processes, which includes RM, without taking into consideration the dynamics of the project, may be counterproductive.

The study finding indicates that rightsizing the RM processes based on an initial assessment of the project is just one aspect of the participants' successful RM strategies. P3 indicated that RM would benefit when “you can adjust what you need for the dynamic of the situation.” P7 explained the need for the “right level of risk management to the right project at the right time.” These findings align with those of Besner and Hobbs (2012), who indicated PMs need to be improvisational when managing innovation or complex projects, which characterizes most IT projects.

Rightsizing the RM process in terms of flexibility increases the likelihood that the IT PMs or other project actors may find the best solution possible when changes occur throughout the project lifecycle (Osipova & Eriksson, 2013). P2 explained that their RM strategy includes “getting input and doing additions, subtractions, things along those lines as we need to.” The subtheme not only aligns with the research of Osipova and Eriksson

(2013) but also suggests that the actor-network in terms of people and the RM framework, a nonhuman actor, is in a state of continual rebuilding throughout the project lifecycle in successful RM strategies. According to ANT, during the process of building and rebuilding the actor-network, the OPP is continually negotiating with the other actors to maintain alignment and focus on the actor-network (Callon, 1986). During the negotiations to add and subtract elements of the RM framework and rebuild the network, the IT PMs are acting as the OPP given they are speaking on behalf other human actors and nonhuman actors. Specifically, when the IT PMs are rightsizing the RM framework, they are speaking on behalf the human actors like the project sponsors and the nonhuman actors such as the project deliverables, risks, and RM strategy. The concept of continuously reassessing the social is a key concept of ANT (Callon, 1986; Latour, 2005), which in this context is the continuous assessment of the appropriateness of the RM processes and activities to maintain project performance.

Use a risk register. The Project Management Institute (2013) suggested that a risk register is an appropriate tool to document risks and their associated characteristics throughout the lifecycle of the project. In addition to using existing RM process frameworks, all of the participants indicated the incorporation of a risk register within their respective successful RM strategies. P4 stated, “From the risk matrix, if somebody identifies something as a risk to the project, you want to track it.” P7 described the value of a risk register as “a tool to help facilitate the management of risk in a project.” The use and value of a risk register indicated by the participants support the previous research of Sayegh (2014), who identified the importance of using a risk register. P5's statement

reflects the actions of all the participants. P5 stated, “We have a regular project status meeting with the project team, then that [the meeting] would be an opportunity to review the risk register.” P1 also indicated that although not a major strategy per se, part of their strategy is that they “work through the register” during the weekly meetings.

According to Sayegh (2014), a risk register is an effective tool that provides all the project actors visibility to the characteristics of the risks so the various actors can make informed evaluations and decisions concerning the project risks. P3 indicated that the risk register was loaded into SharePoint, which is an online collaboration tool. A review of the documentation related to the online collaboration tool used by the case organization revealed that all the project team members, stakeholders, sponsors, and appropriate vendors have access to the risk register and other information pertinent to managing the project risks, such as budget and schedule information. The finding that all P1, P2, P3, P4, P5, P6, and P7 included the use of a risk register as part of their RM strategies is consistent with the findings of Harding’s (2014) research that identified a risk register as one of the seven essential tools needed for a project to succeed.

Organizational documentation in the form of risk registers provided by P1, P2, P3, P4, P5, and P6 relieved that the risk registers used by the participants contained similar components to the risk register elements identified in the Project Management Institute's PMBOK (2013). The risk registers also contained additional elements beyond the fundamental risk register elements denoted in the PMBOK, such as detectability, residual risks, and triggers. Table 8 shows consolidation of the elements contained in the six risk registers reviewed by the researcher.

Table 8

Consolidation of Risk Register Elements

Number	Risk register element
1	Date identified
2	Risk/issue description
3	Probability
5	Impact
6	Detectability
7	Overall risk level
8	Mitigation plan/action
9	Mitigation trigger
10	Decision to trigger risk mitigation and why
11	Trigger decision maker
12	Residual risks after mitigation
13	Contingency plans
14	Risk owner
15	Exposure (budget, schedule, quality)
16	Priority
17	Mitigation status
18	Status (open/closed)
19	Risk identified by
20	Risk Modified by

The risk review of the registers used by the participants also indicated that the risk registers contained more than just the statistical probability of the likelihood the risk will occur but also a more subjective notion of its occurrence and impact in terms of what several risk registers denoted as detectability. Banerjee et al. (2014) indicated that relying solely on the use of statistical risk analysis and risk registers risk is a threat to RM success and project performance. However, the review of the risk registers used by the majority of the participants indicated that the risk registers contained subjective information about the risk. The risk register is a common nonhuman actor identified by all the participants (P1, P2, P3, P4, P6, P6, P7). Alkhuraiji et al. (2016) indicated the use

of artifacts, and nonhuman actors in IT projects increases the potential for alignment among the actors. Also, Papadaki et al. (2014) indicated that the lack of a common understanding of the risks among the project actors is itself a project risk.

Clarify roles and responsibilities. Five out of the seven participants indicated the need for the team members to understand their roles and responsibilities with respect to the RM processes that they are expected to use during the project (P2, P3, P4, P5, P7). The Project Management Institute (2013) suggested that good RM requires clear roles and responsibilities. Sayegh (2014) indicated that having the project team members understand their roles and responsibilities in relation to the use of the RM processes is one element of the RM planning that is required for successful RM results. In regard to using a RM framework, P3 stated the need to "train everyone on how to use it. Identify the roles and single points of contact or making sure that everyone understands what that approach or process is. Make sure everyone knows what their roles are associated with that." P4 summarized their RM strategy in "terms of making sure that people understand the processes that you're going to use, that type of thing. I guess this is the high-level view of how I've approached risk management." In describing a number of barriers to the successful implementation of an RM strategy, P5 stated, "roles and responsibilities would be a third, so not clearly identifying roles and responsibilities" would constitute a barrier. In describing elements of their RM strategy, P4 emphasized, "I want everybody to know exactly what box they're supposed to be operating in." The majority of participants indicated that ensuring the actors understand their roles and responsibilities with respect to RM is also a component of their overall RM strategy (P2, P3, P4, P5, P7). This finding

is consistent with the outcome of Iyamu and Sehlola's (2012) research indicating that ensuring a proper understanding of roles and responsibilities can have a positive effect on IT project risk identification.

Five out of the seven participants indicated that taking responsibility, in terms of the ownership of the RM process and activities, was a part of the RM strategy (P2, P3, P4, P5, P7). P7 stated, "I think one is from a strategy or an activity perspective is process . . . . also, as part of a process, is you want ownership." The belief that ownership is a key aspect of an effective RM strategy is consistent with Ward's (1999b) premise that perceived responsibilities of the project actors are the key factors to effective risk management. Didraga (2013) also indicated that a lack of ownership is one reason why RM processes are not used. The findings also align with the concept of *interessement*, which is a construct within the actor-network theory. *Interessement* is when the primary actor negotiates with and assigns roles to other actors, team members, and project stakeholders (Callon, 1986). The actions of the IT PMs, during the negotiation and assignment of RM roles and responsibilities to the other project actors (e.g., project team members, stakeholders) is *interessement*, the second moment of translation within the actor-network theory.

Perform Risk-Related Communications

Risk-related communications are the integration point for all other risk activities and are a key component of successful risk management. This activity is critical because it facilitates the exchange of information between all the actors involved in the project (Menezes et al., 2013). P2 explained, "communications is obviously a big thing in this

whole risk space." In terms of the value of risk communications, P3 stated, "You can't not have those conversations. That's a huge risk in itself by not having it [the risk communications]." P5 indicated that "in terms of the "strategy of communications . . . think that the communication process starts early one, goes throughout the program, and at various different times it may increase." P4 summed up the value of RM-related communications among the project actors:

> If you compare that to projects that didn't have a communications plan, you often found that people were reacting based on what they thought, they feared, they expected, not necessarily to what was happening . . . it was important for everyone to know.

All seven of the participants noted the needed for some form of communication concerning the project risk (P1, P2, P3, P4, P5,P6, P7). All seven participants stated they interactively discussed the risks with the project team members on a frequent basis. This finding supports the findings of Sweis (2015) that indicated poor communications was one of the five reasons for IT project failures. Under the main theme of communications, two subthemes reflect the specific aspects of communications used as part of the participant's RM strategies. The two subthemes shown in Table 9 represent two communications tactics.

Table 9

Subthemes Representing Tactics for Risk-Related Communication

Subthemes	Number of participants that presented this perspective	Percentage of participants that presented this perspective
Provide visibility to all actors	7	100%
Use cross-functional communications	7	100%

The two subthemes are also aligned with the premise of Menezes et al. (2013) that communications are an integral part of the other aspects of risk management. The two subthemes of providing visibility and cross-functional risk-related communications partially reflect how the participants fostered the appropriate RM culture. Additionally, subthemes reflect elements of how the participants collected and shared information related to the previous finding concerning the RM strategy of knowledge management. Overall, the two subthemes are integral to how the participants executed their RM strategies and utilized the components of the RM frameworks each of the participants described.

The integral roles of overall RM communications, risk visibility, and cross-functional communications are also aligned with the key concept of translation associated with the actor–network theory. In the context of RM, translation is the building and rebuilding of the actor–network throughout the project lifecycle in respect to the aligned focus of managing project risks. An actor–network is a reflection of the communications among the actors in terms of the dialogs and negotiations among the actors concerning the aligned focus of the actors at any given time (Callon, 1986; Latour, 2005).

Provide visibility to all project actors. Providing visibility of the identified risks to the entire project team enhances the RM process and can ensure that projects are within budget and on schedule (Elzamly & Hussin, 2014). Each of the participants indicated that they provide visibility to all levels of the project team and other interested parties (e.g., stakeholder, sponsors, vendors) associated with a project (P1, P2, P3, P4, P5,P6, P7). According to P4, "In relation to identifying a key risk management strategy, I think that one of the biggest; I don't know if risk is the right word, but causes of issues on projects is a lack of visibility."

P2 emphasized the value of visibility in terms of more ownership by the project actors because by having "more visibility into this whole risk space and you've got more skin in the game." P7 also noted that risk ownership is important because ownership will help structure the mitigation and remediation activities. As part of their RM strategy, P6 described that keeping a "high visibility of the risks" among the project actors makes sure that "there is alignment and understanding when these things come along." P5 summed up the role of an IT PM in terms of maintaining the visibility of the project risk in terms of being the "key communicator . . . and I will make sure that other people stay worried about them." This finding is consistent with the research of Taherdoost and Keshavarzsaleh (2015), who indicated that the visibility of the risks and associated risk registers are centrally important to the RM process and the corresponding project performance. The indications given by the participants that visibility leads to risk ownership is important and supports the findings of Kutsch and Hall (2009), who

indicated that a lack of risk ownership leads to problems in developing risk responses and mitigation strategies.

Use cross-functional communications. The inherently complex nature of IT projects warrants the need for cross-functional communications, concerning the actions and decisions related to the identification and mitigation of project risks that could negatively impact project performance and the ultimate success of an IT project (Kutsch et al., 2013). All seven participants mentioned that they had reviewed the project risks, using various project actors, such as the team members, sponsors, stakeholders, vendors, end-users, the business management, and technical experts (P1, P2, P3, P4, P5,P6, P7). P1 indicated that they communicated with "the business partner, also the technical lead, in this project: "We have a vendor partner; we're reviewing those on a weekly basis." P1 further emphasized the other cross-functional communications with other levels, such as the sponsors and senior executives, on a monthly basis.

Additionally, P5 mentioned that the cross-functional communications needed to mitigate the business process and organizational change related risks that IT project deliverables can induce. Specifically, P5 listed various cross-functional communications methods, including videos, newsletters, town hall meetings, and focus groups to "get people on board" in relation to mitigating the risk associated with change. In relation to identifying risks, P2 stated,

> We also run an additional meeting on a monthly basis . . . . and what that does is it gets the right BT [business technology] folks, the right IM [information management] folks, and the right business process owner

> folks into the meeting, so they're around early on and part of that whole process change.

P6 indicated one of the reasons that cross-functional communications are important is to make sure the project team is getting the feedback from everyone that they should be in order to avoid having risks "just pop up at the last minute." P7 appropriately summarized the scope of cross-functional communication to include "a contractor that's delivering a widget all the way through leadership."

This finding is consistent with Thamhain's (2013) findings that indicated the fostering of cross-functional communications helps early risk identification and related mitigation actions before the risks impact project performance. In addition, these findings align with the research findings of Kutch et al. (2013). Kutch et al. (2013) indicated that poor cross-functional communication negatively affects project performance.

Other Findings

The thematic analysis yielded four major themes representing RM strategies in terms of managing project risks along with the subthemes that represent the tactics used to implement the strategies. In addition to the themes and subthemes derived from the interview and collected documents, the analysis also yielded insight into how the participants measure the effectiveness of their respective RM strategies. The surprising answer to how the majority, five out of seven, of the participants measured the effectiveness of their RM strategies was literally no surprise in terms of risks affecting project performance with little or no warning. Specifically, P4, P5, P6, and P7 all used the words "surprised" or "no surprises" in their explanation of how they measure the

effectiveness of RM strategies. P2 described that it would be “no surprise” in terms of having “it [a risk] on the radar screen, and had I been tracking it, or is it something that came out of right field and actually hit us and it took us out? Why didn't we have that on the radar screen?” This finding is consistent with that of Sundqvist et al. (2014),who indicated that successful projects are the ones with no surprise in the end.

P2, P3, P4, P5, and P7 all indicated that a barrier to implementing an RM strategy is the project team's lack of time to focus on risk management. When asked about the barriers to implementing a risk RM strategy, P7 appropriately summed up the issue by stating that “everybody can manage risk; it's just having the time to manage it appropriately. It's an investment. It's about a worthy investment, but it is an activity that you need to spend time on. It just doesn't happen.” Hwang et al.’s (2014) examination of the barriers to RM implementations in 686 construction projects also found that the lack of time was a barrier to the implementation of risk management.

Applications to Professional Practice

In this study, I focused on RM strategies that might help IT PMs in managing IT project risks to maintain or increase IT project performance for the successful delivery of an IT project. The findings of this study could benefit IT PMs, IT program managers, and line managers acting as IT PMs in their efforts to manage IT project risks by improving the effectiveness of their efforts in managing project risks that might negatively affect project performance and the subsequent likelihood of project success. Overall, not only will the application of the findings benefit the IT PMs as individuals in relation to their

goals of successfully delivering an IT project, but also it will also ultimately benefit organizations that are relying on IT as an enabler of their strategic imperatives.

The following subsections describe each of the strategies individually concerning the intended approach, value, and practical application. Each of the RM strategies provides its own unique benefit to IT project management practitioners as regards their RM goals. However, the common benefit to a sponsoring organization is the increased likelihood of realizing the expected benefits of the IT project with no surprises throughout the project lifecycle or at the end of the project concerning project performance.

Application of Performing Knowledge Management

The strategy of performing knowledge management reflects an RM approach that project management practitioners can use that consists of collecting and sharing information about the context of the business, goals, processes, and culture along with the project sponsor and stakeholder's expectations, interests, and influence. The RM approach also includes taking inventory of the expert knowledge and associated resources available to the project to engage in all RM activities. The approach also consists of increasing the overall knowledge and the value of the knowledge by sharing the information with all the project's players.

Knowledge management is valuable to IT project management practitioners performing RM because creating, maintaining, sharing, and growing knowledge is critical to identifying risks, performing risk assessments, making informed decisions, and developing effective risk mitigations (Cagliano et al., 2015). Not understanding the

project environment is a common reason for project failures (Lech, 2013; Lehtinen et al., 2014; Thamhain, 2013). Understanding stakeholders' expectations and influence can have a positive effect on project RM outcomes (Islam et al., 2014) and project performance (Mazur et al., 2014). One of the most effective tools in managing project risks is knowledge (Neves et al., 2014).

The practical application of this strategy should include gaining knowledge through the collection of information during initial scoping meetings, workshops, planning sessions, resource planning assessments, vendor meetings, periodic stakeholder meetings, and ongoing team meetings. The complimentary tactic associated with building knowledge is performing knowledge sharing through frequent team and stakeholder meetings, town hall meetings, workshops, and the use of information sharing technology such as SharePoint for the knowledge repository. Additionally, the use of knowledge for lessons learned concerning the RM process at specified increments throughout the project and project closing is an important tactic for the IT project management practitioners and organizations to realize the maximum benefit of the strategy in order to deliver the expected value on time and within the budget.

Application of Promoting a Positive Risk Culture

The strategy of promoting a positive risk culture reflects an RM approach that project management practitioners can use to encourage the reporting of risks and the engagement of all the individuals associated with the project in risk management. A positive RM culture is one that positively embraces risks and bad news along with encouraging early and frequent risk identification. Additionally, within a positive RM

culture, the project team members and stakeholders accept that RM is an integral part of their role in the project. Equally important is that a positive risk culture reflects the consistent use of familiar RM processes that can create organizational norms and legitimatize RM as a valuable element of the team ethos. Ultimately, the application of this strategy improves the RM outcomes as a culture that is cavalier, avoidant or oblivious to risk is a major reason for IT project failure (Rasheed, ChangFeng, et al., 2015).

One specific aspect of the value of a positive risk culture is that it encourages the early identification of risks; the lack of early identification can lead to IT project failures (Ramingwong & Ramingwong, 2013).The early identification of risks also has a positive impact on project performance (Keil et al., 2014). The other aspect of the value of encouraging a positive risk culture is that consistently using familiar RM processes helps in keeping the project actors engaged in risk management (Kutsch et al., 2013).

The practical application of this strategy should include encouraging risk reporting without the fear of consequences or negative feedback while reinforcing risk ownership among the project actors. Additionally, using this strategy requires the reinforcement of the team culture by running meetings that create an atmosphere for having courageous and tough conversations. Incorporating RM as a standing agenda item for all meetings at all levels is another tactic. The utilization of this strategy also requires the promotion of risk ownership through clear roles and responsibilities and a common understanding of the RM process. Finally, the application of the strategy requires the

consistent application and the use of familiar RM processes in an effort to normalize and legitimize the processes within the team culture.

Application of Selecting an Existing Risk Management Framework

The applicability of selecting an existing RM framework is relevant to most IT projects, as it is a rare situation that an IT project does not require some form of RM to maintain or increase project performance. This approach consists of the selection of an RM framework that is familiar to the team and must be relevant to the project, given that all projects are a unique endeavor. This strategy encourages the use of an existing RM framework, which can save time and effort. However, the key improvement to business practices rests in the value of rightsizing the framework since the blind application of a framework can be counterproductive (Klein et al., 2015).

The additional value to the practice of IT project RM is that the repeatable use of preexisting RM processes promotes a higher level of RM maturity that can lead to better project performances (Hartono, Wijaya, et al., 2014). The use of the existing RM process with which individuals have already had experience and in which they understand their roles and responsibilities is one planning element that can increase the likelihood of project success (Sayegh, 2014). Overall, the use of RM frameworks by IT project managers can positively impact project performance (Kinyua et al., 2015).

The practical application of this strategy should include using contextual knowledge and analyzing the characteristics of the project such as its size, scope, duration, and complexity to select the applicable aspects of the chosen RM framework so as to balance team and organizational familiarity with the RM framework against the

expected value and effort required to maintain the processes. Incorporating the use of a risk register is necessary if the selected framework does not utilize one. Otherwise, the performance gains that come with using the strategy can be reduced (Taherdoost & Keshavarzsaleh, 2015). In order to derive the maximum benefit from the strategy, the organization or IT manager must provide training and delegate clear responsibilities to project members. IT PMs must make sure to allocate the appropriate resources and time to each of the four RM processes and monitor risks and the timeline of the implementation since the participants noted that a lack of time is a barrier to the successful implementation of RM strategies

Performing Risk-Related Communications

Risk-related communications facilitate the information exchange between all functions involved in the project, the project manager, team members, and stakeholders. The approach relies on both one-way and bidirectional risk communications because both types of communications are integral to all other risk activities and outcomes. Fundamentally, effective communications are a contributing factor in project success (Sweis, 2015).

Providing visibility through risk-related communications is one beneficial aspect of this strategy because visibility of the project risks to all the individuals associated with the project can improve the RM processes and facilitate the effective management of project performance (Elzamly & Hussin, 2014). Additionally, increased visibility of the risks promotes risk ownership, and ownership aids in developing risk responses and mitigation plans that are key to avoiding or reducing a risk's impact on project

performance (Kutsch & Hall, 2009). Another aspect of this strategy is engaging in cross-functional communications, as cross-functional communications promote the early identification of risks (Thamhain, 2013).Ultimately, the value of risk-related communications to both the IT PM and the business sponsors is the achievement of the goals of RM, which are to reduce or eliminate the likelihood and impact of risk on project performance.

To achieve the full benefit of this strategy, a PM should facilitate and encourage conversations concerning risks to the team, stakeholders, end users, and vendor meetings. The application of this RM strategy requires that a risk review section is included in all periodic project status meetings and reports to encourage decisions and actions. The IT PM or other relevant organization entities or actors (e.g., PMO, portfolio managers, line managers) should invest in the use of collaboration software or document-sharing capabilities to make the risk registers, project status reports, and other risk-related documents visible and accessible to all parties. The IT PM should also consider creating focus groups to review the risks and expected deliverables. The sponsoring organizational leaders should champion the use of town hall meetings, videos, and newsletters to engage the broader project audience affected by the project deliverables. Most of all, the project and the IT PM will benefit when the IT PM and other project team members are receptive to communications containing feedback concerning potential risks, even unsolicited feedback, from all levels and organizations that may have a stake in the project deliverables and then take action on the feedback.

Implications for Social Change

Fundamentally, the positive social change implications of the study are rooted in the discovery of RM strategies that IT PMs can utilize to maintain or increase IT project performance. IT is either an enabler or a potential solution to increasing a pharmaceutical company's abilities to efficiently and expeditiously develop and discover new therapies (Costa, 2013; Marx, 2013; Tierney et al., 2013), which in turn may create positive social change by extending or improving the quality of life of afflicted individuals and populations in need of safe, economic, and innovative therapies. In addition to increasing the research and development capabilities of a pharmaceutical company, IT projects are also used as vehicles to achieve an organization's broader strategic goals such as (a) increasing market share, (b) maintaining a competitive advantage, and (c) increasing innovation (Berman & Marshall, 2014). Therefore, the use of the identified RM strategies may also enhance the ability of an organization to achieve its strategic goals concerning long-term sustainability. The long-term sustainability of an organization could also lead to positive social change as organizations with long-term sustainability may provide an increase in stable employment and socioeconomic stability to the employees and surrounding communities.

Although the case organization used in this study was a profit-driven organization, the potential generalization of the findings might also lead to additional positive social change if utilized by IT PMs in charitable organizations. McMahon, Seaman, and Lemley (2015) indicated that embracing technology is also a key imperative for nonprofits. Given the limited funds of the majority of charitable organizations, the

need to effectively manage project risks and maintain or increase IT project performance for successful delivery is perhaps even more important to a charitable organization than to a for-profit organization. Delivering IT projects on time, within budget, and with the expected organizational value has several positive social implications for nonprofit organizations. These implications include (a) increasing membership through social media projects, (b) using IT to mobilize volunteers for broader social impact, and (c) providing services to previously unreachable communities and individuals in need through IT solutions.

Recommendations for Action

The purpose of this study was to explore the RM strategies that IT PMs used in increasing or maintaining project performance for successfully delivering IT projects. The four strategies that emerged from the thematic analysis included (a) implementing knowledge management, (b) promoting a positive risk culture, (c) utilizing an existing RM framework, and (d) performing risk-related communications. The tactics that the IT PMs utilized in the execution of the identified four RM strategies also emerged from the thematic analysis as subthemes. The purpose of the study was not the exploration IT PM's soft skills. However, using ANT as the lens of inquiry also illuminated the soft skill of negotiation related to how the IT PMs described their RM activities. Specifically, the actions described by the IT PMs reflect the role of the primary actor who through negotiation with the other actors aligns the actors on the intended focus of the network. Communication was also an identified soft skill used by the participants given the direct association with the identified theme of risk-related communications. Although there are

other important soft skills IT PMs may need for effectively managing a project, these skills are beyond the scope of this research and did not emerge during data analysis. Nevertheless, the soft skills that did emerge from the data analysis are not only key project management skills but also are integral to the effective execution of the recommended actions. Therefore, the recommendations represent two areas of focus. The first area focuses on the implementation and sequencing of the RM strategies. The second area focuses on the most implementer, the IT PM, regarding the two identified soft skills.

Figure 3 shows how each of the individual recommendations concerning the identified strategies fits into the context of the overall recommendation and the continuous application of the recommendations throughout the project lifecycle. The outermost ring of Figure 3 represents the project context that contains numerous elements like the (a) organizational processes, (b) project sponsors and stakeholders, (c) end users, (d) organizational culture, (e) resistance to change, and (f) expected value of project deliverables. The overall recommendation is that an IT PM needs to implement all the strategies. The implementation of all the strategies reflects the findings that all seven IT PMs incorporated all four strategies in some way into their RM efforts. Therefore, any other recommendation would not reflect the nature of findings since there is no evidence that IT PMs did not implement all of the strategies as part of their overall RM efforts.

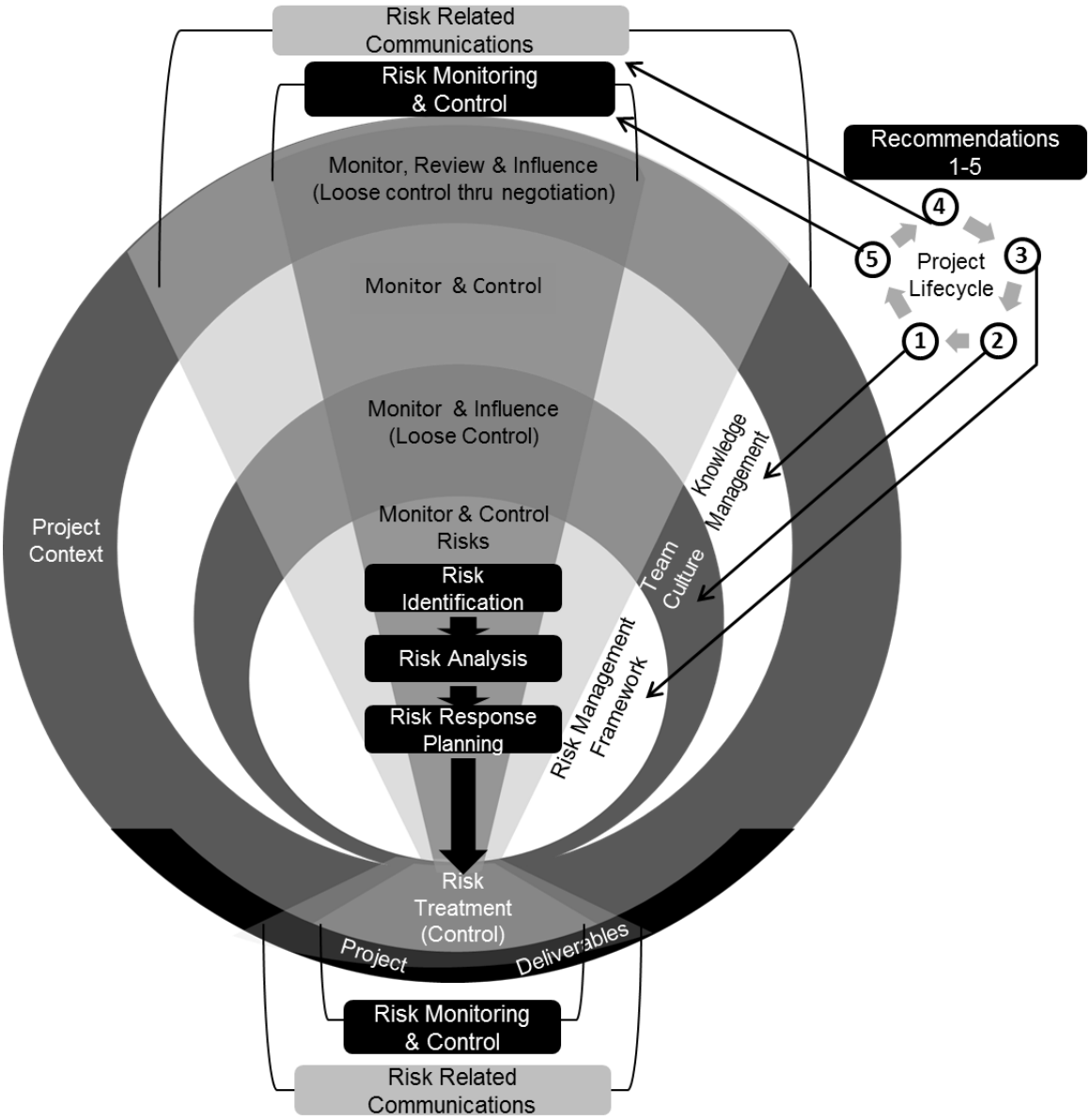

*Figure 3.*Context of implementing the recommendations in a project environment.

Based on the findings, there is an assumption that an IT PM will be implementing the recommendations concerning the application of the RM strategies as part of a broader project management methodology. Additionality, it is highly unlikely that an IT PM will not be using some project management framework. Although an IT PM could implement

the strategies in isolation, there is value in incorporating the recommendations within the broader context of a project management framework. Concerning the strategy of performing knowledge management, the first recommendation is that an IT PM initially collects and shares information related to the project environment. Without an understanding of the (a) business context, (b) stakeholders' expectations and influence, and (c) resources and expertise available to the project, there will be insufficient information for the effective implementation of the other recommendations or the utilization of the majority of the tactics associated with the four identified strategies.

The second recommendation is making the initial assessment of the team culture based on the information garnered from the first recommendation, as understanding the culture may help in the selection of what aspects of an RM framework. Specifically, an IT PM or an individual who is accountable for the organizational project management practices should understand what the potential or existing project team members and stakeholders consider normalized and legitimized RM practices. Using already legitimized RM processes can increase the likelihood that actors will not disengage from the RM processes (Kutsch et al., 2013). An initial assessment of the culture and the knowledge gained from the first recommendation will also help an IT PM in the future negotiations related to aligning team members, sponsors, and stakeholders concerning the probability and impact of identified risks and the willingness to address these risks so as to avoid project performance issues.

The third recommendation, known as rightsizing, is when the IT PM selects the appropriate elements of an existing RM framework. This recommendation requires

knowledge gained from the first recommendation concerning the project characteristics and environment, along with information about the project team's culture gained through the second recommendation. The selection of the RM framework elements and associated activities requires that the IT PM balance the appropriate level of effort taking into consideration the project's characteristics (e.g., scope, complexity, duration, budget, performance requirements) against the expected value of the RM activities. Also, this recommendation requires that the IT PM have an initial understanding of the project team's familiarity and comfort with an RM framework in order to gauge the legitimacy of the RM framework and activities within the team culture. Understanding of the project team's familiarity and comfort with an RM framework is important as a culture can influence how projects are run (Alotaibi & Mafimisebi, 2016).

The fourth recommendation is the incorporation of risk-related communication into a broader project communication plan or makes sure that risk-related communications are prevalent throughout all activities and levels of the relevant organizations. This recommendation reflects the occurrence of using a communications plan or just incorporating risk communications into all activities within the collected data. An IT PM should at least consider the common elements of a communications plan that the Project Management Institute (2013) suggested, whether the project's characteristics warrant a formal communication plan or not. The Project Management Institute stated that a PM should manage the channels, contents, and frequency of the communications among the project team members, stakeholders, and sponsors. Based on the findings of this study an IT PM needs to integrate risk related conversations concerning risk

identification, analysis, and planning along with monitoring and controlling each team member and stakeholder meeting. Lastly, an IT PM should make sure the risk related project communications are frequent and cross functional.

The fifth recommendation is that IT PMs invest the required time and effort in risk monitoring as monitoring and controls are concerned not only with the actual project risks but also with the efficiency and effectiveness of the four RM processes. This recommendation also includes monitoring the team culture to gauge the alignment and cohesion of the project team, also known as the actor-network, so the IT PM can (a) make additional rightsizing adjustments to the RM activities, (b) reinforce the positive nature of reporting bad news, and (c) make it clear that RM is everyone's responsibility. Figure 3 shows the coverage and degree of monitoring and controlling across all the other recommendations. In addition, Figure 3 illustrates the continuous application of the five recommendations throughout the project lifecycle. Figure 3 also illustrates that the treatment of the risk happens within the actual business environment in which the IT PM is managing the project, which is why gaining knowledge about the business context is important.

The second focus area of recommendations only contains one recommendation that focuses on the implementer versus the implementation, which in this case is the IT project manager. Specifically, these recommendations concern the ability of an IT PM to successfully implement and derive the maximum benefit from utilizing the identified RM strategies throughout the project lifecycle. The recommendation is that IT PMs undertake some form of assessment (e.g., self-assessment, peer feedback, team member feedback)

to determine their effectiveness in relation to the soft skills of negotiation and communications. These assessments can provide information an IT PM can use to decide if there is a need for improvement. This recommendation along with the first set of recommendations may not only benefit the IT PM personally with respect to their professional development but may also increase the likelihood the IT PM will realize the maximum benefit of the RM strategies. By realizing the maximum benefit from the recommendations, IT PMs may improve project performance to deliver the enhanced organizational capabilities on time, within budget, and with the expected value.

In addition to IT PMs, the results of the study might also benefit program managers, project office managers, project portfolio managers, business sponsors, and stakeholders in the identification and management of IT project risks. The dissemination of the results of this study could happen at conferences and roundtables sponsored local and regional chapters of the Project Management Institute located within the northeastern United States. The IT leaders from the case organization will also receive a synopsis and a full copy of the results to use as a reference for IT project RM strategies that have been effective within the organization. Additionally, I may consider sending a consolidated version of the results to the editors of several journals focusing on the topic of project management.

Recommendations for Further Research

Future research recommendations include conducting further qualitative studies of (a) additional geographies, (b) other industries, and (c) risks that come with organizational change along with using different social theories or ANT in combination

with other theories. Future research could expand on RM knowledge of IT PMs, which might lead to an increase in project performance and the overall success rates of IT projects.

Organizational changes create additional risks to IT project performance that IT PMs need to be capable of managing (Alfaadel et al., 2014).The findings of this studying indicate that understanding the business context, which includes organizational processes, is a key part of knowledge management strategies based on data analysis. Therefore, additional research should specifically focus on the exploration of IT project risks and possible changes in organizational business processes that may be beneficial to IT project management practitioners. An ERP project is an example of an IT project that may cause major process changes (Mustafa, 2013).

The findings also highlight that understanding the team's culture is a key aspect of IT project risk management. Therefore, researchers in other industries and geographies could investigate the applicability of the findings of this study to other cultural contexts. Examining project team culture is important given the potential negative effect a diverse project team culture has on project performance (Sanderson, 2012).

Performing additional qualitative research or a mixed methods research using ANT in combination with other social theories may provide insight into the complex nature of RM from several perspectives. Research combining ANT with other social theories, such as rational choice theory, to explore the decision making by the project actors could be beneficial to IT PMs and researchers. Specifically, understanding the nature of the decisions and negotiations that the IT PMs are involved in during

problematization, *interessement*, or the four main RM processes may help IT PMs in both their hard and soft risk assessments. Research using ANT in conjunction with structuration theory may provide additional information concerning the construction and irreversibility of the actor-network focused on RM and the potential effect of irreversibly on RM and project performance. The value of using ANT in combination with structuration theory is that structuration theory provides a lens to view the situations when an actor (e.g., a project team member, SME, sponsor) disengages from the normalized RM process within the actor-network created by the IT PM for the purpose of risk management. The ability to understand the impetus and impact of RM disengagement by project actors may assist IT PMs in rightsizing or adjusting the RM process throughout the project lifecycle to keep RM prioritized and legitimized within the project team to maintain or increase project performance for the successful delivery of an IT project.

Reflections

As noted previously, I have extensive IT operational experience and occasionally in previous organizations acted as a project (a) sponsor, (b) stakeholder, (c) user, and (d) team member. I have also managed several IT projects in parallel to my various IT operational roles. Based on my IT operational expertise and my previous formal project management training, there is always the possibility that I could have exhibited researcher bias. However, I attempted to limit my bias through bracketing. I also performed member checking to help limit researcher bias and used rich quotes for

confirmability in an effort to demonstrate that the findings reflected the participants' responses versus my own viewpoints.

I was apprehensive about reviewing my initial findings with the participants because member checking can create complications if a participant disagrees with the findings or takes issue with the use of specific data attributed to them. However, the member checking was extremely valuable. Not only did the participants agree that the initial findings reflected the content of their interview responses, but they also provided valuable confirmatory statements and insight into why they agreed with the findings. Additionally, a participant found an error in the use of their response, which was not included in the final version of the study.

Although my belief that RM is critical to maintaining IT project performance has not changed, my perspective has changed on the role of knowledge management in projects where the sponsors are not part of the IT PM's department, division, or company. I previously had limited exposure to the importance of knowledge management in regards to acquiring, managing, and sharing information concerning business contexts and stakeholder interests when performing RM to maintain project performance. In my previous roles, I did perform some ancillary IT project management, but the projects were internal. Therefore, I already had some knowledge of the business context and stakeholder interests, so I never consciously set out to perform knowledge management. I now realize the need to perform knowledge management in any IT project that I may manage in the future.

Overall, my experience throughout the doctoral study process was positive, enlightening, and contributed to my growth as an organizational leader. I encountered several challenges along the way, including (a) numerous evolutions of the business problem, (b) a change in study design from a phenomenological to a case study design during the review process, (c) a change in the theory used for the conceptual framework, (d) and a major rework of my literature review. However, overcoming these challenges ultimately resulted in a more robust study design that contributed to my ability to solicit rich participant responses leading to relevant findings that addressed the business problem in a contemporary context.

Conclusion

Information technology has been at the heart of businesses for several decades (Markus & Benjamin, 1996) and is a key enabler of business processes (Grant, 2016). Leading companies are using agile project management techniques to further leverage IT's role in gaining and maintaining a competitive advantage (Lesser & Ban, 2016) (Lesser & Ban, 2016). However, historically poor IT project performance and success rates threaten the ability for businesses to achieve their strategic objectives through IT-enabled processes and new capabilities. One of the most important activities IT PMs can perform to increase project performance and the likelihood of success is risk management (Didraga, 2013). Therefore, it is imperative that additional RM strategies are available to IT PMs in their efforts to improve IT project performance and the likelihood of project success to support their respective organizations' strategic goals.

The purpose of this qualitative case study was to explore RM strategies that IT PMs within the pharmaceutical industry use in order to improve project performance for the successful delivery of IT projects. This case study allowed for the in-depth exploration of RM strategies used by IT PMs within a pharmaceutical company located in the northeastern United States. The seven participants were IT PMs who successfully managed at least five IT projects and who successfully completed at least one project within the last 3 years. The study design included the use of ANT as the lens of inquiry. The use of ANT, a social theory, in project management research provides a framework to investigate the social aspects of a problem (Floricel et al., 2016).

The semistructured interviews of the seven IT PMs elicited rich responses concerning the RM strategies each participant used in their RM efforts. The research also included the use of NVivo during the coding and identification of emergent themes from the unstructured data. The thematic analysis of the interview transcripts and related RM artifacts yielded four major themes about four RM strategies and 11 subthemes about the tactics used by IT PMs in the application of the RM strategies. The four RM strategies identified were (a) implementing knowledge management, (b) promoting a positive risk culture, (c) utilizing an existing RM framework, and (d) establishing risk-related communications.

In summary, the identified RM strategies may be beneficial not only to IT project managers in their efforts to successfully deliver the expected organizational value on time and within budget but also to the achievement of near-term organizational objectives and long-term sustainability. The successful delivery of IT projects may benefit

pharmaceutical companies by delivering new IT-enabled drug discovery and development capabilities. The organizational benefits for pharmaceutical companies may also have positive social implications given the role successfully delivered IT projects play in enabling efficient drug discovery and development capabilities, leading to new therapies that may improve the lives of people around the world.

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Appendix A: Interview Protocol

Introduction Information by the Interviewer

Date:

Participant's coded ID:

Purpose of the study

Confidentiality

Duration of interview

Double check that this time is still a good time for the interview

Gain Permission to audio record the interview

Provide opportunity for questions

Signature of informed consent

Background of Participants

Years of PM Experience

Interview Questions

Key Closing Components

Additional comments: What else would you like to share regarding IT risk management strategies for IT project performance?

Explain next steps regarding member checking: I will send you a copy of the transcript of the interview for your review and a subsequent summary of the essence of your responses.

Thank the participants for their time

Provide contact information.

Remind participant of their ability to withdraw at any time.

Follow-up Questions**:** Ask participant for permission to ask follow-up questions later, if there is any area that may need further discussion to add to the richness of the data for an in-depth exploration and data saturation.

Appendix B: Interview Questions

1. What knowledge and information do you require in the implementation of a risk management strategy?
2. As an IT PM, what strategies do you use to manage IT project risks that could affect project performance regarding budget, schedule and delivering the expected functional capability?
3. What project success criteria do you consider when managing IT project risks?
4. How do you use risk management strategies to manage project performance for the successful delivery of a project?
5. How do you know when you have identified the major concerns of the project sponsor (s), stakeholders, team members, and other groups related to the implementation and execution of a project risk management strategy?
6. How do you identify the people, groups, technology, and processes that contributed to your ability to manage IT project risks?
7. How do you evaluate the impact of project risks on IT project performance?
8. As an IT PM, how do you assign roles and responsibilities regarding project risk management?
9. What methods or strategies have you employed to evaluate if an individual or group has accepted their role in managing IT project risks?
10. As an IT PM, how do you assess the effectiveness and success of risk a management strategy?

11. As an IT PM, what role(s) do you play throughout the project lifecycle in relation to the project team members and stakeholders concerning risk management?
12. In your experience, what barriers inhibit IT PMs from successfully implementing a risk management strategy?
13. Based on your experience as an IT PM, is there any other information you would like to add that I did not address in the interview questions, which may be beneficial for the successful management of IT project risks?

Appendix C: Recruitment Letter

Date:

Re: Doctoral candidate research study

Dear [redacted]

My name is John Cabral; I am a colleague here at [redacted] and also a student at Walden University seeking a doctorate in business administration with a specialization in project management. I am conducting a research study entitled Project Risk Management Strategies for IT Project Managers. I am interested in conducting this study to explore what project risk management strategies IT project managers can use to improve IT project performance for the successful delivery of an IT project

I am seeking face-to-face interviews with IT project managers who meet the following criteria:

- Who have successfully implemented IT project risk management strategies for at least one IT project within the last 3 years that have maintained project performance leading to the successful delivery of an IT project.
- Who have successfully implemented IT project risk management strategies for at least 5 IT projects that have maintained project performance leading to the successful delivery of an IT project.

I developed the study selection criteria to assure that the participants are likely to possess the knowledge and information that are relevant to the purpose of this study. Your participation in the study is voluntary, and you may withdraw at any time, even after I've completed the data collection for the study. I will protect your identity, and your individual responses to interview questions will not be published or disclosed.

All of your responses to individual interview questions will be recorded for the analysis and reported in the study with no information that identifies you or your organization. I will also be asking for project related documents and artifacts regarding IT project risk management practices within the organization. I will share the findings of the study with each participant individually, other scholars, and the leaders within the participant's organization.

I am requesting that you participate in my study. You can contact me via telephone at [redacted] or John.Cabral@Waldenu.edu, if you are interested in participating. After, you have indicated that you are willing to participate; I will send you a copy of the consent form for your review. I will then set up an introductory phone call / WebEx meeting to introduce myself, reiterate the purpose of the study, review the consent form, and provide you an opportunity to ask any questions you may have concerning participating in the study. I will schedule introductory phone call no earlier than 7 days

after you have received the consent form to allow you time to review the details contained within the consent form.

Thank you for your time and consideration

Sincerely,

John Cabral, DBA Candidate
Walden University

Appendix D: Certificate of Completion: Protecting Human Research Participants

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **John Cabral** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 01/12/2015

Certification Number: 1646139