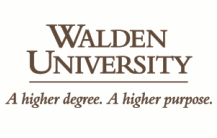

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Using Organizational, Coordination, and Contingency Theories to Examine Project Manager Insights on Agile and Traditional Success Factors for Information Technology Projects

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2011

Abstract

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by

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M.S.P.P.P.A., Purdue University, 1980

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Dissertation Submitted in Partial Fulfillment

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Abstract

Two dominant research views addressing disappointing success rates for information technology (IT) projects suggest project success may depend on the presence of a large number of critical success factors or advocate for agile project management as an alternative to traditional practice. However, after two decades of research, success rates remain low, and the role of critical success factors or project management approach remains unclear. The purpose of this study was to use views of experienced project managers to explore the contribution of success factors and management approach to project success. Applying organizational, coordination, and contingency theories, the research questions examined IT project manager perceptions about success factors, how those success factors interrelate, and the role of management approach in project success. A Q methodology mixed method design was used to analyze subjective insights of project managers about the important critical success factors for IT projects. Two critical success factors emerged as important: a sustained commitment from upper management to the project and clear, measurable project goals and objectives. Three composite factors also surfaced representing the importance of people-project interactions, user/client involvement, and traditional project management tasks. The analyses found no broad support for agile project management and could not confirm principles of organizational or coordination theories as critical for project success. However, a contingent relationship might exist between some critical success factors and merits further investigation. Helping the project management community understand IT project success factors could improve project execution and reduce failure rates leading to sizeable savings for project clients.

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"No one who achieves success does so without the help of others. The wise and confident acknowledge this help with gratitude."

- Alfred North Whitehead

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Chapter 1: Introduction to the Study

The difficulty in achieving and measuring success for information technology (IT) related projects is a problem readily acknowledged within the IT industry. In 1994, the first large-scale analysis of IT project success, known as the CHAOS report indicated only 16% of the projects concluded successfully (The Standish group, 1995). Although more recent measures place IT project success rates at 32% (The Standish Group, 2009), low success rates continue to be a concern. Shenhar (2008) reported nearly two thirds of IT projects do not meet their time and budget goals, and many do not meet their business objectives (p. 13). In fact, over 15 years of research supports the low rate of success for IT projects (Taylor, 2004; Sauer, Gemino, & Reich, 2007).

The search for critical success factors (CSF) represents one of the major research approaches for investigating aspects of IT projects. A critical success factor is a condition or activity required for ensuring the success of a project. Emphasis on the role of critical success factors in IT projects predates the release of the first CHAOS report and in early studies researchers suggested different critical success factors were important during various stages of a project lifecycle (Slevin & Pinto, 1987). Those researchers also suggested project success included both tactical and strategic factors and proposed excelling in one area, but lagging in the other would negatively affect the success of a project. The majority of studies examining critical success factors since the work of Slevin and Pinto have focused primarily on operational concerns rather than strategy. To date, critical success factors for IT projects have been linked to issues involving user support (Schmidt, Lyytinen, Keil, & Cule, 2001), project management leadership (Iacovou, & Dexter, 2004), project planning (Sutterfield, Friday-Stroud, & Shivers-

Blackwell, 2006), executive and upper management support (Kearns, 2007), and team dynamics (Reich, Sauer, & Wee, 2008) to name a few.

Although there have been some attempts to group or categorize critical success factors (Pinto & Prescott, 1988; Schmidt, Lyytinen, Keil, & Cule, 2001; Kendra & Taplin, 2004; Tesch, Kloppenborg, & Frolick, 2007), few researchers have examined how critical success factors (or groups of factors) interrelate. One reason for this may be the predominant methodologies used in most studies tend to make it difficult to find relationships between factors. Much of the research conducted in the study of critical success factors for IT projects has involved using project managers and other stakeholders as the unit of observation, but looking at IT projects as the unit of analysis. Common research methods using the project as the unit of analysis include the case study approach (Milosevic & Patanakul, 2005; Lefley, 2006; Plant & Willcocks, 2007) or a survey in which respondents use specific projects as a frame of reference (Pinto& Prescott, 1988; Emam & Koru, 2008; Malach-Pines, Dvir, & Sadeh, 2009). Another factor hindering the search for relationships among critical success factors may be the sheer number of CSFs identified. Preparation of the literature review for this study found more than 200 different critical success factors for IT projects appearing in the literature. Freund (1988) noted too many critical success factors often resulted from including factors that were either too detailed or confused performance indicators with critical success factors. Fortune and White (2006) observed a significant overlap among the various lists of factors and suggested the need for a framing device to put them into perspective. Finally, another factor contributing to the large number of suspected CSFs

may be the complexity of today's IT projects and the difficulty in clearly defining IT project success (Baccarini, 1999; Shenhar & Dvir, 2007).

There are considerable differences of opinion on what constitutes success for IT projects since projects often involve diverse stakeholders representing many different perspectives. Traditionally, the most common success criterion for IT project management is the so-called iron triangle of success, consisting of meeting budget, schedule, and performance requirements (Atkinson, 1999). Over the years, dissatisfaction with restricting project success to the limited criteria of the iron triangle led to consistent calls for expanding the definition of IT project success (Wateridge, 1998; Bryde, 2008). Kendra and Taplin (2004) indicated IT project success was dependent upon both social and technical factors. Jha and Iyer (2007) recommended examining project success from two perspectives, an objective perspective such as budget, schedule, and specifications, and a second set of more subjective criteria such as customer and stakeholder satisfaction. Taylor (2004) suggested one reason for problems associated with information systems is the management of IT projects represents a different type of product and in some ways presents a different set of problems than project management for other projects such as construction, engineering, and new product development. The movement to include more perspectives into the definition of IT project success developed at about the same time as the concept of agile project management evolved. Differences in opinion concerning the traditional view of success based on the iron triangle versus a more expanded view of project success address many of the same issues as the distinction between the traditional plan-driven approach and an agile approach to IT project management.

Shenhar (2008) characterized traditional project management as using a management as planned philosophy, which aligns closely with the practices promoted by the Project Management Institute (PMI) in its *Guide to Project Management Body of Knowledge* (2004) or *PMBOK Guide*. This traditional philosophy assumes the project plan, if followed correctly, will lead to project success and therefore naturally supports success measures based on the iron triangle (Fernandez & Fernandez, 2008). Agile methods, on the other hand, focus more on customer interaction and working software supporting business strategy and less on detailed planning and documentation (Boehm, 2002; Augustine, Payne, Sencindiver, & Woodcock, 2005). Traditional methods focus on comprehensive planning reducing the need for changes in the project whereas agile methods assume the inevitability of change and can therefore more easily tolerate changes (Nerur, Mahapatra, & Mangalaraj, 2005).

Agile methodologies encompass a number of software development techniques (Extreme Programming and SCRUM for example) as well as IT project management practices (Highsmith, 2004). The agile manifesto (Manifesto for Agile Software Development, 2001) is the basis for management methods used in agile project management. This manifesto presents four value statements for agile development contrasted against four features associated with traditional systems development. The major characteristics of an agile approach include relying on an open style of management, releasing working versions of software at regular intervals, significant involvement of the customer, and a design process, which responds quickly to changes in project scope or specifications. The driving force behind this movement was the need to accommodate two key features associated with IT projects, changing project

requirements due to the evolving nature of organizations and a need to develop products quickly.

In practice, neither the role of critical success factors nor the impact of the project management approach used for IT projects may be as important to success as they appear in the research literature. According to Sauser, Reilly, and Shenhar (2009) there is little evidence to support a positive impact of critical success factors on project management success

> The assumption in these studies is that projects succeed or fail because of similar reasons and the researcher's objective is to identify these reasons… Yet, in spite of their popularity, critical success factors studies have had little impact on project management practices and few organizations or managers are actually using the findings of these studies to improve their managerial processes. (p. 2)

Additionally, the differences between an agile approach to IT project management and the traditional approach may not be as severe in practice as it appears in the literature. Neither approach appears to be a perfect fit for all types of IT projects, and in many ways the approach is often dependent upon the type of project and the organization involved (Vinekar, Slinkman, & Nerur, 2005). In practice, the agile and traditional approaches may not be mutually exclusive since practitioners who employ the traditional approach may also use methods associated with the agile perspective as a way of improving IT project performance (Shenhar, 2008; Reich, Sauer, & Wee, 2008).

The Problem Statement

The problem this study addressed was that after two decades of research, success rates remain low and the role of critical success factors or the project management approach remains unclear. There continues to be a lack of knowledge about the relationship between commonly reported IT success factors and how those factors related to the management approach used for IT projects. A better understanding of the connections among critical success factors and their relationship to the project management approach may improve strategies for planning and executing IT projects.

The disappointing rate of success for IT projects has been a concern among project management professionals for nearly two decades. Much of the project management literature indicates success in IT projects depends on a wide range of critical success factors, which are difficult to quantify and standardize and present in varying degrees among projects (Yetton, Martin, Sharma, & Johnston, 2000; Tesch, Kloppenborg, & Frolick, 2007; Gowan & Mathieu, 2005). Additionally, the research focus on individual projects as the units of analysis in most studies may contribute to the large number of factors suspected of being critical to IT project success. These circumstances make it difficult to see possible relationships between the commonly reported critical success factors and represent a gap in the literature.

Another stream of research suggests traditional approaches for project management may be too structured and rigid for many IT projects and calls for more agile management processes (DeCarlo, 2004; Erickson, Lyytinen, & Siau, 2005; Fernandez & Fernandez, 2008). Thus, the project management approach represents

another dimension for examining the relationship between critical success factors and IT project success.

This study used Q Methodology to focus on the collective insights and experiences of IT project managers. This method involved collecting subjective viewpoints from experienced project managers about critical success factors often associated with IT projects followed by rotational factor analysis of these points of view to reveal ways the success factors interrelated. The use of Q methodology moved the unit of analysis from the individual project to the insights and opinions of the project manager. The methodology addressed the research problem by investigating the perceptions of IT project managers regarding (a) how critical success factors may interrelate to contribute to successful IT projects, and (b) how their interpretations of those factors are associated with an agile and traditional views of project management.

Purpose of the Study

Over the past decade, two of the more prevalent research approaches used for explaining IT project success or failure have been the search for critical success factors and the impact of management approach. The purpose of this study was to use viewpoints of practicing project managers to explore the connection between research findings from those two approaches.

To date, research on critical success factors in IT projects has been limited in its ability to determine general perceptions and beliefs about the many factors because most information comes from studies focusing on the performance of specific IT projects rather than tapping into the breadth of project manager experience. Additionally, although much of the literature regards agile project management as if it were distinct and

separate from traditional forms of managing projects there are signs indicating some IT projects may benefit from including techniques and principles associated with agile project management into the traditional approach of project management (Reich, Sauer, & Wee, 2008; Shenhar, 2008). The goal of this research was to take a fresh look at critical success factors for IT projects based on the accumulated knowledge, experience, and opinions of practicing project managers. Consequently, there were three primary objectives for this study. The first main objective was to identify, contrast, and describe the shared subjective insights of project managers about factors affecting IT project success. The factors came from the extensive research literature on critical success factors for IT projects. A second objective was to develop a better understanding of project manager's perceptions of success factors as they related to the organizational characteristics, attributes of the project or product, behaviors and roles of the people involved in the project, and the project management processes used. The third objective was to examine the shared subjective perceptions of project managers regarding the factors influencing project success with respect to the project management approach. This study focused on factors associated with both the traditional plan-driven approach and the agile approach to project management.

Significance of the Study

This exploratory study has the potential to expand our understanding of project manager views of critical success factors commonly associated with IT projects. Developing an insightful understanding of the relationships between critical success factors and IT project success is important because most studies treat success factors individually and do not "analyse the interaction between them and the possible

consequences" (Belassi & Tukel, 1996, p. 142). Findings from this Q methodological study may assist the project management community in making sense of the large numbers of suspected critical success factors first by developing a better awareness for the relationship between critical success factors, and secondly by exploring how the approach for managing IT projects aligns with critical success factors. The factors identified from the methodology employed in this study suggested how critical success factors combined into groups representing categories of concern and provided a different perspective on the nature of critical success factors, perhaps as components of a larger set of factors. Finally, this study expanded the use of Q methodology by examining the subjective opinions of practitioners on diverse, wide-ranging, and sometimes conflicting information available to them through research publications in their field. As a result, this study also provided an additional tool for exploring how research findings align with practice.

Nature of the Study

This study looked at the extensive and broad list of critical success factors associated with IT projects from a different perspective. Rather than using individual projects as the unit of analysis, this study examined the interrelationships among the many critical success factors based on the subjective insights and experience of project managers. Q methodology provided a fitting tool for examining how project managers view the relationships among the vast list of critical success factors because it provided a "systematic and rigorously quantitative means for examining human subjectivity" (McKeown & Thomas, 1988, p. 7). Q methodology is a combination of qualitative and quantitative research techniques:

> The methodology attempts to render a structure and form to individual subjectivities by modeling a respondent's viewpoint on a particular subject and then constructing a 'factor array' of several factors, each of which represents a general pattern of opinion on the subject at hand. (Day, 2008, p. 151)

The goal of a Q methodological study is to uncover dimensions of individual subjective viewpoints, statistically identify different dimensions of those viewpoints, and identify characteristics of clusters of individuals who share common viewpoints (Brown, 1993). In this study, the viewpoints under investigation consisted of project manager perceptions about the importance of critical success factors associated with IT project success.

The basis of Q methodology is the concourse, which is the collection of statements covering an issue that the respondents interpret. Stephenson (1979) characterized the concourse as a "common communicability" where everyone is familiar with every statement in the concourse (p. 355). The concourse for this study consisted of a collection of statements, derived from the project management literature, describing categories of critical success factors for IT project success from both agile and traditional perspectives of project management. Classification of critical success factors aligned with four general areas of influence based on relationships project managers have with project stakeholders and the project in general. These four categories included organizational influences, project management processes employed, roles and behaviors of the people involved, and project attributes. Table 1 presents a sample of some of the typical success

factors included in these categories. These categories are similar to the project-specific dimensions of IT projects in the descriptive model proposed by Aladwani (2002).

The primary activity for data collection in Q methodology is the Q sort. Q-sorting is a process involving participants arranging a sample of statements (in a relative quasi-normal distribution) according to their agreement about the issue under investigation. In this study, the Q sort consisted of 40 statements describing critical success factors, which project managers ranked from most important to most unimportant for achieving IT project success.

The sample of participants in Q Methodology referred to as the person-sample (or P-set) consisted of project managers, mostly from the United States, who were current or former members of the Project Management Institute (PMI) or the American Society for the Advancement of Project Management (ASAPM), and participated in or led IT projects. According to McKeown and Thomas (1988), the purpose of Q methodology is to study the self-referent perspective of individuals on a specific issue and can therefore use a selection method where "persons are chosen because of their special relevance to the goals of the study" (p. 36). A Q methodological study uses a limited number of respondents since the requirement is only to have enough subjects to establish the existence of a factor (van Exel & de Graaf, 2005). Tinsley and Tinsley (1987) recommended a minimum sample size 5 to 10 times greater than the number of factors used in the factor analysis. This study used a sample of 60 volunteers, representing 12 to 20 times the anticipated number of factors.

Table 1

Category of Critical Success Factors for IT Project Success

Category	Success Factor Example	Supporting Publications
Organizational	Organizational critical success factors deal with the structure, culture, and decision-making procedures associated with the client organization. Factors in this category could include: top management support , the degree to which various subunits coordinate and work together, the evaluation and decision processes for determining projects to pursue or terminate, and the general managerial strengths of the organization	Young & Jordan, 2008; Sharma & Yetton, 2003; Green, Welch, & Dehler, 2003; Kanter & Walsh, 2004
Process Related	Process related critical success factors deal with the planning and execution stages of a project and include factors such as clarity in defining project requirements, adequate user involvement, appropriate and competent project staffing, and the importance of process activities for addressing project risk.	Hartman & Asharifi, 2002; Biehl, 2007; Wallace & Keil, 2004; Tesch, Kloppenborg, & Frolick, 2007
People Related	People-related critical success factors tend to focus upon working with the client or other stakeholders. These factors include concerns such as leadership characteristics of the project manager, upper management characteristics, project team characteristics, and communication skills of the project manager with both clients and team members	Thamhain, 2004; Green, Welsh, & Dehler, 2003; Scott-Young & Samson, 2006; Anantatmula, 2008
Project Related	Project-related critical success factors tend to focus on the uncertainty and technological complexity of the project, the degree of innovation involved in the product , and the projects role in enhancing business decision-making	Shenhar, Dvir, Levy, & Maltz, 2001; Vinekar, Slinkman, & Nerur, 2005; Yeoh, Koronios, & Gao, 2008

A unique feature of data analysis in Q Methodology is the participants represent the variables and the statements used in the Q sort represent the sample.

> Q methodology employs a *by-person* correlation and factor analytic procedure. Hence, it is the *overall configurations* produced by the participants that are intercorrelated and factor analyzed. The initial correlation matrix duly reflects the relationship of each (Q sort) configuration with every other (Q sort) configuration (*not* the relationship of each item with every other item). (Watts & Stenner, 2005, p. 80)

For this study, the subjective organization of the sorted statements represented points of view for each participant. An examination of the distribution of those sorted statements using factor analysis helped to identify clusters of opinions among multiple participants.

Overall, this study provided project managers with an opportunity to give meaning to different situations in IT project management and to evaluate and share their beliefs, values, opinions, and feelings about how to achieve IT project success. The research approach used in this study provided new information, which may improve IT project management practices and provided a different perspective on how critical success factors interrelate.

Research Questions

This Q methodological study explored project manager perceptions regarding the role of critical success factors in IT project success, the relationship among those success factors, and how the IT project management approach (agile and traditional) may influence those perceptions.

This research addressed the following questions:

1. What are the individual general perceptions of project managers regarding factors that might influence the success of IT projects?
2. Based upon the subjective insights of project managers, what critical success factors interrelate in their contributions to project success?
3. How do project manager perceptions of critical success factors relate to the agile and traditional approaches for carrying out IT project management?

Theoretical Framework

This study focused on furthering our understandings of how the organizational approach used in managing IT projects influences the perceived importance of various critical success factors in completing those projects successfully. The theoretical framework for this study encompassed organizational theory, coordination theory, and contingency theory as they relate to the philosophy of managing IT projects and the philosophical and theoretical differences between the agile approach to managing IT projects and the traditional plan-based approach.

Perhaps the major philosophical difference between the agile and traditional approach is rooted in the distinction between mechanistic and organic theories of organizational structure and management as first proposed by Burns and Stalker in 1967 (Burns & Stalker, 1994). Although there are many forms of organizational structure, the mechanistic and organic structures represent two extremes in organizational design. In project management, the basic differences between agile and traditional practices in terms of control, communication, and formalization mirror the fundamental differences

between the mechanistic and organic organizational structures (Rajlich, 2006; Fernandez & Fernandez, 2008; Shenhar, 2008).

Coordination theory represents "a body of principles about how the activities of separate actors can be coordinated" (Malone, 1988, p.6). Coordination problems often "arise from dependencies that constrain how tasks can be performed" (Crowston, 1997, p. 159). As an organized group often within a larger organization, an IT project is especially dependent upon coordination. In software development projects for example, the impact of poor coordination often leads to very serious scheduling problems, design and requirements defects, and other system level problems (Yuan, Zhang, Chen, Vogel & Chu, 2009). Andres and Zmud (2002) observed projects could exhibit both organic and mechanistic forms of coordination consistent with agile and traditional project management approaches respectively.

Contingency theory suggests organizational effectiveness depends on how well an organizational structure matches its environment (Burns & Stalker, 1994; Lawrence & Lorsch, 1986). Ultimately, this theory proposes, "effective organizational performance depends on a complex relationship among environmental characteristics, production technology, internal differentiation, and integration" (Herbert & Mathews, 1977, p. 2). Although there is no widely accepted formal theoretical foundation for project management, one of the most consistent theoretical perspectives used in project management research is contingency theory, where project success is contingent upon a combination of organizational, project, and people-based factors (Shenhar, 2001; Engwall, 2003; von Donk & Molloy, 2008; Howell, Windahl, & Seidel, in press). The

organization of the critical success factors into four categories for this study represented potentially contingent groups of factors.

Limitations of the Study

This study investigated the subjective insights of project managers with respect to the importance of a range of critical success factors for IT project success. Some limitations of this Q methodological study are the following:

1. The participant sample consisted of project manager volunteers mostly from professional project management associations in United States. Although IT projects worldwide face many of the same issues as seen from the international breadth of the literature review, the restriction of geographic location may represent a potential limitation.
2. Project manager perceptions of critical success factors might have been different from their actual project management experiences.
3. Participants' responses may not have reflected their real opinions.
4. There was the implicit assumption that the participants are familiar with the terms and concepts represented by the statements in the Q set.
5. The study did not differentiate among participants' length of experience with IT projects, which could have affected individual responses to critical success factors.
6. There was an assumption that the participants understood the Q sort process as explained in the documentation provided. Although participants had instructions and help available in multiple forms, the Q-sorting took

place in an asynchronous manner and there may still have been some uncertainty by the participants about how to carry out the Q sorts.

Social Contributions of the Study

In an environment where IT projects fail to reach their objectives at an alarming rate and meeting the demands of the rapidly changing business needs presents new challenges, the search for ways of improving project management practice continues to be important. While it is difficult to estimate the economic cost of IT project failure, costs to business and the global economy are significant. Estimates of the cost of software project failure in the United States alone are nearly $75 billion per year (Michaels, 2007), and software projects represent only a portion of total IT projects. The large body of research investigating factors associated with project management success or failure represents a major emphasis in efforts to improve project management practice. However, "the continued high failure rate strongly suggests that the common practice has not captured the essence of the problem" (Young & Jordan, 2008, p. 714). The results from this study helped to identify how success factors relate by using a research method well suited for exploration of research results that are hard to interpret as a group because of the disparate way in which they appear in the literature. By providing a more comprehensive view of critical success factors, the results presented in this study may lead to better strategies to improve practice.

Another strength and contribution of this study was through its use of Q methodology for studying critical success factors. The Q method approach presents an opportunity to compare the subjective perceptions of project managers regarding the factors related to IT project success. Developing a better understanding of what project

managers think and believe about critical success factors might provide the foundation for developing successful strategies to improve IT project success.

Definitions of Terms

Working definitions for project management and Q methodology terms used in this study are as follows:

Agile project management: A project development approach using short iterative product development cycles, collaborative decision-making and rapid feedback, which allows it to adapt to project changes. It supposedly deals with project unpredictability and dynamic environments better than traditional methods (Nerur, Mahapatra, & Mangalaraj, 2005).

Concourse: The concourse is a collection of subjective items pertaining to the particular research topic taking the form of questions, statements, or pictures (Brown, 1993).

Critical Success Factor: "A factor for project success consisting of a circumstance, fact, or influence that contributes to the project outcomes" (Lim & Mohamed, 1999, p. 243).

IT project: "A project is a temporary endeavor undertaken to create a unique product or service" (PMBOK, 2004, p. 5). An IT project for this study is a project resulting in new or improved functionality involving hardware, software or other aspects of information technology.

Processes: Project management processes are a set of interrelated actions and activities performed to achieve a specified result. Processes interact for the purpose of

initiating, planning, executing, monitoring and controlling, and closing projects (PMBOK, 2004, p. 38).

Project Life Cycle: "A collection of generally sequential project phases whose name and number are determined by the control needs of the organization involved in the project" (PMBOK, 2004, p. 368).

Project management: "Project management is the art and science of managing projects to a specific schedule, at or below a predetermined budget, to the customer's performance requirements and within the resources available" (Taylor, 2004, p. 13).

Project scope: "The scope of a project determines what is and is not to be included as deliverables of the project, defining product and service boundaries" (Crawford & Pollack, 2004, p. 648).

Project team: The persons responsible for performing project work as a regular part of their assigned duties. This also includes the project manager and sometimes the project sponsor (PMBOK, 2004).

Person-sample: The participants in a Q methodology study asked to complete a Q sort from their individual points of view. The person-sample is not random but rather a structured sample of people who are relevant to the problem under consideration (van Exel, & de Graaf, 2005). Another term for the person-sample is P-set.

Q sample: Represents a subset of statements drawn from the concourse. It is the set of statements presented to participants for ranking in the Q sort (Brown, 1993). Another term for Q sample is Q set.

Q sort: The process where the participant models his/her point of view by rank ordering the Q sample along a continuum according to a condition of instruction, such as

most to least preferred (McKeown & Thomas, 1988). The continuum is usually a quasi-normal distribution.

Traditional project management: Traditional project management involves the use of regimented planning and control methods. It uses a sequential approach for completing tasks and depends upon developing a comprehensive plan early in the project life cycle (Hass, 2007).

Summary

As projects play an important role in modern business operations many studies suggest projects in general and IT projects in particular, continue to have unacceptably low success rates (Tesch, Kloppenborg, & Frolick, 2007; Shenhar, 2008). This situation has led to research efforts focused on methods for improving the rate of project success while at the same time, seeking to broaden the definition of project success to include measures related to business strategy and organizational performance (Atkinson, Crawford, & Ward, 2006; Pollack, 2007). The changing business climate with reduced project lifecycles, and greater global competition may also contribute to the volatility surrounding the IT project management environment. Some question whether traditional practice of project management is effective in dynamic and unpredictable environments, particularly for IT projects (Collyer & Warren, 2009). Although there is a long history of traditional project management methodology as advocated by the *PMBOK Guide* (2004), strict adherence to those methods may not be suitable for uncertain and rapidly changing environments. Agile development methods may be a better fit for dynamic project settings. However, neither traditional or agile methods appear to be a perfect fit for all

types of IT projects, and in many ways the approach is dependent upon the type of project and the organization involved (Vinekar, Slinkman, & Nerur, 2005).

A great deal of research examining ways of improving IT project success uses a critical success factor perspective. However, much of the critical success factor literature focuses on individual projects. Relatively few studies examine how critical success factors interrelate (Fortune & White, 2006). Perhaps, because of the isolated and disjointed nature of critical success factor research, there is also little evidence indicating the practice of IT project management integrates results from studies of critical success factors (Sauser, Reilly, & Shenhar, 2009). This study explored how the practice of project management fits with years of research findings and how practice aligned with different approaches for project management.

Chapter 2 discusses agile and traditional approaches to project management, the theoretical foundations of traditional and agile project management, different notions of project success, and the critical success factor perspective of project management research. Chapter 3 discusses Q methodology as the research design for investigating both the relationship between critical success factors and how those factors correspond to agile and traditional approaches to project management. Chapter 4 presents the results of this Q methodology investigation into project manager views about critical success factors and management approach. Finally, chapter 5 presents an overall summary of this research study along with conclusions and recommendations for future research.

Chapter 2: Review of the Literature

The role of IT projects in business operations is assuming an increased importance in the general strategy to address competitive advantage (DeCarlo, 2004; Shenhar & Dvir, 2007). As a result, project success is increasing in importance, as is the understanding of the role of critical success factors in IT project success (Baccarini & Collins, 2003). However, project management literature is still unclear about what factors work together to make a project successful (Hyvari, 2006), and there has been little exploration of how success factors may interrelate (Fortune & White, 2006). Additionally, since IT project management is increasingly taking place in a constantly changing environment due to rapid technological change and shifting business focus (Highsmith, 1999; Kochikar & Ravindra, 2007), there is some debate about what might be the best approach for managing IT projects. The focus of this debate centers on whether to conduct project management using traditional plan-based methods, which views projects as a sequential collection of processes, or to employ agile techniques, which are more in keeping with the demands of a volatile development environment and a social process view of projects (Rajlich, 2006; Winter & Smith, 2006; Fernandez & Fernandez, 2008).

The purpose of this research was to explore project manager viewpoints about critical factors associated with IT project success in order to gain a better understanding of how success factors related to management approach and interrelated with one another. This study used Q methodology to identify and describe the shared subjective insights of project managers about commonly reported critical success factors, explore

how those factors interrelate, and ascertain how project manager perceptions of critical success factors align with agile and traditional approaches for managing IT projects.

Organization of the Review

This chapter consists of an overview of literature related to the factors involved in achieving IT project success. The review of literature begins with a discussion of agile and traditional methods for carrying out IT project management followed by a discussion of the theoretical foundations of project management and the role of theory in the practice of agile and traditional project management. The emphasis then shifts to IT project management with an examination of the meaning of IT project success and a review of current literature regarding critical success factors research in IT project management. The critical success factor discussion will focus on factors influencing IT project success associated with four dimensions of project management most in keeping with a project manager view of IT projects: organizational traits, processes, people-related issues, and project characteristics. Finally, this chapter will examine the suitability of Q methodology as a technique to investigate the relationship between IT project success factors.

Strategy for Searching the Literature

This literature review utilized research libraries from a number of universities including Walden University, Indiana University, University of Minnesota (Minneapolis), Ball State University, University of Wisconsin (Madison and Milwaukee), and Marian University (Wisconsin). The primary sources for the literature review included full text peer-reviewed journal articles from the ProQuest databases (ABI/INFORM-Global, Dissertations and Theses, ProQuest Central, and Research

Library), EBSCO databases (Academic Search Premier, Business Source Premier, Computers & Applied Sciences Complete, ERIC, Library, Information Science & Technology Abstracts, PsycARTICLES, and PsycINFO), ScienceDirect, MasterFile, and SAGE Journals Online. Scholarly books by original authors contributed to the theoretical framework of the study and the proposed methodology. Academic or professional web sites provided additional information on methodology, alternative viewpoints, and research articles not otherwise obtainable. The database searches used keywords alone and in various combinations, including critical success factors, project management success factors, information technology/system projects, information technology/system project management, agile project management, project management theory, information technology/system project success, information technology/system project failure, and Q Methodology among others. Expansion of sources for this literature review also resulted from evaluating and choosing additional sources from the reference lists of selected articles.

Traditional and Agile Project Management

Methods for conducting IT and software projects seem to fit into one of two broad categories of approaches, a traditional formal approach and a more open agile approach. The traditional method is a plan-based lifecycle approach in accordance with the doctrine included in the *PMBOK Guide* (Koskela & Howell, 2002). Agile methods are less plan-based and assume many IT projects take place in a volatile development environment, requiring projects to adapt quickly to project changes (Rajlich, 2006; Fernandez & Fernandez, 2008). The traditional approach to IT projects focuses primarily on developing a thorough plan and minimizing changes to the plan during careful execution

of the project. The traditional approach is consistent with the definition of project management provided by the *PMBOK Guide* (2004):

> Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. Project management is accomplished through the application and integration of project management processes of initiating, planning, executing, monitoring and controlling, and closing. (p. 8)

One of the basic philosophical differences between agile and traditional approaches comes out of their different viewpoints for dealing with project changes. In an examination of the driving philosophy behind the movement to agile practices, Nerur and Balijepally (2007) stated:

> Emerging practices (such as agile development) question the assumption that change and uncertainty can be controlled through a high degree of formalization. Proponents of agile methods have discovered inadequacies in formal design that follows systematic procedures dictated by rigid processes. These insights have produced a more incisive method of inquiry that departs from traditional approaches to software development. (p. 80)

The different processes used in the agile approach to IT project management primarily focus on the inevitability of changing specifications in IT projects and the need to deliver business value quickly.

What is Agile Methodology?

The movement towards agile practices in software development and project management is a continuation of a process begun more than 2 decades ago with practices such as cross-functional teams (Takeuchi & Nonaka, 1986) and lean product development (Krafcik, 1988). In the information systems area, the origins of agile thinking began in the 1970s with iterative and incremental development methods (Larman & Basili, 2003). However, the current idea of agile development began in 2001 when 17 advocates of light development techniques introduced the agile manifesto (Sliger & Broderick, 2008, pp. 13-14). This manifesto presented four value statements for agile development contrasted against four features associated with traditional systems development (Appendix A). The group also provided a list of 12 principles for agile software development (Appendix B). The agile manifesto and principles stress an open style of management, which values individuals and interactions, frequent releases of working software, intense customer collaboration, and fast responses to changes in the project.

There are a number of definitions for agile management and development methodologies, but most include strategies for addressing change efficiently and delivering business value quickly. In a review of agile methodology literature van Oosterhout, Waarts, and van Hillgersberg (2006) developed a simple definition of agility. "Agility is a way to cope with external and internal changes, which are unpredictable and uncertain" (p. 133). The ability to master change is a consistent theme across all agile methodology literature.

The Forces Encouraging Agile Methodologies

A major factor encouraging the move to more agile approaches for managing projects is the need to accommodate changing project requirements in a swift and efficient manner. Truex, Baskerville, and Klein (1999) associated the growth in agile methodologies with the concept of emergent organizations, which assumes organizational culture and decision processes are continually evolving and changing. The evolving nature of organizations and the need to develop products more quickly also encourages organizations to adopt a project approach as a general organizational strategy (Jugdev & Muller, 2005; Shenhar & Dvir, 2007). DeCarlo (2004) observed, "We now live in an age of management by project where… executives live or die by projects" (p. 51). The movement towards more projects, quicker turnaround, and the need to adapt to changes lead many to believe strict adherence to a plan-driven traditional methodology for project management may be problematic for many IT projects (DeCarlo, 2004; Augustine, Payne, Sencindiver, & Woodcock, 2005; Cicmil & Hodgson, 2006; Rajlich, 2006). With respect to IT projects, Highsmith (1999) proposed organizations adopt a perspective accepting change and uncertainty as a natural part of the development environment, making the ability to adapt crucial to project success.

Perhaps the best explanation for the movement to agile project management lies in the reasoning behind creation of the agile manifesto, "the need for an alternative to the heavyweight, document driven software development process" (Highsmith, 2001, para 1). The four value statements presented in the agile manifesto represent the bottom line differences in approach between agile and traditional IT project management. The first statement of valuing individuals and interactions over processes and tools suggests an

open style of management stressing cross-functional teams with top management support, but limited interference (DeCarlo, 2004; Sliger & Broderick, 2008). The second principle of valuing the working software over comprehensive documentation reflects the importance of incremental development of working subunits (Sliger & Broderick, 2008; Cao & Ramesh, 2008; Meso & Jain, 2006). Incremental development methods are at the heart of an agile approach to accommodating change. The third value statement stresses the importance of customer collaboration and advocates the immersion of the customer or client into the development process to the point of having a client representative on-site, in close contact with the project team (Sliger & Broderick, 2008; Ceschi, Sillitti, Succi, & De Panfilis, 2005). Nerur, Mahapatra, and Mangalaraj (2005) pointed out, while customer collaboration is important in traditional IT project management, it becomes critical when using an agile approach (p. 75). Finally, one of the major driving forces towards the agile approach comes from the fourth value statement emphasizing the importance of responding to change over following a plan. This involves the use of techniques allowing teams to more readily respond to changes in the project (Sliger & Broderick, 2008) such as using a discrete stream of deliverables (Truex, Baskerville, & Klein, 1999), and avoiding strict adherence to rigid schedules and specifications (Augustine, et al, 2005).

Comparison of Traditional and Agile Methodologies

In a comparison of companies using agile or traditional plan-based project management, Ceschi, Sillitti, Succi, and De Panfilis (2005) found a major difference between the two approaches involved the relationships with their customers. Agile companies tend to have their customers on-site and use flexible contracts. Plan driven firms try to anticipate requirements by creating detailed requirement specifications

upfront and employing more constraints. A natural offshoot of this difference is the approach to changing customer requirements. Most plan-based organizations consider changing requirements as one of the most critical issues they faced while agile companies worried less about variations in requirements. This stems from different approaches to product delivery. Plan-based companies tend to deliver the entire product at the end of the development process, sometimes resulting in customer demands for a speedup in the project. Since the agile companies delivered products through frequent product releases, they encountered less customer pressure to deliver the final product (Ceschi et al., 2005, p. 25).

In a theoretical comparison of traditional and agile approaches, Fernandez and Fernandez (2008) observed traditional methods for project management employ a command and control approach based on a thermostat model, applying additional resources as the situation demands. They suggested the traditional model comes out of production theory based upon inputs transformed into outputs. Fernandez and Fernandez noted agile methods, based upon the agile manifesto, are a better fit with a value generation model, which focuses on product and process innovation driven by understanding and serving customer needs quickly and efficiently (O' Malley, 1998). Fernandez and Fernandez (2008) also contrasted agile and traditional project management according to their overall approach, focus on planning, and management style. They characterized the traditional method as using a linear and incremental approach, which manages projects against budget, schedule, and scope with a dependence upon a well-documented understanding of features, functions, and requirements. Agile project management on the other hand was more iterative and adaptive, discovering

complete product requirements by doing the project, and focusing on deliverables and business value first, and budget and timeline second. Traditional methodologies also tend to be compliance driven and measurement-based, whereas agile methods stress assessment more than measurement and more easily tolerate changes to specifications (Nerur, Mahapatra, & Mangalaraj, 2005).

There is also a significant difference in the philosophical foundations of traditional and agile methodologies. The traditional focus of software development and IT projects uses an underlying assumption suggesting fully specified problems and an optimal solution to nearly every problem (Nerur, Mahapatra, & Mangalaraj, 2005). This view is consistent with a strict rational model of projects (Cicmil, 2006). However, traditional understanding of projects may be undergoing an evolution. Rajlich (2006) argued agile techniques represent a fundamental paradigm shift in the development and execution of IT projects. At the heart of this shift is the concept of incremental change characterized by adding new functionality or properties to existing software. Under the historical paradigm of software development, incremental change was supposed to happen rarely because of thorough identification of required functions and properties during initial development. Rajlich (2006) viewed this propensity to freeze requirements for the duration of a software project as a leading cause of software project failure because development now takes place in an environment where product requirements are quite volatile.

Despite rhetoric and debates about the superiority of one project management method over another, neither appears to be a perfect fit for all types of IT projects. Vinekar, Slinkman, and Nerur (2005) suggested, “systems development organizations can

reap the benefits of both agile and traditional systems development" (p. 40). A number of project and organization factors may dictate the choice of approaches. These factors include the size of the project and the team, the critical nature of the project, the volatility of the environment, team competence, and the organizational culture (Boehm & Turner, 2003). In an effort to map the choice of IT development methods with project attributes, Guntamukkala, Wen, and Tarn (2006) used cluster analysis to demonstrate situational attributes may be the best tool for selecting a development method. The use of traditional waterfall-based approaches appears to be preferred with well-understood project requirements and in projects with an expectation of frequent maintenance. However, agile methods may be a more viable approach when there is a high degree of uncertainty with respect to requirements, scope, risks, or when the project uses new technology. In projects falling somewhere between well-understood requirements and high uncertainty, the project management method chosen did not seem to influence project outcome.

The difference between the agile and traditional methods for managing IT projects is in many ways related to the state of theory in project management research. Theory in IT project management often divides along a positivist, structured perspective of a project versus an interpretive perspective. The next section will examine the role of theory in project management and the collection of theories, which may be particularly relevant in understanding differences between agile and traditional project management methods.

Theoretical Foundations of Project Management

There seems to be no specific theoretical framework or dominant theory for project management research or practice. Instead, project management thought rests on a

number of theories from management and production, which are usually not articulated nor used to explain project results (Koskela & Howell, 2002). An examination of project management literature found not only is there no single theory but there may be up to ten different theories applicable over various stages of a project lifecycle (Leybourne, 2007). This indicates project management practice involves many different frameworks such as projects as temporary organizations (Andersen, 2006), projects as a team activity (Scott-Young & Sampson, 2006; Chiocchio & Essiembre, 2007), and projects as strategic organizational processes (Srivannaboon, 2006). For the most part, research in IT project management deals with a problem-driven perspective based on lessons learned and best practices, representing an approach generally lacking in conceptual framework (Shenhar & Dvir, 2007). In response to this lack of theory, Shenhar and Dvir (2007) noted project management research pursues three distinct perspectives of the project. These three general perspectives include an operational view looking at projects as a sequence of activities, a team leadership view of projects as an organizational team, and a strategic business view that sees projects as business activities.

Expanding the View of Project Management

There is growing interest in broadening the focus of project management research to include and acknowledge the influence of factors that go beyond operational concerns. The traditional view of project management as being concerned with time, budget and specifications is important but needs to expand to include other factors based upon an organizational view of project success (Andersen, 2006). A view focusing solely on harder and more technical aspects of success tends to minimize the softer side of project management such as human processes (Erno-Kjolhede, 2000).

An example of the expanding view of project management success was the Rethinking Project Management movement in Europe from 2006-08. This initiative began as a two-year project, funded by the Engineering and Physical Sciences Research Council (United Kingdom), to identify new directions for project management research and practice. The Rethinking Project Management initiative suggested an expansion of the understanding of projects to include "concepts that facilitate a broader and ongoing conceptualization of projects as being multidisciplinary, having multiple purposes, not always predefined, but permeable, customizable and open to renegotiation throughout" (Winter & Smith, 2006, p. 5).

A broader view of project management recognizes many internal and external factors influence project management practice. This requires a shift in emphasis for project management research from concentrating on tools and processes to more behavioral elements addressing complex social tensions and organizational relationships associated with many projects (Cicmil & Hodgson, 2006; Andersen, 2006; Leybourne, 2007). There are also concerns regarding an emphasis solely on critical success factors or factors related to failure may be inconsistent with the realities of the project management environment (Cooke-Davies, Cicmil, Crawford, & Richardson, 2007).

Interestingly, the movement from a traditional plan-based structured approach for project management to agile project management practices also represents an expansion of the view of a project as more dependent upon people and social interactions for success (Cockburn & Highsmith, 2001). This study further explored these differences in conjunction with organizational, coordination, and contingency theories as they relate to project management.

Project Management and Organizational Theory

Although the focus of most IT projects is to accomplish a specific and one time objective using a project framework, it is still subject to many typical management activities as first proposed by Henri Fayol such as planning, organizing, coordination, and control (Wren, 1994). Project management is, at its heart, a form of management and as such can utilize a number of different theoretical approaches. The basic philosophy of agile and traditional project management practice seems to come out of two extremes of organizational theory.

Scott (1961) observed organization theory represented an evolution in management thought from the classical model of hierarchical organizations to a systems model of the organization integrating many subunits. Scott (1974) described the classical model as a closed system, difficult to change, and with a dependence on hierarchy as a method for coordination and control. Alternatively, he characterized the systems model as an open system, flexible, adaptable to change, and employing lateral processes for coordination and control. Burns and Stalker (1994) viewed these two extremes as mechanistic and organic forms of organization. The major characteristics of the mechanistic structure include rigid task definitions, vertical communications, centralized control, and high degrees of formalization, features similar to those associated with traditional plan-based IT project management (Taylor 2004, Fernandez & Fernandez, 2008; Nerur & Balijepally, 2007, Shenhar, 2008). Organic management structures on the other hand, rely upon characteristics such as flexible task definitions, lateral communications, decentralized controls, and low degrees of formalization, the same set of features upon which agile methods depend (Augustine, Payne, Sencindiver, &

Woodcock, 2005; Rajlich, 2006; Fernandez & Fernandez, 2008). Burns and Stalker (1994) suggested mechanistic structures tend to succeed in environments where decisions depend on the application of predetermined policies and procedures whereas organic structures are appropriate in unstable, turbulent, unpredictable environments.

Despite the dramatic differences in the organic and mechanistic perspectives, projects may employ elements of both models. Spender and Kessler (1995) did not view these two extremes in management as mutually exclusive but instead proposed a trade-off model where organic and mechanistic behaviors were appropriate during different stages of an innovation project. Along similar lines, Henderson and Lee (1992) found high performing information systems design teams showed high process control by managers but high outcome control by team members. Finally, there is some evidence to suggest highly turbulent but innovative new venture projects may initially benefit from a mechanistic management approach to provide structure and clarify roles (Sine, Mitsuhashi, & Kirsh, 2006).

The mechanistic viewpoint of traditional project management and organic perspective of agile project management represented a major contribution to the theoretical framework used in this study.

Project Management and Coordination Theory

Coordination theory studies the problems arising from organizational or unit dependencies restricting how tasks are accomplished. The theory proposes dependencies restricting tasks can be due to the nature of the problem, how the tasks are broken down, or the units and people to which tasks are assigned (Crowston, 1997, p. 159). In a study of team coordination activities for software development projects, Rico, Sanchez-

Manzanares, Gil, and Gibson (2008) proposed two conceptual models of coordination, explicit and implicit. Explicit coordination entails purposeful activities, such as articulating plans, defining responsibilities and negotiating deadlines, whereas implicit coordination involves behaviors that anticipate the actions and needs of other team members. Espinoza, Lerch, and Kraut (2004) suggested shared knowledge among team members is the foundation for implicit coordination.

The nature of IT projects requires many underlying coordination mechanisms focusing primarily on cooperation, decision-making, knowledge sharing, and communication activities. Many of these mechanisms involve processes related to critical success factors for IT projects and naturally align with either the traditional or the agile approach to project management. Kotlarsky, vanFenema, and Willcocks (2008) observed coordination activities for IT projects use a combination of organizational design, work-based, and social mechanisms. Organizational design mechanisms include formal structures, work-based mechanisms consist of plans, specifications, and design documents, and social mechanisms involve communication activities and working relationships. Gossain, Lee, and Kim (2005) suggested projects routinely employ three levels of coordination, lean, rich, and mediated. Lean coordination uses standard policies and procedures aimed at reducing coordination requirements. Rich coordination manages interdependencies among project members through active collaboration and mutual adjustment. Mediated coordination relies on the influence and power of an individual to resolve conflict and keep the project on task. Finally, Andres and Zmud (2002) characterized coordination as mechanistic and organic. According to this classification, mechanistic coordination involved higher levels of formality and low levels of

cooperation with a focus on top down communication and centralized decision-making. Organic coordination utilized less formality and greater cooperation, encouraged greater participation in decision-making and involved a greater degree of horizontal communication. Andres & Zmud (2002) found organic coordination led to more successful software projects than mechanistic coordination (p. 61).

The study of coordination theory often involves the use of a contingency theory perspective since coordination mechanisms are dependent upon many factors (Levitt, et al., 1999; Andres & Zmud, 2002; Gossain, Lee, & Kim, 2005; Jiang, Klein, & Chen, 2006; Kotlarsky, vanFenema, & Willcocks, 2008). Because projects involve so many dependent and contingent activities, contingency theory frequently serves as an implied framework for explaining success or failure of projects.

Project Management and Contingency Theory

Tossi and Slocum (1984) suggested contingency theory with respect to systems rests upon the principle of *equifinality*, which "recognizes that multiple, equally effective design alternatives may exist" (p. 15). Although contingency theory has not been a major focus of organization theory since the 1970s and early 1980s, the temporary nature of IT projects and the large number of success factors associated with project success indicate a contingency theory approach may be particularly applicable for studying project management success (Shenhar & Dvir, 1996; Erno-Kjolhede, 2002; Howell, Windahl, & Siedel, 2009).

Contingency theory finds its roots in the leadership model proposed by Fiedler (Fiedler & Chemers, 1974, pp. 65-95) and the decision making model proposed by Vroom and Yetton (1973, pp. 41-42). Contingency theory also has some similarity to the

Hersey-Blanchard Situational Leadership model (as cited in Bass, 1990, p. 488). The general assumptions of contingency theory are that there is no one best way to manage, organizations are more successful when the management style fits the nature of the work and tasks, and success relates to the fit an organization has with its environment.

Contingent relationships are rarely simple or straightforward. In an empirical test of structural-contingency theory, Pennings (1975) found no support for explaining variance in organizational effectiveness using simple environmental variables. However, Pennings did suggest organizations where work is interdependent may support a structural contingency model and recommended more research focus on the interdependence of factors linked to effectiveness. In a similar evaluation of contingency theory, Drazin and Van de Ven (1985) found no support for a simple interaction model of contingency and indicated congruence between factors could provide a better fit for some contingent relationships. These authors recommended future studies should explore the relationship and interdependencies among factors and examine multiple contextual elements.

The project management literature contains several studies suggesting a contingent arrangement between project factors and project success. Shenhar and Dvir (1996) developed a typological theory of projects based upon a contingent relationship between a project's technological uncertainty and system scope. Sharma and Yetton (2003) suggested a contingent link between the level of management support and the degree of task interdependency. Using a meta analysis of studies examining IS/IT implementation successes they found management support has a small effect on implementation success when task interdependency is low and a medium to large effect

when task interdependency is high. In an examination of software development projects, Andres and Zmud (2002) found effective coordination strategies were contingent upon the degree of task interdependency as well. Specifically, informal, cooperative, and decentralized coordination strategies led to higher productivity under conditions of high task interdependency.

In a comprehensive review of the system requirements development literature, Mathiassen, Tuunanen, Saarinen, and Rossi (2007) developed an integrative contingency model for software development and found the most effective methods for eliciting system requirements were contingent on specific characteristics of the project and the organization. Finally, Chua, Soh, and Singh (2005) proposed that the situational view of control dominates project management practice where situational factors determine the appropriate controls to employ. They suggested effective projects employ a portfolio of controls, which are contingent upon factors related to the project and the organization. Whether to employ an agile or traditional approach also appears to be contingent upon product and organizational factors (Vinekar, Slinkman, & Nerur, 2006).

One of the more interesting attempts applying contingency theory to project management involved an assumption that projects are temporary organizations fitting into one of Mintzberg's five types of organizational structures (von Donk & Molloy, 2008). These structures include simple organizations, machine bureaucracies, divisionalized organizations, professional organizations, and the adhocracies (Mintzberg, 1981). Using Mintzberg's classification scheme von Donk and Molloy proposed five similar classifications for projects. They proposed each type of project uses a different organizational structure contingent upon a combination of Mintzberg's organizational

design parameters of age and size, the technical system, the organizational environment, and outside pressure.

Overall, there seems to be an underlying current of contingency throughout project management literature. Engwall (2003) alluded to the contingent nature of project success when he observed, “a project management approach or technique that is successful in one project, under certain circumstances, might be a failure in a different project or under different circumstances” (p.802). Project success appears to be contingent upon the presence of success factors and the absence of failure factors (Chua &.Lam, 2005; Fowler & Horan, 2007). The literature also suggests project management approach (agile or traditional) may be contingent on product and environmental factors (Vinekar, Slinkman, & Nerur, 2006). In addition, the concept of contingency itself seems to depend upon how various factors and conditions interrelate (Pennings, 1975; Drazin & Van de Ven, 1985; Engwall, 2003). The matrix involved in the factor analysis step in Q methodology served as the model for exploring interrelatedness and provided the approach for exploring the contingent relationships among different types of success factors.

Information Technology Project Success

Measuring whether IT projects are successful or unsuccessful is more difficult than it might initially appear. The complexity of many IT projects and the involvement of many stakeholders representing a variety of perspectives can make it difficult to agree upon definitions of success, failure, or the relative degrees of either success or failure. There are also differences of opinion as to whether to use strict operational definitions of success or to expand the definition to include any type of benefit derived from project

activities. Bryde (2005) went so far as to suggest a measure of organizational success may derive from participating in failed IT projects since those experiences often enhance project management capabilities of an organization.

The purpose of this section is to examine the idea of IT project success and to demonstrate there is no consensus in the literature about exactly how to determine project success. Some measures of success may be more compatible with a traditional plan-based management strategy while others may be more in keeping with an open and organic approach typical of agile practices. In keeping with the categorization used for critical success factors in this study, the following sections examine the notion of IT project success from process, product, organizational, and stakeholder perspectives. Additionally, this section also illustrates how views of success from these perspectives can align with either agile or traditional approaches to project management.

The Iron Triangle Concept of Success

In 1995, The Standish Group released the often-cited CHAOS report, which indicated software projects in business concluded successfully only 16.2% of the time. The criteria used for measuring success known as the *iron triangle,* consisted of completion within budget, within the planned time schedule, and containing all of the features originally specified. Although much of the research following the release of the CHAOS report focused on why IT projects fail, the CHAOS report never specifically referred to projects as failures. The report classified projects into one of three categories, successful, challenged, and impaired. Successful projects satisfied all three criteria of the iron triangle; challenged projects, representing 52% of all projects, were completed, but did not meet one or more of the three components of the iron triangle, meaning they may

have been over-budget, over the time estimate, or with fewer features than originally specified. Finally, impaired projects actually referred to cancelled projects and represented 31% of all projects investigated. The Standish Group has annually updated the results of the CHAOS report documenting a gradual improvement in success rates, but still indicating well over half of all IT projects do not end in success. According to the 2009 update of the report, 24% of IT projects end in cancellation and 44% are challenged, which is an improvement over the initial findings, but slightly worse than the rates reported in the 2008 update (The Standish Group, 2009).

Since the first CHAOS report, the report has been a driving force in research studies examining IT project success and failure. Studies routinely cite the results of the CHAOS report as the justification for the research. However, despite the widespread use of the CHAOS report as a research justification, there have been concerns about the report relating to the research methodology and the definition of success. The questions about the methodology center on the issue of the Standish Group not sharing its methodology with independent researchers. Glass (2006) suggested data collection methods might bias the results towards failed projects because, according to the report, data collection efforts focused on having IT executives share stories of failure. Glass also pointed out other objective studies do not seem to confirm the CHAOS findings. Eveleens and Verhoef (2010) point out considerable limitations in the interpretations and application of definitions used in the various CHAOS reports. Other researchers using budget, schedule, user satisfaction, quality, and productivity as success measures estimated only 26 to 34% of IT projects do not meet performance estimates or end in cancellation (Emam & Koru, 2008). These values indicate a somewhat brighter picture

than those presented by the Standish Group. Another related criticism of the CHAOS methodology is that strictly classifying projects into categories of success or failure does not account for degrees of budget, time, and scope variance. Sauer, Gemino, and Reich (2007), using a less rigid method to categorize projects, found 60% of IT projects were within 7% of planned budget, 2% of planned schedule, and 7% of planned scope. Thus, even basing the notion of project success on a set of seemingly well-defined criteria can be the subject of considerable debate. Another criticism stems from the phrasing in the CHAOS report, because it measured the budget and schedule overruns against estimates as *originally* or *initially* specified. However, due to the changing nature of information technology, measuring against original estimates may not represent a fair estimate of IT project success.

The other major concern with the CHAOS report and project management research in general, centers on how to define project success. Shortly after the first CHAOS report, there were concerns that the iron triangle of budget, time, and specifications was too limiting a lens to act as the sole determinant of IT project success (Baccarini, 1999; Jugdev & Muller, 2005). Wateridge (1998) even suggested, "…the fixation on the part of project managers, particularly satisfying timescale and budget constraints, at the expense of other criteria is leading to the failure of IS/IT projects" (p. 62).

The main concerns about limiting definitions of success to the iron triangle are that such definitions do not clearly distinguish between project management success and product success, fail to include organizational and social components into the definition of success, and ignore other stakeholder perspectives. In general, the concept of project

success represents an aggregate measure while much of the research focuses on a single measure, such as meeting schedule or cost estimates (Milosevic & Patanakul, 2005).

The difficulty in measuring success for IT projects is not a new phenomenon. In a study of what measures determine information system success, DeLone and McLean (1992) noted, "…there are nearly as many measures as there are studies" (p. 61). The subsequent DeLone-McLean model indicated not one but many interrelated and interdependent measures of success. Gable, Sedera, and Chan (2008) also suggested information system success was a multi-dimensional phenomenon based upon individual and organizational perceptions of the impact of system and information quality. These views of IT project success go beyond simple interpretations of meeting project specifications and illustrate the difficulty in capturing product success with a single measure.

As the meaning of project success expands beyond the concept of the iron triangle, some project management literature is re-evaluating the basic concepts of project management and its role in complex environments (Cicmil, 2006; Cicmil & Hodgson, 2006). The expanding perspectives used for determining IT project success are similar to the evolving views of the traditional and agile approaches to managing projects.

Project Management Success vs. Product Success

Baccarini (1999) observed no consistent interpretation of the term project success in the literature and noted project management literature often combines two separate components into the notion of project success, project management success and product success. Project management success focuses on processes and deals more directly with the iron triangle objectives of cost, time, and quality. Product success involves the

usefulness and utility of the final product. Using this view, product success aligns more closely to the goals and purpose of the project whereas the management of inputs and outputs to achieve success are more consistent with the goals of project management. Baccarini (1999) noted projects "…can be product failures even when the project management success objectives of time, cost and quality have been successfully met. Conversely, projects can be project management failures but a product success" (p. 29). Baccarini also observed that although good project management practices can contribute to product success it is unlikely they would be able to prevent product failure. Although the purpose of all project management approaches is to produce a successful product in an efficient manner, the traditional plan-based approach has a greater emphasis on project management success while the agile approach has a decidedly end-product emphasis.

Organizational Influences on the Concept of IT Project Success

The organizational influences on project success often relate to the broader set of goals driving the organization, the predominant management style and practices of the parent organization, and the organizational culture. Standing, Guilfoyle, Lin, and Love (2006) found the cultural environment within organizations helped to construct the definition of success or failure. For example, in organizations where the assignment of blame is a common practice, there may be a cultural reluctance to measure success (or failure) or to understand the process for terminating projects (Thomas & Fernandez, 2008; Green, Welsh, & Dehler, 2003).

In an examination of projects as strategic endeavors, Shenhar, Dvir, Levy, and Maltz (2001) noticed day-to-day management of projects used an operational perspective centered on project execution and typically did not focus on business aspects. They noted

that “Clearly most projects are conceived with a business perspective in mind, and often with a goal which is focused on better results and organizational performance—more profits, additional growth, and improved market position” (p. 701). Using a multistage case study approach, they found four dimensions contribute to the organizational perspective of project success: project efficiency, impact on the customer, business success, and preparing for the future. Other than perhaps the project efficiency dimension, iron triangle concerns do not contribute significantly to these organizational perspectives of project success nor do they align with a traditional plan-based management approach. On the other hand, agile methods often focus on close customer interactions and the early delivery of business value (Cao & Ramesh, 2008; Dyba & Dingsoyr, 2009).

Thomas and Fernandez (2008) found specific management practices could shape an organization’s determination of project success such as its confidence in the ability of IT projects to produce business benefits and a commitment to measuring success throughout the project. They suggested some effectiveness measures linked to organizational activities could influence project success, such as having an effective project approval process and dedication to post implementation evaluation. The most effective practices identified included an agreed-upon definition of success, consistent measurement of that definition, and the use of results from those measurements (Thomas & Fernandez, 2008). The focus on up-front planning associated with these types of activities fit well with a structured plan-based approach to managing projects.

Doherty and King (2001) found social or organizational factors played an important part in the failure of information systems development projects, and noted

"organisational issues are now strongly implicated in the unacceptably high levels of information systems failure that greatly reduce the organisational contribution of information technology" (p. 158). Doherty and King (2001) found four areas where organizational issues played an important role in project success. These issues were a projects contribution to the organizational goals, the culture of user acceptance, implementation issues related to organizational disruption, and how the project aligns with social aspects of the organization (p. 58). They also found 50% of senior IT executives surveyed felt traditional project management practices did not deal with these issues satisfactorily.

Stakeholder Perspectives and IT Project Success

A view of project success closely related to organizational influences is the perspective of the different stakeholders. Different stakeholders can have different ideas about what constitutes project success, which in turn can influence the perception of success. Wateridge (1998) explored what various stakeholders meant with respect to IT project success and found notable differences in perspective between IT project managers and users of IT products. IT users measured success in terms of how happy they are with the system and how well it met their needs. On the other hand, project managers focused more on short-term criteria, such as meeting deadlines and bringing projects in within budget, probably because those are the criteria often used for their performance evaluations. Wateridge (1998) also found project managers often implemented *their* interpretations of user requirements, and not the users' interpretations, which likely influences the final user perceptions of success. In a similar study using construction projects, Lim and Mohamed (1999) found there are often two perspectives of project

success, the macro perspective of the users related to the utility of the project outcome and the micro view, used by developers to evaluate project completion. These two views are consistent with the differences between and agile and traditional project management approach in that the agile approach relies upon intense customer collaboration and the traditional approach deals with customers in a more formal manner in keeping with the project plan.

Agarwal and Rathod (2006) argued the dynamic nature of software projects makes it difficult to depend upon a standard definition of success or failure and makes it necessary to evaluate project success from several perspectives. Restricting success criteria to cost, time and quality limits the inherent subjectivity in software projects. Measuring the notion of success held by different stakeholders, they found the scope of the software project, which included functionality, and the quality of the outcome were the strongest determinants of success and cost was the least important factor for measuring project success.

Project management literature illustrates there are different perspectives on how to define project success and overall, some measures of success fit better with a traditional management approach while others align with agile practices. Clearly, the definition of project success would influence the choice of which factors are critical to success. The lack of a connection to a standard definition of project success may help to explain the large number of critical success factors identified in project management literature. It may also be possible for a factor to be critical to one definition of success or management approach but unimportant when using another. The next section investigates

the concept of critical success factors and their contribution to IT project management literature.

Critical Success Factors Research

The concept of critical success factors began with the work of Daniel (1961) in an effort to distinguish between critical and non-critical information for business decisions with respect to information stored and supplied through management information systems (MIS). Rockart (1979) later found defining CSFs for information systems design depended upon a wide range of data and often relied upon subjective assessments of top executives. In a review of the use of critical success factors in MIS planning, Boynton, and Zmud (1984) developed a general definition of the concept.

> Critical success factors are those few things that must go well to ensure success for a manager or an organization, and, therefore, they represent those managerial or enterprise areas that must be given special and continual attention to bring about high performance. (p. 17)

The work of Slevin and Pinto (1987) was among the first to extend the critical success factor approach into project management. Slevin and Pinto (1987) recognized a major problem associated with successful project management dealt with the fact that project managers needed to think in both tactical and strategic terms. They proposed a list of ten factors critical to successful projects and divided those factors into two categories, strategic and tactical. Strategic factors included planning and goal setting while tactical factors were actions designed to achieve goals. Using this framework, Slevin and Pinto proposed project success was dependent upon an appropriate mix of effort and resources between tactical and strategic categories of success factors. Projects not exhibiting both

high tactics and high strategy were likely to be unsuccessful. Slevin and Pinto (1987) also suggested that due to different factors associated with strategic and tactical goals, different management strengths might also be more important at different stages of the project. In an extension of this research, Pinto and Prescott (1988) reduced the set of critical success factors from ten to eight and demonstrated success factors occurred in different combinations throughout a project's lifecycle. This work began the trend in project management research where measuring project success was in some way related to measuring the presence of success factors. Examining attributes associated with successful projects became a major focus of IT project management research over the next 15 years. In an examination of IT project success factors, Esteves-Sousa and Pastor-Collado (2000) characterized the Pinto and Slevin critical success factor approach to IT project management success as $S = f(x_1, x_2, x_3, \ldots\ldots, x_n)$ where S is project success and x_i is critical success factor i.

IT Project Success Factors in General

Since the original work identifying critical success factors for IT projects (Slevin & Pinto, 1987; Pinto & Prescott, 1988) and the initial CHAOS report (The Standish Group, 1995), the list of potential critical success factors has expanded allowing inclusion of a larger number of stakeholder viewpoints and different types of projects. Common categories of success factors now include many operational concerns, such as effective user support and involvement, good project management and leadership, effective planning, executive and sponsor commitment, organization and project team commitment, dedicated resources, and team competence (Standing, Guilfoyle, Lin, & Love, 2006; Plant & Willcocks, 2007). Although most research studies focus on only a

limited set of projects, there is considerable deviation among various sets of critical success factors. Hyvari (2006) examined the degree of agreement among studies of critical success factors for a wide range of projects, and found only moderate agreement among the studies. In particular, the analysis seemed to show a trend towards recognizing effective communication as being a very important success factor among project management professionals. Interestingly, communication, not generally recognized as a strategic issue, was one of the success factors removed from the original list of 10 factors in the Pinto and Prescott (1988) study because of multicollinearity with other success factors.

As research focus moved away from strategic factors for IT projects, success factors related to the iron triangle and factors most closely related to project management practices continued to be an emphasis. Emam and Koru (2008) found major reasons for IT project cancellation included lack of senior management involvement, budget shortages, and lack of project management skills. The factor strongly associated with project success was delivering projects on time, suggesting schedule estimation and managing to that estimate is critical for project success.

Although there have been a large number of studies examining critical success factors, a significant portion of studies focused on factors associated with IT project failure. In an analysis of data from surveys of IT projects (Krauth, 1999), a number of factors associated with failure began to surface. In general, the reasons captured from those survey results involved issues relating to lack of support, ineffective leadership, changing user requirements, and the size and complexity of the project. In an examination of knowledge management IT projects, Chua and Lam (2005) found four

categories of failure factors including technology, culture, information content, and project management. Interestingly, in the Chua and Lam study, some of the cases exhibited many factors associated with successful IT projects yet still ended in failure. The authors suggested project success is not only dependent on the presence of success factors but also the absence of failure factors. In a study specifically examining the relationship between success factors and failure factors Fowler and Horan (2007) found four of the top six success factors reported for successful projects also related to failure factors cited in the literature. These factors included effective project management, top management support, project personnel skills, and user acceptance. Fowler and Horan (2007) suggested that although there seems to be a relationship between success and failure factors for regularly cited success factors, not all failure factors relate to success factors. The implication is that in addition to pursuing critical success factors, project managers should also be aware of factors associated with project failure. This line of research suggests controlling factors associated with project failure is in effect a critical success factor.

The subsequent discussion of critical success factors will focus on four areas: factors related to organizational issues, factors associated with project management processes, factors associated with people and their roles in the management and execution of IT projects, and factors related to characteristics of the of project. These comprise the four categories of critical success factors making up the research matrix used in this Q Methodology study.

Organizational Related Success Factors

Lee and Anderson (2006) found organizational level factors influence IT project management capability. The authors viewed organizational factors as important because they found organizational structure, politics, and commitment exerts influence on the project's critical success factors that often surpasses the authority of the project manager to overcome.

Top management support is a commonly listed critical success factor in the literature, although the specific meaning of top management support is often unclear. Young and Jordan (2008) believed top management support is more dependent upon organizational goals than project goals. "Organisations do not invest in IS projects to simply be on time, meet budgets or satisfy users; they invest in projects to realise business benefits" (Young & Jordan, 2007, p. 721). Their study examined and identified behaviors on the part of top management present in successful projects and absent in failed projects.

Generally, top management behaviors center on effective decision-making, managing risk, and authorizing business process changes. A specific behavior associated with evidence of top management support for IT projects is a willingness of top management to intervene to resolve or influence an impasse in decision-making. Using this interpretation, top management support consists of direct actions clearly demonstrating support for the benefits an organization will derive from project success. Kearns (2007) found top management support tended to reduce IT project implementation problems and management support in resolving implementation problems and involvement in project planning were associated with information systems

success for organizations. Along those same lines, the failure to hold open, honest, and difficult conversations between project leaders and project sponsors throughout IT project stages can significantly contribute to IT project failure (Grenny, Maxfield, & Shimberg, 2007). There is also some research indicating methods used to monitor and control IT projects may diminish top management support because they portray projects as operational and non-strategic. "If project success is limited to the variables of the time, cost, and scope-and the links to productive service value are missing-then project management is perceived as providing tactical (operational) value and not strategic value" (Jugdev & Muller, 2005, p. 19).

In an effort to describe conditions where management support makes a difference, Sharma and Yetton (2003) examined levels of task interdependencies. Task interdependency is a concept originally proposed by Thompson (1967) describing the degree to which tasks involve multiple users performing tasks that are a part of a larger process. High interdependence requires increased levels of information exchange and coordination. Low levels of interdependence require less information exchange and achieve completion by relying on policies and procedures. Management support appears to have a small effect on IT implementation success when task interdependencies are low, however, when task interdependencies are high, management support seems to have a considerable effect on implementation success (Sharma & Yetton, 2003, p. 545).

Although top management support is a factor in IT project success, Kanter and Walsh (2004) found project success also depends on activities related to general managerial strengths and capabilities of an organization. These factors include general guidelines such as staying on top of things by using open communication, knowing what

is going on in the project, and taking proactive actions in dealing with the various stakeholders. Kanter and Walsh also found organizations can improve management techniques associated with IT success by examining past failures. However, the capability of learning from failures by reporting or examining failure is also linked to organizational culture (Keil, Im, & Mahring, 2007; Park, Im, & Keil, 2008). Some organizations simply do not have a culture that treats failure as an opportunity to learn (Smith & Keil, 2003). Even in organizations that attempt to learn from failure, improvement activities often limit the lessons learned to the project management level rather than looking at how knowledge could apply to the entire organization (Reich, 2007). A related factor is the reluctance to terminate projects. The literature refers to this phenomenon as escalation, where organizations continue to commit resources to failing or troubled projects (Mahring & Keil, 2008; Keil, Depledge, & Rai, 2007). The reasons for escalation may include project managers and teams not recognizing they are in trouble, simple denial, or a culture where it is difficult to admit projects are having problems (Aiyer, Rajkumar, & Havelka, 2005). Sometimes there is no clear link between project performance and termination. Green, Welsh, and Dehler (2003) found a negative relationship between management advocacy and project termination decisions and while positive performance judgments reduced the likelihood of termination for some projects, the degree of management advocacy for the project mediated those decisions.

Although organizational activities and factors can contribute to IT project success, a project involves the completion of many activities involving a number of different processes. Therefore, any discussion of critical success factors must also address various factors associated with the process of IT project management.

Process Related Success Factors: Addressing Project Risks

The major reference in the field of project management in the United States is the *PMBOK Guide* (2004), which is a collection of best practices concentrating on five basic process groups and nine knowledge areas typical of most projects. The *PMBOK Guide* forms the foundation for the traditional methods of conducting project management as it describes processes in terms of inputs, tools, and outputs. This guide serves as the basis for information required for certification. Although processes and knowledge areas are common to many projects, the discussion of processes in the literature often relates processes to project risks.

The process of addressing project risks is a viable strategy to enhance project success and is a focus of many procedures proposed in the *PMBOK Guide*. Common risks associated with IT project failure include inadequate top management commitment, rigid budgeting and scheduling plans produced at project outset, shortage of overall project staff having the right skill set, sacrificing requirements for the sake of technology, handling project changes poorly, and failure to meet user expectations (Tesch, Kloppenborg, & Frolick, 2007). Many proposed strategies for reducing the impact of these risks include widely accepted project management processes such as clearly stating goals, requirements and deliverables, understanding the needs of users, clearly defining roles and responsibilities, developing a system to manage and monitor changes, and examining recent lessons learned (Tesch, Kloppenborg, & Frolick, 2007; Baccarini, Salm, & Love, 2006). Baccarini, Salm, and Love (2004) indicated processes related to managing stakeholder expectations appear to be one of the most critical risk management

strategies. This view presumes the best way to address risk is by focusing on internal processes that promote good project management practice.

Keil, Tiwana, and Bush (2002) proposed failure to manage project risks is at the heart of IT project failure and project managers and users have different perceptions of project risks. IT project risks shared by both users and project managers included: improper definition of roles and responsibilities, lack of adequate user involvement, misunderstanding requirements, insufficient or inappropriate staffing, lack of required knowledge or skills in project personnel, conflict between departments, and changing scope and objectives (p. 112). Overall, however project managers and users shared only seven of 23 identified risks, indicating a need for a more comprehensive understanding of risk on the part of project managers.

In a study of 100 projects exploring how project managers employ risk management, Raz, Shenhar, and Dvir (2002) found evidence project management processes addressing risk management strategies seem to correlate with project success. Examining how risks affect project outcomes, Wallace and Keil (2004) indicated execution, scope, and requirements risks affected process outcomes. Wallace and Keil also concluded that concentrating on project execution processes such as staffing, development methodology, role definitions, planning, and control might sometimes compensate for risks in other areas.

Gemino, Reich, and Sauer (2007) found risks that emerge as a project continues are related to the *a priori* risks (such as organizational knowledge and structure), indicating that initial stages of project planning, may be crucial for identifying critical risks associated with the project. Project volatility (changes occurring during a project) is

another major risk faced by IT project managers. It is interesting to note that these two categories of risk seem to call for different management approaches. The traditional approach to project management addresses the *a priori* risks whereas the agile approach is a better method for addressing volatility risks. Gemino, Reich, and Sauer (2007) also found the one factor to mitigate these risks and improve project performance was effective coordination strategies. They also suggested effective coordination involved both horizontal and vertical coordination among stakeholders (pp. 33-35), approaches associated with agile and traditional project management respectively.

Throughout IT project management literature there are studies consistently promoting proper project management methodologies as an effective way to improve project performance. Hartman and Asharifi (2002) examined project management practices for successful projects in IT/IS industries and found general agreement about the importance of a clearly defined project mission, consultation with project sponsor, good communication with team and client, and the availability of adequate resources. Gowan and Mathieu (2005) found neither project size nor complexity were direct critical success factors in project performance but rather the use of formal project management methodology in response to those characteristics seemed to make a difference. Finally, Milosevic and Patanakul (2005) found standardized project management processes, such as a standard project management toolbox and developing project managers with standardized leadership skills might drive project success. However, they concluded standardizing project-management processes would not automatically enhance success.

People Related Success Factors

Critical success factors related to people tend to encompass organizational design and processes, but also include a behavioral component. Some of the success factors for IT projects associated with the people involved in the project focus on team dynamics, project manager leadership, and the style and behaviors of the project manager.

The project team is a people-related factor that can affect project success. In general, opinions of participants on project teams tend to focus on problems such as projects receiving insufficient resources, project team members being ill trained in project management methods, and leaders lacking many of the process and behavioral skills necessary for project success (Guttman & Longman, 2006). Thamhain (2004) examined the role of team effectiveness in technology-based project success with the assumption that project success depends to a great degree on the overall effectiveness of team interactions. His analysis indicated factors conducive to improved team performance seemed to help teams deal more effectively with risks and uncertainties. It is also interesting to note that the top factors team members felt were important in team performance were also considered important by project managers, such as the ability to resolve conflicts and problems, clearly defined objectives, and team skills and expertise appropriate for the work. Kautz, Madsen, and Norjberg (2007) suggested the knowledge requirements for IT project teams are increasing because of the pace of change and rapid expansion of IT into all areas of a firm,. IT project teams and developers must now possess considerable knowledge about the technology, the user application, and the information needs of the people involved. Mitchell (2006) raised similar concerns regarding a lack of integration among internal and external entities involved in IT

projects. Mitchell suggested integrating internal and external knowledge increases the likelihood of on-time project completion and cross-functional teams are an effective way to facilitate communication of internal knowledge.

In a study examining leadership in project management, Sumner, Brock, and Giamartino (2006) found that while project managers did not view leadership skills as a key for successful project completion, the assessment of project managers by team members did show a link between leadership skills and IT project success. Scott-Young and Sampson (2006) found empowering team leadership by project managers and regular performance feedback related positively to project performance. Faraj and Sambamurthy (2006) also found team members viewed directive-based leadership as negative and an empowering type of leadership more positively. Agile approaches for project management are typically associated with more empowering styles of team leadership and a command and control structure are used more often with the traditional approach (Augustine, et al., 2005). In an analysis of project manager leadership, Muller and Turner (2007) determined leadership competencies correlate with project success. In particular, they found a transactional style of leadership was more effective in more complex projects and those with an engineering focus, whereas a transformational style was more effective in other types of projects.

The style of the project manager may also be a factor in project success. Using a sample of project managers experienced in rescuing troubled projects, Reich, Sauer, and Wee (2008) examined counterintuitive project management practices in relation to successful IT projects. In these results turning around troubled projects depended heavily on decisive action by the project manager. They found three stages where applications of

innovative practices were most effective: goal definition, project team selection, and project execution. Nearly all of these innovative practices dealt with managerial behavior rather than processes. During the goal definition stage, for example, they found successful project managers did not accept project goals as presented and instead looked for ways to challenge customers to align project goals with business value. Other strategies included generating a project plan that develops early momentum by delivering value early in the project, selecting a project team with a wide range of skills to facilitate a culture of sharing knowledge and learning, managing project deliverables through frequent interactions with the client, and focusing the team on business value. Finally, they suggested project execution requires the willingness to re-plan as project focus changes, establishing a no blame culture that encourages dissent, and creating a team environment based on empowerment and delegation. Interestingly, many of the suggestions from these innovative project managers closely mirror the agile project management approach (Augustine, et al., 2006; Nerur, Mahapatra, & Mangalaraj, 2005).

Another project manager behavior affecting project success is the reluctance to report bad news about a troubled project. Smith and Keil (2003) contended this factor might be behind many project failures since the most cost-effective solution may be to terminate troubled projects early in the process. Iacovou and Dexter (2004) suggested managers tend to mask problems in hopes of overcoming them without attracting attention, leading to a tendency to cover up early indications of project troubles. They surmised this behavior may relate to cultural issues associated with being part of a failure, or project managers may not have the skills or organizational influence to alter project plans.

In an exploratory study of managerial perspectives on project success, Bryde (2005) suggested project managers revert to measuring against the iron triangle because of difficulty in measuring softer performance indicators. In general, his study found project managers have problems aligning different stakeholder perspectives and integrating those perspectives into the project. Anantatmula (2008) used interpretive structural modeling to examine underlying interactions among factors that improve performance. His study found defining roles and responsibilities of a project team contributes to other success factors related to IT project success because it facilitates clear and effective communication. The construction of project success or failure may also depend upon experience of the evaluator. Standing et al (2006) found project managers with less experience appear to be less perceptive in identifying causes for project success and failure while more experienced project managers are better at identifying external factors contributing to success or failure (pp. 1158-1159).

The role of project champion may also be a factor linked to project success. Project champions can be important for generating and maintaining support from top management (Pinto & Slevin, 1989a). Sipior (2000) noted the sudden departure of the project champion could negatively influence the continuation of a project. However, Lefley (2006) observed project champions could often exert undue influence on projects and may in fact bias the process of project selection and play a part in project escalation.

While behaviors and characteristics of the people involved in an IT project certainly influence project success, there are also characteristics associated with the project itself that play a role.

Project Related Success Factors

One factor influencing critical success factors involved in a project may be the category of a project itself, i.e. construction, new product development, software development, and so forth. For example, construction and utility projects are low-tech project types because they involve little development work (Shenhar & Wideman, 2000) and many of the project unknowns are resolved during the early stages of the project (Collyer & Warren, 2009). Conversely, information systems projects are often high-tech, which entails considerable development work, many business processes, and technologies that often change during project execution (Collyer & Warren, 2009). Even within the scope of IT projects there are project features influencing project success. Theses features include projects introducing new technologies (Wallace & Keil, 2004), the critical nature of the system involved (Kautz, Madsen, & Norjberg, 2007), the degree of innovation involved (Vinekar, Slinkman, & Nerur, 2005), and the magnitude of organizational change demanded by the project (Muller & Turner, 2005). Another project-related success factor involves the business objectives driving IT projects. Nah and Delgado (2006) proposed it was critical for ERP projects to have a business plan, a clear vision and mission to guide project goals, and clearly understood project goals. In business intelligence systems, the most critical success factors incorporate how well IT components support the enhancement of business decision-making (Yeoh, Koronios, & Gao, 2008). Practitioners increasingly see the link between strategic intent of the project and project success as a critical factor for all types of IT projects and not just ERP or business intelligence applications (The Insights Group, 2009).

While characteristics of the industry or features of the project may present different project environments influencing tools and skills needed for success, it is also true most projects employ similar project management practices, such as cost and scope management, quality management, and schedule management. Project related factors used in this study were general in nature, focused on factors associated with all types of information technology projects, and included success factors such as clear goals, urgency of the project, and resources available (see Table 2).

Finally, since the movement to agile methods began with the aim of improving software development projects, perhaps some project related characteristics unique to IT projects may help to distinguish success factors associated with agile methods from those related to the traditional project management approach. Rodriguez-Repiso, Setchi, and Salmeron (2007) noted some attributes common to IT projects might lie at the heart of the low success rates. They observed IT projects are often poorly defined, demand short time deliveries, allow for limited application of expertise due to rapid technological changes, often involve much iteration, and frequently involve a great degree of novelty. These are the types of problems specifically addressed by agile approaches to project management.

Table 2

Samples of Project-related Critical Success Factors

Critical Success Factor	Literature
Clear project goals	Baccarini & Collins, 2003; Belassi& Tukel, 1996; Biehl, 2007; Hyvari, 2006; Lee & Anderson, 2006; Nah & Delgado, 2006; Pinto & Prescott, 1988; Slevin & Pinto, 1987; Somers & Nelson, 2001; Umble, Haft, & Umble, 2003
Sufficient resources	Baccarini& Collins, 2003; Wixom & Watson, 2001; Biehl, 2007; Green, Welsh, & Dehler, 2003; Hyvari, 2006; Somers & Nelson, 2001; Plant & Willcocks, 2007; Belassi & Tukel, 1996
Business driven /Strong business case	Umble, Haft, & Umble, 2003; Lee & Anderson, 2006; Johnson, Boucher, Connors, & Robinson, 2001; Nah & Delgado, 2006; Nah, Lau, & Kuang, 2001; Poon & Wagner, 2001; Fortune & White, 2006; Yeoh, Koronios, & Gao, 2008
Project Size	Gowan & Mathieu, 2005; Hyvari, 2006; Cannon, 1994; Cooke-Davies, 2002; Fortune & White, 2006; Shenhar, 2001; Yetton, Martin, Sharma, & Johnston, 2000; Sauer, Gemino, & Reich, 2007; Emam & Koru, 2008
Stable requirements	Emam & Koru, 2008; Keil, Cule, Lyytinen, & Schmidt, 1998, Keil, Tiwana, & Bush, 2002; Lee & Anderson, 2006; Schmidt, Lyytinen, Keil, & Cule , 2001; Somers & Nelson, 2001; Plant & Willcocks, 2007; Tesch, Kloppenborg, & Frolick, 2007; Wallace & Keil, 2004
Project urgency	Pinto & Slevin, 1989; Belassi & Tukel, 1996; Biehl, 2007; Hyvari, 2006; van Oosterhout, Waarts, & van Hillgersberg, 2006; Legris & Collerette, 2006
Project viewed favorably by end-users	Chua & Lam, 2005; Emam & Koru, 2008; Hyvari, 2006; Keil, Cule, Lyytinen, & Schmidt, 1998; Keil, Tiwana, & Bush, 2002; Johnson, Boucher, Connors & Robinson, 2001; Lee & Anderson, 2006; Schmidt, Lyytinen, Keil, & Cule, 2001; Legris & Collerette, 2006; Tesch, Kloppenborg, & Frolick, 2007

Agile Success Factors

Agile project management and software development are subject to many of the same critical success factors as traditional methods (Chow & Cao, 2008). For example, both agile and traditional approaches for project management value communication with the stakeholders as a factor critical to success. Under a traditional approach this critical factor may take the form of formally documenting methods used to communicate with stakeholders, whereas an agile approach to communication may imply a process in place to make project information available to all interested parties at all times (Sliger & Broderick, 2008, p. 59). There are agile and traditional perspectives for most critical success factors associated with IT projects, and those different points of view served as an important part of the data matrix used in this study.

Chow & Cao (2008) identified six areas of success factors critical to agile IT projects. In general, critical success factors especially important to agile projects focused on delivery strategy, team capabilities, team environment, project management processes, and customer involvement. The sixth area focused on specific software development techniques unique to agile methods. In a related study of 16 firms employing agile approaches in software development such as extreme programming, the critical success factors included more face-to-face communication, a focus on delivering business value early, constant planning techniques, and the use of frequent review meetings (Cao & Ramesh, 2008). Lindstrom and Jeffries (2004) identified similar core success factors that included frequent small releases, continuous design improvement, and extensive customer testing. A survey of extreme programming projects indicated a critical factor for extreme development methods was having easy access to the customer, and frequent

absences of the customer posed the greatest risk. The most serious organizational problems encountered with use of agile methods were skepticism of management and policies preventing the use of extreme methods such as on-site customers (Rumpe & Schroder, 2002).

Agile methodologies are based on the assumption that many IT projects take place in a highly volatile environment requiring the project to adapt to rapidly changing markets, technologies, and social conditions (Augustine, Payne, Sencindiver, & Woodcock, 2005). This assumption of a volatile project environment influences the types of factors associated with agile project success. Vinekar, Slinkman, and Nerur (2005), proposed agile projects benefit from better matching between personnel and processes, a shift towards pluralistic decision-making, and significant client involvement where customers or clients become part of the development team. The environment assumed by agile proponents also requires less administrative overhead and may benefit from using self-directing teams, simplified rules and processes, and a commitment to free and open exchange of information (Augustine, et al, 2005). The design of agile teams may also necessitate some success factors such as team structures that enhance team innovation and creativity, a higher degree of collaboration, a reduction in manager authority, and more involvement from the customer (Nerur & Balijepally, 2007; Nerur, Mahapatra, & Mangalaraj, 2005).

Assumptions about the nature of IT projects may also shape the characteristics of agile success factors. Turk, France, and Rumpe (2005) examined assumptions inherent in agile software development methodologies to differentiate them more clearly from traditional methods. They found nearly all agile techniques assume satisfying the

customer by continuous delivery of software was a top priority. They maintained this base assumption changes the concept of project visibility from being dependent upon reports, quality measures, and productivity measures to the delivery of software as the major focus. Other key assumptions for agile methods included assuming constant customer or client availability, the costs of changes not increasing over time, and constantly evolving project requirements. Because of these base assumptions, Turk, France, and Rumpe (2005) suggested agile methodologies may be ill suited for safety critical projects, large and complex projects, and projects that depend upon a sequential development process.

Shortcomings of the Critical Success Factor Approach

Although use of a critical success factor approach is a common methodology in project management research, it is not without critics. One common criticism of the approach is that it does a poor job of addressing relationships between factors (Belassi & Tukel, 1996; Goldfinch, 2007). In a review of CSF methodology, Fortune and White (2006) observed the "inter-relationships between factors are at least as important as the individual factors but the CSF approach does not provide a mechanism for taking account of these inter-relationships" (p.54). In a study of data warehousing projects, Hwang and Xu, (2008) suggested success factors not only interact in different ways but most studies have not examined the relationships between success factors.

A second shortcoming of the CSF methodology relates to its focus and the general applicability of its findings. One of the first published papers employing a critical success factors approach indicated they were difficult to define and often required subjective assessments that are not neatly quantifiable (Rockart, 1979, p. 92). Later, Boynton and

Zmud (1984) cautioned against using the critical success factor approach at lower operational levels of management because people generally have a limited capacity to deal with the complexity of strategic issues and critical success factors from an operational perspective may sometimes provide simple thought provoking statements but not accurately represent the complete environment. Fortune and White (2006) observed the CSF approach in project management research covers a wide range of activities, often produces lists of factors related to specific problem domains, and generally searches for a definitive list of factors to match a project. Freund (1988) noted critical success factors should be few in number and important for achieving overall goals and objectives. He also noted too many critical success factors often resulted from including factors that were too detailed or confused performance indicators with critical success factors. Goldfinch (2007) suggested the large number of critical factors in the IT project management research creates a lack of overall consistency among important factors (i.e. few are important in all cases). It also appears findings coming out of a critical success factors approach to project management research may not be compelling to practitioners since there is little evidence to support a positive impact of critical success factors on project management success (Sauser, Reilly, & Shenhar, 2009).

The choice of Q Methodology as the research method for this study addresses some of the limitations found in many studies of critical success factor. First, the design of a Q methodology study focuses on searching for interrelationships among a diverse set of viewpoints addressing a major shortcoming of CSF research. Secondly, because participants will be focusing on a set of suspected critical success factors, this study will not confuse CSFs with performance indicators nor expand the number of critical success

factors but rather use factor loadings from the subjective evaluations of project managers to explore relationships among factors. Finally, the matrix nature of Q methodology will also support examining these relationships using four common dimensions influencing project work within a framework of the organizational approach for managing IT projects.

Foundations of Q Methodology

Q methodology finds its origins in the work of physicist and psychologist William Stephenson, in the 1930s. Stephenson, dismayed by the rigidness of psychological experiments at the time, felt the field was losing a valuable perspective due to the requirements for large numbers of test subjects and burdensome analyses. He observed techniques of the time were better for massive fieldwork and not for more subtle settings. Stephenson (1935) proposed inverting normal factor analysis so rather than the participants becoming the study sample, the measurable items (pictures, statements, and so forth) could become the sample. Variables become the viewpoint of persons not test results, thereby studying correlations between persons. Brown (1997) supported the original work of Stephenson by pointing out that traditional R methodology excels at measuring and correlating objective variables such as budgets, times, and quality measures whereas Q methodology supports the analysis of subjective viewpoints for common factors and interrelationships.

As a research method, Q methodology falls between qualitative and quantitative methods. It is qualitative, because it collects self-referent subjective opinion, but then employs a quantitative factor analysis to identify clusters of shared subjective opinions. Overall, the analysis is not concerned with where specific respondent opinions fall, but

on discovering the overall pattern of opinion, and is a good tool for identifying prevailing clusters of opinion from a group (Brown, 2004). One of the advantages of using Q Methodology is its suitability for research questions having complex and diverse points of view, because it focuses on the variety of accounts people construct about an issue (Cross, 2005). Shemmings (2006) suggests this strength comes from the process of reversing the correlation matrix. In reversing the matrix, the analysis correlates the sorted data from individual people, which results in a better understanding of the collection of factors making up a viewpoint. This attribute of Q methodology makes it a suitable method for gaining insight into subjective choices, motivations, and values often accompanying complex issues (Baker, Thompson, & Mannion, 2006). The state of opinion on the importance of critical success factors in IT projects seems to represent a complex issue consisting of diverse views about what is appropriate, desirable or needed for successful completion of an IT project, demonstrating the appropriateness of Q methodology for this study.

In preparation of this literature review, it appeared that predominant research methods used in studies of project management success (or failure) include case studies, personal interviews, surveys, literature reviews, and Delphi techniques. While each of those methods is useful for some types of investigations, Q methodology may be better for exploring the interrelatedness of success factors. McKeown, Hinks, Stowall-Smith, Mercer, and Forster (1999) noted Q methodology is different from traditional Likert scales because it lets respondents share a viewpoint unconstrained by the viewpoint of the researcher. In most surveys, the researcher defines the issues and response range, which may not correspond to the belief or opinions held by the subject.

In a study of key issues facing information systems managers, Gottschalk (2001) noted most studies examining those issues used either Delphi techniques or surveys. In selecting Q methodology for his study, he noted a number of problems involving the use of Delphi surveys when collecting data using what are in effect educated opinions. He maintained the Delphi studies, rather than reporting consensus, report aggregations of concerns, which may be different for different groups of respondents. He also pointed out that surveys of all types tend to consider key issues independently and ignore interactions between them. Finally, he noted in the use of ratings (as opposed to ranking) the entire scale is not utilized, often the highest scores on a 10 point scale will be nine or 10 while the lowest rated issues usually achieve approximately 5.4. In addition, since the results of individual Q sorts are normally distributed it is probably more suitable for evaluating subjective attitudes than a general attitude questionnaire (Zraick & Boone, 1991 as cited in Cross, 2005, p. 210).

Although text analysis of interviews and other documents are suitable methods for collecting subjective opinion, Q methodology represents a different approach from the typical analysis of text. Q methodology does not focus on specific individuals in a thematic fashion, as is the case in text analysis (Watts & Stenner, 2005, p. 70). The strength of Q methodology lies in its ability to show combinations of themes which are preferred by groups of subjects. It differs from narrative analysis because it does not deal with the specific words of the participants. Instead, it focuses on responses to a prepared set of statements (Watts & Stenner, 2005). This is an important distinction when exploring the large number of suspected critical success factors from the project management literature.

Q methodology as a research tool is gaining ground in studies focusing on business issues and problems. Table 3 presents a number of interesting studies in the areas of consumer behavior, organizational behavior, health care administration, and information systems. In each study, the research focus is on a complex issue involving multiple perspectives and a large number of opinions or viewpoints.

Table 3

Notable Q Methodology Studies in Business and Information Systems Related Literature

Author(s)	Focus of the Study
Martin & Reynolds (1976)	Used Q methodology as a tool to measure self-image, as it relates to product use
Wolfe (2000)	Used Q methodology to demonstrate customer orientation in sales associates is a multifaceted construct
Bidwell (1957)	One of the earliest published applications of Q methodology in the realm of organizational administration examining the relationship between role expectations and behavior
Chatman (1989) O'Reilly, Chatman, & Caldwell (1991)	Used Q methodology to develop an assessment tool for determining the level of person-organization fit
Wright, Riggle, & Wright (1998)	Used Q methodology as a technique for understanding the perceptions of workers participating in quality programs
Valenta & Wigger (1997)	Applied Q methodology to the field of health informatics examining the opinions of physicians and medical students about their use or resistance to using information technologies in the health care setting
Tractinsky & Jarvenpaa (1995)	Used Q methodology to explore project manager decisions about the distribution of IT applications, hardware, software, and data in global information systems
Gottshalk (2001)	Used a Q sort survey to explore the importance of and relationship between key issues for information systems management from other surveys and the literature
Anandarajan, Paravastu, & Simmers (2006)	Studied the perceptions of personal web usage in the workplace
Lee (2000)	Studied user perspective of regulations protecting privacy on the worldwide web

Summary

The study of IT project management faces significant challenges. There is no consistent definition of IT project success, the field lacks a dominant theoretical framework, and despite nearly two decades of research looking for ways to improve the practice of IT project management, 30 to 60% of IT projects continue to fall short in some measures of success. However, in spite of these challenges, the role of IT project management in today's business operations continues to grow (Shenhar, 2008). Some of the environmental forces contributing to the increased importance of projects include shorter product life cycles, increased global competition, and rapidly changing technology. At the same time, these forces often create an uncertain and unpredictable environment for IT project development, which calls into question the effectiveness of strict adherence to traditional plan-based project management practices. An agile project management approach for IT projects (or elements of that approach) may represent a more effective method for managing projects in such a turbulent environment (Augustine, et al, 2005).

In this atmosphere of uncertainty about the meaning of project success and the most appropriate project management approach, a major focus of IT project management research has been the search for critical success factors. The research in this area led to a large list of suspected critical success factors involving virtually every aspect of project management, such as organizational factors, team factors, and product complexity factors. In an examination of critical success factor research, Hyvari (2006) found only a moderate agreement among critical success factors identified. Additionally, Sauser,

Reilly, and Shenhar (2009) observed little evidence to support a positive impact of critical success factors on project management success.

In examining the practice of project management, Young and Jordan (2008) proposed, “the continued high failure rate strongly suggests that the common practice has not captured the essence of the problem” (p. 714). Given the current challenges of interpreting research findings regarding IT project success, it may be time to take a fresh look at the research results on critical success factors and project management approaches through the eyes of practitioners. A more comprehensive exploration of critical success factors may lead to better strategies for improving practice and provide new research directions.

Q methodology (McKeown & Thomas, 1988) served as the research design for this study because it provided an opportunity to evaluate the subjective perceptions of project managers about the importance of critical success factors for IT projects. This methodology also supported the exploration of how perceptions about the practice of IT project management aligned with the traditional and agile approaches. Chapter 3 describes and explains the qualities of Q methodology as a research method for addressing these issues.

Chapter 3: Research Method

The purpose of this Q methodological study was to identify and describe the subjective insights of project managers about IT project success factors, explore their perceptions of how critical success factors interrelate, and examine project manager views of critical success factors as they related to agile and traditional approaches for managing IT projects. In addition, this study examined project manager perceptions of critical success factors from four general areas of influence: organizational factors, process factors, people related factors, and factors related to the project.

Q methodology is a mixed method design blending both quantitative and qualitative analyses to achieve a richer understanding of a specific issue about which there may be considerable differences of opinion. Given the large number of critical success factors reported, it is reasonable to assume project managers make subjective assessments about how those factors might apply to their particular work situations. In effect, their perceptions regarding critical success factors are likely subjective in nature. This study focused on the subjective beliefs and opinions formed by the professional experiences of project managers about the relative importance of the large number of reported critical success factors for IT projects. Since this study explored the subjective opinions of project managers and not their behavior, the use of Q methodology was appropriate.

The following questions directed the work for this Q methodological study:

1. What are the individual general perceptions of project managers regarding factors that might influence the success of IT projects?

2. Based upon the subjective insights of project managers, what critical success factors interrelate in their contributions to project success?
3. How do project manager perceptions of critical success factors relate to the agile and traditional approaches to carrying out IT project management?

This chapter describes the research design and method for data analysis used to answer these research questions. In addition, this chapter presents the theoretical rationale for the use of Q Methodology in this study.

Q Methodology

The roots of Q methodology as a research method for measuring subjectivity goes back to the work of William Stephenson, who was unhappy with the state of psychology research in the 1930s because it did not address subtle complexities of human behavior (Stephenson, 1935). He proposed one could invert normal factor analysis, using the participants as the variables and a set of subjective measurements as the sample. In this way, participant subjectivity loads on factors and not scores from test items.

McKeown and Thomas (1988) defined Q methodology as "a method for the scientific study of human subjectivity" (p.12). The subjectivity explored in Q methodology is *self-referent* because it collects a participant's individual (and internal) point of view on the topic under investigation (Stephenson, 1979; McKeown & Thomas, 1988). As a research method, Watts & Stenner (2005) label Q Methodology as "qualiquantological" (p. 69), since it is a qualitative method with quantitative aspects. The data collection methods are qualitative because they involve human subjectivity, yet Q Methodology relies on factor analysis to identify themes and patterns in the subjective

data collected. The unique quality of Q methodology lies in the inverted matrix involved in the factor analysis, where respondents assume the role of variables and the subjective statements used in the study serve as the sample. In this way, the participant's subjectivity loads onto factors determined in the factor analysis representing different points of view.

There are three general stages involved in Q methodology (Valenta & Wigger, 1997). The first stage involves developing the set of statements used in the Q sort and entails two tasks, developing the concourse, which is an exhaustive collection of statements about the topic, and generating a Q sample, which is a process of selecting statements from the concourse for use in the Q sort. The second stage of Q Methodology is data collection, which involves the process of selecting participants (the person-sample), and conducting the Q-sorting, which requires the participants to sort the statements by preference using a quasi-normal distribution. The third and final stage of Q methodology involves analyzing and interpreting the data. Data analysis generally includes "three sets of statistical procedures: correlation, factor analysis, and the computation of factor scores" (McKeown & Thomas, 1988, p. 46). Interpretation of the results on the other hand is more subjective and involves producing "a series of summarizing accounts, each of which explicates the viewpoint being expressed by a particular factor" (Watts & Stenner, 2005, p. 82). The following sections describe the tasks involved in each of these three stages.

Selecting the Concourse

The concourse is the population of statements used in the study and represents the collection of all statements on the topic under investigation. According to Stephenson

(1979, p. 355), the concourse is the "common communicability" where everyone in the study is familiar with every statement in the concourse. In general, a concourse consists of statements from within a relevant domain of subjectivity and can come from a variety of sources such as interviews, written narratives, editorials, case notes, media, professional journals, or conference proceedings (McKeown, Hinks, Stowell-Smith, Mercer, & Forrester, 1999). The main goal of a concourse is that "… the collection of items in the concourse should reflect the range of perceptions on a particular topic of interest" (Brown, 2004, p. 4).

For this study, the concourse came from statements and findings in journal articles, professional publications, and conference proceedings, which proposed critical success factors for IT project success. The concourse included statements representing the traditional approach to project management and statements representing the agile approach. Although many Q methodology studies form their concourse from interviews of various types, a concourse based upon statements from research and professional literature is not a new approach and has been used to study issues of web privacy (Lee, 2000), acceptance of information technologies among medical professionals (Valenta & Wigger, 1997), and visions of leadership among CIOs (Schelin & Jacobson, 2005).

As stated earlier, this study structured the statements in the concourse according to whether the statement best represented an agile or traditional approach to IT project management, and whether the critical success factor was organization-related, process-related, people-related, or project-related. Brown (1980) addressed the use of an imposed structure on the concourse quite thoroughly, and cautioned not to confuse structure with the phenomenon under study.

> The idea behind structuring a population of statements is therefore an innocent one: the observer merely organizes it from the standpoint of what appears to him to be the most useful way of thinking, each theoretical standpoint bringing to light different aspects of the same items. (Brown, 1980, p. 189)

In the end, no matter what structure the concourse and resulting Q sample used, the participant in the study was unaware of it and only saw a collection of statements about critical success factors. The participant then agreed or disagreed with the statements, in effect providing his or her own point of view (Brown, 1980, p. 189). Finally, according to Brown (1980), the researcher is not interested in the logical structure of the sample "but in learning how the subject, not the observer, understands and reacts to the items" (p. 191).

The raw data forming the basis for the concourse consisted of 676 statements from the literature characterizing suspected critical success factors for IT projects. These statements were organized into groups representing a viewpoint associated with one of the four areas of influence (organizational, process, people, or project) and one of the two managerial approaches (agile or traditional). Groups of statements appearing to represent similar factors received a brief descriptor denoting the critical success factor it represented to aid categorization, such as *adaptive view towards change* or *formal communications procedures*. The final concourse consisted of composite statements from the cited literature representing the descriptor. Each statement included in the subsequent Q sample embodied a perspective expressed from a minimum of three

sources. The concourse of statements making up the Q sample appears in Appendix C along with the supporting references.

The Q sample

The Q sample is a subset of statements selected from the concourse and used by study participants for rank ordering in the Q sort. The composition of statements in the Q sample should be representative of the range of statements in the concourse, in effect representing the concourse in "miniature" (Brown, 1993, p. 4). The selection of statements for inclusion into the Q sample can involve the use of several strategies. McKeown and Thomas (1988) suggested the process for selecting the Q sample can be structured or unstructured and can come from naturalistic or ready-made sources (pp. 25-28). Items in a Q sample coming primarily from oral or written accounts about an issue under study are naturalistic, whereas items from sources other than respondents are ready-made.

An unstructured process of Q sample selection does not follow a specific sampling strategy other than to provide comprehensive coverage of the topic. The structured process uses a deductive approach based on some *a priori* assumptions and often follows the design principles of a factorial experiment. Since this study used statements from the literature on critical success factors and included representation from two project management approaches and four categories of success factors, it employed a structured process using ready-made statements, thus it used a factorial theoretical design. The total number of statement types represented in the research matrix was eight (two approaches times four categories of success factors).

Webler, Danielson, and Tuler (2009) suggested the use of strategic sampling to ensure the Q statements represent the entire concourse. The approach is similar to the stratified random sampling process used in survey research where the categories of statements used in the Q sample are the same as those used to organize the concourse. This study used an equal number of statements for each cell in the research matrix.

There are many opinions in the research literature regarding how large the Q sample should be in a Q methodological study. Watts and Stenner (2005) suggested the size of the Q sample be large enough to provide adequate coverage of the topic, yet not be so unwieldy that the sorting process becomes burdensome. Brown (2004) noted many Q method studies use a Q sample of 33 statements, Watts and Stenner (2005) suggested using 40-80 statements, and Baker, Thompson, & Mannion (2006) reported Q studies have used 20-100 statements in the Q sample. Another strategy is to use statements that are most different from one another within each cell as a method of simulating the complexity of the issue under study (Brown, 1980, p. 189). Brown (1991) acknowledged the fundamental importance of the Q sample to the methodology, but cautioned not to place too much emphasis on the categories and specific statements. Brown submitted there is no one standard set of statements representing an issue and there is no one single meaning for the statements, because ultimately it is the participant who gives meaning to the statements in the Q sort. This study used five statements from each of the eight cells in the factorial design, yielding 40 statements in the Q sample. Table 4 presents this study's research matrix and an abbreviated description for the focus of each statement. Appendix D presents the full text associated with each statement in the Q sample.

Table 4

Theoretical Design of the Q Methodological Study

Matrix	Category of Critical Success Factor			
Project Management Approach	c) Organizational	d) Process	e) People	f) Project
a) Agile	ac	ad	ae	af
b) Traditional	bc	bd	be	bf

Concourse Design (8 x 5 = 40 items)

ac (agile x organizational)
1. Collaborative work environment
2. Top management support - involvement
3. Adaptive view towards change
4. Cooperative horizontal business culture
5. People-oriented culture

bc (traditional x organizational)
1. Goal oriented organizational culture
2. Top management support - influence
3. Commitment to project management
4. Project team authority
5. Change management approach

ad (agile x process)
1. Adaptive/iterative requirements management
2. Early delivery of important features
3. Regular and frequent communication
4. Test-driven environment
5. Co-location of staff and stakeholders

bd (traditional x process)
1. Formal change management process
2. Detailed planning process
3. Formal communications procedures
4. Strong project management practices
5. Formal documentation and reporting

ae (agile x people)
1. Adaptive leadership style
2. Self-organizing teams
3. Team competency and trust
4. Cross-functional teams
5. Close team-customer relationship

be (traditional x people)
1. Project manager interpersonal skills
2. Project management skills
3. Project team commitment
4. Team technical expertise
5. Users attitude

af (agile x project)
1. Rapid/early delivery of value
2. Emergent requirements
3. Fluid project schedule
4. Customer involvement
5. Continuous and incremental business value

bf (traditional x project)
1. Clearly stated goals
2. Clear and unambiguous requirements
3. Detailed schedule
4. User involvement
5. Availability of required technical expertise

N = 40 statements

The Person-Sample

The person-sample, also known as a P-set or P-Sample, simply refers to the number of participants performing Q sorts. However, because of the inverted matrix used in the factor analysis of Q methodology, persons represent variables and statements in the Q sample represent our typical understanding of the term *sample.* The number of participants is important to ensure there are enough to provide adequate factor loadings. "What is of interest ultimately are the factors with at least four or five persons defining each; beyond that additional subjects add very little" (Brown, 1980, p. 260). van Exel and de Graff (2005) estimated the typical Q methodology study yields a limited number of factors, "which are often two to four, and rarely more than six" (p. 6). The dilemma in this case is that the true number of factors is unknown prior to the study. "The preferred size of the P set is ultimately related to the number of factors yielded and the way in which individual Q sorts 'load' on them and hence cannot be established firmly until the data are collected"(Baker, Thompson, & Mannion, 2006, p. 40). Brown (1980) proposed a person sample should seek to attain theoretical saturation and "a P-set of 40 to 60 persons is more than adequate, but far fewer may be sufficient for specific purposes" (p. 260).

This study used a person-sample of 60 project managers with experience leading or working on IT projects and who are members of one of two professional organizations for project managers, the Project Management Institute (PMI) or the American Society for the Advancement of Project Management (ASAPM) an affiliate of the International Project Management Association (IPMA). This sample size provided enough participants to elicit proper factor loading, yet avoided problems associated with using large samples

in Q methodology such as losing the ability to identify subtle nuances in the data (Watts & Stenner, 2005). This study also collected a limited amount of demographic data from each participant such as age, gender, years of experience with IT projects, and the types of IT projects on which they have worked (See Appendix D).

Although the number of participants in the person-sample is important, Q methodology is fundamentally a qualitative method and does not predict the percentage of individuals in the population who subscribe to viewpoints discovered in the study.

> There is little attempt made to structure the sample in any way, nor to choose a representative sample. It is acknowledged that any data will only give a snapshot of the attitudes and beliefs on a particular subject in a given population. No claims are made that they are representative of the wider population. (Paradice, 2001, pp. 216-17)

Additionally, Q methodology does not claim the results will represent all possible viewpoints (Rhoads, 2006). The aim of the person-sample in this exploratory study was to reveal subjective viewpoints held by IT project managers about the role of critical success factors in IT project success, and given the size of the Q sample, the person sample of 60 participants was adequate to achieve that aim.

The Q-sorting Procedure

The Q sort is the process of collecting participant perceptions, where the participant "models his or her point of view by rank-ordering Q sample stimuli along a continuum defined by a condition of instruction" (McKeown & Thomas, 1988, p. 30). For this study, the stimuli were the text statements in the Q sample and the condition of instruction was to order the statements of critical success factors in the Q sample from

most important to most unimportant to IT project success based upon the participant's personal opinion and experience with IT projects.

The participants in the study performed a Q sort on the statements based on their personal perceptions regarding the importance of critical success factors associated with IT project success from both agile and traditional management perspectives. The process of Q-sorting used the FlashQ Software version 1.0 (Hackert & Braehler, 2007) and followed the two stage sorting procedure advocated by Brown (1993). The program randomly presented each statement from the Q sample to the participant who initially divided the statements into three piles, statements representing factors important for IT project success, statements reflecting factors unimportant for IT project success and statements somewhere between important and unimportant into a third pile, labeled *neutral*. After the initial sorting activity was complete, the rating scale for the sort appeared on the screen and the participant received instructions for filling in the quasi-normal distribution grid with the Q sample statements from the three piles. Figure 1 presents a depiction of a grid for a 40-item Q sample.

The instructions for the participant was to examine the statements from the important pile and place the two statements felt to be the most important in the right-most cells on the grid (+4), then place the two statements from the unimportant pile felt to be the most unimportant in the left-most cells on the grid (-4). Following the placement of the extreme statements, the participants selected statements they felt were the next most important/unimportant and placed them on the grid (+3, -3). They repeated this procedure for all statements in the important and unimportant piles. The participants then arranged statements from the *neutral* pile on the remaining grid spaces (often from +2 to -2). The

participants reviewed the placement of their statements and the software allowed them to rearrange any statement on the grid.

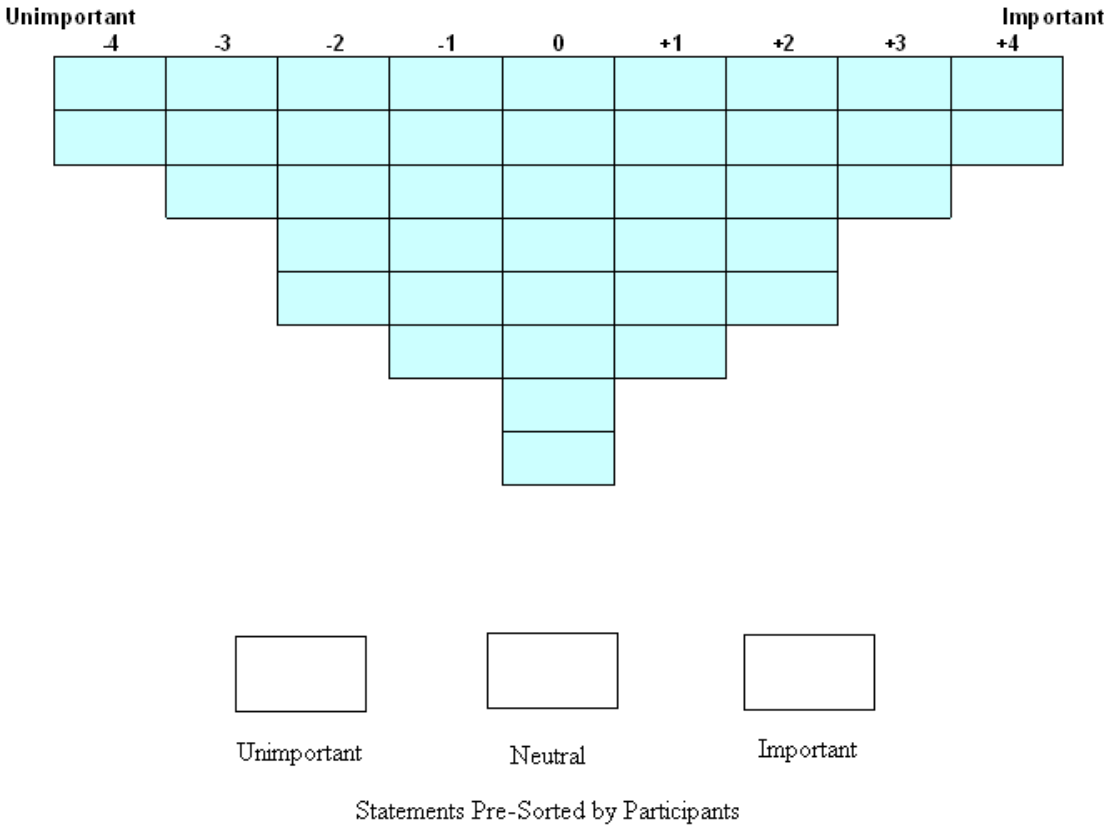

Figure 1. A Sample Q-sorting Grid for a 40-item Q sample

Once the participant was satisfied with the placement of the statements, he or she had the option of explaining the reasons behind the placement of the four statements at each extreme. The software also collected additional data via a short survey. The survey questions collected participant age, gender, years of experience with IT projects, and the types of IT projects on which they have worked. There was also an option for providing

additional comments about the process or their sorts. The software recorded the participant sorting arrangements from the grid, the rationale for statements at the extremes, survey responses, and any additional comments. At the conclusion of the survey, the software emailed the results directly back to the researcher and stored a copy of the results on the web server used for administering the Q-sorting. Participants who were members of the PMI Information Systems Special Interest Community of Practice and wanted to earn a Professional Development Unit (PDU) also supplied their name, which was stored on a server separate from their data and forwarded to PMI at the conclusion of the data collection phase.

Data collection took place via a web site (www.michaeljdoherty.com) where potential participants were able to learn more about the purpose of the study and the process of Q-sorting. Upon consenting to be a part of this study, the participant accessed a web application for data collection and storage of the results. To assist the participants the software provided for the inclusion of help screens and a link to a series of web pages illustrating the Q-sorting process.

The Data Analysis Procedure

The organization of the sorted statements (the Q sort) represented subjective points of view for each participant. The analysis of the Q-sorted statements focused on identifying clusters of opinions among multiple participants. In data analysis for a Q study, participants represent the variables and statements represent the sample.

> Q methodology employs a *by-person* correlation and factor analytic procedure. Hence, it is the *overall configurations* produced by the participants that are intercorrelated and factor analyzed. The initial

> correlation matrix duly reflects the relationship of each (Q sort) configuration with every other (Q sort) configurations (*not* the relationship of each item with every other item). (Watts & Stenner, 2005, p. 80)

This study employed the PQMethod Release 2.11 for Windows software (Schmolck, 2002) for data analysis. After completing the data entry for the Q sort rankings for each subject, the program calculated the correlations between each person's rankings and created a correlation matrix. The correlation matrix produced from Q Methodology is an *n* x *n* matrix, where *n* represented the number of participants. Q Methodology includes the Q sort correlations as variables correlating the completed sorts of participants, but not the items in the sorts (Kline, 1994; McKeown & Thomas, 1988). Therefore, 60 participants produced a 60 x 60-correlation matrix. This matrix was the focus of the subsequent factor analysis, which "consists of a number of statistical techniques the aim of which is to simplify complex sets of data" (Kline, 1994, p. 3). In Q methodology, the factor analysis identifies patterns among the individual Q sorts producing factors consisting of specific arrangements of Q statements (Webler, Danielson, & Tuler, 2009). These patterns are the factors representing a relationship between a set of variables (in the case of Q, the variables are the correlations of the individual Q sorts). The factor loadings, which are the correlations of a variable with a factor, are the embodiment of these relationships (Kline, 1994, p. 5). The PQMethod software supports both centroid and principal components analysis (PCA) methods for building the initial factor matrix. This study used the PCA method but McKeown and Thomas (1988) noted the choice of factoring method makes little difference in the resulting factor matrices (p. 49).

The initial matrix produced by factor analysis yielded the unrotated factors, which were simply a set of factors correlated to individual Q sorts. This initial set of factors was a reflection of the algebra involved in the calculations, and often includes many high negative and positive loadings, and is hard to interpret (Kline, 1994, p. 55). The next step in factor analysis involved a process called factor rotation. One of the most straightforward explanations for factor rotation comes from the work of Rummel (1967).

> Most often, however, a scientist rotates his factors to a simple structure solution. When a factor matrix is entitled 'rotated factors', this almost always means a simple structure rotation. That is, each factor has been rotated until it defines a distinct cluster of interrelated variables. Through this rotation the factor interpretation shifts from unrotated factors delineating the most comprehensive data patterns to factors delineating the distinct groups of interrelated data. (pp. 473-474)

In the case of Q methodology, the rotated factors for this study represented clusters or groups of subjective viewpoints about critical success factors. The final set of factors "represents a group of individual points of view that are highly correlated with each other and uncorrelated with others" (van Exel & de Graaf, 2005, p. 9).

Since rotated factors may occupy virtually any position in the factor space, they represent an almost infinite number of mathematical solutions (Kline, 1994, p. 61). In Q methodology, the choice of strategy for which of the initial factors to rotate can be based on either theoretical or statistical criteria (McKeown & Thomas, 1988). Since this study was exploratory in nature and had no *a priori* assumptions regarding the final set of factors, it employed a statistical approach for selecting factors for rotation. The most

common practice for this approach is the use of eigenvalues, which are indicators of the amount of variance accounted for by the factor. Generally, eigenvalues greater than 1.00 are considered significant (McKeown & Thomas, 1988, p. 51). This limit served as the initial criteria for rotation selection.

The PQMethod software supports two methods for factor rotation, manual rotation and Varimax rotation. In general, studies using a statistical selection approach employ the Varimax methodology, which was the approach for this study. In Q Methodology, factor loading represents the correlation of an individual Q sort with the idealized Q sort for that factor. Upon completion of factor rotation, the PQMethod software provided a summary report including normalized factor scores for each factor representing an idealized Q sort for the factor, a list of distinguishing statements for each factor, and a list of consensus statements (Webler, Danielson, & Tuler, 2009). These data and the factor loading arrays formed the basis for the interpretation of the results.

Determination of the statistical significance for factor loading is an important step in Q method data analysis and begins with calculating, the standard error (*SE*) of factor loadings using the formula $1/\sqrt{N}$, where *N* is the number of items in the Q sample. In this Q methodological study the Q sample included 40 statements; therefore, the standard error of factor loadings was $1/_{\text{SQrt } 40} = 1/6.32 = 0.158 = 0.16$. In order for a loading to be significant at the 0.01 level, it must have surpassed $2.58(\text{SE}) = 2.58(0.16) = 0.412 \approx 0.41$. To achieve a 0.05 level of significance required loadings in excess of $1.96(SE) = 1.96(0.16) = 0.313 \approx 0.31$. These values are in keeping with the suggestion proposed by Brown (1993) that a good rule of thumb for reaching the reliability coefficient for

significance in Q methodology is when the correlation is between 2 and 2.5 times the standard error. In this study, the correlations needed to be between 2(0.16) = 0.32 and 2.6(0.16) = 0.41.

Factor Interpretation

The interpretation of the results obtained from the factor analysis and rotation depend upon analyzing how the factor scores align with the statements in the Q sample. The factor scores reflect the extent of agreement on points of view related to the individual Q sort statements. In effect, the factors represent different points of view in the person-sample where positive loadings on a factor indicates an individual's shared point of view with others on that factor and negative loadings reflects disagreement with the factor's perspective (Brown, 2004). Creating a narrative interpretation of Q method results is more an art than a science (Webler, Danielson, & Tuler, 2009) and involves using all of the data available. Interpretations for this study used factor loadings, the distribution of statements associated with the normalized scores for each factor, and the comments provided by participants indicating reasons for statements placed at the extremes of the Q sort gird. The interpretation of the results from the data analysis concentrated on exploring the similarities and differences in the subjective perceptions of project managers about the project management approach and importance of critical success factors in IT project success.

Participant Confidentiality

This research adhered to all parameters set forth by the Walden University Institutional Review Board and followed sound ethical principles. These principles included voluntary participation, informed consent, participant confidentiality, and

participant anonymity (Trochim, 2001, p. 24). Participants were fully aware of the purpose of this study, provided in advance with a reasonable estimate of the amount of time required for the Q-sorting procedure, and informed that they could see the results of the study if they desire. In addition, participants could withdraw from participation at any time or decline to have their results used any time prior to the completion of data collection. Appendix E presents a copy of the Participant confidentiality screen used for this study.

The identity of all participants and their data sets was confidential as each data set used only a computer generated code number for identification. This research did not collect the name of the organization for which the participant worked. Participants could voluntarily supply their names if they were a member of the PMI Information Systems Special Interest Community of Practice and wished to earn a PDU for participation. The name of the participant, if supplied, was not stored with their data but stored on another server. The researcher emailed the list of PDU earning participants to the PMI for processing at the conclusion of data collection. All analysis and reference to the collected data used the identification number of the subject as the sole identifier. Participant request for the final report or other correspondence with the researcher occurred through an email interface that was distinct and separate from data collection activities thereby making it virtually impossible to associate data sets with email correspondence. Results emailed from the web server were stored on the researcher's personal computer until data analysis was complete. At the conclusion of data analysis, the researcher transferred the data to a compact disk stored in a secure location at the researcher's home.

Summary

Q methodology is a tool for offering insight but not prediction. The strengths of Q methodology are that it offers the capability for capturing rich and complex points of view and can identify potential areas for research or action (Brown, 2004). This study used Q Methodology as a research method because it provided a methodical approach for expanding our understanding of factors associated with IT project success. Chapter 3 presented a description of the research design used in this study including the process used for collecting the concourse, determination of the Q sample, size and composition of the person-sample, and the Q-sorting procedure. Chapter 3 also included a discussion of the method used for analysis and interpretation of the data using freely available software products for both data collection (FlashQ) and data analysis (PQMethod ver. 2.11). The utility of employing Q methodology in this study lied in its potential for uncovering opinion/perception clusters from project managers regarding how critical success factors interrelated in achieving IT project success.

Chapter 4: Data Analysis

The disappointing rate of success for IT projects has been a concern among project management professionals for nearly two decades (Taylor, 2004; Sauer, Gemino, & Reich, 2007). Much of the project management literature indicates success in IT projects depends on a wide range of critical success factors and some suggest a traditional approach for project management may be too structured and rigid for many IT projects and call for more agile management processes (DeCarlo, 2004; Fernandez & Fernandez, 2007). The goal of this research was to employ Q methodology to take a fresh look at critical success factors for IT projects based on the accumulated knowledge, experience, and opinions of practicing project managers. Consequently, this research addressed the following questions:

1. What are the individual general perceptions of project managers regarding factors that might influence the success of IT projects?
2. Based upon the subjective insights of project managers, what critical success factors interrelate in their contributions to project success?
3. How do project manager perceptions of critical success factors relate to the agile and traditional approaches for carrying out IT project management?

This chapter presents the results of the data analysis conducted for this research to answer these research questions. This chapter reviews the data collection procedures, presents the demographic and professional characteristics of the project manager participants, describes the procedures used in the factor analysis, and applies the findings of that analysis to the research questions.

Summary of the Data Collection Process

This Q methodological study used a 40-statement Q sample from an initial concourse of 676 statements collected from journal articles, professional publications, and conference proceedings proposing critical success factors for IT projects. The research design for this study used two levels of statements for the project management approach (agile or traditional) and four categories of critical success factors for IT projects (organization, process, people, and project). The 40 statements formed a research matrix and consisted of five statements in each of the four categories for each of the two management approaches (agile or traditional).

This study used a person-sample of 60 project managers with experience leading or working on IT projects and who were members of one of two professional organizations for project managers, the Project Management Institute (PMI) or the American Society for the Advancement of Project Management (ASAPM) an affiliate of the International Project Management Association (IPMA). Although the original research proposal called for a person sample of 30 project managers, a decision by the Information Systems Special Interest Community of Practice (a sub group of PMI) to offer a Professional Development Unit (PDU) for members who participated in the study, led to a dramatic increase in anticipated participation. As a result, over 500 project manager participants submitted Q sorts during the final month of data collection. In order to adhere to the original research design, this study used a random sample of the 60 participants from 519 Q sorts collected. Although this is twice the number originally projected, it is within the level for the number of participants required for theoretical saturation as proposed by Brown (1980, p. 260).

The collection of participant data took place via an internet web site (www.michaeljdoherty.com). Prior to participating in the Q-sorting process, participants were required to indicate consent for participation with the understanding that their data would remain confidential, but their name may be stored for the PMI in order to receive the PDU. Appendix E displays the consent form. Upon consenting to be a part of this study, the participant gained access to a web application that collected the data and stored the results. The process of Q-sorting employed the FlashQ Software version 1.0 (Hackert & Braehler, 2007) and followed a two stage sorting procedure advocated by Brown (1993). The program randomly presented each statement from the Q sample to the participant who initially divided the statements into one of three piles, statements representing factors important for IT project success, statements reflecting factors unimportant for IT project success and statements somewhere between important and unimportant into a third pile, labeled *neutral*. After completion of the initial sort, the participant received additional instructions for completing a quasi-normal distribution grid with the previously divided statements. Participants first placed statements they believed to be most and least important at the extremes of the grid and then filled in the remainder of the grid with the remaining statements. After sorting the statements, the software presented participants with the opportunity to provide justification for their placement of the statements at each extreme and to complete a brief survey designed to collect simple demographics and level of experience with IT projects. The software recorded the participant sorting arrangements from the grid, the rationale for statements at the extremes, survey responses, and any additional comments. At the conclusion of the survey, the software sent an email of the results directly back to the researcher and stored

a copy of the results on the web server used for administering the q sorts. The names of participants who provided one for reporting of PDUs were not stored with their data and were instead, emailed to a separate server for processing.

Demographic Information

The sample for this study included 60 project managers who were members of the Project Management Institute (PMI) or the American Society for the Advancement of Project Management (an affiliate of the International Project Management Association). PMI members came primarily from the Information Systems Special Interest Community of Practice. The sample used for this study was a random selection from a larger sample of 519 participants who participated in data collection activities.

Table 5 displays a summary of the demographic characteristics for the sample used in this study and demographic data for the entire population of 519 participants for comparison purposes. Table 6 presents the individual characteristics for each of the 60 participants used in this study. The average age of the participant was 46 years in a range of 30 to 62 years and 28% of the sample were females. On average, the participants had 18 years experience working on IT projects with a minimum of two years experience and a maximum of 40 years experience. Nearly 90% of the participants (53 of 60) have worked on 10 or more IT projects with 35% indicating they have worked on over 50 projects. About two-thirds of the participants (39 of 60) indicated they led more than 50% of the IT projects on which they worked. Table 7 shows the range of IT project types with which the participants have experience.

Based upon the characteristics presented in Tables 5, 6, and 7, this sample possessed the required experience with IT projects to have insights that provide “special

relevance to the goals of the study" (McKeown & Thomas, 1988, p. 36) as required for a study employing Q methodology.

Table 5

Demographic Characteristics of Project Manager Sample

	Study Sample		All Respondents*	
Characteristic	*n*	%	*n*	%
Age				
20-30	1	2%	27	5%
31-40	23	38%	144	28%
41-50	14	23%	175	34%
51-60	20	33%	139	27%
60+	2	3%	34	7%
Gender				
Female	17	28%	145	28%
Male	43	72%	374	72%
Years Experience				
10 years or less	14	23%	117	23%
11 to 20 years	28	47%	233	45%
21 to 30 years	13	22%	128	25%
More than 30 years	5	8%	41	8%
Number of IT Projects				
Fewer than 5 projects	1	2%	17	3%
5 to 10 projects	6	10%	46	9%
10 to 20 projects	14	23%	98	19%
20 to 50 projects	18	30%	191	37%
More than 50	21	35%	167	32%
Percent of IT Projects Led				
Zero	0	0%	4	1%
Less than 10%	0	0%	10	2%
10 to 25%	2	3%	45	9%
26 to 50%	19	32%	135	26%
51- to 75 %	25	42%	193	37%
Over 75%	14	23%	132	25%

* This represents the demographic and professional data for all 519 participants who completed the data collection for comparison purposes with the P-set (n = 60)

Table 6

Demographic Characteristics of 60 Participants

Subject ID	Age	Gender	Years working on IT Projects	Number of IT Projects participated	Percent of Projects Led
08009	56	F	30	20 to 50 projects	51 to 75%
08218	43	F	22	More than 50 projects	51 to 75%
09024	58	M	30	More than 50 projects	51 to 75%
09215	37	M	6	10 to 20 projects	Over 75%
10020	51	M	15	20 to 50 projects	26 to 50%
10038	59	M	30	20 to 50 projects	26 to 50%
12221	33	M	10	10 to 20 projects	26 to 50%
13122	45	F	15	10 to 20 projects	26 to 50%
13210	39	F	15	More than 50 projects	Over 75%
14031	40	M	9	5 to 10 projects	51 to 75%
14057	30	F	5	5 to 10 projects	26 to 50%
14100	37	F	14	20 to 50 projects	10 to 25%
14171	40	M	15	More than 50 projects	51 to 75%
15062	49	M	12	20 to 50 projects	26 to 50%
15076	59	M	35	More than 50 projects	51 to 75%
15105	38	M	15	20 to 50 projects	26 to 50%
15142	49	M	26	More than 50 projects	51 to 75%
16031	58	M	40	More than 50 projects	51 to 75%
16048	42	M	20	More than 50 projects	Over 75%
16049	32	F	6	5 to 10 projects	26 to 50%
16056	49	M	15	More than 50 projects	Over 75%
16087	53	M	22	More than 50 projects	Over 75%
17007	36	M	11	20 to 50 projects	Over 75%
17042	39	M	18	20 to 50 projects	51 to 75%
17055	49	F	25	10 to 20 projects	26 to 50%
17194	45	M	10	More than 50 projects	Over 75%
17204	37	M	12	10 to 20 projects	26 to 50%
18040	53	M	20	20 to 50 projects	26 to 50%
18064	52	M	30	5 to 10 projects	51 to 75%
18072	52	F	12	10 to 20 projects	Over 75%
18108	51	M	6	Fewer than 5 projects	10 to 25%
18158	48	F	13	20 to 50 projects	Over 75%
19018	36	M	10	20 to 50 projects	26 to 50%
19024	53	M	30	10 to 20 projects	26 to 50%
19096	31	F	8	20 to 50 projects	26 to 50%
20053	47	M	20	20 to 50 projects	51 to 75%
20064	50	M	11	10 to 20 projects	Over 75%

(table continues)

Subject ID	Age	Gender	Years working on IT Projects	Number of IT Projects participated	Percent of Projects Led
20070	47	F	14	More than 50 projects	51 to 75%
20150	62	M	30	More than 50 projects	26 to 50%
21116	40	M	17	More than 50 projects	26 to 50%
20184	33	M	11	20 to 50 projects	51 to 75%
21042	54	M	12	10 to 20 projects	51 to 75%
22015	51	M	20	10 to 20 projects	Over 75%
22056	38	M	8	10 to 20 projects	26 to 50%
22059	34	F	10	10 to 20 projects	51 to 75%
22061	31	M	2	5 to 10 projects	51 to 75%
22068	62	M	35	More than 50 projects	51 to 75%
22075	41	M	15	10 to 20 projects	51 to 75%
22079	39	M	19	More than 50 projects	51 to 75%
24012	34	M	10	20 to 50 projects	Over 75%
24169	60	F	20	20 to 50 projects	51 to 75%
24176	60	M	30	More than 50 projects	51 to 75%
25107	40	F	7	10 to 20 projects	26 to 50%
26113	52	M	20	More than 50 projects	51 to 75%
27084	40	F	15	5 to 10 projects	Over 75%
29182	60	M	35	More than 50 projects	Over 75%
1401A	59	M	35	More than 50 projects	51 to 75%
2002A	50	M	28	20 to 50 projects	51 to 75%
2206B	38	F	14	20 to 50 projects	26 to 50%

Table 7

Experience of Participants by Type of IT project

Type of IT Project	Participant-Projects
Manufacturing and Production systems	28
Sales and Marketing systems	14
Finance & Accounting Systems	32
Human Resources systems	14
Decision support systems	19
Management information systems	42
Executive information systems	17
Communication systems	22
Groupware systems	5
Knowledge Management systems	17
Enterprise Resource Planning systems	19
Other	30

Note: Totals reflect participant involvement in multiple project types

Analysis of Data

Upon completion of the data collection phase, the study focused on a random sample of 60 Q sorts for further analysis. The analysis of this data set utilized the PQMethod 2.11 analysis software (Schmolck, 2002), an analysis package specifically designed for Q methodology. Data analysis followed a three-stage plan as proposed by McKeown and Thomas (1988), involving correlation of the 60 Q sorts, factor analysis of the resulting correlation matrix, and the computation of factor scores. Interpretation of the results on the other hand is more subjective and involved producing "a series of summarizing accounts, each of which explicates the viewpoint being expressed by a particular factor" (Watts & Stenner, 2005, p. 82). The following sections describe the tasks involved in generating the composite factors followed by interpretation of those factors.

Correlation Matrix

The first step of statistical analysis for this study involved the computation of correlations between each of the individual Q sorts. The formula used for calculating the correlation statistic *r* was:

$$r = 1.00 - \sum d^2 / 2Ns^2$$

Where d^2 is the sum of squared differences for each statement rank between two Q sorts, $N = 40$, the size of the Q sample, and $s^2 = 4.250$, the variance for forced distribution of the sample.

These correlations represent the degree of similarity in the way a participant arranged the 40 statements with each other participant. Correlations of +1.00 theoretically represent a perfect positive relationship between Q sorts, correlations of -1.00 represent perfect negative relationship between the two sorts, and a 0.00 correlation statistic represents no relationship between a pair of Q sorts. The completed correlations formed a 60 x 60 correlation matrix (see Appendix F), which captured the different ways participants subjectively arranged the statements and represents individual perception about the importance of various critical success factors in IT project success. In Q methodology, the correlation matrix represents a transitional phase between the raw data, represented by the Q sorts and the factor analysis.

Factor Analysis

The goal of factor analysis is to simplify complex sets of data by condensing the matrix of correlations (Kline, 1994). Factor analysis in Q methodology determines the number of factors based upon the number of Q sorts having high correlations with each other (Brown, 1993). This study employed the PQMethod2.11 software (Schmolck,

2004) for the computation of unrotated factors using the principal components analysis method (PCA) in order to reduce the observed correlations into a smaller set of composite variables (factors). PCA is a computational data reduction technique that maximizes the variance explained for any number of factors (Kline, 1994). PCA is often the recommended choice for exploratory factor analysis, where there are no *a priori* assumptions about the relationships in the data.

After generating the correlation matrix, the PQMethod2.11 produced an unrotated factor-loading matrix containing eight factors (Appendix G). Each factor represented a linear combination of individual Q sorts and the factor loadings embody the correlation of individual Q sorts with a given factor. In effect, a factor loading represents the correlation of an individual Q sort with the *idealized* Q sort for the factor (McKeown & Thomas, 1988). Although the PCA method of factor analysis can extract as many factors as there are variables, thus explaining all of the variance in the matrix, the goal of factor analysis is to explain the matrix with as few factors as possible (Kline, 1994, p. 37). The PQMethod software extracts eight unrotated factors along with their associated eigenvalues and explained variance (see Appendix G). An eigenvalue is the sum of squared factor loadings for each factor. The explained variance represents the importance of a factor and is equal to the ratio of the eigenvalue over the number of variates, in this case 60 (McKeown & Thomas, 1988, p. 51). These initial eight unrotated factors explained 66% of the variance among the 60 Q sorts.

Due to the algebra involved in the process, the initial set of unrotated factors produced by principal components analysis often consists of one large general factor followed by several bipolar factors (Kline, 1994, p. 39). The next step in factor analysis

involved factor rotation, which simplifies the factor structure making the factors easier to interpret. Brown (2009) provides a straightforward explanation of rotation as a collection of methods "…used to further analyze initial PCA or EFA results with the goal of making the pattern of loadings clearer, or more pronounced. This process is designed to reveal the simple structure" (p. 20). The concept of simple structure as first proposed by Thurstone (1947), strives to account for the greatest amount variance using the fewest number of factors. There are several methods for selecting factors for rotation.

A common method for selecting factors for rotation involves selecting unrotated factors with eigenvalues greater than 1.00 (McKeown & Thomas, 1988, p. 51). Eigenvalues represent the sum of the squares of factor loadings for each factor and are thus a measure of total variance accounted for by the factor. In this study, all eight unrotated factors had eigenvalues greater than one, thus there was no clear cut-off to the number of factors using only eigenvalue criteria. A second method for factor selection involves using the Scree test (Kline, 1994, p. 75). Kline recommends the use of Cattell's Scree test to determine which factors to retain for rotation. Figure 2 presents the Scree Chart, which plots the eigenvalues against the percent of explained variance for each factor. The point at which the curve levels out represents the last factor to include. The Scree chart was also somewhat inconclusive as the eigenvalues began to level out at about factor 3 or 4.

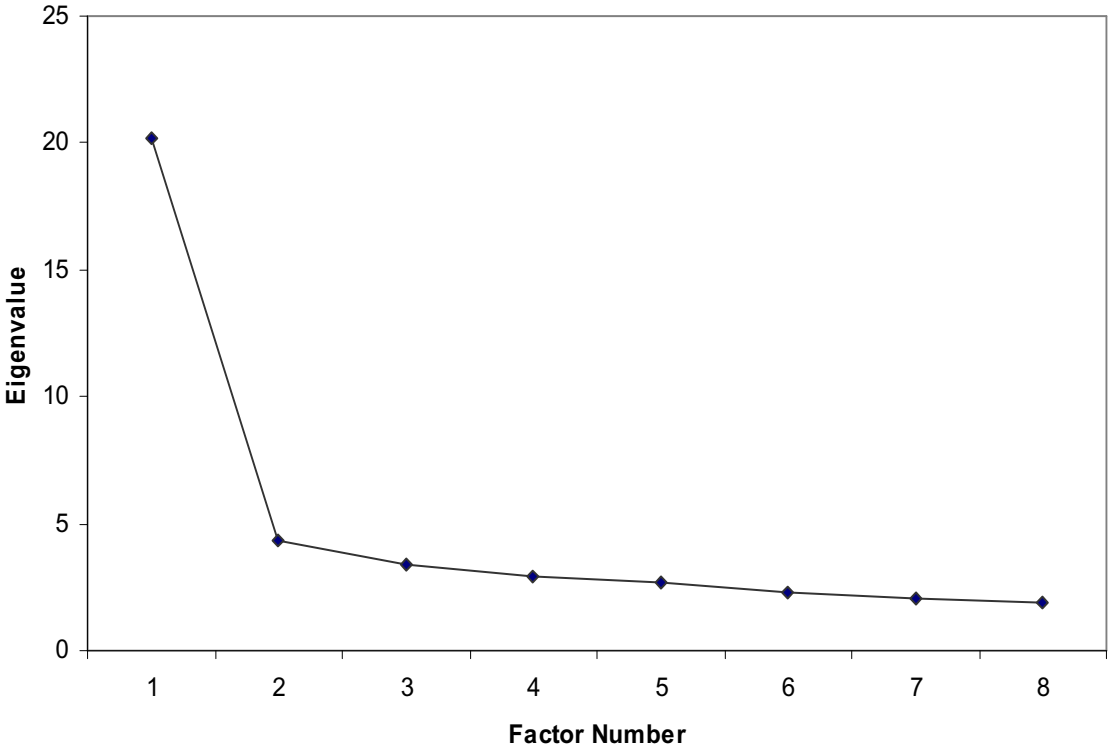

Figure 2. Scree Test of Unrotated Factors

A third approach is to examine the amount of cumulative variance accounted for by the number of factors selected (Brown, 2009). In this sample, the first three factors accounted for 47% of the variance. The remaining five factors collectively accounted for only 19% of the variance. A preliminary Varimax rotation confirmed the choice of three factors since including a fourth factor increased the explained variance by 5% and only revealed three defining sorts for the additional factor. Thus, this study used three factors for further investigation.

Factor Rotation

The procedure of factor rotation does not change underlying relationships found in the original correlation matrix. As McKeown and Thomas (1988) point out, rotation simply represents a "change in the *vantage point* from which the data are viewed" (p.52).

Rotation of the three selected factors took place using the QVARIMAX feature of the PQMethod2.11 software. Varimax rotation employs an orthogonal rotation process to maximize the sum of the variances of squared loadings for each factor. In orthogonal rotation, each subsequent factor rotation attempts to account for the remaining variance independent of the previous factor rotations. Brown (1980) suggests Varimax is an appropriate method for exploring *atheroetical* rotations by searching for statistical solutions (p. 227). Additionally, Kline (1994) notes Varimax is "an excellent method of reaching an orthogonal simple structure" (p. 68). Rummel (1967) provides a clear explanation for the advantage of seeking a simple structure.

> A major ontological assumption underlying the use of simple structure is that, whenever possible, our model of reality should be simplified. If phenomena can be described equally well using simpler factors, then the principle of parsimony is that we should do so. Simple structure maximizes parsimony by shifting from general factors involving all the variables to group factors involving different sets of variables. (p. 475)

The PQMethod2.11 software automatically flags defining sorts for each factor. Generally, the flagged sorts have high loadings and represent q sorts that help define that particular orthogonal rotation while not exhibiting high loadings on *both* other factors. In this study, 51 of the 60 Q sorts loaded on one of the three factors at or above the $p < .05$

level of significance. Additional visual inspection of the factor loadings did not identify any additional Q sorts for inclusion. Table 8 presents the factor loadings for all Q sorts in addition to the eigenvalues and percent of explained variance for each of the three factors. Table 8 also identifies the 51 defining sorts used for factor interpretation.

Table 8

Rotated Factor Loadings Indicating Defining Sorts

		Factors		
No.	Q Sort ID	1	2	3
1	8009	0.5443***X***	0.1164	0.3364
2	8218	0.3713	0.0169	0.5314***X***
3	9024	0.0818	0.3832***X***	0.1193
4	9215	0.2950	0.3519	0.3536
5	10020	0.3429	0.0778	0.5660***X***
6	10038	0.6011***X***	0.1255	0.5126
7	12221	0.3866	-0.1760	-0.3560
8	13122	0.6066***X***	0.0755	0.4968
9	13210	0.6476***X***	0.0688	0.3343
10	14031	0.3189	0.4437	0.4128
11	14057	0.5104***X***	-0.0634	0.4267
12	14100	0.7831***X***	0.0576	0.0584
13	14171	0.0084	0.6588***X***	0.1899
14	15062	0.1540	0.3805***X***	0.2240
15	15076	0.0211	0.6096***X***	-0.1702
16	15105	0.2967	0.5127***X***	0.3780
17	15142	0.6960***X***	0.2639	0.1725
18	16031	0.7304***X***	0.1047	0.2728
19	16048	0.2185	0.3217	0.4373***X***
20	16049	0.5233***X***	-0.1063	0.2133
21	16056	0.2396	0.0307	0.7329***X***
22	16087	0.3973	0.0583	0.6391***X***
23	17007	0.4538***X***	0.0946	0.2311
24	17042	0.4938	0.1019	0.6290***X***
25	17055	0.5829***X***	0.3080	0.4848
26	17194	0.0944	0.0020	0.6012***X***
27	17204	0.5260***X***	0.3850	0.0063

X indicates a defining sort

(*table continues)*

		Factors		
No.	Q Sort ID	1	2	3
28	18040	0.2636	-0.0424	0.4406***X***
29	18064	0.3625	0.1749	0.6642***X***
30	18072	0.1813	-0.1436	0.5428***X***
31	18108	0.6823***X***	-0.0207	0.2952
32	18158	0.6207***X***	-0.0151	0.2134
33	19018	0.3849***X***	0.1261	0.1993
34	19024	0.6708***X***	0.4201	0.0011
35	19096	0.6383***X***	0.3122	0.0505
36	20053	0.5199	0.4070	0.4540
37	20064	0.1363	0.6730***X***	-0.3178
38	20070	0.6411***X***	0.1886	0.2675
39	20150	0.5260***X***	0.3490	0.3207
40	20184	0.6865***X***	0.0876	-0.0094
41	21005	0.6096***X***	0.1037	0.5792
42	21042	0.3936	0.2172	0.5310***X***
43	21116	0.4921	0.2221	0.5580***X***
44	22015	0.4513	-0.2768	0.4749
45	22056	0.4862	0.1224	0.6281***X***
46	22059	0.1255	0.1835	0.6529***X***
47	22061	-0.0367	-0.1470	0.2929
48	22068	0.5228***X***	0.1722	0.3566
49	22075	0.4230***X***	0.1926	0.3580
50	22079	0.3580***X***	0.2333	-0.0305
51	24012	0.3701***X***	0.3194	0.0823
52	24169	0.1246	0.6046***X***	-0.2638
53	24176	-0.1877	0.6760***X***	0.3900
54	25107	0.5854***X***	-0.0184	0.5297
55	26113	-0.1028	0.2420	0.7197***X***
56	27084	0.4393	0.3701	0.3281
57	29182	0.3436	0.3144	0.2877
58	1401A	0.4803	0.3698	0.5015
59	2002A	0.0224	0.7272***X***	-0.0269
60	2206B	0.4431***X***	-0.0425	0.2878
Eigenvalue		12.28	5.62	10.00
% of Variance		20	9	17

X indicates a defining sort

Note: Eigenvalue = Sum of squared factor loadings for each factor. The explained variance equals the eigenvalue divided by the number of variates (Q sorts, i.e. 60)

Table 9 shows the correlation between the three factor scores. The defining sorts demonstrated a very high correlation between factors 1 and 3 (0.7154). Although this may be due in part because eight defining sorts had high loadings on both factors 1 and 3, the basis for the correlation is the relative rank order of the normalized factor scores for each statement. Thus, the correlation represents the overall similarity between the relative ranks of the statements for each factor. The high correlation between factors 1 and factor 3 is an indication that project managers loading on those factors are likely to have similar feelings about some of the critical success factors presented in this study, but are by no means identical. There was only a low to moderate correlation between factors 1 and 3 with factor 2.

Table 10 displays the characteristics of factor reliability and accounts for 51 of the 60 Q sorts in the person sample. Dennis (1986) suggests a view or perception associated with a factor in Q studies becomes stable with four or more loadings. All three factors exceeded this number. In Q methodology, the assumption is that the average coefficient of reliability is 0.80 and represents the probability a person will render the same q sort at different times (McKeown & Thomas, 1988, p. 54). The composite reliability for each factor was in excess of 95%. The standard error of factor scores derives from the normalized scores of the forced distribution, represents a value for measuring whether scores are significantly different between factors, and helps to determine statements that distinguish one factor from another.

Table 9

Correlation between Factor Scores

Factors	1	2	3
1	1.0000	0.2856	0.7154
2	0.2856	1.0000	0.2197
3	0.7154	0.2197	1.0000

Table 10

Factor Reliability

	Factor		
	1	2	3
Number of defining sorts	27	9	15
Average Coefficient of Reliability	0.800	0.800	0.800
Composite Reliability	0.991	0.973	0.984
Standard Error of Factor Scores	0.096	0.164	0.128

Statistical Characteristics of the three factors

Factor analysis and rotation uncovered three composite factors explaining 46% of the observed variance among the q sorts. Defining Q sorts included those with loadings greater than .32 or .41 exceeding the standard error at the $p < .05$ and $p < .01$ levels respectively. The PQMethod 2.11 software also selects distinguishing statements for each sort based upon the standard error of differences (SED) between the sorts.

Distinguishing statements are statements placed at significantly different spots on the grid for any two factors. The difference in normalized scores between two sorts x and

y must exceed the standard error of difference between the two scores. At a significance level of $p < .01$ the standard error of differences (SED_{xy}) = $2.58 * \sqrt{SE_x^2 + SE_y^2}$; for a significance level of $p < .05$ a constant of 1.96 is used instead of 2.58. The PQMethod2.11 software computes the difference between statements for each pair of factors and if a statement difference in normalized ranking exceeds the SED for *all* other factors, it becomes a distinguishing statement. Table 11 presents the standard error for differences for the three factors.

Table 11

Standard Error for Differences in Normalized Factor Scores

Factor	1	2	3
1	0.135	0.190	0.160
2	0.190	0.232	0.208
3	0.160	0.208	0.181

Note: Diagonal entries represent the standard error within factors

Factor 1 accounted for the greatest amount of explained variance (20%). Twenty-seven project manager participants loaded on this factor at a level of significance greater than 0.32 ($p < .05$) or 0.41 ($p < .01$). Thirteen of the 27 loadings were positively associated with this factor at or above the .01 level. Factor 1 had 24 distinguishing statements associated at a confidence level of 95% ($p < .05$). Eighteen of the 24 statements were significant to the 99% confidence level ($p < .01$).

Factor 2 explained nine per cent of the variance with nine project managers loading on the factor at a level of significance greater than 0.32 ($p < .05$) or 0.41 ($p < .01$). Seven of the nine loadings were positively associated with this factor at or above the

.01 level. Factor 2 had 24 distinguishing statements associated at a confidence level of 95% ($p < .05$). Eighteen of the 24 statements were significant to the 99% confidence level ($p < .01$).

Factor 3 explained the second highest amount of variance (17%). Fifteen project manager participants loaded on this factor at a level of significance greater 0.41 ($p < .01$). Factor 3 had 25 distinguishing statements associated at a confidence level of 95% ($p < .05$). Twenty of the 25 statements were significant to the 99% confidence level ($p < .01$). Factor 3 exhibited a very high correlation with factor 1 (0.7154).

Factor Interpretation

The PQMethod2.11 software created an idealized Q sort for each factor (see Figure 3). The statement position on the idealized grid represents the order of the normalized scores for each statement within a factor. Thus, the difference in normalized scores between two factors of different rank may not be as great as the rankings may indicate (e.g. for a given factor a statement ranked +2 may be quite close in normalized score to a statement ranked at +1). For this study, factor interpretation followed a conservative approach; basing the explanatory importance of a statement for a given factor on both the idealized rank of the statement mitigated by the normalized score of the statements around it. Generally, idealized ranks at the extremes (either + 3/+4 or -3/-4) were considered strong perceptions, statements ranked at +2 or -2 were considered perceptions of moderate strength, and the remainder (-1 to +1) were interpreted as minor to no importance. The interpretation of factor scores and distinguishing statements takes place within the context of the research questions for this study.

Factor 1

-4	-3	-2	-1	0	1	2	3	4
5	3	13	1	2	17	24	9	7
31	4	15	8	6	19	27	26	36
	12	20	10	14	25	34	29	
		22	11	18	28	37		
		35	16	21	39	38		
			33	23	40			
				30				
				32				

Factor 2

-4	-3	-2	-1	0	1	2	3	4
4	3	5	8	9	1	2	10	7
17	33	19	12	11	6	24	34	39
	38	20	21	14	13	25	36	
		22	23	15	26	29		
		37	27	16	32	31		
			30	18	35			
				28				
				40				

Factor 3

-4	-3	-2	-1	0	1	2	3	4
3	11	4	1	10	2	8	7	27
33	15	5	12	13	6	9	17	36
	32	22	14	20	16	18	19	
		23	21	29	25	26		
		31	24	30	28	38		
			40	34	37			
				35				
				39				

Figure 3. Idealized Q Sorts for each factor

Note: Statements presented randomly to the participants, but the statement numbers relate to the dimension of the critical success factor.

Statement numbers ending in 1-5 are agile oriented; those ending with 6 to 0 are traditional
Statements 1-10 are organizational, 11-20 are process-related, 21-30 are people related, and 31-40 are project related.

Research Question 1

The first research question asked, what are the individual general perceptions of project managers regarding factors that might influence the success of IT projects? This study identified three factors explaining 46% of the total variance. Each factor represented the views of a unique group of project managers who tended to agree with the 40 statements by arranging them in a similar way on the quasi-normally distributed grid. The statements represented critical success factors for IT projects classified by dimensions of managerial approach (agile or traditional) and the general area of influence of the critical success factor based on relationships project managers have with project stakeholders and the project in general. These four categories included organizational influences, project management processes employed, roles and behaviors of the people involved, and project attributes.

Each factor also possessed some unique characteristics as illustrated by its associated distinguishing statements. The collection of these statements helped to provide a descriptive label for each of the factors.

Figure 4 presents the average normalized factor scores for each of the four areas of influence. This figure shows the general tendency of whether a category of influence ranked positively or negatively among the 40 statements. Overall factors 1 and 2 indicated a preference towards people and project related critical success factors. Factor 3 did not appear to demonstrate a general preference towards any group of influences and displayed a balanced view of success factors by category of influence. The underlying reason for average normalized scores close to zero was due primarily to a low ranking of

agile statements and the high ranking of traditional statements within a category. This is the focus of the third research question.

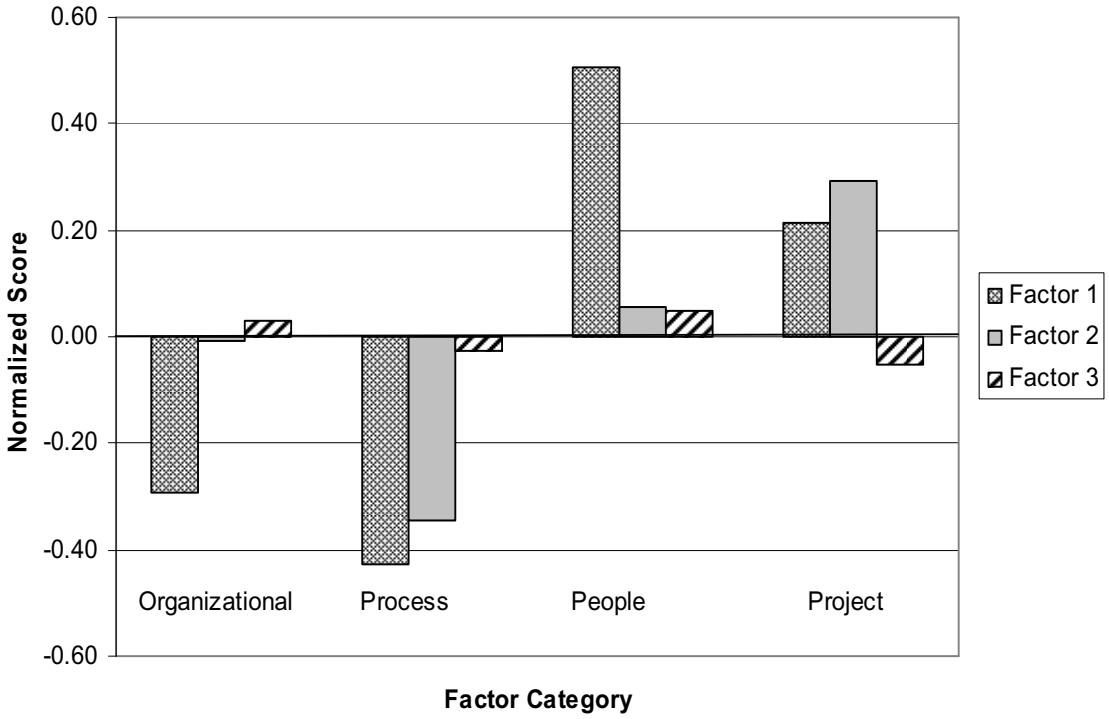

Figure 4: Average Normalized Factor Scores by Area of Critical Success Factor Influence

Factor 1 - A project-person focus. Project managers loading on factor 1 tend to value the importance of critical success factors associated with the people involved in the project and the characteristics of the project. This factor demonstrated an importance in traditionally focused critical success factors related to the project and relationships involving persons and the organization. Three of the five top distinguishing statements for this factor dealt with people issues related to the skill levels of the project manager and the project team and the importance of interpersonal skills for the project manager.

The other two most important factors related to characteristics of the project and included the importance of clear project objectives (statement 36) and clear and unambiguous system requirements (statement 37). Among the least important critical success factors, participants loading on factor 1 generally dismissed the importance of delivering business value early or regularly (statements 31 and 35) and tended to dismiss the importance of face-to-face communication (statements 5 and 13). Two other process-related critical success factors: delivering important features early and locating the team with the customers (statements 12 and 31) ranked lower in importance as well.

The scores for 13 of the 24 distinguishing statements for factor 1 reflected minor to no importance (ranks -1 to +1). Statements in this group included CSFs from all four categories and collectively tend to reflect relative neutrality towards user involvement, collaborative/cooperative leadership, and towards the critical importance of budgets and milestones. One of the more interesting aspects of factor 1 was seven of the ten statements in the Q sample reflecting process-related CSFs were included in the set of distinguishing statements and all of them ranked either among the most unimportant or of no particular importance. Three distinguishing statements associated with organizational critical success factors followed a similar pattern for this factor. Table 12 presents the 24 distinguishing statements for factor 1.

Table 12

Distinguishing Statements for Factor 1

No.	Statement (Abbreviated)	Rank	Score
36	Project has clearly stated and measurable goals and objectives	4	1.88*
26	PM interpersonal skills build trust and resolve conflict	3	1.50*
29	Team has required tech skill, expertise, and knowledge	3	1.35
27	PM has good proj mgmt. skills; track scope, time, cost & quality	2	1.32*
37	Initial system requirements for the proj are clear and unambiguous	2	1.11*
34	Continuous and close participation of the project customer	2	0.64*
40	Adequate staff with the required technical knowledge and expertise	1	0.54
17	Detailed project planning w/ well-defined estimates	1	0.48*
19	Use of strong project management practices to control project	1	0.41*
30	Users are cooperative & have positive attitude towards project	0	0.22
21	PM employs adaptive management style for leading team	0	0.14*
32	Understand project requirements emerge as the proj work unfolds	0	-0.08*
23	Focus of team effectiveness is on the individual competency	0	-0.19*
2	Mgmt supports close & continuous involvement users, stakeholders	0	-0.21*
11	Project work uses adaptive process that is iterative	-1	-0.27*
33	Schedule for project is incremental and fluid	-1	-0.35*
10	Org employs change mgmt approach to minimize resistance…	-1	-0.36*
16	Project uses formal chg mgmt proc linked to budget and schedule	-1	-0.36
15	Team, users, and customers are co-located	-2	-1.02
13	Regular and frequent face-to-face comm w/ all project stakeholders	-2	-1.17*
35	Proj focus is on continuous delivery of incremental business value	-2	-1.32*
12	Delivers the most important features early in the project	-3	-1.45*
31	Focus of the project is to develop early business value	-4	-1.81*
5	Org culture is people-centric and values face-to-face communication	-4	-1.84

Note. $p < .05$ for all statements, asterisk (*) indicates significance at $p < .01$.

Factor 2 – client involvement focus. Factor 2 represents a less negative perspective about agile focused success factors. Unlike the other two factors, project managers loading on factor 2 have a perception of some traditional critical success factors as being among the most unimportant for IT project success. Table 13 presents the distinguishing statements for factor 2.

Project managers loading on this factor appear to have a strong appreciation for user and client involvement in the project. Three of the statements ranked as most important among the distinguishing statements deal with involving users to develop their sense of ownership in the project (statement 39), close and continuous participation by the project customer (statement 34) and an organization having a change management approach which encourages support for the project (statement 10). Additionally, participants loading on this factor share a belief with those loading on factors 1 and 3 regarding the importance of clearly stated goals and objectives (statement 36).

However, what truly sets this factor apart from the other two factors is that unlike factors 1 and 3, four of the most unimportant distinguishing statements represent traditional oriented success factors whereas, all of the most unimportant distinguishing statements for factors 1 and 3 represent agile oriented success factors. Managers loading on this composite factor considered detailed planning with well-defined estimates (statement 17) and a realistic project schedule (statement 38) to be among the least important factors for project success. Project managers loading on factor 2 also believed clear and unambiguous system requirements (statement 37) and an emphasis on strong project management practices (statement 19) were of less importance to project success.

The only unimportant critical success factor among the distinguishing statements that managers loading on factor 2 shared with project managers loading on the other two factors was a belief that a people-centric organizational culture valuing face-to-face communication (statement 5) is of limited importance to project success. Interestingly, three of the four most important distinguishing statements for project managers loading on this factor are traditionally oriented as well. Thus, while managers loading on this factor tended to reject some of the traditional critical success factors as being unimportant, they did not appear to embrace the agile perspective for project management completely.

When examining the distinguishing statements between the extremes of most and least importance, factor 2 exhibits an interesting behavior in that the normalized scores for statements ranked at +2 (moderately important) are not easy to discern from statements ranked at +1. Therefore, for interpretation of factor 2, any statement ranked at +2 was not considered particularly important. When examining factor 2 in this manner, the range of statements appearing to be of minor to no importance contains 15 statements, ten of which emphasize an agile perspective. Additionally these relatively neutral statements distribute evenly among organizational, process, people and project concerns. The only slight theme emerging from the statements of minor to no importance is that over half of the statements (8 of 15) relate to some aspect of personnel issues or interpersonal interactions (statements 2, 25, 29, 13, 1, 40, 15, and 27).

Table 13

Distinguishing Statements for Factor 2

No.	Statement (Abbreviated)	Rank	Score
39	Project has user participation developing a sense of ownership	4	1.77*
34	Continuous and close participation of the project customer	3	1.42*
10	Org employs change mgmt approach to minimize resistance…	3	1.38*
36	Project has clearly stated and measurable goals and objectives	3	1.33*
2	Close & continuous involvement of users, stakeholders w/team	2	1.05
31	Focus of the project is to develop early business value	2	1.01*
25	Team commitment to serve and involve the project customers	2	0.95
29	Team has required tech skill, expertise, and knowledge	2	0.91
13	Regular and frequent face-to-face comm w/ all project stakeholders	1	0.90*
35	Proj focus is on continuous delivery of incremental business value	1	0.77*
32	Understand project requirements emerge as the proj work unfolds	1	0.42*
1	Org has collaborative work environment x-functional coop & support	1	0.34*
11	Project work uses adaptive process that is iterative	0	0.24*
16	Project uses formal chg mgmt proc linked to budget and schedule	0	0.13
40	Adequate staff with the required technical knowledge and expertise	0	0.11
9	PM & team given the authority over the necessary resources	0	0.11*
15	Team, users, and customers are co-located	0	-0.02*
27	PM has good proj mgmt. skills; track scope, time, cost & quality	-1	-0.28*
12	Project delivers the most important features early in the project	-1	-0.41
37	Initial system requirements for the proj are clear and unambiguous	-2	-1.00*
19	Use of strong project management practices to control project	-2	-1.33*
5	Org culture is people-centric and values face-to-face communication	-2	-1.37*
38	Schedule for project completion is detailed and realistic	-3	-1.52*
17	Detailed project planning w/ well-defined estimates	-4	-1.55*

Note. $p < .05$ for all statements, asterisk (*) indicates significance at $p < .01$.

Factor 3 – traditional project management focus. Factor 3 demonstrates a clear focus on the values associated with traditional project management as seen by its unique distinguishing statements. For this factor, the five statements ranked among the most important align with a traditional approach to IT project management and the five statements felt to be most unimportant for project success were all agile-oriented critical success factors. Some of the most important critical success factors for project managers who loaded on this factor are process oriented and include the use of strong project management practices (statement 19), a detailed planning process incorporating budget, schedule and performance (statement 17), and appropriate formal communications procedures to share information (statement 18). This factor also included the importance of the client organization having a commitment to developing a project management capability (statement 8).

Alternatively, unique distinguishing statements identifying the least important critical success factors include some of the key operational and philosophical components of an agile perspective for IT project management. Among the most unimportant CSFs are co-located work-teams and clients (statement 5), emergent a requirements (statement 32), using an adaptive and iterative process for managing requirements (statement 11), a horizontal client organization (statement 4), and delivering business value early in the project (statement 31).

Among statements ranked of minor to no importance there were no clear trends between agile and traditional focus except for a general disinterest in the role and involvement of people associated with the project. Six of the 13 statements ranked from -1 to +1 relate to some sort of interpersonal activity dealing with the project team,

stakeholders, customers, or staff (statements 2, 29, 34, 13, 10 and 40). A similar trend is also evident for factor 2. Table 14 presents the 25 distinguishing statements for factor 3.

Table 14

Distinguishing Statements for Factor 3

No.	Statement (Abbreviated)	Rank	Score
36	Project has clearly stated and measurable goals and objectives	4	2.31*
27	PM has good proj mgmt. skills; track scope, time, cost & quality	4	1.89*
19	Use of strong project management practices to control project	3	1.31*
17	Detailed project planning w/ well-defined estimates	3	1.29*
18	Formal comm procedures established to share information	2	0.93*
8	Org commitment to principles of project mgmt or capability	2	0.85*
16	Project uses formal chg mgmt proc linked to budget and schedule	1	0.71*
2	Close & continuous involvement of users, stakeholders w/team	1	0.63
37	Initial system requirements for the proj are clear and unambiguous	1	0.38*
10	Org employs change mgmt approach to minimize resistance…	0	0.15*
29	Team has required tech skill, expertise, and knowledge	0	0.09*
34	Continuous and close participation of the project customer	0	0.03*
13	Regular and frequent face-to-face comm w/ all project stakeholders	0	-0.18*
20	Project has formal method for documentation & project reporting	0	-0.19*
35	Proj focus is on continuous delivery of incremental business value	0	-0.20*
24	Project team is x-functional & has business and tech knowledge	-1	-0.46*
40	Adequate staff with the required technical knowledge and expertise	-1	-0.49*
14	Uses a test-driven environment to correct problems	-1	-0.65*
12	Delivers the most important features early in the project	-1	-0.93
5	Org culture is people-centric and values face-to-face comm	-2	-0.93
31	Focus of the project is to develop early business value	-2	-1.06*
4	Client org has a cooperative horizontal business culture	-2	-1.09
11	Project work uses adaptive process that is iterative	-3	-1.18*
32	Understand project requirements emerge as the proj work unfolds	-3	-1.33*
15	Team, users, and customers are co-located	-3	-1.38

Note. $p < .05$ for all statements, asterisk (*) indicates significance at $p < .01$.

Research Question 2

The second research question asked, based upon the subjective insights of project managers, what critical success factors interrelate in their contributions to project success?

Each of the three factors identified in this analysis corresponds to a different perspective on the importance of certain characteristics associated with the management of IT projects. The collection of statements of suspected critical success factors for IT projects helps to describe each of these three perspectives. The aim of this research question is to examine how the three perspectives related to one another.

Consensus statements. The process of identifying distinguishing statements for each factor also results in the discovery of consensus statements consisting of statements common to all factors. A consensus statement is one for which there is no significant difference between any of the factors. For consensus statements, all of the factors tend to give the statement the same score. Table 15 presents the four consensus statements with the rank of each statement for each factor and the z-scores to demonstrate the comparability of the ranks. The consensus statements demonstrated statement number 7 "There is a sustained commitment from upper management to provide resources, authority, and influence for project success" ranks as one of the most important critical success factors for all three composite factors (ranked +3 or +4 for all factors). Conversely, the statement indicating the importance of an adaptive client organization (statement 3) ranked as one of the least important CSFs among all factors (-3 or lower for all three factors). The CSF of employing self-organizing work teams also ranks low in importance for a successful IT project. Finally, the criticality of loyal team

members with a strong commitment to the project ranked as minor to no particular importance among the three perspectives.

Table 15

Consensus Statements among All Three Factors

		Factor 1		Factor 2		Factor 3	
No.	Statement	Rank	Z-Score	Rank	Z-Score	Rank	Z-Score
7	There is a sustained commitment from upper management to provide resources, authority, and influence for project success.	4	1.79	4	1.69	3	1.38
28	Project team is loyal to the project and possesses a high level of commitment.	1	0.46	0	0.02	1	0.30
22*	The project team is self-organizing; changing configuration and work patterns as the project progresses.	-2	-0.83	-2	-1.06	-2	-1.14
3*	The organization embraces a loosely controlled adaptive view focused on continuous learning, improvement, and the inevitability of change.	-3	-1.32	-3	-1.42	-4	-1.61

* $p < .05$ for all statements, asterisk (*) indicates non-significant at the $p < .01$ level

Tables 16 and 17 present some selected participant justifications for these consensus statements. Interestingly, in Table 16 the justifications for upper management support tend to mirror the focus of the three factors with which the participant is associated. In the case of the participant loading on factor 1, there is a sense of the importance of the people related to the organizations. For factor 2, there is a strong focus on an organic management approach more closely associated with the agile project management as suggested by the use of such concepts as aligning the focus, empowering the team, and leveraging management influence. Finally, the justification provided by a project manager loading on factor 3 is a good example of the factor's alignment with traditional project management practice, as the project needs a clear case from someone in authority. As seen from the justifications in Table 17, the unimportance of adaptive organizational practices and self-organizing teams appears to be universal. In fact, even the participant loading on factor 2, which is the most agile leaning factor, is extreme in the negativity expressed towards these two statements.

Table 16

Justification for the Importance of Upper Management Support

Statement #7: There is a sustained commitment from upper management to provide resources, authority, and influence for project success

ID No.	Factor	Justification
10038	1	Without the support of the organisational decision makers, the project manager ends up being one person trying to change a whole organisation single handedly and spends all their time getting consensus/approval, negotiating, making compromises. The original project goals are forgotten in an attempt to provide a solution that nobody disagrees with.
2002A	2	Top management is vital to articulating the value and priority of a project to the organization and its goals. Visible and sustained support and commitment encourages lower levels of the organization to align their focus and priorities with the project. It also greatly empowers the project team to secure needed resources and facilitate resolution of issues by leveraging management influence and linking recommended approaches with outcomes that clearly align with organizational strategies and objectives.
21116	3	Without the support from upper management, a project will fail. Projects must have a clear case presented and approved from someone with authority. If not, there can be roadblocks from even low level stakeholders that cannot (be) resolved

Table 17

Justification for Unimportant Consensus Statements

Statement 22: The project team is self-organizing; changing configuration and work patterns as the project progresses.

ID No.	Factor	Justification
17055	1	The project team needs a clear, achievable schedule, defined goals and objectives in order to be successful. Schedule, scope and goals cannot be changed as needed. Project framework is needed in order to achieve the promised result and benefits.
24176	2	Self-organizing is close to anarchy. Projects using this approach offer an appealing work environment but represent a culture that gives almost no priority to the project goal.
16056	3	If the project team is self-organizing, who is going to monitor the execution. Team roles must be clear as from day 1. Adaptations are possible through the project manager.

Statement 3: The organization embraces a loosely controlled adaptive view focused on continuous learning, improvement, and the inevitability of change.

ID No.	Factor	Justification
16031	1	I'm not even sure what this means, but rated it as unimportant because I feel that, regardless of the culture of the organization, it is the culture of the team that will drive project success, and the team's culture can certainly be at odds with the corporate culture (the "skunkworks" concept).
24176	2	This statement is not just unimportant; it's downright toxic to project progress and ultimate success. Words like loosely controlled make for an appealing work environment but tend to emphasize a culture that places insufficient emphasis on a project goal.
18064	3	Projects are nose-to-the-grindstone busy. Mumbo jumbo words about continuous training sound nice, but there is no time on many projects.

Similarities among the three factors. The PQMethod 2.11 software produced a list of statements ordered from consensus to disagreement based upon the variance in normalized factor scores. Table 18 presents the ten statements from the Q sample having the closest normalized scores among the three factors but do not include consensus statements. The results presented in Table 18 shows the importance of a clearly stated and measurable goals and objectives (statement 36) as among the most important critical success factors for all three factors. Additionally, there appears to be a general agreement among project managers loading on all three factors about the importance of the project manager possessing the interpersonal skills necessary to build trust, motivate people, and resolve conflict (statement 26). Statement 25, a commitment to serve and involve the project customers, appears to be of moderate importance. Statements representing critical success factors unimportant for IT project success include a people-centric organization that places a high value on face-to-face communication and organizations having a cooperative horizontal business culture (statements 4 and 5). The remaining similarly ranked statements represent critical success factors considered neither important nor unimportant. These success factors include a supportive and helpful organizational culture, the presence of cooperative users with a positive attitude towards the project, a test-driven project environment, a project manager with a collaborative and adaptive management style, and a team focus on individual competency.

Table 18

Similarly Ranked Statements among the Three Factors

No	Statement	Factor 1	Factor 2	Factor 3
36	The project has clearly stated and measurable goals and objectives.	4* (1.88)	3* (1.33)	4* (2.31)
26	The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict.	3* (1.50)	1 (0.71)	2 (0.97)
25	There is a strong commitment on the part of the project team to serve and involve the project customers in the project.	1 (0.42)	2* (0.95)	1 (0.44)
6	The culture of the organization is supportive and helpful for achieving project goals.	0 (0.01)	1 (0.25)	1 (0.52)
30	Users are cooperative and have a positive attitude towards the project.	0* (0.22)	-1 (-0.21)	0 (-0.18)
14	The project uses a test-driven environment to correct problems and improves integration and adaptability of the work products.	0 (0.01)	0 (-0.04)	-1* (-0.65)
21	The project manager employs an adaptive management style for leading the team that depends upon collaboration rather than command and control.	0* (0.14)	-1 (-0.45)	-1 (-0.46)
23	A major focus of team effectiveness is on the individual competency of team members; trusting individuals to apply their competency in effective ways.	0* (-0.19)	-1 (-0.97)	-2 (-0.96)
5	The organizational culture is people-centric and places a high value on face-to-face communication.	-4* (-1.84)	-2* (-1.37)	-2* (-0.93)
4	The client organization has a cooperative horizontal business culture	-3 (-1.43)	-4 (-1.67)	-2* (-1.09)

Note: Normalized score is in parentheses below each factor rank.

* Denotes a distinguishing statement for that factor

Differences between factors. The PQMethod2.11 software provided the opportunity to examine factor similarity by computing the difference in normalized scores for each statement in the Q sample. Appendix H presents a table of differences between normalized scores for each statement between factors. Inspection of the differences in normalized scores between factors 1 and 3 showed only small differences between most statements. Table 19 shows six notable statements differing in degree of importance between the two factors by two or more positions on the grid often indicating a noteworthy difference between rankings (Brown, 1993). With respect to statements deemed important, the requirement for greater team skill levels was of higher importance to participants who loaded on factor 1, however, the use of detailed planning and strong project management practices was more important to project managers who loaded on factor 3. Delivery of important features early in the project life cycle and a people centered culture seem to be of less importance to managers who loaded on factor 1 than on factor 3. However, the importance of a fluid schedule while of no particular importance for managers who loaded on factor 1 is among the most unimportant of all CSFs for project managers loading on factor 3.

Interestingly, the differences between factors 1 and 3 were more a matter of degree than direction. Among the statements with the largest differences as shown in Table 19 there are no rankings reflecting opposite opinions. This is likely another manifestation of the high correlation between the two factors. Overall, these results were consistent with the people-project focus of factor 1 and traditional plan focus of the factor 3.

Table 19

Differences between Factors 1 and 3

No.	Statement	Factor 1		Factor 3	
		Rank	Z-Score	Rank	Z-Score
29	Project team members possess the required technical skill, expertise, and knowledge.	3	1.350	0	0.093
17	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance.	1	0.478	3	1.291
19	The use of strong project management practices used to control the project, set milestones, identify critical paths, and meet delivery dates.	1	0.410	3	1.314
12	Project execution and organization delivers the most important features early in the project life cycle.	-3	-1.450	-1	-0.928
5	The organizational culture is people-centric and places a high value on face-to-face communication.	-4	-1.839	-2	-0.907
33†	The schedule for the project is incremental and fluid within the constraints of the final deadline.	-1	-0.351	-4	-1.479

† Statement was not a distinguishing statement for either factor 1 or 3

When examining statements with noteworthy differences between factor 2 and both factors 1 and 3, Table 20 clearly shows a contradictory association between factor 2 and the other 2 factors. Although the differences varied in degree, the direction was consistent. Some statements felt to be important for project managers loading on factors 1 or 3 were clearly unimportant to managers loading on factor 2, with the reverse also appearing to be true.

Table 20

Differences between Factor 2 and Factors 1 and 3

		Rankings		
No.	Statement	Factor 1	Factor 2	Factor 3
31	The focus of the project is to develop early business value.	-4	2	-2
39	The project involves user participation at a level sufficient for developing a sense of ownership.	1	4	0
10	The client organization employs a change management approach that minimizes potential resistance and disruption and encourages people throughout the organization to embrace the project.	-1	3	0
27	Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality.	2	-1	4
19	The use of strong project management practices used to control the project, set milestones, identify critical paths, and meet delivery dates.	1	-2	3
38	The schedule for project completion is detailed and realistic.	2	-3	2
17	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance.	1	-4	3

Contrary to participants loading on factors 1 or 3, project managers loading on factor 2 believed delivering early business value in a project, having users develop a sense of ownership for the project, and working with a client organization that minimizes potential resistance and disruption are important for project success. Similarly, participants loading on factor 2 felt traditional project management skills and management practices, detailed scheduling, and project planning were found to be moderately to very unimportant for IT project success. This view was opposite the views of project managers loading on factors 1 or 3.

Differences unique between factors 1 and 2 appear in Table 21 and show that while having project manager authority over resources is among the most important CSFs for project managers loading on factor 1, it was of no particular importance to those loading on factor 2, which is indicative of a more collaborative approach. The other notable difference is that while making sure the initial system requirements for the project are clear, unambiguous, and obtainable is moderately important for managers loading on factor 1, that statement was moderately unimportant for managers loading on factor 2.

Table 21

Differences between Factors 1 and 2

		Factor 1		Factor 2	
No	Statement	Rank	Z-Score	Rank	Z-Score
9	The project manager and project team are given the authority over the resources necessary to carry out the strategy for project completion.	3	1.457	0	0.107
37	Initial system requirements for the project are clear, unambiguous, and obtainable.	2	1.110	-2	-0.998
13	The project involves regular and frequent face-to-face communication with all project stakeholders.	-2	-1.166	1	0.898
35	Project focus is on the continuous delivery of incremental business value throughout.	-2	-1.322	1	0.771

Differences unique between factors 2 and 3 appear in Table 22 and did not show extreme disagreement, but appeared to confirm a trend that critical success factors among the least important to project managers loading on factor 3, were of little or no importance to managers loading on factor 2. In this case, two agile process-related statements, an adaptive and iterative work process and co-location of clients and the team were among the most unimportant for managers loading on factor 3 and of no real importance to those loading on factor 2. Similarly, while close and continuous involvement of the customer was among the most important factors for project success for project managers loading on factor 2, it was of no particular importance to those loading on factor 3.

Table 22

Differences between Factors 2 and 3

		Factor 2		Factor 3	
No	Statement	Rank	Z-Score	Rank	Z-Score
11	Project work follows an adaptive process that manages project requirements through an iterative process of project completion.	0	0.242	-3	-1.182
15	Project team, users, and project customers are co-located and have easy and regular access to one another.	0	-0.020	-3	-1.377
32	There is an understanding that project requirements emerge as the project work unfolds.	1	0.417	-3	-1.329
24	Project team is cross-functional possessing both business and technical knowledge allowing it to communicate and cooperate well inside and outside of the team.	2	0.954	-1	-0.456
34	Project involves continuous and close participation of the project customer (internal and external)	3	1.419	0	0.027

Overall, except for the consensus and similarly ranked statements, the differences in statement arrangements among the three composite factors tended to reinforce the interpretation of the general characteristics of the factor, i.e. they supported the people-project, client-involvement, or traditional project management viewpoints.

One final observation regarding the three factors was that statements relating to people oriented critical success factors fared the best. No statement associated with a people-related success factor ranked lower than a -2 for any of the three composite factors and no composite factor had more than 4 people oriented statements ranked below

0. This may be indicative of a movement encouraging project managers to pay greater attention to skills related to effective people management (Fisher, 2010).

Research Question 3

The third research question asked, how do project manager perceptions of critical success factors relate to the agile and traditional approaches for carrying out IT project management? Overall, project managers in this sample expressed strong opinions towards the importance of traditional success factors and held agile related success factors among the most unimportant for project success. Factors 1 and 3 showed a pronounced preference for traditional success factors, while project managers who loaded on factor 2 maintained a more balanced view, but were by no means strong advocates of an agile perspective. Figure 5 presents the average normalized scores for statements by managerial approach.

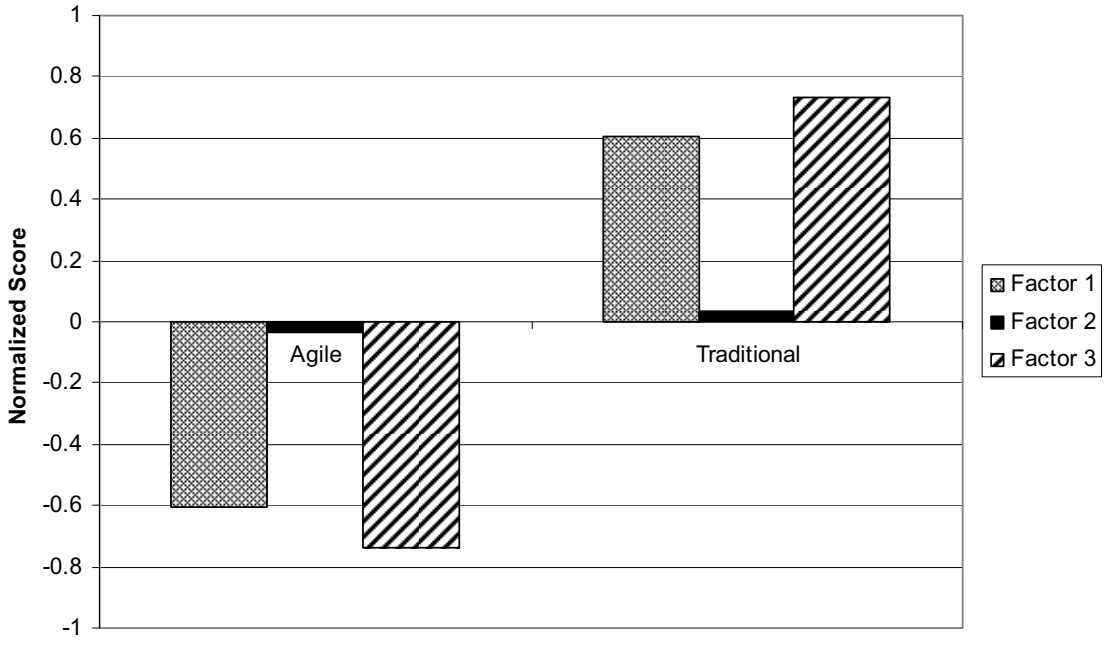

Figure 5. Average Normalized factor scores for Agile and Traditional Success Factors

An examination of the arrangement of agile statements on the grid for the idealized sorts of the three factors shows a definite pattern of preference towards the traditional approach to IT project management. Project managers loading on factor 3 showed an extreme negativity towards agile success factors as only two agile statements ranked at +1 and 15 of 20 agile related statements were placed at ranks less than zero. Factor 1 displayed a similar pattern with only two agile statements above zero and 12 statements ranked below zero. Project managers loading on factors 1 or 3 placed only agile statements along the lowest five ranks and only traditional oriented critical success factors at the highest five ranks. Only factor 2 demonstrated a slight degree of balance between agile and traditional related success factors. Project managers loading on factor 2 placed eight agile statements above zero, and an equal number below zero. Additionally, one agile success factor was among the highest five ranks and two traditionally oriented success factors were ranked among the lowest five places.

When examining the largest discrepancies between the factors by management approach (agile or traditional) the best illustration of the difference between individual statements among the three factors was the placement of statements at the extremes. Table 23 presents the statements placed at +3 or higher for the three factors. All but one of the statements placed at the most important extreme are statements associated with traditional success factors. Statements associated with the importance of planning, scheduling and project management practices (statements 17, 19, and 27) showed the largest discrepancy between factor 2 and the other 2 composite factors. However, even for the one agile statement included in Table 23, project managers loading on factors 1

and 3 did not consider continuous and close participation of the project customer an entirely unimportant success factor.

Table 23

Statements Ranked +3 or higher among the three Factors

		Factor		
No.	Statement	1	2	3
Agile Related Success Factors				
34	Project involves continuous and close participation of the project customer (internal and external).	2	3	0
Traditional Related Success Factors				
7*	There is a sustained commitment from upper management to provide resources, authority, and influence for project success.	4	4	3
36	The project has clearly stated and measurable goals and objectives.	4	3	4
39	The project involves user participation at a level sufficient for developing a sense of ownership.	1	4	0
27†	Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality.	2	-1	4
29	Project team members possess the required technical skill, expertise, and knowledge.	3	2	0
26	The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict.	3	1	2
9	The management of the organization supports close and continuous involvement of the users and other stakeholders with the project team.	3	0	2
10	The client organization employs a change management approach that minimizes potential resistance and disruption and encourages people throughout the organization to embrace the project.	-1	3	0
19†	The use of strong project management practices used to control the project, set milestones, identify critical paths, and meet delivery dates.	1	-2	3
17†	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance.	1	-4	3

* Denotes a consensus statement

† Statements showing an opposite in importance rankings between factor 2 and factors 1 and 3.

Table 24 shows the statements ranked as very unimportant (-3 or below) for the three composite factors. Only two of the 11 statements were associated with a traditional project management approach. For the most part except for the success factor related to developing early business value, none of the agile success factors demonstrated a strong opposite preference among the three factors. The development of early business value while moderately important to project managers loading on factor 2 is moderately to very unimportant for PMs loading on factors 1 or 3. Interestingly, even among the statements ranked among the most unimportant, only three statements demonstrate a large disparity (statements 31, 38, and 17). The extreme unimportance of detailed planning and schedules for project managers loading on factor 2 was in stark contrast to those loading on factors 1 and 3. This difference in views regarding the importance of planning represents a key distinction between traditional and agile project management approaches (Fowler & Highsmith, 2001; Augustine, Payne, Sencindiver, & Woodcock, 2005; Lee & Xia, 2010).

Table 24

Statements Ranked -3 or lower among the three Factors

No.	Statement	Factor 1	Factor 2	Factor 3
Agile Related Success Factors				
31†	The focus of the project is to develop early business value.	-4	2	-2
5	The organizational culture is people-centric and places a high value on face-to-face communication...	-4	-2	-2
4	The client organization has a cooperative horizontal business culture.	-3	-4	-2
33	The schedule for the project is incremental and fluid within the constraints of the final deadline.	-1	-3	-4
3*	The organization embraces a loosely controlled adaptive view focused on continuous learning, improvement, and the inevitability of change.	-3	-3	-4
12	Project execution and organization delivers the most important features early in the project life cycle.	-3	-1	-1
15	Project team, users, and project customers are co-located and have easy and regular access to one another.	-2	0	-3
11	Project work follows an adaptive process that manages project requirements through an iterative process of project completion.	-1	0	-3
32	There is an understanding that project requirements emerge as the project work unfolds.	0	1	-3
Traditional Related Success Factors				
38†	The schedule for project completion is detailed and realistic.	2	-3	2
17†	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance.	1	-4	3

* Denotes a consensus statement

† Statements showing an opposite in importance rankings between factor 2 and factors 1 and 3.

Tables 25 and 26 provide some of the project manager justifications for placement of traditional critical success factors at the most important extreme and agile-related success factors as the most unimportant. One noteworthy observation in the selected justifications was how the words used to justify the placement of the statement tended to support the general description for each composite factor provided, especially for the statements at the most important extreme.

Table 25 presents the justifications that seemingly match the focus of the factor. Statement 36 for example, demonstrates that the project manager loading on factor 1 (the project-person focus) felt clearly stated and measurable goals were important for team performance. The participant loading on factor 2 (the client involvement focus) stresses the importance of a shared vision with the team and the project stakeholders. Finally, the project manager loading on factor 3 (traditional project management focus) clearly associated the importance of this statement to the deliverables and measurement of performance. Similar distinctions are present for the other statements in Table 25. For example, justification for user participation (statement 39) has a customer-oriented perspective from the participant loading on factor 2 and a user ownership perspective from the statement associated with factor 1. There is also a clear distinction between the person-project focus (factor 1) and the traditional project management focus (factor 3) with respect to the importance of project manager skills.

Table 25

Participant Justifications for the Importance of the Traditional Approach

Statement 36: The project has clearly stated and measurable goals and objectives.

ID No.	Factor	Justification
17055	1	This is critical since the project team needs to clearly understand the scope and goal of the project in order to be successful. It's also very important to ensure that the team is working towards the goals and objectives and does not get distracted or torn into other directions.
2002A	2	This is essential to establishing a clear, shared vision within the project team and stakeholders for what the project is to accomplish, what a successful outcome looks like and what resources and activities are most appropriate. It helps the project team rationalize priorities and what activities and decisions are conducive to project success and which ones are not.
26113	3	Need to be able to measure the projects actual performance when compared to the planed goals and deliverables to ensure the project satisfies the original intent and revised intent that it was intended to.

Statement 39: The project involves user participation at a level sufficient for developing a sense of ownership.

ID No.	Factor	Justification
22068	1	The users need a sense of ownership to contribute to project deliverables at a high level and to embrace the project when it is implemented
20064	2	A successful IT project has a customer base that embraces the results. If the final product does not address user needs, the customer will move on elsewhere to a developer that can meet their needs

Statement 27: Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality.

ID No.	Factor	Justification
13122	1	If the project manager does not have the skills to run the project efficiently then it will not succeed
8218	3	A project won’t be considered successful if it doesn't complete within scope, time, cost, and quality. A person will need to have good PM skills in order to accomplish that.
18072	3	If scope, time, cost, and quality are not being effectively managed, you will not know if the project goals are being achieved within a reasonable time and at a reasonable cost.

Of the three statements presented in Table 26 showing the justifications for the unimportance of agile critical success factors at the extremes, the justifications from project managers loading on the three factors were rather uniform for two of the statements. Only for statement 4, regarding the importance of a horizontal business culture was there a distinction between project managers loading on the three factors that complemented the perspective of the factor. Once again, the person-project focus (factor 1) was on success factors influencing team organization, the client-involvement focus demonstrated a concern for the needs of the customer, and the traditional project management focus stressed how the practice of project management would minimize such problems. Justifications for the other two statements were consistent among the project managers irrespective of the factor on which they loaded. The importance of face-to-face communication and delivering early business value both appear to be situational in importance and therefore were not felt to be uniformly important to all projects.

Table 26

Participant Justifications for the Unimportance of the Agile Approach

Statement 4: The client organization has a cooperative horizontal business culture.

ID No.	Factor	Justification
8009	1	Project management has to deal with all kinds of clients organizations. the project team's organization is important, not the client's organization.
20064	2	The focus of an IT project is not on the organizational culture so much as the needs of the customer in order to meet business needs (increase profit, etc.). Business culture is important, but not a show stopper for the development effort.
21042	3	Good project management practices will allow a project manager to succeed in all types of organizational structures and cultures.

Statement 5: The organizational culture is people-centric and places a high value on face-to-face communication.

ID No.	Factor	Justification
14100	1	Face-to-Face communication is very important to some organizations and not as important to others. Remote communication can be very effective if done correctly.
8218	3	Face-to-face communication is not necessary for a project to succeed. I've worked on multiple successful IT projects where teams were global, in multiple locations, and sometimes never even met one another face to face. I do believe the organization needs to place high value on frequent contact/communication, but that is different that what the card indicated.

Statement 12: Project execution and organization delivers the most important features early in the project life cycle.

ID No.	Factor	Justification
10038	1	Sometimes the most important benefits come at the end of the project. It's nice to get early runs on the board but it's not always possible.
15105	2	Driving a project based on the feature set is a recipe for failure. Projects need to be rolled out based on the technical requirements, providing stability to the environment first
16031	3	In some cases, it is just not possible to deliver the most important features early in the cycle -- it often happens that they necessarily come much later after implementation of interim steps and deliverables that are required as a foundation. I think this is an unrealistic statement.

Summary

This chapter presented the analysis of data from a sample of IT project managers about the importance of suspected critical success factors to IT project success. The study employed Q methodology, involving the empirical examination of the correlated sorts of statements associated with various critical success factors and factor analysis resulting in the extraction of factors representing distinctive perspectives of experienced IT project managers. These findings revealed general perceptions of project managers regarding the critical success factors that might influence the success of IT projects, how these critical success factors interrelated in their contributions to project success, and how these project manager perceptions related to the agile and traditional approaches for project management. The data analysis used the PQMethod 2.11 software on a sample of 60 Q sorts of 40 statements about IT project critical success factors.

This study identified three composite factors regarding project manager perceptions about the importance of critical success factors in IT project success. Factor 1 accounted for 20% of the observed variance with 27 participants loading on this factor at a significance level greater than .32 ($p < .05$) or 0.41 ($p < .01$). Distinguishing statements associated with factor 1 revealed a focus on the importance of the people involved with management and execution of the project and project characteristics affecting those people. Factor 2 included nine significant participant loadings and accounted for 9% of the explained variance. Factor 2 was the least negatively disposed towards agile project management practices of the three composite factors, but did not reflect a strong advocacy for agility. Factor 2 represents a client buy-in focus reflecting a strong appreciation for user and client involvement in the IT project. Project managers loading

on this factor also discounted the importance of stringent up-front planning and scheduling. Factor 3 was highly correlated with factor 1 (0.71), included 15 significant project manager loadings accounting for 17% of the explained variance. Distinguishing statements for factor 3 disclosed a strong connection to project management practices associated with the traditional approach. This included a strong appreciation for up-front planning and a tendency to trust project management processes to overcome most project difficulties.

Overall, the three factors displayed a similarity in the importance of involvement of upper management to IT project success, the importance of clearly stated and measurable goals, and the ability of the project manager to resolve conflict and motivate. There was also agreement among the three factors regarding the unimportance of the culture of the client organization being adaptive, horizontal, or people centric. Finally, except for minor differences among some project managers, there was a common dismissal of agile-oriented critical success factors as being crucial for project success. Chapter 5 includes a discussion of these findings, general conclusions, implications for social change, and suggestions for future research.

Chapter 5: Discussion, Conclusions, and Recommendations

The problem of disappointing success rates for IT projects continues to be a persistent dilemma despite over 2 decades of research. One major focus of those research efforts is to identify critical success factors for IT projects in the hopes of providing guidelines for future projects. One by-product of efforts to improve IT project success rates involves the adaptation of agile management practices, which represents a significantly different approach (Boehm. 2002; Augustine, Payne, Sencindiver, & Woodcock, 2005). To date, much of the research on critical success factors in IT projects comes from studies focusing on the performance of specific IT projects rather than tapping into the breadth of project manager experience. In a review of CSF methodology, Fortune and White (2006) observed, "inter-relationships between factors are at least as important as the individual factors but the CSF approach does not provide a mechanism for taking account of these inter-relationships" (p.54). Goldfinch (2007) suggested the large number of critical factors in the IT project management research creates a lack of overall consistency among important factors (i.e. few are important in all cases). The purpose of this study was to use the accumulated knowledge, experience, and opinions of practicing project managers to explore the relationships among commonly reported success factors and their contribution to IT project success, including the influence of management approach. In order to develop a better understanding of project manager perceptions of success factors this study categorized critical success factors by four general areas of influence based on relationships project managers have with project stakeholders and the project in general. These categories included organizational

characteristics, attributes of the project or product, behaviors and roles of the people involved in the project, and the project management processes used.

This study also attempted to link the practice of IT project management to various organizational theories. As there is no specific theoretical framework or dominant theory for project management practice, project management thought rests on a number of theories from management and production (Koskela & Howell, 2002). The theoretical framework for this study encompassed organizational theory, coordination theory, and contingency theory as they relate to the philosophy of managing IT projects and the differences between agile and traditional forms of project management.

The focus of this study was project manager perceptions about the role of critical success factors in IT project success. Specifically, findings from the study addressed three research questions:

1. What are the individual general perceptions of project managers regarding factors that might influence the success of IT projects?
2. Based upon the subjective insights of project managers, what critical success factors interrelate in their contributions to project success?
3. How do project manager perceptions of critical success factors relate to the agile and traditional approaches for carrying out IT project management?

This study used Q methodology to measure the subjective points of view of project managers about the importance of a large number of suspected critical success factors for IT projects. Three composite factors emerged from the factor analysis and subsequent interpretation of project manager Q sorts. Chapter 4 addressed the results of those analyses in conjunction with the research questions. The three factors identified

during data analysis represented a focus on the importance of people involved in project activities, a focus on the importance of user/client involvement, and a focus on the traditional activities and concerns of project management. A strong appreciation for the importance of upper management support and clearly defined goals and objectives were common to all three factors. Although there was some appreciation for a few aspects of an agile approach among project managers loading on one of the three factors, project managers in this study did not collectively agree that any agile-related critical success factors were important for IT project success.

Chapter 5 includes a discussion of the results of the study and interpretation of the results relevant to the theoretical framework of project management used for this study. This chapter also includes an assessment of the implications of these research results for IT project management, recommendations for future research, and suggestions for positive social change.

Data Interpretation and Theoretical Relevance

Preparation of the literature review for this study found project management research over the past two decades have reported more than 200 different critical success factors for IT projects. Based upon those critical success factors, this Q methodological study used 40 distinct statements representing categories encompassing the predominant critical success factors found in the literature. The PQMethod2.11 software (Schmolck, 2002) isolated three significant factors from the resulting correlation matrix of participant sorts (Appendix G). Factor analysis and empirical examination of weighted statement scores aided by the assessment of participant comments (Appendices J and K) supported the factor interpretations presented in chapter 4. From the set of statements used in the Q

sample, this study found some critical success factors to be very important for IT project success and others very unimportant to IT project success based upon the opinions and views of practicing project managers.

This study identified three composite factors, which explained 46% of the variance and represented different perspectives of project manager opinion about the importance of various critical success factors for IT projects. The composition and the difference in the collection of distinguishing statements associated with those factors shaped the interpretation of each composite factor. The following discussion summarizes the findings according to each of the three research questions and explores the significance of these results with respect to the theoretical framework used in this study

Discussion of Results: Research Questions

The first research question sought to identify the individual general perceptions of project managers regarding factors that might influence the success of IT projects. The answer to this question arose from the interpretation of the order of statements characterizing each of the three composite factors identified. Project managers loading on the first factor encompassed a view of the skill of the project team and the interpersonal skills of the project manager as playing an important role in IT project success. The primary view among project managers who loaded on factor 2 was the importance of client/customer buy-in, characterized by the expressed importance for stakeholder participation in the project, a sense of ownership by the users, and an organization that minimizes resistance and problems. Project managers associated with factor 3 emphasized a focus on the importance of traditional project management skills associated

with controlling and monitoring project progress in conjunction with a detailed planning function.

Equally important for interpretation of the three factors were project manager opinions about suspected critical success factors that, in their experience, were unimportant for overall IT project success. These areas of unimportance corresponded well with the most important critical success factors for each of the three composite factors. For example, project managers loading on factor 1 believed in the importance of project team and project manager skills and abilities, they do not consider the delivery of important features or business value early in a project to be critical. The consensus among justifications supplied for this opinion is that while not harmful to a project, delivery of early features or value should not be a prime focus of the project management efforts. Critical success factors unimportant to IT project success for project managers loading on factor 2 are consistent with some aspects of an agile view of a plan-driven approach. These project managers did not see the value of efforts focused on detailed project planning, realistic schedules, and a controlled approach to managing these activities. Justification for this position appeared to be the belief that IT projects often involved too much change for up-front detailed planning to be valuable. The perspective on planning and scheduling for project managers loading on factor 2 was opposite to those loading on factor 3. Project managers loading on factor 3 believed detailed plans and schedules were crucial for IT project success and emergent requirements or adaptive work processes, two features often associated with agile approaches, were features that lead to ambiguity in project focus.

The critical success factors describing the three perspectives presented in this study were similar in nature to the some of the views found in the project management literature. The literature has long supported the importance of planning, schedules, and the project management skills supporting those activities (Brown, Chervany, & Reinicke, 2007). At the same time, there is increasing recognition about the importance of interpersonal skills of the project manager and the technical skills of the team in IT project success (Fisher, 2010). Finally, there is also growing appreciation for the importance of client and customer buy-in for the project as a key contributor to success (Chen, Law, & Yang, 2009; Schmidt, Lyytinen, Keil, & Cule, 2001).

The second research question examined the subjective insights of project managers for critical success factors that may interrelate in their contributions to project success. For this question, this study examined the three composite factors for common themes represented by consensus statements and similarly ranked statements. Although the three factors seemed to represent slightly different perspectives regarding critical success factors important to IT project success, they shared a collective belief about the importance of commitment from upper management to provide resources, authority, and influence for project success. Additionally, all three factors included the importance of clearly stated and measurable goals and objectives among their top five statements. There was also a general agreement among the three viewpoints about the importance of the project manager possessing the interpersonal skills necessary to build trust, motivate people, and resolve conflict. The three factors exhibited some similarity among critical success factors considered unimportant to IT project success as well. There was universal agreement that conducting an IT project in an organization that embraces a loosely

controlled adaptive view focused on continuous learning, improvement, and the inevitability of change, was not critical to success and may in fact negatively influence chances for success. Additionally, the importance of self-organizing work teams and performing project work in organizations having a cooperative horizontal business culture and value face-to-face communication also ranked low in importance as critical for IT project success. One general tendency observed was that statements relating to people-oriented critical success factors seemed to fare the best, as statements from this category of CSFs were missing from statements aligned as most unimportant for any of the three composite factors. Using Q methodology to identify composite factors representing clusters of opinion, these findings addressed the interrelationship among success factors, which is a major criticism of the critical success factor approach for studying IT project management (Fortune & White, 2007; Goldfinch, 2007). The results presented in this study demonstrated that even project managers with different perspectives on the importance of various critical success factors share common beliefs about the importance of management support, clear goals and the unimportance of a horizontal business culture. Fortune and White (2007) suggested that for critical success factors the "inter-relationships between factors are at least as important as the individual factors" (p. 54). A recent study using Delphi methodology (Nasir & Sahibuddin, 2011) found similar results with respect to important critical success factors. However, the distinction between the different points of view, and how those views interrelated was lost. The Nasir and Sahibuddin (2011) study viewed the most important critical success factors as equally important best practices, whereas this research study demonstrated the

overall view of the role critical success factors in project success might be a composition of distinct viewpoints with similarities and differences.

The third and final research question explored how project manager opinions about critical success factors aligned with an agile or traditional project management approach. Although there was some appreciation for a few aspects of the agile approach to IT project management among participants loading on factor 2, project managers as a whole did not collectively support agile-related critical success factors as important for IT project success. Project managers loading on factors 1 or 3 consistently listed agile oriented success statements as the most unimportant for project success and only statements associated with the traditional approach as most important. Only project managers loading on factor 2 demonstrated any positive inclination towards agile related statements or leaned negatively towards traditionally worded statements. The sole feature associated with an agile approach that came close to agreement among all project managers in this sample involved the importance of participation by the project customer. Based upon the sample used in this study, many activities associated with an agile approach are not important in achieving IT project success, even among project managers loading on factor 2, the most favorable towards an agile approach. One important observation was that the opposing viewpoints about the importance of detailed up-front planning and scheduling seems to be the major issue of disagreement between the two approaches and is the most distinguishing difference between factor 2 and the other two factors. This difference in views is also consistent with the focus of the agile approach as stated in the Agile Manifesto (see Appendix A). However, a simplistic and extreme view of the differences between agile and traditional practices may not be realistic (Lee & Xia,

2010). Vinekar and Huntley (2010) suggest traditional methods are often iterative and agile project management may not meet frequently with the customers. Although there is no strong support for agile success factors, the composite factors found in this study collectively support a somewhat mixed view towards agile and traditional project management.

It is interesting to note that the findings from this study tend to confirm a small-scale exploratory study conducted by Fowler and Horan (2007). Results from their study also suggested effective project management, top management support, project personnel skills, and user acceptance were often associated with project success. This is noteworthy since their study also used success factors from the literature, focused on the insights and experience of professionals involved in IT projects, and did not rely solely upon events reported from specific projects.

Discussion of Results: Theoretical Framework

The theoretical framework for this study encompassed elements of organizational theory, coordination theory, and contingency theory as they relate to the philosophy behind the practice of project management and differences between the agile and the traditional plan-based approach to managing IT projects.

Organizational theory in this study centered on examining whether project managers preferred a mechanistic or organic environment for project management. Interestingly, except for two consensus statements among the three composite factors, there were few strong opinions about the importance of the organizational structure for IT project success. As stated previously, the major concerns regarding organizational structure are the importance of a sustained commitment from upper management to

support the project, and the view that an organization with a loosely controlled adaptive management structure was unimportant to project success. As might be expected, project managers loading on the factor associated with traditional project management approach (factor 3) leaned towards statements focused on controlling project work indicating a more mechanistic approach to management. Managers who loaded on the factor aligned with a client involvement focus (factor 2) favored statements associated with stakeholder involvement and a customer focus, which reflected a more organic management style. Finally, project managers loading on the factor with a people-project focus (factor 1), tended to value leadership skills of the project manager and team competency as being important to success, however the distinguishing statements for this factor were nearly all traditional in nature indicating a closer affinity for a mechanistic style. Interestingly, aside from the previously mentioned consensus statements, there was virtually no overlap among project managers loading on the three composite factors with respect to preferences in management style. In general, statements representing critical success factors related to the structure, culture, and decision-making procedures associated with the client organization did not comprise a major emphasis for any of the three composite factors.

Coordination theory proposes people in organizations face coordination problems arising from dependencies that restrict task performance (Crowston, 1997). As this study did not examine specific projects, the application of coordination theory focused on the importance of statements related to activities affecting coordination, such as overall cooperation, communication, and levels of knowledge. The importance of coordination-related statements by factor appears in Table 27. Overall, the results for this sample

indicated, from a critical success factor perspective, statements relating to communication and cooperation were not particularly important for project success. Communication for coordination as a success factor appears to have particular unimportance and is consistent with previous research. According to Espinoza, Lerch, and Kraut (2004), the role of communication in effective coordination can vary from high importance when undertaking complex tasks to less importance for routine tasks or during later stages of projects.

The results from this study pertaining to the role of communication suggest project managers do not view IT projects as relying on complex tasks, where communication is important. Cooperation and support, as would be expected, appears more important for those positively predisposed towards agility than for project managers loading on the other factors (factors 1 and 3). Of the statements associated with coordination activities, only the levels of knowledge among the project team demonstrated to be of some importance to project success. This result is consistent with the work of Faraj and Sproul (2000) who observed coordination of expertise in a team exhibits a strong relationship with team performance above that of administrative coordination. The group with the strongest leaning toward levels of knowledge as important were the participants with a people-project focus (factor 1), knowledge levels appeared somewhat important to those with agile leanings (factor 2) and somewhat unimportant to those project managers with a strong traditional focus. Overall, project manager opinions from this study, did not view the major elements of coordination theory as critical to IT project success.

Table 27

Statements Associated with Coordination Theory

	Factor		
Statement	1	2	3
Cooperation and Support			
1. The project takes place in an organization that has a collaborative work environment exhibiting cross-functional cooperation and support.	0*	2*	1*
2. The management of the organization supports close and continuous involvement of the users and other stakeholders with the project team.	0	2*	1
6. The culture of the organization is supportive and helpful for achieving project goals.	0	1	1
Communication			
5. The organizational culture is people-centric and places a high value on face-to-face communication.	-4*	-2*	-2*
13. The project involves regular and frequent face-to-face communication with all project stakeholders.	-2*	1*	0*
18. There are appropriate formal communications procedures established to share necessary information with all stakeholders of the project.	0	0	-2
20. Project has a formal method for documentation in place to support project reporting.	-2	-2	0
Level of Knowledge			
24. Project team is cross-functional possessing both business and technical knowledge allowing it to communicate and cooperate well inside and outside of the team.	2	2	-1*
29. Project team members possess the required technical skill, expertise, and knowledge	3*	2*	0*
40. The technology involved in the project is such that there are adequate staff available with the required knowledge and expertise.	1*	0*	-1*

* denotes a distinguishing statement among rank loadings

Critical success factors, by their very nature, represent a type of contingent relationship with IT project success. These results supported two different approaches for looking at the importance of critical success factors from the contingency theory perspective. One perspective involves looking at the statements shared by all three factors as representing universal importance for all IT projects. Using this perspective of contingency, IT project success was contingent upon the support of upper management from the client organization for the project and clearly stated and measurable project goals and objectives. This view is consistent with much of the IT project management literature (Hartman & Asharifi, 2002; Young & Jordan, 2008; Gelbard & Carmeli, 2009, Tan, Cater-Steel, & Tolemann, 2009).

A second application of contingency theory involves a close examination of the idealized Q sort for each composite factor. Since, the Q sort grid represents a trend of relative importance for the Q sample one could view the placement of related statements on the grid as indicating a potentially contingent relationship. Thus, for some related statements, the relative importance of critical success factors ranked as +1 and +2 might indicate contingency for the presence of a *related* success factor ranked at +3 or +4. Four interesting relationships arise when examining the placement of certain statements as a representation of contingencies. Table 28 presents four sets of related statements that, due to their relative rankings on the sorting grid, may indicate a potentially contingent relationship. The four areas of critical success factors for which other CSFs may be contingent included commitment from upper management, clearly stated and measurable goals and objectives, user participation leading to a sense of ownership, and the project manager possessing strong project management skills. For example, all three composite

factors held that it is important for the project to have clearly stated and measurable goals and objectives (statement 36). Project managers loading on factors 1 and 3 also indicated importance for initial system requirements for the project to be clear, unambiguous, and obtainable (statement 37), but was not ranked as important as statement 36. When viewed in this way, the criticality of clear system requirements may be contingent upon clear project goals and objectives for project managers loading on factors 1 and 3. Viewing some critical success factors as potentially contingent on one another may help to explain the large number of suspected critical success factors for IT projects. Under this view, the number of critical success factors in the literature may be large because these lists include some related and contingent factors.

Although management of all IT projects include some task coordination and involves a management style, results from this study did not indicate managerial style was critical to success nor were some common features associated with coordination theory. For this study, the only indication of a theoretical perspective important to IT project success was the suggestion that some suspected critical success factors are contingent on the presence of other success factors. These results are consistent with past observations regarding importance of contingency in IT project success (Shenhar & Dvir, 1996; Erno-Kjolhede, 2002; Howell, Windahl, & Siedel, 2009).

Table 28

Possible Contingent Relationships among Q-sorted Statements

Factor	Statement	Potentially Contingent Statement(s)
1,3	There is a sustained commitment from upper management to provide resources, authority, and influence for project success.(7)	The project manager and project team are given the authority over the resources necessary to carry out the strategy for project completion (9)
1,3	The project has clearly stated and measurable goals and objectives (36)	Initial system requirements for the project are clear, unambiguous, and obtainable.(37) The schedule for project completion is detailed and realistic.(38) There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance. (17)
2	The project involves user participation at a level sufficient for developing a sense of ownership (39)	The client organization employs a change approach that minimizes potential resistance and disruption and encourages people throughout the organization to embrace the project. (10) Project involves continuous and close participation of the project customer (internal and external) (34) There is a strong commitment on the part of the project team to serve and involve the project customers in the project. (25) The management of the organization supports close and continuous involvement of the users and other stakeholders with the project team. (2) The project takes place in an organization that has a collaborative work environment exhibiting cross-functional cooperation and support.(1)
3	Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality (27).	The use of strong project management practices used to control the project, set milestones, identify critical paths, and meet delivery dates. (19) The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict. (26)

Statement number for the Q sample is in parentheses

Research Implications

Based upon the results from this study it appears the presence of two success factors were consistent components of the viewpoints expressed by project managers and may represent generally accepted perspectives.

1. There is a sustained commitment from upper management to provide resources, authority, and influence for project success.
2. The project has clearly stated and measurable goals and objectives.

These two critical success factors rated as highly important for all three composite factors found in this study.

In addition to the shared subjective opinions about management support and clearly stated objectives, this study found three composite factors representing critical success factors focused on specific areas of concern. According to the views expressed by project managers' loadings, one composite factor supported the qualities and strengths of the project managers and team as critical to IT project success. A second composite factor clearly conveyed a high a value for close customer participation and support in successful IT projects. Finally, the third composite factor demonstrated a traditional view of project management expressed by a strong belief in the importance of careful planning, scheduling, and monitoring for IT project success.

Rather than looking at these three composite factors as mutually exclusive viewpoints, it may be more useful to consider these subjective assessments of critical success factors as indicative of families of viewpoints within the project management community regarding the most important critical success factors. Thus, from this study

the following additional critical success factors may also play an important role in successful IT projects:

1. The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict.
2. Project team members possess the required technical skill, expertise, and knowledge
3. The project involves continuous and close participation of internal and external project customers
4. Project manager has good project management skills including the ability to monitor and track project scope, time, cost, and quality.

Additionally, a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance was important in the opinions of many project managers, but there was still some question about how possible it is to plan and schedule an IT project at the outset, which is an often-cited concern among agile project management proponents (Nerur, Mahapatra, & Mangalaraj, 2005). However, the viewpoints studied in this research did not advocate relying solely on emergent requirements. In statements justifying the unimportance of detailed planning, the focus appeared not to be on the planning effort, but rather the unwillingness to modify the early plans as the project unfolds, which is another concern agile advocates have with the traditional approach (Ceschi, Sillitti, Succi, & De Panfilis, 2005; Subramanian, Klein, Jiang, & Chan, 2009). It is important to note that statements used in this study did not address how closely to follow an initial plan, simply that a detailed plan was necessary.

Finally, this research indicated project manager opinions do not show widespread support or conviction for agile project management practices as critical to IT project success. In fact, for the most part, the results indicated many features associated with agile management were unimportant to project success. For example, Rajlich (2006) suggested incremental development is at the heart of agile project management, yet the opinions of project managers used in this study indicated incremental development was not important or particularly achievable. Additionally, a focus on responding to changes in the project is one of the four value statements associated with the Agile Manifesto, yet this study did not find process related agile statements that support adapting or planning for changes to be important to project success. The only agile management practice appearing to have support from this study was the importance of including customers and other stakeholders in the project.

Another stated purpose of this research was to use Q methodology to take a fresh look at critical success factors for IT projects based on the accumulated knowledge, experience, and opinions of practicing project managers. The function of Q methodology is not to determine the proportion of project managers representing a given viewpoint, but rather to transform subjective events into operant factors (McKeown & Thomas, 1988). This study used Q methodology to explore the meaning of the very large number of suspected critical success factors found in the literature. During this process, it was interesting to note that one implication from this research approach was that perhaps the meaning of the term *critical success factor* should return to its roots. In one of the first published papers employing a critical success factors approach, Rockart (1979) noted critical success factors were difficult to define and often required subjective assessments.

A few years later, Boynton and Zmud (1984) cautioned practitioners about using critical success factors focused on lower operational activities. The implications from this Q methodology study are in agreement with those early admonitions, since despite the focus on a wide variety of critical success factors for IT project success found in the project management literature, the opinions of practicing project managers suggest there are but a few interrelated factors most important for project success. Furthermore, application of contingency theory to determine relationships among the suspected critical success factors may be helpful in sorting them out.

Implications for Social Change

An improved understanding of which factors contribute to successful IT projects is important to client organizations in order to use technology successfully for improving efficiency and effectiveness. Improving the IT project success rate is also important to the project management community, since a successful project is the goal of every project manager. Additionally, there are the obvious economic advantages related to implementing successful systems and reducing the number of unsuccessful or abandoned projects. These benefits are important to the economic sectors directly influenced by improvements in IT project success rates and can positively influence the greater economy as well. However, there are deeper implications for society in general. Castells (2001) suggests a global economy is in fact an informational economy, where wealth generation relies upon the ability to create and apply new knowledge through the application of information technologies. In an information economy well designed and effective information systems become important to everyone. In his book *Holding On To Reality*, Albert Borgmann (1999) observed as early society moved from an oral tradition

of information to a written form, oral agreements became less meaningful than written agreements. Borgmann extends this trend to a society based upon electronic information, where the data about people stored in information systems begins to define them and shape their actions. This subtle but increasing reliance on information simply enhances the importance of successful IT projects to society.

Recommendation for Action

A major focus of this research was to explore the perceptions of experienced project managers toward critical success factors for IT projects. The role of a project manager in IT project success is very important. Often, there are many tasks, people, and activities to manage. In the flood of activity and demands surrounding the work of a project manager, it may be helpful to stay focused on a core of success factors important for achieving IT project success. The findings of this study suggest a number of applications for action and further research.

The characteristics of the IT project may influence the numbers of critical success factors. Each IT project can have very different technical specifications, purpose, business value, and customers. Additionally, project work can be very intense. Perhaps the research practice of focusing on attributes of the last project implemented for critical success factors gives rise to more potential critical success factors because project managers recall issues critical to that particular project, but not to IT projects in general. Focusing on a smaller set of general critical success factors may help to improve the consistency of post-project performance evaluation. The two general factors and four area specific factors suggested by the results of this study may be a good place to start in order to assess IT project success in general. As the focus narrows, it may also be a good

strategy to investigate how the IT projects dealt with each of these general success factors to get a better idea as to the range of responses to potential problems in these areas.

Online collection of subjective opinion using Q methodology is straightforward and presents a valuable avenue for reaching online and virtual communities of practice. Davis Brand Capital Corporation (2009) has already noted the wide variety of online tools and social media platforms may create new opportunities for developing Q samples. Additionally, this study demonstrated Q methodology might be a useful tool for exploring practitioner views of research results.

Understanding the factors and variables that contribute to IT project success is important to project management practitioners and academia. Publication of these research results can generate discussion among practitioners regarding how suspected critical success factors interrelate in current and past projects. The dissemination of these results to academic journals, professional management journals, and practitioners through organizations with large membership, such as PMI and IPMA, will expand understanding about the categories of success factors that may be important to all types of IT projects and illustrate the utility of Q methodology as another tool for collecting such data.

Future Research

The results from this study generated several topics for future research. The most obvious area is to explore further the role of agile project management techniques in the execution of IT projects. This study found no opinions of compelling support for those techniques, yet agile project management advocates are very adamant in their views of its benefits. Does the apparent lack of support for agile methods represent rejection of the agile concept? Is the average IT project manager aware of the concepts and techniques of

agile project management? These are important issues to understand since different answers lead to vastly different conclusions about the future of agile project management for IT projects.

Another topic of potential research relates to the degree of initial planning that is appropriate for IT projects. One of the composite factors found in this study clearly rejects the idea of detailed early planning, yet does not advocate relying on emergent requirements. A second composite factor reflects the belief that early detailed planning is crucial to project success. In a survey of IT project managers, Misra and Kumar (2009) found the transition from process centered plan-driven software development to short, iterative, test-driven, and people-centric development was one of the most important changes required to include agile methods into traditional software development. More research into the range of structure and details that are acceptable and useful for planning IT projects appears warranted. A related topic is to examine effective ways to adapt and change IT project plans once created, as that appears to be at the heart of agile proponents' objections to detailed advanced planning. Does a structured and detailed plan mean a rigid plan? Is there some level of early planning that is more adaptable to change? What types of plans were present in IT projects that successfully adapted to changes in project specifications or user requirements?

Another implication from this study suggests expanding the use of a contingency theory approach for the examination of large numbers of critical success factors. This would entail the collection of dependencies among the critical success factors in project evaluations. However, since a good portion of project manager training focuses on identifying and accounting for dependencies in sequential activities this type of data may

not be difficult to collect. A further examination of success factor contingencies may help to explain the very large number of critical success factors found in the literature. However, such research must also be mindful of critical success factors for IT projects demonstrating congruent relationships (Drazin & Van de Ven, 1985) characterized by unconditional associations between related tasks for an IT project.

Finally, the large and rich data set collected during this study must not go to waste. The 519 project manager responses represent a valuable source of data for future studies. This data set will support some R methodology studies in addition to supporting more Q analyses. Since this study used only an appropriate randomly selected quantity of the collected data for Q methodology analysis, there is also the potential for this data set to support other graduate research and future publications.

Limitations

This research study extended the understanding of individual beliefs and opinions of practicing project managers about the relative importance of critical success factors for IT projects. Although Chapter 1 presented the limitations of the research method, the way the participant sample unfolded represents another limitation. Many of the participants were volunteers who participated in order to earn a PDU. While this may not affect the quality of the data, there is the possibility that timely completion of the Q sort was more important than having it represent their true subjective opinions based on personal reflection.

With respect to the exclusive use of traditional or agile project management, Boehm (2002) suggested a combined approach is feasible and preferable because unless one views each method from an extreme vantage point, there is considerable common

ground between agile and traditional approaches. More recently, Vinekar and Huntley (2010) found, most agile teams use some upfront design, and most formal methods are iterative. The statements from the literature used in this study represented extremes in differences between the agile and traditional project management practices. However, while that approach to Q sample selection is in keeping with Brown's suggestion that statements within a given category should strive to be very different in order approximate the complexity of the phenomenon under investigation (Brown, 1980, p. 189), it may not have truly reflected what practicing project managers observe.

Finally, since Q methodology is qualitative in nature it does not propose to represent the opinions of all project managers. Thus, these results are not necessarily proportional to opinions in the project manager population, although the data came from a randomly selected sample. This study represented the self-referent subjective opinions about success factors in order to get an improved understanding about how those factors are related. The purpose of this study was not to develop a model of critical success factors for IT projects, but rather to empirically explore the thoughts and beliefs of project managers as operant communicability about the current set of suspected critical success factors found in the literature.

Conclusion

Project managers are responsible for accomplishing project objectives by applying appropriate skills, tools, and techniques to accomplish project work and meet project requirements (PMBOK, 2004). The disappointing rate of success for IT projects over the past two decades indicated the management of IT projects might present different problems than project management for other projects (Taylor, 2004). This

contributed to research emphases focused on new management approaches such as agile project management, and the search for critical success factors as a way of improving success rates. Unfortunately, research on critical success factors created a very large set of suspected success factors, failed to examine how the factors may be related, and may have confused success factors with performance indicators (Freund, 1988; Fortune & White, 2006; Goldfinch, 2007). This Q methodological study focused on helping the project management community make sense of the large numbers of suspected critical success factors by developing a better awareness for the relationship between factors, and exploring the influence of management approach on opinions about critical success factors.

This Q methodology study found the two critical success factors felt to be of high importance to all project managers were a sustained commitment from upper management to provide resources, authority, and influence and the presence of clearly stated and measurable goals and objectives. Additionally, there were three perspectives of critical success factors thought to be important for IT project success characterized by a) a perspective valuing the importance of people involved in project activities, b) a perspective emphasizing the importance of user/client involvement, and c) a perspective encompassing many of the traditional activities and concerns of project management. The composite factors represent beliefs about the importance of some critical success factors based upon the personal and professional experiences of the participating project manager. None of the three composite factors represents the definitive view of critical success factors for IT projects. The value of Q methodology lies in discovering important clusters of opinion (Valenta & Wigger, 1997). The results from this study utilized the

collective insights and experiences of practicing IT project managers and not the recollections of specific projects. Thus, the project management community should look at the viewpoints represented by these three composite factors as indicative of clusters of opinions among project managers.

The findings of this study also demonstrated no widespread acceptance of the principles and activities associated with agile project management as critical for successful IT projects. In fact, except for involvement of the user or customer in the project, none of the statements associated with the core principles of agility ranked as highly important among any of the three perspectives.

The management of IT projects is a complex and dynamic phenomenon. A variety of perceptions and attitudes abound in relation to what is appropriate, desirable, or needed for successful completion of an IT project. The research literature mirrors this diversity of opinion through the presence of such a large number of suspected critical success factors. This study successfully used Q methodology to evaluate and group this set of divergent critical success factors based upon the views of practitioners. The analysis was not concerned with where specific opinions fell, but on discovering patterns of opinion and demonstrated a potentially powerful tool for determining practitioner perspectives about diverse and perhaps conflicting research findings.

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Appendix A

Manifesto for Agile Software Development

We are uncovering better ways of developing software by doing it and helping others do it. Through this work, we have come to value:

Individuals and interactions over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more. (Manifesto for Agile Software Development, 2001)

Appendix B

Principles behind the Agile Manifesto

We follow these principles:

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity--the art of maximizing the amount of work not done--is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

(Principles behind the Agile Manifesto, 2001).

Appendix C

Concourse with References for Selected Q Sample

ac: Agile x Organizational

1. *The project takes place in an organization that has a collaborative work environment exhibiting cross-functional cooperation and support. Collaborative Work Environment*

   Akkermans, H, & van Helden, K. (2002). Vicious and virtuous cycles in ERP implementation: A case study of interrelations between critical success factors. *European Journal of Information Systems, 11*(1), 35–46.

   Kendra, K., & Taplin, L. (2004, Apr). Project success: A cultural framework. *Project Management Journal, 35*(1), 20-45.

   Robertson, S., & Williams, T. (2006, Sep). Understanding project failure: Using cognitive mapping in an insurance project. *Project Management Journal*; *37*(4), 55-71.

   Thamhain, H. (2004, Dec). Team leadership effectiveness in technology-based project environments. *Project Management Journal,* 35(4), 35-46.

2. *The management of the organization supports close and continuous involvement of the users and other stakeholders with the project team (Top Management Support – involvement).*

   Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

   Kearns, G. (2007). How the internal environment impacts information systems project success: An investigation of exploitative and explorative firms. *Journal of Computer Information Systems, 48*(1), 63-75.

   Koch, A. (2005). *Agile software development: Evaluating the methods of your organization.* Norwood: MA, Artech House.

   Meso, P., & Jain, R. (2006, Jun). Agile software development: Adaptive systems principles and best practices. *Information Systems Management, 23*(3), 19-30.

   Sliger, M., & Broderick, S. (2008). *The software project manager's bridge to agility*. Boston, MA: Pearson Education.

Tallon, P. (2008). Inside the adaptive enterprise: an information technology capabilities perspective on business process agility. *Information Technology Management, 9*(1), 21–36.

3. *Organization embraces a loosely controlled adaptive view focused on continuous learning, improvement, and the inevitability of change (Adaptive View towards Change).*

Augustine, S., Payne, B., Sencindiver, F., & Woodcock, S.(2005, Dec). Agile project management: Steering from the edges. *Communications of the ACM, 48*(12), 85-89.

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

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Lindstrom, L., & Jeffries, R. (2004). Extreme programming and agile software development methodologies. *Information Systems Management, 21*(3), 41-52.

Meso, P., & Jain, R. (2006, Jun). Agile software development: Adaptive systems principles and best practices. *Information Systems Management, 23*(3), 19-30.

4. *The organization has a cooperative horizontal business culture (Cooperative horizontal business culture).*

Augustine, S., Payne, B., Sencindiver, F., & Woodcock, S.(2005, Dec). Agile project management: Steering from the edges. *Communications of the ACM, 48*(12), 85-89.

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

Collyer, S., & Warren, C. (2009, May). Project management approaches for dynamic environments. *International Journal of Project Management, 27*(4), 355-364.

Nerur, S., & Balijepally, V. (2007, May). Theoretical reflections on agile development methodologies. *Communications of the ACM, 50*(3), 79-83.

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Vinekar, V., Slinkman, C., & Nerur, S. (2006). Can agile and traditional systems development approaches coexist? An ambidextrous view. *Information Systems Management, 23*(3), 31-42.

5. *The organizational culture is people-centric and places a high value on face-to-face communication (People-oriented Culture)*

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

Nerur, S., & Balijepally, V. (2007, May). Theoretical reflections on agile development methodologies. *Communications of the ACM, 50*(3), 79-83.

Vinekar, V., Slinkman, C., & Nerur, S. (2006). Can agile and traditional systems development approaches coexist? An ambidextrous view. *Information Systems Management, 23*(3), 31-42.

bc: Traditional x Organizational

6. *The culture of the organization is supportive and helpful for achieving project goals (Goal oriented Organizational Culture).*

Chua, A., & Lam, W. (2005). Why KM projects fail: A multi-case analysis. *Journal of Knowledge Management, 9*(3), 6-17.

Cooke- Davies, T., & Arzymanow, A. (2003). The maturity of project management in different industries: An investigation into variations between project management models. *International Journal of Project Management, 21*(6), 471–478.

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Nah, F., Lau, J., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. *Business Process Management Journal*, *7*(3), 285-296.

Somers, T., & Nelson, K. (2001, Sep). *The impact of critical success factors across stages of enterprise resource planning.* Paper presented at the 34th Hawaii International Conference on System Sciences, Honolulu, HI.

7. *There is a sustained commitment from upper management to provide resources, authority, and influence for project success (Top Management Support – influence).*

Akkermans, H, & van Helden, K. (2002). Vicious and virtuous cycles in ERP implementation: A case study of interrelations between critical success factors. *European Journal of Information Systems, 11*(1), 35–46.

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Cox, J., Zmud, R., & Clark, S. (1981). Auditing an MRP system, *Academy of Management Journal, 24*(2), 386-402.

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Pinto, J., & Slevin, D. (1989b). Critical success factors in R&D projects. *Research Technology Management*; *32*(1), 31-35.

Pinto, J., & Prescott, J. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management, 14*(1), 5-18.

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Wixom, B., & Watson, H. (2001, Mar). An empirical investigation of the factors affecting data warehousing success. *MIS Quarterly, 25*(1), 17-41.

8. *There is an organizational commitment to employing the principles of project management or developing a project management capability (Commitment to Project Management),*

Cooke- Davies, T., & Arzymanow, A. (2003). The maturity of project management in different industries: An investigation into variations between project management models. *International Journal of Project Management, 21*(6), 471–478.

Kerzner, H. (1987, Feb). In search of excellence in project management. *Journal of Systems Management,* 38(2), 30-39.

Somers, T., & Nelson, K. (2001, Sep). *The impact of critical success factors across stages of enterprise resource planning.* Paper presented at the 34th Hawaii International Conference on System Sciences, Honolulu, HI.

9. *The project manager and project team are given the authority over the resources necessary to carry out the strategy for project completion (Project Team Authority).*

Baccarini, D., & Collins, A. (2003). Critical success factors for projects, in Brown, A. (Ed.), *Surfing the Waves: Management Challenges; Management Solutions*, Proceedings of the 17th ANZAM Conference, 2-5 December, 2003. Fremantle, Western Australia.

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Pinto, J., & Slevin, D. (1989b). Critical success factors in R&D projects. *Research Technology Management*; *32*(1), 31-35.

10. *The organization employs a change management approach that minimizes potential resistance and disruption and encourages people throughout the organization to embrace the project (Change Management Approach).*

Esteves-Sousa, J., & Pastor-Collado, J. (2000, Nov). *Towards the unification of critical success factors for ERP implementations*. Paper presented at the 10th Annual BIT conference, Manchester, UK.

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ad: Agile x Process

11. Project work follows an adaptive process that manages project requirements through an iterative process of project completion (Adaptive/iterative requirements management).

Augustine, S., Payne, B., Sencindiver, F., & Woodcock, S.(2005, Dec). Agile project management: Steering from the edges. *Communications of the ACM, 48*(12), 85-89.

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Principles behind the Agile Manifesto. (2001). Retrieved from http://agilemanifesto.org/principles.html

12. Project execution and organization delivers the most important features early in the project life cycle (Early Delivery of important features).

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Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

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Principles behind the Agile Manifesto. (2001). Retrieved from http://agilemanifesto.org/principles.html

13. The project involves regular and frequent face-to-face communication with all project stakeholders (Regular and Frequent Communication).

Cao, L., & Ramesh, B. (2008). Agile requirements engineering practices: An empirical study. *IEEE Software, 25*(10), 60-67.

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

Coram, M., & Bohner:, S. (2005, Apr). The impact of agile methods on software project management. *Proceedings of the 12th IEEE International Conference and Workshops on the Engineering of Computer-Based Systems* (pp. 363-370). Greenbelt, MD: IEEE Computer Society.

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Turk, D., France, R., & Rumpe, B. (2005). Assumptions underlying agile software development processes. *Journal of Database Management 16*(4), 62-87.

14. *The project uses a test-driven environment to correct problems and improves integration and adaptability of the work products (Test-Driven Environment).*

Cao, L., & Ramesh, B. (2008). Agile requirements engineering practices: An empirical study. *IEEE Software, 25*(10), 60-67.

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Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005, May). Challenges of migrating to agile methodologies. *Communications of the ACM, 48*(5), 73-78.

15. *Project team, users, and project customers are co-located and have easy and regular access to one another (Co-location of stakeholders).*

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

Cockburn, A. (2002). Agile software development joins the "Would-Be" crowd". *Cutter IT Journal, 15*(1), 6-12.

Fernandez, D., & Fernandez, J. (2008). Agile project management - Agilism versus traditional approaches, *The Journal of Computer Information Systems, 49*(2), 10-17.

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Schuh, P. (2005). *Integrating agile development in the real world.* Hingham: MA, Charles River Media.

bd: Traditional x Process

16. The project employs a formal change management process linked to budget and schedule involving all key stakeholders in the project (Formal Change Management Process).

Baccarini, D., & Collins, A. (2003). Critical success factors for projects, in Brown, A. (ed,), *Surfing the Waves: Management Challenges; Management Solutions*, Proceedings of the 17th ANZAM Conference, 2-5 December, 2003. Fremantle, Western Australia.

Baccarini, D., Salm, G., & Love, P. (2004). Management of risks in information technology projects. *Industrial Management & Data Systems, 104*(4), 286-295.

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Finch, P. (2003, Sep). Applying the Slevin-Pinto project implementation profile to an information systems project. *Project Management Journal, 34*(3), 32-39.

Hyvari, I. (2006, Sep). Success of projects in different organizational conditions. *Project Management Journal, 37*(4), 31-41.

Iacovou, C., & Dexter, A. (2004). Turning around runaway information technology projects. *California Management Review, 46*(4), 68-88.

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Tesch, D., Kloppenborg, T., & Frolick, M. (2007). IT project risk factors: The project management professional’s perspective, *Journal of Computer Information Systems, 47*(4), 61-69.

17. There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance (Detailed Planning Process).

Baccarini, D., & Collins, A. (2003). Critical success factors for projects, in Brown, A. (Ed.), *Surfing the Waves: Management Challenges; Management Solutions*, Proceedings of the 17th ANZAM Conference, 2-5 December, 2003. Fremantle, Western Australia.

Belassi, W., & Tukel, O. (1996, Jun). A new framework for determining critical success/failure factors in projects. *International Journal of Project Management, 14*(3), 141-151.

Clark, A. (1999). A practical use of key success factors to improve the effectiveness of project management. *International Journal of Project Management, 17*(3), 139-145.

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Kanter, J., & Walsh, J. (2004, Spring). Toward more successful project management. *Information Systems Management, 21*(2), 16-21.

Keil, M., Tiwana, A., & Bush, A. (2002). Reconciling user and project manager perceptions of IT project risk: A Delphi study. *Information Systems Journal, 12*(2), 103-119.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Slevin, D., & Pinto, J. (1987). Balancing strategy and tactics in project implementation. *Sloan Management Review*, *29*(1), 33-41.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

18. Project has a formal method for documentation in place to support project reporting (Formal Documentation and Reporting).

Baccarini, D., Salm, G., & Love, P. (2004). Management of risks in information technology projects. *Industrial Management & Data Systems, 104*(4), 286-295.

Cooke-Davies, T. (2002, Apr). The ‘‘real’’ success factors on projects. *International Journal of Project Management, 20*(3), 185–190.

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Kydd, C. (1989, Sep). Understanding the information content in MIS management tools. *MIS Quarterly, 13*(3), 277-290.

19. *The use of strong project management practices to control the project, set milestones, identify critical paths, and meet delivery dates (Strong Project Management Practices).*

Cooke- Davies, T., & Arzymanow, A. (2003). The maturity of project management in different industries: An investigation into variations between project management models. *International Journal of Project Management, 21*(6), 471–478.

Gowan, Jr., J., & Mathieu, R. (2005). The importance of management practices in IS project performance: An empirical study. *The Journal of Enterprise Information Management, 18*(2), 235-255.

Keil, M., Tiwana, A., & Bush, A. (2002). Reconciling user and project manager perceptions of IT project risk: A Delphi study. *Information Systems Journal,12*(2), 103-119.

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Oz, E., & Sosik, J. (2000). Why information systems projects are abandoned: A leadership and communication theory and exploratory study. *The Journal of Computer Information Systems*, *41*(1), 66-78.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

20. *There are appropriate formal communications procedures established to share necessary information with all stakeholders of the project (Formal Communications procedures).*

Anantatmula, V. (2008, Mar). The role of technology in the project manager performance model. *Project Management Journal*, *39*(1), 34-48.

Baccarini, D., & Collins, A. (2003). Critical success factors for projects, in Brown, A. (Ed.), *Surfing the Waves: Management Challenges; Management Solutions*, Proceedings of the 17th ANZAM Conference, 2-5 December, 2003. Fremantle, Western Australia.

Belassi, W., & Tukel, O. (1996, Jun). A new framework for determining critical success/failure factors in projects. *International Journal of Project Management, 14*(3), 141-151.

Clark, A. (1999). A practical use of key success factors to improve the effectiveness of project management. *International Journal of Project Management, 17*(3), 139-145.

Esteves-Sousa, J., & Pastor-Collado, J. (2000, Nov). *Towards the unification of critical success factors for ERP implementations*. Paper presented at the 10th Annual BIT conference, Manchester, UK.

Finch, P. (2003, Sep). Applying the Slevin-Pinto project implementation profile to an information systems project. *Project Management Journal, 34*(3), 32-39.

Iacovou, C., & Dexter, A. (2004). Turning around runaway information technology projects. *California Management Review, 46*(4), 68-88.

Legris, P., & Collerette, P. (2006, Dec). A roadmap for it project implementation: Integrating stakeholders and change management issues. *Project Management Journal, 37*(5), 64-75.

Nah, F., & Delgado, S. (2006). Critical success factors for enterprise resource planning implementation and upgrade. *Journal of Computer Information Systems, 47*(Special Issue), 99-113.

Nah, F., Lau, J., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. *Business Process Management Journal*, 7(3), 285-296.

Oz, E., & Sosik, J. (2000). Why information systems projects are abandoned: A leadership and communication theory and exploratory study. *The Journal of Computer Information Systems*, *41*(1), 66-78.

Pinto, J., & Prescott, J. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management, 14*(1), 5-18.

Reich, B. (2007, Jun). Managing knowledge and learning in IT projects: A conceptual framework and guidelines for practice. *Project Management Journal, 38*(2), 5-17.

Slevin, D., & Pinto, J. (1987). Balancing strategy and tactics in project implementation. *Sloan Management Review*, *29*(1), 33-41.

Thamhain, H. (2004, Dec). Team leadership effectiveness in technology-based project environments. *Project Management Journal,* 35(4), 35-46.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

ae: Agile x People

21. The project manager employs an adaptive management style for leading the team that depends upon collaboration rather than command and control (Adaptive Leadership Style).

Augustine, S., Payne, B., Sencindiver, F., & Woodcock, S.(2005, Dec). Agile project management: Steering from the edges. *Communications of the ACM, 48*(12), 85-89.

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

Collyer, S., & Warren, C. (2009, May). Project management approaches for dynamic environments. *International Journal of Project Management, 27*(4), 355-364.

Dyba, T., & Dingsoyr, T. (2009, Sep). What do we know about agile software development? *IEEE Software, 26*(5), 6-9.

Haas, K. (2007, May). Tips & techniques: The blending of traditional and agile project management. *PM World Today, 9*(5). Retrieved from http://www.pmworldtoday.net/tips/2007/may.htm#5

Highsmith, J., & Cockburn, A. (2001). Agile software development: The people factor. *Computer, 34*(11), 131-133.

Meso, P., & Jain, R. (2006, Jun). Agile software development: Adaptive systems principles and best practices. *Information Systems Management, 23*(3), 19-30.

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005, May). Challenges of migrating to agile methodologies. *Communications of the ACM, 48*(5), 73-78.

Vinekar, V., Slinkman, C., & Nerur, S. (2006). Can agile and traditional systems development approaches coexist? An ambidextrous view. *Information Systems Management, 23*(3), 31-42.

22. The project team is self-organizing changing configuration and work patterns as the project progresses (Self-Organizing Teams).

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

Koch, A. (2005). *Agile software development: Evaluating the methods of your organization.* Norwood: MA, Artech House.

Meso, P., & Jain, R. (2006, Jun). Agile software development: Adaptive systems principles and best practices. *Information Systems Management, 23*(3), 19-30.

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005, May). Challenges of migrating to agile methodologies. *Communications of the ACM, 48*(5), 73-78.

Principles behind the Agile Manifesto. (2001). Retrieved from http://agilemanifesto.org/principles.html

23. A major focus of team effectiveness is on the individual competency of team members trusting individuals to apply their competency in effective ways (Team Competency and Trust)

Beecham, S., Sharp, H., Baddoo, N., Hall, T., & Robinson, H. (2007, Aug). Does the XP environment meet the motivational needs of the software developer? An empirical study. In *Proceedings Agile 2007* (pp. 26–36). Washington D.C.: IEEE Computer Society.

Koch, A. (2005). *Agile software development: Evaluating the methods of your organization.* Norwood: MA, Artech House.

Highsmith, J., & Cockburn, A. (2001). Agile software development: The people factor. *Computer, 34*(11), 131-133.

Larsen, D. (2007, Aug). The first thing to build: Leveraging trust on agile teams. Paper Presented at *Agile 2007 Conference*, Washington, D.C.

Robinson, H. & Sharp, H. (2005). The social side of technical practices. In *Proceedings of the Sixth International Conference on Extreme Programming and Agile Processes in Software Engineering.* Sheffield, UK: Springer Verlag.

Whitworth, E., & Biddle, R. (2007). The social nature of agile teams. In *Proceedings Agile 2007* (pp. 26–36). Washington D.C.: IEEE Computer Society.

24. Project team is cross-functional possessing both business and technical knowledge allowing it to communicate and cooperate well inside and outside of the team (Cross-Functional Team)

Abrahamson, P., Salo, O., Ronkainen, J., & Warsta, J. (2002), *Agile software development methods: Review and Analysis* (VTT Publications 478). Oulu, Finland: VTT Information Service.

Akkermans, H, & van Helden, K. (2002). Vicious and virtuous cycles in ERP implementation: A case study of interrelations between critical success factors. *European Journal of Information Systems, 11*(1), 35–46.

Biehl, M. (2007, Jan). Success factors for implementing global information systems. *Communications of the ACM, 50*(1), 53-58.

Chau, T., & Maurer, F. (2004). Knowledge sharing in agile software teams. In W. Lenski (Ed.): *Logic versus Approximation (pp. 173-183). Lecture Notes in Computer Science Series, Vol. 3075*. New York: Springer-Verlag

Kendra, K., & Taplin, L. (2004, Apr). Project success: A cultural framework. *Project Management Journal, 35*(1), 20-45.

Nah, F., Lau, J., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. *Business Process Management Journal*, 7(3), 285-296.

25. There is a strong commitment on the part of the project team to serve and involve the project customers in the project (Close Customer Team Relationship)

Chow, T., & Cao, D. (2008). A survey study of critical success factors in agile software projects. *The Journal of Systems and Software 81*(6), 961–971.

Highsmith, J., & Cockburn, A. (2001). Agile software development: The business of innovation. *Computer, 34*(9), 120-122.

Koch, A. (2005). *Agile software development: Evaluating the methods of your organization.* Norwood: MA, Artech House.

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005, May). Challenges of migrating to agile methodologies. *Communications of the ACM, 48*(5), 73-78.

Schuh, P. (2005). *Integrating agile development in the real world.* Hingham: MA, Charles River Media.

Vinekar, V., Slinkman, C., & Nerur, S. (2006). Can agile and traditional systems development approaches coexist? An ambidextrous view. *Information Systems Management, 23*(3), 31-42.

be: Traditional x People

26. The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict (Project Manager Interpersonal Skills).

Baccarini, D., & Collins, A. (2003). Critical success factors for projects, in Brown, A. (Ed.), *Surfing the Waves: Management Challenges; Management Solutions*, Proceedings of the 17th ANZAM Conference, 2-5 December, 2003. Fremantle, Western Australia.

Hyvari, I. (2006, Sep). Success of projects in different organizational conditions. *Project Management Journal, 37*(4), 31-41.

Iacovou, C., & Dexter, A. (2004). Turning around runaway information technology projects. *California Management Review, 46*(4), 68-88.

Keil, M., Tiwana, A., & Bush, A. (2002). Reconciling user and project manager perceptions of IT project risk: A Delphi study. *Information Systems Journal, 12*(2), 103-119.

Kendra, K., & Taplin, L. (2004, Apr). Project success: A cultural framework. *Project Management Journal, 35*(1), 20-45.

Pinto, J., & Prescott, J. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management, 14*(1), 5-18.

Pinto, J., & Slevin, D. (1989b). Critical success factors in R&D projects. *Research Technology Management*; *32*(1), 31-35.

Slevin, D., & Pinto, J. (1987). Balancing strategy and tactics in project implementation. *Sloan Management Review*, *29*(1), 33-41.

Summer, M., Bock, D., & Giamartino, G. (2006). Exploring the linkage between the characteristics of IT project leaders and project success. *Information Systems Management, 23*(4), 43-49.

Thamhain, H. (2004, Dec). Team leadership effectiveness in technology-based project environments. *Project Management Journal,* 35(4), 35-46.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

27. Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality (Project Management Skills).

Emam, K., & Koru, A. (2008). A replicated survey of IT software project failures. *IEEE Software*, *25*(5), 84-90.

Hyvari, I. (2006, Sep). Success of projects in different organizational conditions. *Project Management Journal, 37*(4), 31-41.

Kendra, K., & Taplin, L. (2004, Apr). Project success: A cultural framework. *Project Management Journal, 35*(1), 20-45.

Pinto, J., & Slevin, D. (1989b). Critical success factors in R&D projects. *Research Technology Management*; *32*(1), 31-35.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Summer, M., Bock, D., & Giamartino, G. (2006). Exploring the linkage between the characteristics of IT project leaders and project success. *Information Systems Management, 23*(4), 43-49.

28. Project team is loyal to the project and possesses a high level of commitment (Project Team Commitment).

Esteves-Sousa, J., & Pastor-Collado, J. (2000, Nov). *Towards the unification of critical success factors for ERP implementations*. Paper presented at the 10th Annual BIT conference, Manchester, UK.

Fowler, J., & Horan, P. (2007). Are information systems' success and failure factors related? An exploratory study. *Journal of Organizational and End User Computing, 19*(2), 1-22.

Lee, L., & Anderson, R. (2006). An exploratory investigation of the antecedents of the IT project management capability. *e-Service Journal, 5*(1), 27-42.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

29. Project team members possess the required technical skill, expertise, and knowledge (Team Technical Expertise)

Chua, A., & Lam, W. (2005). Why KM projects fail: A multi-case analysis. *Journal of Knowledge Management, 9*(3), 6-17.

Emam, K., & Koru, A. (2008). A replicated survey of IT software project failures. *IEEE Software*, *25*(5), 84-90.

Fowler, J., & Horan, P. (2007). Are information systems' success and failure factors related? An exploratory study. *Journal of Organizational and End User Computing, 19*(2), 1-22.

Keil M., Cule P., Lyytinen, K., & Schmidt R. (1998, Nov).Against all odds: a new framework for identifying and managing software project risks, *Communications for the ACM*, *41*(11), 77-83.

Keil, M., Tiwana, A., & Bush, A. (2002). Reconciling user and project manager perceptions of IT project risk: A Delphi study. *Information Systems Journal,12*(2), 103-119.

Reich, B. (2007, Jun). Managing knowledge and learning in IT projects: A conceptual framework and guidelines for practice. *Project Management Journal, 38*(2), 5-17.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Somers, T., & Nelson, K. (2001, Sep). *The impact of critical success factors across stages of enterprise resource planning.* Paper presented at the 34th Hawaii International Conference on System Sciences, Honolulu, HI.

30. Users are cooperative and have a positive attitude towards the project .(Users Attitude).

Cox, J., Zmud, R., & Clark, S. (1981). Auditing an MRP system, *Academy of Management Journal, 24*(2), 386-402.

Keil M., Cule P., Lyytinen, K., & Schmidt R. (1998, Nov).Against all odds: a new framework for identifying and managing software project risks, *Communications for the ACM*, *41*(11), 77-83.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

af: Agile x Project

31. Project focus is on the early and continuous delivery of incremental business value throughout the project (Rapid/Early Delivery of Value)

Cao, L., & Ramesh, B. (2008). Agile requirements engineering practices: An empirical study. *IEEE Software, 25*(10), 60-67.

Fernandez, D., & Fernandez, J. (2008). Agile project management - Agilism versus traditional approaches, *The Journal of Computer Information Systems, 49*(2), 10-17.

Meso, P., & Jain, R. (2006, Jun). Agile software development: Adaptive systems principles and best practices. *Information Systems Management, 23*(3), 19-30.

Principles behind the Agile Manifesto. (2001). Retrieved from http://agilemanifesto.org/principles.html

Schuh, P. (2005). *Integrating agile development in the real world.* Hingham: MA, Charles River Media.

32. There is an understanding that project requirements emerge as the project work unfolds (Emergent Requirements)

Boehm, B. (2002, Jan). Get ready for agile methods with care. *Computer, 35*(1), 64-69.

Cao, L., & Ramesh, B. (2008). Agile requirements engineering practices: An empirical study. *IEEE Software, 25*(10), 60-67.

Dyba, T., & Dingsoyr, T. (2009, Sep). What do we know about agile software development? *IEEE Software, 26*(5), 6-9.

Meso, P., & Jain, R. (2006, Jun). Agile software development: Adaptive systems principles and best practices. *Information Systems Management, 23*(3), 19-30.

Nerur, S., & Balijepally, V. (2007, May). Theoretical reflections on agile development methodologies. *Communications of the ACM, 50*(3), 79-83.

33. The schedule for the project is incremental and fluid within the constraints of the final deadline (Fluid Project Schedule).

Boehm, B., & Turner, R. (2003). *Balancing agility and discipline: A guide for the perplexed*, Boston: Addison-Wesley.

Ceschi, M., Sillitti, A., Succi, G., & De Panfilis, S. (2005). Project management in plan-based and agile companies. *IEEE Software, 22*(3), 21-27.

Collyer, S., & Warren, C. (2009, May). Project management approaches for dynamic environments. *International Journal of Project Management, 27*(4), 355-364.

Haas, K. (2007, May). Tips & techniques: The blending of traditional and agile project management. *PM World Today, 9*(5). Retrieved from http://www.pmworldtoday.net/tips/2007/may.htm#5

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005, May). Challenges of migrating to agile methodologies. *Communications of the ACM, 48*(5), 73-78.

Rajlich, V. (2006). Changing the paradigm of software engineering. *Communications of the ACM, 49*(8), 67-70.

Rising, L., & Janoff, N. (2000). The Scrum software development process for small teams. *IIIE Software, 17*(4), 26-32.

Vinekar, V., Slinkman, C., & Nerur, S. (2006). Can agile and traditional systems development approaches coexist? An ambidextrous view. *Information Systems Management, 23*(3), 31-42.

34. Project involves continuous and close participation of the project customer (internal or external) (Customer Involvement).

Boehm, B., & Turner, R. (2003). *Balancing agility and discipline: A guide for the perplexed*, Boston: Addison-Wesley.

Ceschi, M., Sillitti, A., Succi, G., & De Panfilis, S. (2005). Project management in plan-based and agile companies. *IEEE Software, 22*(3), 21-27.

Lindstrom, L., & Jeffries, R. (2004). Extreme programming and agile software development methodologies. *Information Systems Management, 21*(3), 41-52.

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005, May). Challenges of migrating to agile methodologies. *Communications of the ACM, 48*(5), 73-78.

Rumpe, B., & Schroder, A. (2002, May).Quantitative survey on extreme programming projects. In *Proceedings of the Third International Conference on Extreme Programming and Flexible Processes in Software Engineering (XP2002)* (pp. 95-100). Alghero, Italy.

35. Project focus is on the continuous delivery of incremental business value throughout (Continuous and incremental business value)

Abrahamson, P., Salo, O., Ronkainen, J., & Warsta, J. (2002), *Agile software development methods: Review and Analysis* (VTT Publications 478). Oulu, Finland: VTT Information Service.

Ceschi, M., Sillitti, A., Succi, G., & De Panfilis, S. (2005). Project management in plan-based and agile companies. *IEEE Software, 22*(3), 21-27.

Cockburn, A. (2002). Agile software development joins the "Would-Be" crowd". *Cutter IT Journal, 15*(1), 6-12.

Fernandez, D., & Fernandez, J. (2008). Agile project management - Agilism versus traditional approaches, *The Journal of Computer Information Systems, 49*(2), 10-17.

Guntamukkala, V., Wen, H., & Tarn, J. (2006). An empirical study of selecting software development life cycle models. *Journal of Human Systems Management, 25*(4), 265-278.

Meso, P., & Jain, R. (2006, Jun). Agile software development: Adaptive systems principles and best practices. *Information Systems Management, 23*(3), 19-30.

Schuh, P. (2005). *Integrating agile development in the real world.* Hingham: MA, Charles River Media.

bf: Traditional x Project

36. The project has clearly stated and measurable goals and objectives (Clearly Stated Goals).

Akkermans, H, & van Helden, K. (2002). Vicious and virtuous cycles in ERP implementation: A case study of interrelations between critical success factors. *European Journal of Information Systems, 11*(1), 35–46.

Al-Mashari, M., Al-Mudimigh, A., & Zairi, M. (2003, Apr). Enterprise resource planning: A taxonomy of critical factors. *European Journal of Operational Research, 146*(2), 352–364

Baccarini, D., & Collins, A. (2003). Critical success factors for projects, in Brown, A. (Ed.), *Surfing the Waves: Management Challenges; Management Solutions*, Proceedings of the 17th ANZAM Conference, 2-5 December, 2003. Fremantle, Western Australia.

Belassi, W., & Tukel, O. (1996, Jun). A new framework for determining critical success/failure factors in projects. *International Journal of Project Management, 14*(3), 141-151.

Fortune, J., & White, D. (2006, Jan). Framing of project critical success factors by a systems model. *International Journal of Project Management, 24*(1), 53–65.

Hyvari, I. (2006, Sep). Success of projects in different organizational conditions. *Project Management Journal, 37*(4), 31-41.

Nah, F., & Delgado, S. (2006). Critical success factors for enterprise resource planning implementation and upgrade. *Journal of Computer Information Systems, 47*(Special Issue), 99-113.

Pinto, J., & Prescott, J. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management, 14*(1), 5-18.

Poon, P., & Wagner, C. (2001), Critical success factors revisited: Success and failure cases of information systems for senior executives. *Decision Support Systems, 30*(3), 393-418.

Slevin, D., & Pinto, J. (1987). Balancing strategy and tactics in project implementation. *Sloan Management Review*, *29*(1), 33-41.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

37. Initial system requirements for the project are clear, unambiguous, and obtainable (Clear and Unambiguous Requirements).

Baccarini, D., & Collins, A. (2003). Critical success factors for projects, in Brown, A. (Ed.), *Surfing the Waves: Management Challenges; Management Solutions*, Proceedings of the 17th ANZAM Conference, 2-5 December, 2003. Fremantle, Western Australia.

Baccarini, D., Salm, G., & Love, P. (2004). Management of risks in information technology projects. *Industrial Management & Data Systems, 104*(4), 286-295.

Fairley, R., & Willshire, M. (2003). Why the Vasa sank: 10 problems and some antidotes for software projects. *IEEE Software, 20*(2), 18-25.

Johnson, J., Boucher, K., Connors, K., & Robinson, J. (2001, February 26). Project management: The criteria for success. *Software Magazine*. Retrieved from http://www.softwaremag.com/archive/2001feb/collaborativemgt.html

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

38. The schedule for project completion is detailed and realistic (Detailed Schedule).

Fairley, R., & Willshire, M. (2003). Why the Vasa sank: 10 problems and some antidotes for software projects. *IEEE Software, 20*(2), 18-25.

Fortune, J., & White, D. (2006, Jan). Framing of project critical success factors by a systems model. *International Journal of Project Management, 24*(1), 53–65.

Pinto, J., & Prescott, J. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management, 14*(1), 5-18.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Slevin, D., & Pinto, J. (1987). Balancing strategy and tactics in project implementation. *Sloan Management Review*, *29*(1), 33-41.

39. The project involves user participation at a level sufficient for developing a sense of ownership (User Involvement).

Chua, A., & Lam, W. (2005). Why KM projects fail: A multi-case analysis. *Journal of Knowledge Management, 9*(3), 6-17.

Emam, K., & Koru, A. (2008). A replicated survey of IT software project failures. *IEEE Software*, *25*(5), 84-90.

Hyvari, I. (2006, Sep). Success of projects in different organizational conditions. *Project Management Journal, 37*(4), 31-41.

Keil M., Cule P., Lyytinen, K., & Schmidt R. (1998, Nov).Against all odds: a new framework for identifying and managing software project risks, *Communications for the ACM*, *41*(11), 77-83.

Johnson, J., Boucher, K., Connors, K., & Robinson, J. (2001, February 26). Project management: The criteria for success. *Software Magazine*. Retrieved from http://www.softwaremag.com/archive/2001feb/collaborativemgt.html

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Wallace, L., & Keil, M. (2004, Apr). Software project risks and their effect on outcomes. *Communication of the ACM, 47*(4), 68-73.

40. The technology involved in the project is such that there are adequate staff available with the required knowledge and expertise (Availability of Required Technical Expertise).

Pinto, J., & Prescott, J. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management, 14*(1), 5-18.

Pinto, J., & Slevin, D. (1989b). Critical success factors in R&D projects. *Research Technology Management*; *32*(1), 31-35.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of Management Information Systems, 17*(4), 5-36.

Slevin, D., & Pinto, J. (1987). Balancing strategy and tactics in project implementation. *Sloan Management Review*, *29*(1), 33-41.

Tesch, D., Kloppenborg, T., & Frolick, M. (2007). IT project risk factors: The project management professionals perspective. *Journal of Computer Information Systems, 47*(4), 61-69.

Appendix D

Q Sort Statements and Demographic Survey

The following statements were randomly presented to each participant for sorting.

Matrix Interaction	Descriptor	Statement
1: Agile x Organizational	Collaborative Work Environment	The project takes place in an organization that has a collaborative work environment exhibiting cross-functional cooperation and support.
2: Agile x Organizational	Top Management Support - involvement	The management of the organization supports close and continuous involvement of the users and other stakeholders with the project team.
3: Agile x Organizational	Adaptive View towards Change	Organization embraces a loosely controlled adaptive view focused on continuous learning, improvement, and the inevitability of change.
4: Agile x Organizational	Cooperative Horizontal Business Culture	The organization has a cooperative horizontal business culture
5: Agile x Organizational	People-oriented Culture	The organizational culture is people-centric and places a high value on face-to-face communication.
6: Traditional x Organizational	Goal oriented Organizational Culture	The culture of the organization is supportive and helpful for achieving project goals.
7: Traditional x Organizational	Top Management Support - influence	There is a sustained commitment from upper management to provide resources, authority, and influence for project success.
8: Traditional x Organizational	Commitment to Project Management	There is an organizational commitment to employing the principles of project management or developing a project management capability.
9: Traditional x Organizational	Project Team Authority	The project manager and project team are given the authority over the resources necessary to carry out the strategy for project completion.
10: Traditional x Organizational	Change Management Approach	The organization employs a change management approach that minimizes potential resistance and disruption and encourages people throughout the organization to embrace the project.
11: Agile x Process	Adaptive/iterative requirements management	Project work follows an adaptive process that manages project requirements through an iterative process of project completion.
12: Agile x Process	Early Delivery of Important features	Project execution and organization delivers the most important features early in the project life cycle.
13: Agile x Process	Regular and Frequent Communication	The project involves regular and frequent face-to-face communication with all project stakeholders.

Matrix Interaction	Descriptor	Statement
14: Agile x Process	Test-Driven Environment	The project uses a test-driven environment to correct problems and improves integration and adaptability of the work products.
15: Agile x Process	Co-Location of staff and stakeholder	Project team, users, and project customers are co-located and have easy and regular access to one another.
16: Traditional x Process	Formal Change Management process	The project employs a formal change management process linked to budget and schedule involving all key stakeholders in the project.
17: Traditional x Process	Detailed Planning Process	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance
18: Traditional x Process	Formal Communications Procedures	There are appropriate formal communications procedures established to share necessary information with all stakeholders of the project.
19: Traditional x Process	Strong Project Management Practices	The use of strong project management practices used to control the project, set milestones, identify critical paths, and meet delivery dates.
20: Traditional x Process	Formal Documentation and Reporting	Project has a formal method for documentation in place to support project reporting.
21: Agile x People	Adaptive Leadership style	The project manager employs an adaptive management style for leading the team that depends upon collaboration rather than command and control.
22: Agile x People	Self-Organizing Teams	The project team is self-organizing changing configuration and work patterns as the project progresses.
23: Agile x People	Team Competency and Trust	A major focus of team effectiveness is on the individual competency of team members trusting individuals to apply their competency in effective ways
24: Agile x People	Cross-Functional Team	Project team is cross-functional possessing both business and technical knowledge allowing it to communicate and cooperate well inside and outside of the team.
25: Agile x People	Close Team-Customer Relationship	There is a strong commitment on the part of the project team to serve and involve the project customers in the project.
26: Traditional x People	Project Manager Interpersonal Skills	The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict.
27: Traditional x People	Project Management Skills	Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality.

Matrix Interaction	Descriptor	Statement
28: Traditional x People	Project Team Commitment	Project team is loyal to the project and possesses a high level of commitment
29: Traditional x People	Team Technical Expertise	Project team members possess the required technical skill, expertise, and knowledge.
30: Traditional x People	Users Attitude	Users are cooperative and have a positive attitude towards the project.
31: Agile x Project	Rapid/Early Delivery of value	The focus of the project is to develop early business value.
32: Agile x Project	Emergent Requirements	There is an understanding that project requirements emerge as the project work unfolds.
33: Agile x Project	Fluid Project Schedule	The schedule for the project is incremental and fluid within the constraints of the final deadline.
34: Agile x Project	Customer Involvement	Project involves continuous and close participation of the project customer (internal or external)
35: Agile x Project	Continuous and incremental business value	Project focus is on the continuous delivery of incremental business value throughout.
36: Traditional x Project	Clearly Stated Goals	The project has clearly stated and measurable goals and objectives.
37: Traditional x Project	Clear and Unambiguous Requirements	Initial system requirements for the project are clear, unambiguous, and obtainable.
38: Traditional x Project	Detailed Schedule	The schedule for project completion is detailed and realistic
39: Traditional x Project	User Involvement	The project involves user participation at a level sufficient for developing a sense of ownership
40: Traditional x Project	Availability of Required Technical Expertise	The technology involved in the project is such that there are adequate staff available with the required knowledge and expertise.

At the conclusion of the Q-Sorting, the participants completed the following demographic survey

What is your age in years? _____

What is your gender?

____ Female
____ Male

Over your professional career, approximately how many years have you been working on IT projects?
_____

Approximately how many IT projects have you been involved with in your career?

_____ Fewer than 5 projects
_____ 5 to 10 projects
_____ 10 to 20 projects
_____ 20 to 50 projects
_____ More than 50

Please estimate the percentage of your experience with IT projects you have spent leading the project?

_____ Zero
_____ Less than 10%
_____ 10 to 25%
_____ 26 to 50%
_____ 51- to 75 %
_____ Over 75%

What types of IT projects have you worked on? (Check all that apply)

_____	Manufacturing and Production systems	_____	Executive information systems
_____	Sales and Marketing systems	_____	Communication systems
_____	Finance & Accounting Systems	_____	Groupware systems
_____	Human Resources systems	_____	Knowledge Management systems
_____	Decision support systems	_____	Enterprise Resource Planning systems
_____	Management information systems	_____	Other

General Comments - regarding the survey, the software, or any other issues/observations

PMI members - To earn one PDU in this study
Please provide your name in the text area below, then contact Dhiraj Bellara, PDU Coordinator at dhiraj.bellara@cedge.in
NOTE: This information is stored separately and NOT with your responses. It will be sent to PMI as verification for your PDU

Appendix E

Informed Consent

You are invited to take part in a research study exploring the insights and opinions of project managers about the large number of suspected critical success factors for IT projects. You were chosen for the study because of your membership in an organization concerned with IT projects and you have lead or worked on IT projects during your professional career. Your point of view is an important contribution towards understanding how your practical insights and experiences align with research findings about critical success factors for IT projects.

Please read this form and feel free to ask any questions (via email) before agreeing to be a part of this study. Your participation is purely voluntary and you may decline participation at any point during the data collection process. Your signature on this form is not required because no personal identifiers are collected; however, you should print and keep a copy of this form for your records.

The researcher for this study is Michael J. Doherty, a doctoral student at Walden University.

Background Information:
Over the past decade, two of the more prevalent research approaches used for explaining IT project success or failure have been the search for critical success factors and the impact of management approach. The purpose of this study is to use viewpoints of practicing project managers to explore the connection between research findings from those two approaches.

Procedures:
Once you begin the online data collection you must continue until completion, there is **no way** to stop mid-survey and pick up where you left off at another time. Participation in the study will require about 30-35 minutes of your time.
If you agree to participate in this study, you will:

- Read the instructions for using the data collection software *(3 minutes)*
- Be presented with a list of 40 virtual index cards, each card containing one statement about a suspected success factor for IT projects. As you read the cards you will arrange them into three stacks: a stack for statements you feel are important factors, a stack for statements you feel represent unimportant factors, and a stack for statements about which you are neutral. *(this task normally takes about 8 minutes)*
- Rank order the cards according to your opinion about the relative importance or unimportance of each statement and place them onto a grid from left to right ranging from "unimportant" to "important" (*approximately 12 minutes)*

- Indicate briefly why you selected the statements you feel are most important and most unimportant *(5-7 minutes)*
- Complete a brief questionnaire asking for general demographic and professional experience information *(3-5 minutes)*

Voluntary Nature of the Study:
Your participation in this study is voluntary. You may remain anonymous and are not required to provide your name or place of employment. If you do provide your name, your identity will be kept completely confidential and no personally identifying information will be stored with the data collected for this study. No one will know whether you declined to participate or withdrew during the data collection process. If you decide to begin the study, you can change your mind and stop at any time prior to submitting your data.

Risks and Benefits of Being in the Study:
Though minimal, the risks of participating in this study may include anxiety created by

- unfamiliarity with the statement sorting process used in Q methodology
- strong personal feelings about the statements
- the length of time it takes to sort the statements

Benefits by participating in this study are that you may

- help to develop a better understanding of what managers of IT projects think and believe about critical success factors
- afford a more comprehensive view of critical success factors
- provide a foundation for developing successful strategies to improve IT project success.

You will also have the satisfaction of knowing you contributed to a pioneer research project that helps to explore how research findings align with practice.

Compensation:
There is no direct compensation provided for participating in this research study. However, if you are a member of the Information Systems Special Interest Group of PMI you are eligible to earn one Professional Development Unit (PDU) for participation. In that case you must provide your name, which will be stored separate from your data on another server. The list of names will be reported to the PDU coordinator for IS-SIG at the end of the data collection period for this study (February 28, 2011).

Confidentiality:
All information you provide will be kept confidential and your identity (should you choose to provide it) will remain separate from you data throughout the study. The research does not require that you provide personally identifying information nor will the researcher use the information you provide for any purposes outside of this research

project. Neither your name nor any other information that could personally identify you will be used in any reports from the study.

Contacts and Questions:
The researcher's name is Michael J. Doherty. The researcher's faculty advisor is Dr. Anthony Lolas. If you have questions, you may contact the researcher by phone at 920-923-8742 (work) or via email mdohe001@waldenu.edu. You may also contact his faculty advisor at anthony.lolas@waldenu.edu. If you want to talk privately about your rights as a participant, you may call Dr. Leilani Endicott, the Walden University representative who can discuss this with you. Her phone number is 1-800-925-3368, extension 1210.

Walden University's approval number for this study is IRB is **11-18-0299548** which expires on **November 17, 2011**.

I have read the above information and feel I understand the study well enough to make a decision about my involvement.
(By participating in this study, you agree that you are at least 18 years of age and that your consent is implied.)

I **AGREE** to participate in this study	I **DECLINE** to participate in this study
Agree	Decline

Note: Clicking on the Agree button will begin the data collection process.
If you are not ready to take the survey at this time, simply use the back button on your browser to return to the home page

Appendix F

IRB Approval

The Walden University Institutional Review Board officially approved the methodology for this study on November 18, 2010. The IRB approval number was 11-18-10-0299548. The expiration date for this approval was November 17, 2011.

Appendix G

Correlation Matrix between Q Sorts

Correlation Matrix between Sorts

		Q Sort									
No	ID	1	2	3	4	5	6	7	8	9	10
1	8009	100	32	3	43	35	53	1	51	46	41
2	8218	32	100	5	24	51	62	9	53	49	49
3	9024	3	5	100	4	17	18	6	8	21	3
4	9215	43	24	4	100	35	36	1	33	39	50
5	10020	35	51	17	35	100	65	10	39	35	49
6	10038	53	62	18	36	65	100	13	60	52	38
7	12221	1	9	6	1	10	13	100	8	4	5
8	13122	51	53	8	33	39	60	8	100	45	39
9	13210	46	49	21	39	35	52	4	45	100	54
10	14031	41	49	3	50	49	38	5	39	54	100
11	14057	26	31	18	26	45	64	7	54	38	15
12	14100	40	45	13	41	14	44	36	55	58	35
13	14171	27	24	14	21	25	20	15	15	9	39
14	15062	11	29	26	18	33	37	8	16	4	24
15	15076	6	4	4	10	6	18	9	8	14	29
16	15105	38	32	36	27	38	48	3	30	35	54
17	15142	37	42	16	28	32	65	7	42	55	30
18	16031	29	36	21	29	48	61	8	57	54	35
19	16048	26	18	31	41	41	33	1	32	36	44
20	16049	39	36	0	23	21	42	16	34	48	20
21	16056	41	48	3	38	31	44	12	58	45	37
22	16087	36	45	32	39	45	51	3	54	43	36
23	17007	34	31	15	35	41	26	19	25	42	30
24	17042	63	43	12	46	54	59	4	62	49	45
25	17055	55	53	14	51	39	59	3	69	57	50
26	17194	25	27	2	24	35	39	16	26	26	9
27	17204	42	21	19	31	37	48	4	35	32	45
28	18040	32	32	13	6	35	40	3	31	27	26
29	18064	33	42	21	30	40	47	4	71	42	51
30	18072	34	26	36	5	43	35	13	23	14	6
31	18108	52	49	12	21	50	59	6	49	59	29
32	18158	43	23	21	5	32	59	1	45	38	24
33	19018	34	14	31	6	9	34	8	29	44	18
34	19024	44	29	16	33	20	54	6	54	50	40
35	19096	36	19	15	32	28	32	21	40	53	49
36	20053	44	43	37	30	46	56	3	62	45	49
37	20064	3	5	31	21	5	5	2	8	11	9
38	20070	33	42	18	32	39	64	5	52	59	40
39	20150	38	39	32	32	34	45	12	50	48	40
40	20184	49	20	20	19	24	26	23	50	36	19
41	21005	54	49	25	42	62	61	12	64	57	54
42	21042	41	49	14	35	49	59	5	59	47	34
43	21116	35	45	20	45	58	68	1	61	46	47
44	22015	32	32	6	3	41	48	23	55	42	21
45	22056	45	51	8	45	57	63	9	52	52	50
46	22059	31	41	12	43	39	32	17	47	35	51
47	22061	1	3	11	2	14	5	5	25	4	2
48	22068	44	49	1	36	26	67	6	54	58	44
49	22075	41	38	23	39	11	47	1	42	39	19
50	22079	17	13	29	8	22	18	18	26	6	4
51	24012	15	5	36	22	28	16	11	31	11	17
52	24169	18	32	4	16	23	6	6	1	9	9
53	24176	9	30	27	20	16	27	35	22	9	29
54	25107	52	55	6	35	56	64	14	61	61	49
55	26113	21	19	22	34	20	24	32	33	25	38
56	27084	62	28	23	49	32	44	2	43	35	39
57	29182	36	8	2	59	15	24	3	37	37	34
58	1401A	49	36	31	50	51	49	3	60	49	62
59	2002A	6	9	33	14	10	1	4	1	14	35
60	2206B	24	18	13	21	23	35	8	44	22	10

(table continues)

		Q Sort									
No	ID	11	12	13	14	15	16	17	18	19	20
1	8009	26	40	27	11	6	38	37	29	26	39
2	8218	31	45	24	29	4	32	42	36	18	36
3	9024	18	13	14	26	4	36	16	21	31	0
4	9215	26	41	21	18	10	27	28	29	41	23
5	10020	45	14	25	33	6	38	32	48	41	21
6	10038	64	44	20	37	18	48	65	61	33	42
7	12221	7	36	15	8	9	3	7	8	1	16
8	13122	54	55	15	16	8	30	42	57	32	34
9	13210	38	58	9	4	14	35	55	54	36	48
10	14031	15	35	39	24	29	54	30	35	44	20
11	14057	100	28	2	6	3	21	50	57	14	12
12	14100	28	100	11	8	4	20	56	58	24	42
13	14171	2	11	100	24	39	32	31	6	16	1
14	15062	6	8	24	100	30	47	34	14	15	24
15	15076	3	4	39	30	100	31	21	12	3	7
16	15105	21	20	32	47	31	100	32	38	35	32
17	15142	50	56	31	34	21	32	100	56	10	44
18	16031	57	58	6	14	12	38	56	100	36	44
19	16048	14	24	16	15	3	35	10	36	100	12
20	16049	12	42	1	24	7	32	44	44	12	100
21	16056	42	26	12	30	18	43	30	22	26	22
22	16087	50	28	11	24	28	36	44	37	41	31
23	17007	25	37	27	7	5	15	46	35	34	37
24	17042	54	48	26	14	6	30	47	55	54	35
25	17055	44	50	33	36	17	42	63	55	24	48
26	17194	43	16	12	29	11	19	31	18	16	14
27	17204	37	38	22	29	32	44	37	45	22	5
28	18040	31	25	30	3	6	15	29	31	23	22
29	18064	45	36	15	14	18	52	40	48	46	14
30	18072	36	12	12	9	29	18	15	28	31	6
31	18108	48	49	18	22	4	32	47	62	25	39
32	18158	35	45	7	24	7	35	45	51	25	35
33	19018	29	21	5	4	11	44	25	30	27	35
34	19024	37	46	11	27	33	48	55	53	14	27
35	19096	32	45	21	21	22	39	45	62	34	32
36	20053	52	48	39	35	16	54	60	61	37	26
37	20064	2	8	38	27	44	9	22	5	2	14
38	20070	61	47	15	15	16	34	62	62	23	23
39	20150	42	48	36	13	4	41	50	45	34	23
40	20184	19	49	15	4	18	32	36	46	24	41
41	21005	55	48	14	19	9	55	45	62	47	42
42	21042	44	36	19	39	11	48	35	44	43	28
43	21116	59	52	34	19	9	35	51	65	46	21
44	22015	44	32	1	21	22	16	41	31	31	36
45	22056	46	49	23	38	1	38	52	58	45	36
46	22059	21	24	36	29	13	29	20	29	24	37
47	22061	14	12	25	5	7	12	1	18	15	24
48	22068	48	56	5	12	18	40	52	45	34	36
49	22075	29	47	6	17	1	37	49	38	36	39
50	22079	4	28	24	37	9	12	39	6	21	14
51	24012	3	23	10	44	10	28	25	39	47	24
52	24169	0	14	37	6	36	17	27	4	4	16
53	24176	9	3	64	29	39	41	17	2	24	4
54	25107	59	41	16	28	0	41	48	59	22	38
55	26113	21	4	11	3	0	41	8	25	46	22
56	27084	18	36	19	24	6	46	35	44	36	29
57	29182	15	45	9	16	7	19	33	42	38	25
58	1401A	45	31	20	31	3	56	44	46	56	26
59	2002A	1	11	51	6	31	36	29	14	31	14
60	2206B	42	36	21	24	4	13	45	45	8	22

(table continues)

		Q Sort									
No	ID	21	22	23	24	25	26	27	28	29	30
1	8009	41	36	34	63	55	25	42	32	33	34
2	8218	48	45	31	43	53	27	21	32	42	26
3	9024	3	32	15	12	14	2	19	13	21	36
4	9215	38	39	35	46	51	24	31	6	30	5
5	10020	31	45	41	54	39	35	37	35	40	43
6	10038	44	51	26	59	59	39	48	40	47	35
7	12221	12	3	19	4	3	16	4	3	4	13
8	13122	58	54	25	62	69	26	35	31	71	23
9	13210	45	43	42	49	57	26	32	27	42	14
10	14031	37	36	30	45	50	9	45	26	51	6
11	14057	42	50	25	54	44	43	37	31	45	36
12	14100	26	28	37	48	50	16	38	25	36	12
13	14171	12	11	27	26	33	12	22	30	15	12
14	15062	30	24	7	14	36	29	29	3	14	9
15	15076	18	28	5	6	17	11	32	6	18	29
16	15105	43	36	15	30	42	19	44	15	52	18
17	15142	30	44	46	47	63	31	37	29	40	15
18	16031	22	37	35	55	55	18	45	31	48	28
19	16048	26	41	34	54	24	16	22	23	46	31
20	16049	22	31	37	35	48	14	5	22	14	6
21	16056	100	69	15	41	64	36	11	18	65	41
22	16087	69	100	36	55	69	38	5	24	53	46
23	17007	15	36	100	53	36	32	8	32	26	22
24	17042	41	55	53	100	58	48	28	54	56	52
25	17055	64	69	36	58	100	34	28	24	54	25
26	17194	36	38	32	48	34	100	4	23	40	38
27	17204	11	5	8	28	28	4	100	13	29	8
28	18040	18	24	32	54	24	23	13	100	34	44
29	18064	65	53	26	56	54	40	29	34	100	34
30	18072	41	46	22	52	25	38	8	44	34	100
31	18108	29	29	34	53	47	39	49	31	44	43
32	18158	36	43	18	35	54	12	25	24	36	32
33	19018	30	37	3	22	34	1	17	23	23	25
34	19024	32	22	9	25	59	6	56	7	42	5
35	19096	22	45	45	41	58	2	51	8	23	11
36	20053	50	56	36	62	62	27	55	25	54	37
37	20064	24	13	18	5	20	2	28	17	6	20
38	20070	49	55	32	34	55	5	35	31	35	20
39	20150	36	42	45	56	48	19	39	39	58	29
40	20184	15	37	43	39	43	5	22	26	38	15
41	21005	64	63	36	55	62	33	50	34	65	46
42	21042	44	39	34	52	48	52	25	27	54	34
43	21116	35	46	29	70	61	48	36	40	66	41
44	22015	50	42	31	47	36	39	15	38	57	44
45	22056	59	54	46	62	55	45	36	41	55	32
46	22059	61	39	23	38	54	32	16	40	41	8
47	22061	24	4	1	10	21	18	2	5	21	3
48	22068	43	44	9	55	53	19	37	30	46	16
49	22075	30	39	35	48	37	43	18	39	44	21
50	22079	1	23	45	28	18	24	1	13	19	7
51	24012	2	28	25	24	28	14	24	14	26	15
52	24169	6	15	8	2	4	4	34	5	2	14
53	24176	26	19	11	24	32	28	4	14	26	2
54	25107	55	58	34	59	60	30	35	42	46	21
55	26113	44	39	11	45	33	26	7	31	60	25
56	27084	35	44	26	47	57	31	31	12	47	38
57	29182	31	41	18	52	61	30	22	7	35	9
58	1401A	49	67	36	59	66	27	34	18	65	24
59	2002A	11	16	13	4	23	4	22	9	26	6
60	2206B	33	28	34	31	42	37	28	30	35	23

(table continues)

		Q Sort									
No	ID	31	32	33	34	35	36	37	38	39	40
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2	8218	49	23	14	29	19	43	5	42	39	20
3	9024	12	21	31	16	15	37	31	18	32	20
4	9215	21	5	6	33	32	30	21	32	32	19
5	10020	50	32	9	20	28	46	5	39	34	24
6	10038	59	59	34	54	32	56	5	64	45	26
7	12221	6	1	8	6	21	3	2	5	12	23
8	13122	49	45	29	54	40	62	8	52	50	50
9	13210	59	38	44	50	53	45	11	59	48	36
10	14031	29	24	18	40	49	49	9	40	40	19
11	14057	48	35	29	37	32	52	2	61	42	19
12	14100	49	45	21	46	45	48	8	47	48	49
13	14171	18	7	5	11	21	39	38	15	36	15
14	15062	22	24	4	27	21	35	27	15	13	4
15	15076	4	7	11	33	22	16	44	16	4	18
16	15105	32	35	44	48	39	54	9	34	41	32
17	15142	47	45	25	55	45	60	22	62	50	36
18	16031	62	51	30	53	62	61	5	62	45	46
19	16048	25	25	27	14	34	37	2	23	34	24
20	16049	39	35	35	27	32	26	14	23	23	41
21	16056	29	36	30	32	22	50	24	49	36	15
22	16087	29	43	37	22	45	56	13	55	42	37
23	17007	34	18	3	9	45	36	18	32	45	43
24	17042	53	35	22	25	41	62	5	34	56	39
25	17055	47	54	34	59	58	62	20	55	48	43
26	17194	39	12	1	6	2	27	2	5	19	5
27	17204	49	25	17	56	51	55	28	35	39	22
28	18040	31	24	23	7	8	25	17	31	39	26
29	18064	44	36	23	42	23	54	6	35	58	38
30	18072	43	32	25	5	11	37	20	20	29	15
31	18108	100	33	18	47	39	45	5	37	54	48
32	18158	33	100	42	51	36	39	2	49	30	44
33	19018	18	42	100	41	18	35	11	47	27	24
34	19024	47	51	41	100	42	44	38	59	52	45
35	19096	39	36	18	42	100	65	16	56	31	45
36	20053	45	39	35	44	65	100	11	64	52	34
37	20064	5	2	11	38	16	11	100	6	31	21
38	20070	37	49	47	59	56	64	6	100	46	29
39	20150	54	30	27	52	31	52	31	46	100	52
40	20184	48	44	24	45	45	34	21	29	52	100
41	21005	58	44	54	44	49	68	7	62	54	41
42	21042	42	37	45	39	14	41	15	34	35	22
43	21116	65	44	21	39	30	58	12	42	53	33
44	22015	51	42	21	14	11	32	19	27	34	22
45	22056	48	49	15	34	44	63	16	56	46	22
46	22059	21	15	14	19	23	43	14	35	31	4
47	22061	15	9	21	5	2	9	15	1	17	9
48	22068	34	49	49	54	24	43	1	46	47	33
49	22075	31	24	33	28	19	31	2	32	38	32
50	22079	21	22	2	19	10	19	43	14	47	44
51	24012	19	28	31	25	34	28	25	19	24	31
52	24169	5	8	25	36	14	18	35	16	13	10
53	24176	5	4	1	16	4	41	45	16	35	1
54	25107	56	47	22	41	50	54	15	61	48	45
55	26113	5	8	31	11	5	34	23	16	25	5
56	27084	50	32	28	55	35	38	24	30	42	45
57	29182	18	25	24	35	39	35	9	21	26	18
58	1401A	41	38	38	45	55	65	21	52	55	44
59	2002A	9	2	12	25	37	38	35	21	31	7
60	2206B	48	26	5	18	34	39	0	38	33	16

(table continues)

		Q Sort									
No	ID	41	42	43	44	45	46	47	48	49	50
1	8009	54	41	35	32	45	31	1	44	41	17
2	8218	49	49	45	32	51	41	3	49	38	13
3	9024	25	14	20	6	8	12	11	1	23	29
4	9215	42	35	45	3	45	43	2	36	39	8
5	10020	62	49	58	41	57	39	14	26	11	22
6	10038	61	59	68	48	63	32	5	67	47	18
7	12221	12	5	1	23	9	17	5	6	1	18
8	13122	64	59	61	55	52	47	25	54	42	26
9	13210	57	47	46	42	52	35	4	58	39	6
10	14031	54	34	47	21	50	51	2	44	19	4
11	14057	55	44	59	44	46	21	14	48	29	4
12	14100	48	36	52	32	49	24	12	56	47	28
13	14171	14	19	34	1	23	36	25	5	6	24
14	15062	19	39	19	21	38	29	5	12	17	37
15	15076	9	11	9	22	1	13	7	18	1	9
16	15105	55	48	35	16	38	29	12	40	37	12
17	15142	45	35	51	41	52	20	1	52	49	39
18	16031	62	44	65	31	58	29	18	45	38	6
19	16048	47	43	46	31	45	24	15	34	36	21
20	16049	42	28	21	36	36	37	24	36	39	14
21	16056	64	44	35	50	59	61	24	43	30	1
22	16087	63	39	46	42	54	39	4	44	39	23
23	17007	36	34	29	31	46	23	1	9	35	45
24	17042	55	52	70	47	62	38	10	55	48	28
25	17055	62	48	61	36	55	54	21	53	37	18
26	17194	33	52	48	39	45	32	18	19	43	24
27	17204	50	25	36	15	36	16	2	37	18	1
28	18040	34	27	40	38	41	40	5	30	39	13
29	18064	65	54	66	57	55	41	21	46	44	19
30	18072	46	34	41	44	32	8	3	16	21	7
31	18108	58	42	65	51	48	21	15	34	31	21
32	18158	44	37	44	42	49	15	9	49	24	22
33	19018	54	45	21	21	15	14	21	49	33	2
34	19024	44	39	39	14	34	19	5	54	28	19
35	19096	49	14	30	11	44	23	2	24	19	10
36	20053	68	41	58	32	63	43	9	43	31	19
37	20064	7	15	12	19	16	14	15	1	2	43
38	20070	62	34	42	27	56	35	1	46	32	14
39	20150	54	35	53	34	46	31	17	47	38	47
40	20184	41	22	33	22	22	4	9	33	32	44
41	21005	100	52	58	52	64	54	26	48	41	12
42	21042	52	100	55	46	48	32	24	42	55	31
43	21116	58	55	100	46	56	35	0	50	33	22
44	22015	52	46	46	100	39	25	15	34	22	26
45	22056	64	48	56	39	100	72	2	41	49	23
46	22059	54	32	35	25	72	100	26	25	24	4
47	22061	26	24	0	15	2	26	100	4	2	22
48	22068	48	42	50	34	41	25	4	100	45	1
49	22075	41	55	33	22	49	24	2	45	100	34
50	22079	12	31	22	26	23	4	22	1	34	100
51	24012	35	46	25	19	31	19	10	1	43	49
52	24169	0	13	3	21	4	4	10	15	29	11
53	24176	7	31	33	1	15	31	7	22	14	16
54	25107	57	39	50	38	72	56	5	54	35	11
55	26113	37	34	40	12	39	48	28	29	45	14
56	27084	51	46	46	11	40	24	0	38	52	21
57	29182	40	38	44	4	42	36	24	33	43	10
58	1401A	68	49	61	38	45	32	6	38	37	34
59	2002A	15	1	16	9	12	11	14	21	8	8
60	2206B	42	22	43	48	52	43	6	1	32	20

(table continues)

		Q Sort									
No	ID	51	52	53	54	55	56	57	58	59	60
1	8009	15	18	9	52	21	62	36	49	6	24
2	8218	5	32	30	55	19	28	8	36	9	18
3	9024	36	4	27	6	22	23	2	31	33	13
4	9215	22	16	20	35	34	49	59	50	14	21
5	10020	28	23	16	56	20	32	15	51	10	23
6	10038	16	6	27	64	24	44	24	49	1	35
7	12221	11	6	35	14	32	2	3	3	4	8
8	13122	31	1	22	61	33	43	37	60	1	44
9	13210	11	9	9	61	25	35	37	49	14	22
10	14031	17	9	29	49	38	39	34	62	35	10
11	14057	3	0	9	59	21	18	15	45	1	42
12	14100	23	14	3	41	4	36	45	31	11	36
13	14171	10	37	64	16	11	19	9	20	51	21
14	15062	44	6	29	28	3	24	16	31	6	24
15	15076	10	36	39	0	0	6	7	3	31	4
16	15105	28	17	41	41	41	46	19	56	36	13
17	15142	25	27	17	48	8	35	33	44	29	45
18	16031	39	4	2	59	25	44	42	46	14	45
19	16048	47	4	24	22	46	36	38	56	31	8
20	16049	24	16	4	38	22	29	25	26	14	22
21	16056	2	6	26	55	44	35	31	49	11	33
22	16087	28	15	19	58	39	44	41	67	16	28
23	17007	25	8	11	34	11	26	18	36	13	34
24	17042	24	2	24	59	45	47	52	59	4	31
25	17055	28	4	32	60	33	57	61	66	23	42
26	17194	14	4	28	30	26	31	30	27	4	37
27	17204	24	34	4	35	7	31	22	34	22	28
28	18040	14	5	14	42	31	12	7	18	9	30
29	18064	26	2	26	46	60	47	35	65	26	35
30	18072	15	14	2	21	25	38	9	24	6	23
31	18108	19	5	5	56	5	50	18	41	9	48
32	18158	28	8	4	47	8	32	25	38	2	26
33	19018	31	25	1	22	31	28	24	38	12	5
34	19024	25	36	16	41	11	55	35	45	25	18
35	19096	34	14	4	50	5	35	39	55	37	34
36	20053	28	18	41	54	34	38	35	65	38	39
37	20064	25	35	45	15	23	24	9	21	35	0
38	20070	19	16	16	61	16	30	21	52	21	38
39	20150	24	13	35	48	25	42	26	55	31	33
40	20184	31	10	1	45	5	45	18	44	7	16
41	21005	35	0	7	57	37	51	40	68	15	42
42	21042	46	13	31	39	34	46	38	49	1	22
43	21116	25	3	33	50	40	46	44	61	16	43
44	22015	19	21	1	38	12	11	4	38	9	48
45	22056	31	4	15	72	39	40	42	45	12	52
46	22059	19	4	31	56	48	24	36	32	11	43
47	22061	10	10	7	5	28	0	24	6	14	6
48	22068	1	15	22	54	29	38	33	38	21	1
49	22075	43	29	14	35	45	52	43	37	8	32
50	22079	49	11	16	11	14	21	10	34	8	20
51	24012	100	31	9	15	18	42	48	45	8	34
52	24169	31	100	14	8	5	28	30	2	49	4
53	24176	9	14	100	12	37	18	5	31	47	0
54	25107	15	8	12	100	26	30	19	52	8	49
55	26113	18	5	37	26	100	42	36	49	18	6
56	27084	42	28	18	30	42	100	56	51	20	16
57	29182	48	30	5	19	36	56	100	49	19	14
58	1401A	45	2	31	52	49	51	49	100	18	26
59	2002A	8	49	47	8	18	20	19	18	100	2
60	2206B	34	4	0	49	6	16	14	26	2	100

Appendix H

Unrotated Factor Matrix

		Unrotated Factor							
	ID	1	2	3	4	5	6	7	8
1	8009	0.6387	-0.0369	-0.1169	-0.0568	0.0816	-0.1621	-0.1315	-0.2076
2	8218	0.6040	-0.2166	0.0937	-0.0720	-0.3710	-0.0341	-0.0490	-0.1758
3	9024	0.2467	0.2902	0.1507	0.4633	0.1701	0.5831	-0.0064	0.1536
4	9215	0.5376	0.1610	0.1448	-0.1480	0.1388	-0.4669	-0.0286	0.0392
5	10020	0.6228	-0.1784	0.1561	0.1700	-0.2679	0.0706	0.1168	0.1851
6	10038	0.7918	-0.1069	-0.0392	-0.0632	-0.2693	0.2087	0.1310	-0.2433
7	12221	0.0091	0.0101	-0.5541	0.1018	0.1924	-0.1318	-0.0022	0.2125
8	13122	0.7712	-0.1444	-0.0700	-0.0455	0.0294	0.0112	0.0282	-0.0425
9	13210	0.6985	-0.0765	-0.2052	-0.3212	-0.0330	-0.1624	-0.1648	-0.0760
10	14031	0.6187	0.2168	0.1977	-0.2700	-0.0863	-0.1643	-0.1740	0.2279
11	14057	0.6166	-0.2387	-0.0964	-0.0195	-0.1971	0.2789	0.0039	-0.0113
12	14100	0.6231	0.0400	-0.4796	-0.0744	-0.0117	-0.2958	-0.1156	-0.1294
13	14171	0.3185	0.5033	0.3397	0.1799	-0.3858	-0.1953	-0.1725	0.0033
14	15062	0.3632	0.2421	0.1677	0.1701	-0.1933	0.0590	0.6336	0.0547
15	15076	0.0904	0.6214	0.0824	-0.3299	-0.3101	0.0362	0.3023	-0.0848
16	15105	0.6014	0.2937	0.2139	-0.1206	0.0796	0.2795	0.0958	0.0301
17	15142	0.6914	0.1713	-0.2766	0.0371	-0.2068	-0.0201	0.0989	-0.1331
18	16031	0.7314	-0.0153	-0.2894	-0.0850	-0.0054	0.0965	0.0603	0.1597
19	16048	0.5248	0.0950	0.2410	0.1962	0.3234	-0.0111	-0.2152	0.1589
20	16049	0.4814	-0.1809	-0.2572	-0.1288	0.1119	-0.1846	0.2269	-0.0865
21	16056	0.6369	-0.2974	0.3185	-0.2153	0.0414	0.0540	0.0061	0.0759
22	16087	0.7018	-0.2276	0.1593	0.0902	0.1788	0.0944	-0.1093	0.2001
23	17007	0.5012	-0.0108	-0.1301	0.3916	-0.0623	-0.3596	-0.1292	0.1658
24	17042	0.7787	-0.1822	0.1014	0.1556	0.0388	-0.1803	-0.1820	-0.0941
25	17055	0.8153	0.0682	0.0172	-0.1567	-0.0028	-0.1066	0.1089	0.0427
26	17194	0.4412	-0.2666	0.3235	0.2865	-0.0853	-0.2164	0.2715	-0.2349
27	17204	0.5006	0.3509	-0.2261	-0.1586	-0.2067	0.1581	0.0661	0.1081
28	18040	0.4519	-0.2309	0.0889	0.1464	-0.1412	-0.0154	-0.1803	-0.1837
29	18064	0.7265	-0.1354	0.2388	0.0506	0.1639	0.1048	-0.1357	0.0001
30	18072	0.4253	-0.3687	0.1769	0.3678	0.0696	0.2922	-0.1423	-0.0089
31	18108	0.6731	-0.1383	-0.2845	0.1717	-0.2433	0.0216	-0.0506	-0.1041

(table continues)

		Unrotated Factor							
	ID	1	2	3	4	5	6	7	8
32	18158	0.5793	-0.0977	-0.2930	-0.0490	0.0581	0.3161	0.1360	-0.0477
33	19018	0.4407	0.0303	-0.0927	-0.2465	0.4287	0.4481	0.0156	-0.1711
34	19024	0.6133	0.3874	-0.3168	-0.2946	0.0133	0.1939	0.0768	-0.1723
35	19096	0.5882	0.2682	-0.2992	-0.1250	0.0029	-0.0747	-0.0583	0.5269
36	20053	0.7797	0.1694	0.0741	-0.0249	-0.1150	0.1725	-0.0464	0.2546
37	20064	0.1017	0.7465	-0.0703	0.2932	-0.1604	-0.0083	0.1325	-0.1394
38	20070	0.6879	0.0604	-0.2033	-0.2256	-0.1485	0.2171	-0.0618	0.1630
39	20150	0.6845	0.1775	-0.0356	0.2236	-0.0936	0.0503	-0.3296	-0.1138
40	20184	0.5198	0.0954	-0.4470	0.2179	0.1848	-0.0156	-0.2858	-0.0304
41	21005	0.8328	-0.1561	-0.0095	-0.0750	0.1313	0.1378	-0.0154	0.2116
42	21042	0.6792	-0.0372	0.1460	0.1190	0.1236	0.0308	0.3085	-0.3104
43	21116	0.7691	-0.0431	0.0976	0.1358	-0.1276	0.0122	-0.0779	-0.0750
44	22015	0.5404	-0.4521	-0.0971	0.2395	-0.0772	0.1202	0.0807	-0.0082
45	22056	0.7787	-0.1638	0.1130	-0.0132	-0.1286	-0.2020	0.0855	0.1493
46	22059	0.5495	-0.1271	0.3969	-0.2686	-0.1301	-0.3404	0.1564	0.1948
47	22061	0.1110	-0.2636	0.1641	-0.3242	0.2446	0.0642	0.4992	0.0878
48	22068	0.6521	0.0034	-0.0703	-0.3711	0.0090	0.1409	-0.1851	-0.4086
49	22075	0.5863	0.0191	0.0060	0.1287	0.3155	-0.1740	0.0811	-0.3884
50	22079	0.3107	0.2289	-0.1860	0.6927	0.0300	-0.1214	0.1128	-0.1372
51	24012	0.4148	0.2553	-0.0925	0.3628	0.4534	-0.0561	0.4339	0.1775
52	24169	0.1064	0.6609	-0.0506	-0.1230	0.2227	-0.0817	0.0035	-0.2183
53	24176	0.3046	0.4250	0.6090	0.0658	-0.2964	0.0452	-0.1024	-0.1940
54	25107	0.7483	-0.2434	-0.0662	-0.1758	-0.2750	-0.0539	-0.0178	0.0858
55	26113	0.4421	-0.1092	0.6163	-0.1608	0.3912	0.0071	-0.1300	-0.0443
56	27084	0.6323	0.1915	0.0357	0.0674	0.3638	-0.0975	-0.0228	-0.1806
57	29182	0.5211	0.1580	0.0564	-0.1562	0.4748	-0.3870	0.1433	0.0076
58	1401A	0.7693	0.1141	0.1192	0.0756	0.2065	0.0628	-0.0491	0.2059
59	2002A	0.2148	0.6620	0.2136	-0.0520	0.0561	0.0808	-0.2945	0.2100
60	2206B	0.4880	-0.1590	-0.1326	0.2332	-0.2419	-0.1483	0.2484	0.2665
Eigenvalues		20.2118	4.3408	3.3546	2.8806	2.6444	2.2794	2.0636	1.9279
% expl.Var.		34	7	6	5	4	4	3	3

Eigenvalue = Sum of squares of factor loadings for each factor
The explained variance equals the eignevalue divided by the number of variates (q-sorts, i.e. 60)

Appendix I

Differences between Normalized Factor Scores

Descending Array of Differences Between Factors 1 and 2

No.	Statement (Abbreviated)	Factor 1	Factor 2	Difference
38	Schedule for prj completion is detailed and realistic	1.218	-1.517	2.735
37	Initial sys req for the prj are clear, unambig	1.11	-0.998	2.109
17	Detailed prj planning w/ well-defined estimates	0.478	-1.55	2.028
19	Use strong project management practices to control prj	0.41	-1.33	1.739
27	PM has good prj mgmt skill track scope, time, cost & qual	1.322	-0.276	1.597
9	PM & team given the authority over the necessary resources	1.457	0.107	1.35
33	Schedule for prj is incremental and fluid	-0.351	-1.386	1.035
26	PM interpersonal skills build trust and resolve conflict	1.503	0.712	0.791
23	Focus of team effectiveness is on the individual competency	-0.194	-0.969	0.775
21	PM employs adaptive management style for leading team	0.141	-0.447	0.588
36	Prj has clearly stated and measurable goals and objectives	1.882	1.33	0.552
28	Team is loyal to the prj and has high level of commitment.	0.462	0.018	0.444
29	Team has required tech skill, expertise, and knowledge	1.35	0.915	0.435
40	Adequate staff with the req knowledge and expertise	0.544	0.115	0.43
30	Users are cooperative & have positive attitude towards prj	0.219	-0.209	0.427
18	Formal comm procedures established to share information	0.058	-0.195	0.253
4	Client org has a cooperative horizontal business culture	-1.428	-1.667	0.239
22	Team is self-organizing; changing config as prj progresses	-0.833	-1.063	0.231
20	Prj has formal method for documentation & prj reporting	-0.976	-1.168	0.192
7	Commitment from upper mgmt to provide resources for prj succ	1.786	1.688	0.097
3	Org embraces a loosely controlled adaptive view	-1.324	-1.419	0.095
14	Uses a test-driven environment to correct problems	0.014	-0.036	0.051
8	Org commitment to principles of prj mgmt or capability	-0.387	-0.437	0.05
6	Culture of org supportive & helpful for achieving prj goals	0.015	0.253	-0.238
24	Prj team is x-functional has business and tech knowledge	0.677	0.954	-0.278
5	Org culture is people-centric and values f2f comm	-1.839	-1.367	-0.472
16	Prj uses formal chg mgmt proc linked to budget and sched	-0.358	0.125	-0.484
32	Understand prj requirements emerge as the prj work unfolds	-0.081	0.417	-0.498
11	Project work uses adaptive process that is iterative	-0.27	0.242	-0.512
25	Team commitment to serve and involve the prj customers	0.42	0.949	-0.529
34	Continuous and close participation of the prj customer	0.645	1.419	-0.774
1	Collaborative work environment X-functional coop & support	-0.66	0.336	-0.996
15	Team, users, and customers are co-located	-1.02	-0.02	-1
12	Delivers the most imp features early in the project	-1.45	-0.408	-1.042
2	Close & continuous involvement usrs, stkhldrs team	-0.209	1.047	-1.255
39	Prj has User participation developing a sense of ownership	0.324	1.769	-1.445
10	Org employs change mgmt approach minimizes and encourages	-0.358	1.381	-1.739
13	Regular and frequent f2f comm w/ all prj stakeholders	-1.166	0.898	-2.064
35	Prj focus is on continuous delivery of incremental bus val	-1.322	0.771	-2.093
31	Focus of the prj is to develop early business value	-1.808	1.014	-2.822

Descending Array of Differences Between Factors 1 and 3

No.	Statement (Abbreviated)	Factor 1	Factor 3	Difference
29	Team has required tech skill, expertise, and knowledge	1.35	0.093	1.257
32	Understand prj requirements emerge as the prj work unfolds	-0.081	-1.329	1.249
24	Prj team is x-functional has business and tech knowledge	0.677	-0.456	1.133
33	Schedule for prj is incremental and fluid	-0.351	-1.479	1.128
40	Adequate staff with the req knowledge and expertise	0.544	-0.486	1.031
11	Project work uses adaptive process that is iterative	-0.27	-1.182	0.912
23	Focus of team effectiveness is on the individual competency	-0.194	-0.964	0.769
37	Initial sys req for the prj are clear, unambig	1.11	0.385	0.725
14	Uses a test-driven environment to correct problems	0.014	-0.645	0.66
34	Continuous and close participation of the prj customer	0.645	0.027	0.618
21	PM employs adaptive management style for leading team	0.141	-0.464	0.606
26	PM interpersonal skills build trust and resolve conflict	1.503	0.968	0.535
7	Commitment from upper mgmt to provide resources for prj succ	1.786	1.38	0.406
30	Users are cooperative & have positive attitude towards prj	0.219	-0.176	0.395
15	Team, users, and customers are co-located	-1.02	-1.377	0.357
22	Team is self-organizing; changing config as prj progresses	-0.833	-1.136	0.303
9	PM & team given the authority over the necessary resources	1.457	1.158	0.299
3	Org embraces a loosely controlled adaptive view	-1.324	-1.61	0.286
39	Prj has User participation developing a sense of ownership	0.324	0.128	0.196
28	Team is loyal to the prj and has high level of commitment.	0.462	0.305	0.158
1	Collaborative work environment X-functional coop & support	-0.66	-0.766	0.106
38	Schedule for prj completion is detailed and realistic	1.218	1.178	0.04
25	Team commitment to serve and involve the prj customers	0.42	0.441	-0.021
4	Client org has a cooperative horizontal business culture	-1.428	-1.085	-0.343
36	Prj has clearly stated and measurable goals and objectives	1.882	2.311	-0.429
6	Culture of org supportive & helpful for achieving prj goals	0.015	0.516	-0.501
10	Org employs change mgmt approach minimizes and encourages	-0.358	0.149	-0.507
12	Delivers the most imp features early in the project	-1.45	-0.928	-0.522
27	PM has good prj mgmt skill track scope, time, cost & qual	1.322	1.891	-0.569
31	Focus of the prj is to develop early business value	-1.808	-1.061	-0.748
20	Prj has formal method for documentation & prj reporting	-0.976	-0.192	-0.784
17	Detailed prj planning w/ well-defined estimates	0.478	1.291	-0.813
2	Close & continuous involvement usrs, stkhldrs team	-0.209	0.634	-0.842
18	Formal comm procedures established to share information	0.058	0.925	-0.867
19	Use strong project management practices to control prj	0.41	1.314	-0.904
5	Org culture is people-centric and values f2f comm	-1.839	-0.932	-0.907
13	Regular and frequent f2f comm w/ all prj stakeholders	-1.166	-0.178	-0.988
16	Prj uses formal chg mgmt proc linked to budget and sched	-0.358	0.706	-1.064
35	Prj focus is on continuous delivery of incremental bus val	-1.322	-0.199	-1.123
8	Org commitment to principles of prj mgmt or capability	-0.387	0.848	-1.235

Descending Array of Differences Between Factors 2 and 3

No.	Statement (Abbreviated)	Factor 2	Factor 3	Difference
31	Focus of the prj is to develop early business value	1.014	-1.061	2.075
32	Understand prj requirements emerge as the prj work unfolds	0.417	-1.329	1.747
39	Prj has User participation developing a sense of ownership	1.769	0.128	1.641
11	Project work uses adaptive process that is iterative	0.242	-1.182	1.424
24	Prj team is x-functional has business and tech knowledge	0.954	-0.456	1.41
34	Continuous and close participation of the prj customer	1.419	0.027	1.392
15	Team, users, and customers are co-located	-0.02	-1.377	1.357
10	Org employs change mgmt approach minimizes and encourages	1.381	0.149	1.232
1	Collaborative work environment X-functional coop & support	0.336	-0.766	1.102
13	Regular and frequent f2f comm w/ all prj stakeholders	0.898	-0.178	1.076
35	Prj focus is on continuous delivery of incremental bus val	0.771	-0.199	0.97
29	Team has required tech skill, expertise, and knowledge	0.915	0.093	0.822
14	Uses a test-driven environment to correct problems	-0.036	-0.645	0.609
40	Adequate staff with the req knowledge and expertise	0.115	-0.486	0.601
12	Delivers the most imp features early in the project	-0.408	-0.928	0.52
25	Team commitment to serve and involve the prj customers	0.949	0.441	0.508
2	Close & continuous involvement usrs, stkhldrs team	1.047	0.634	0.413
7	Commitment from upper mgmt to provide resources for prj succ	1.688	1.38	0.309
3	Org embraces a loosely controlled adaptive view	-1.419	-1.61	0.19
33	Schedule for prj is incremental and fluid	-1.386	-1.479	0.093
22	Team is self-organizing; changing config as prj progresses	-1.063	-1.136	0.072
21	PM employs adaptive management style for leading team	-0.447	-0.464	0.018
23	Focus of team effectiveness is on the individual competency	-0.969	-0.964	-0.005
30	Users are cooperative & have positive attitude towards prj	-0.209	-0.176	-0.033
26	PM interpersonal skills build trust and resolve conflict	0.712	0.968	-0.256
6	Culture of org supportive & helpful for achieving prj goals	0.253	0.516	-0.263
28	Team is loyal to the prj and has high level of commitment.	0.018	0.305	-0.286
5	Org culture is people-centric and values f2f comm	-1.367	-0.932	-0.435
16	Prj uses formal chg mgmt proc linked to budget and sched	0.125	0.706	-0.581
4	Client org has a cooperative horizontal business culture	-1.667	-1.085	-0.582
20	Prj has formal method for documentation & prj reporting	-1.168	-0.192	-0.976
36	Prj has clearly stated and measurable goals and objectives	1.33	2.311	-0.981
9	PM & team given the authority over the necessary resources	0.107	1.158	-1.051
18	Formal comm procedures established to share information	-0.195	0.925	-1.12
8	Org commitment to principles of prj mgmt or capability	-0.437	0.848	-1.284
37	Initial sys req for the prj are clear, unambig	-0.998	0.385	-1.383
27	PM has good prj mgmt skill track scope, time, cost & qual	-0.276	1.891	-2.167
19	Use strong project management practices to control prj	-1.33	1.314	-2.643
38	Schedule for prj completion is detailed and realistic	-1.517	1.178	-2.695
17	Detailed prj planning w/ well-defined estimates	-1.55	1.291	-2.841

Appendix J

Participant Justifications for Statements Placed as Most Important

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
2	Close & continuous involvement usrs, stkhldrs team	Support from the upper management is essential, it helps the PM to solve the issues easily and faster, and also can help PM to get the support from the functional managers. (14031) Capturing evolving requirements from stakeholders and getting stakeholders to commit to requirements are the two biggest obstacles to successful IT projects. "Oh, that's not what I asked for!" (15076)
5	Org culture is people-centric and values f2f comm	Transversal is important (22061)
6	Culture of org supportive & helpful for achieving prj goals	A lack of support from the onset will derail a project from the onset. (27084)
7	Commitment from upper mgmt to provide resources for prj succ	Loosing authority or resources while executing the project, specially in critical path, can lead to fail or at least delay of the project. (14031) if the upper management is not committed the team will struggle hard and at the end fail, because of problems the team cannot solve without the help of management (8009) Without the support of the organisational decision makers, the project manager ends up being one person trying to change a whole organisation single handedly and spends all their time getting consensus/approval, negotiating, making compromises. The original project goals are forgotten in an attempt to provide a solution that nobody disagrees with. (10038) If upper management is not committed to the project, it is subject to failure. (13210) Commitment from top management is crucial to project success. Without it, the project losses support, focus and motivation. (14057) Organizations follow the explicit and implicit guidance and direction of their leadership assuming the leadership is respected in a reasonably functional corporate environment). (14171) A Project and Project Manager is set up for failure without the proper support from the business. (15105) Project without sufficient support do not survive or are being stopped early (16056) For critical projects, projects that require cross organizational or cultural changes, or high risk/visibility projects most fail unless upper management visibly supports the effort. (16087) All IT projects suffer from resource constraints. If there no sustained commitment from upper management this issue will even be worth and the project manager will have very few options to get the resource constraints resolved. (17055) Upper management commitment represents continuity for the project, mainly when facing requirements, cost or schedule problems. (17204)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
7	Commitment from upper mgmt to provide resources for prj succ	Without sustained committent from upper management, the project programming and execution is at risk and the introduction of risk only exacerbates the issue (18108) IT projects I have been involved in have inevitably required upper management action. In some cases it has been additonal funding or resources, but generally it has been adjusting or simply honoring resource commitments required to meet planned objectives. (19024) Without upper management support projects will flounder when decisions need to be esclated or resources allocated. (19096) Sustained commitment from resource sponsors and leadersip is necessary for a project to maintain project funds, staff resources, user buy-in. (20053) Without management support your project is in big trouble.You will not have the resources or the support to complete the project ontime and with the quaility required. (20070) If they don't support the project, why are you doing it? If they don't support the project, you are dead from the start. If you don't get the resources needed to complete the project, you slowly strangle. If you don't have the authority needed to complete the project, you are on a suicide mission unless you can demonstrate so much business value early that you can melt the opposition - but that isn't likely. (20150) This is the demonstration of how real the management commitment is to the project and its goals (21005) Without the support from upper management a project will fail. Projects must have a clear case presented and approved from someone with authority. If not, there can be roadblocks from even low level stakeholders that cannot resolved. (21116) Great projects fail due to lack of resources, attention or because there are too many top priorities. I think that the Health System I work at today has a lot of really great projects lined up to meet the Meanful Use legislation, but not enough focus on the few, key projects that must get done now. (1401A) Top management is vital to articulating the value and priority of a project to the organization amd its goals. Visible and sustained support and commitment encourages lower levels of the organization to align their focus and prioirites with the project. It also greatly empowers the project team to secure needed resources and facilitate resolution of issues by leveraging management influence and linking recommended approaches with outcomes that clearly align with organizational strategies and objectives. (2002A)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
8	Org commitment to principles of prj mgmt or capability	As the Project Success is Key to the organisational success, having a Project Management Capability would enable the execution of Projects on schedule, per budget and generate profit by achieving the desired goals or objectives of the projects. The Capability helps in the standarisation of handling projects. (9205) Project executed not following a proper methodology are very difficult to follow and asses their current state/stage. (16056)
9	PM & team given the authority over the necessary resources	The project manager and indirectly his/her staff must be able to control their own destiny. Interferenc, by either the client or opposing entities only serves to circumvent the process and inroduces additional risk to the succesful completion of the project (18108) Even with commitment from upper management. The team working on the project must be authorized and recognized as the team that will provide a solution. If not, the project cna be undermind by a rival group. (21116) The PM needs to have authority to enforce team members to work within the project's timeline. If they don't have the authority, then people's normal day-to-day responsibilities will inevitably impede the progress of the project and thus jeopardize the project success. (8218) Timelines are impossible to predict or estaimte when you have no control over resources. Every time someone gets pulled for another project, your schedule shifts. (14100) Without control of project resources, the PM cannot commit to deadlines. his/her target dates can be adversely affected if the resources are pulled away by whoever does have this authority. A key component of project succes is a focused, committed team, which cannot happen if their loyalties are divided through organizational bifurcation. (16031) Authority= capability to assign work and implement consequences positive or negative). Crucial for responsibility of PM to complete project goals. (16048) If project team can not get vital resources, it is impossible to complete the project. (17042) Without the authority over the resources, the project manager cannot apply them in the most effective manner. This authority also provides the sense of owership needed to do a quality job. (18064) The PM has to have the authority to move the project team in the direction to complete the tasks in the manner that he/she is leading the team. (20184) The project requires commited resources who do not have time attention or conflicts in order to achieve its objectives (22068) PM needs to be held accountable for completing the project. Without authority, the PM can not do anything. (29182)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
10	Org employs change mgmt approach minimizes and encourages	It's necessary that the users are aligned with the overall objectives of the project. They should not be threatened perhaps their job would be in jeopardy!) by the introduction of the new system (15062)
13	Regular and frequent f2f comm w/ all prj stakeholders	All stakeholders need to be involved and informed regarding the project. This area is one that must be done to ensure that the resources are available to the project team when required. (9024) Communication between all project members and stakeholders is key to any successful project. It keeps everyone informed and ensures, each member knows when items are expected from them and when items will be available for them to continue their work. (24012)
15	Team, users, and customers are co-located	IT projects are fast moving and fast developing. As such, it is important that the customer is central to defining and validating requirements. (20064)
16	Prj uses formal chg mgmt proc linked to budget and sched	Change control process is important so that the project completes the original and revised deliverables that were intended to be satisfied (26113)
17	Detailed prj planning w/ well-defined estimates	It is essential that a detailed plan is in place, this highlights conflicts, resource availability etc. Also gives the project team a structure to work within. (13122) If there is no detailed project plan, then the project is doomed to fail from the start (22015)
18	Formal comm procedures established to share information	There are isues that come up during every project - haing accepted methods for communicating these issues will facilitate their esolution at the easliest opportunity. (21042)
19	Use strong project management practices to control prj	Strong project management practices are another demonstration of management's commitment and focus on the necessity for formal project management (21005) A project management parctice is a key success factor (10020) The project manager should have milestones and critical path to measure the progress and success of the project (17194)
23	Focus of team effectiveness is on the individual competency	Trust is important for the success of the project (12221)
24	Prj team is x-functional has business and tech knowledge	The team must understand the businees problem that is being solved. A cross-functional team will greatly improve the chances for the project to be successful. (9024)
25	Team commitment to serve and involve the prj customers	If the customers are not committed to the success of the project e.g when it's being jammed down their throat by management) you will get misleading or otherwise poor requirements, and no ownership or buy-in. (15076) Since I work in healthcare, it is important to involve end-users in the deployment of the applications particularly on the clinical side. (22059)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
26	PM interpersonal skills build trust and resolve conflict	People drive success. A Project Manager has to be a leader and focus on the person over the end result. (15105) I can't imagine how a project manager can make a project work without those skills. You must have minimal competence at running a team, or it won't work. (20150) The project team has to be on the same page to understand the motivations of the project and be motivated to complete the requirments in line with the PMs goals & strategy. (20184) Effective communication is very important for project success. Therefore project manager's interpersonal skill is very crucial to build trust among project members, to motivate both project team and project customers and to resolve conflicts between team members and / or other stakeholders (17007) The project manager is the link between all the stakeholders and must be able to control the flow of communication. (25107)
27	PM has good prj mgmt skill track scope, time, cost & qual	A project won't be considered successful if it doesn't complete within scope, time, cost, and quality. A person will need to have good PM skills in order to accomplish that. (8218) paoject management overall skills is a key success factor (10020) Project management depends on a good leader with a good team. Even the best teams flounder if the PM is no good. (10038) If the project manager does not have the skills to run the project effeciently then it will not succeed. (13122) Underlying purpose for having a project manager. otherwise, just acting as an ad-hoc activities coordinator. (16048) The more complex the project the higher level skills are required to ensure its success (16087) Communication is a key skill, working with all levels of the business and making sure they are being heard and informed. (20070) If scope, time, cost, and quality are not being effectively managed, you will not know if the project goals are being achieved within a reasonable time and at a reasonable cost. (18072) It is very important for PM to be able to manage his and his team work - that involves ability to monitor and tracking cost, schedule, scope and quality (22075)
28	Team is loyal to the prj and has high level of commitment.	if the team is not committed and loyal they have other goals than project success (8009)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
29	Team has required tech skill, expertise, and knowledge	A skilled project team represents efficiency and quality, essential for the project completion on time and on budget, and may compesate for other deficiencies in the project. (17204) The project cannot be successful if team members don't have sufficient knowledge of what needs to be done in the area they represent. The project team relies on this expertise to make informed decisions throughout the lifecycle of the project. The project manager also relies on this, to ensure that correct information is provided to the sponsor and key stakeholders. (24012) If you do not have the skills ot complete the work no amount of project management process will get the work completed on time or on budget (18158)
30	Users are cooperative & have positive attitude towards prj	Having user buy in is a must to project success and having a good relationship with the users is a must! Projects I have managed where users are fully engaged and positive have been much more successful both in terms of running the project and how the system is recieved once live than those projects that had less user involvement. definetly my number 1. (2206B)
31	Focus of the prj is to develop early business value	Creating business value is the only real goal of a project.rIf you can't articulate the business value well, then the statement requires more attention or the project should be cancelled. (24176)
34	Continuous and close participation of the prj customer	Customer involvement is critical to ensure the true solution is delivered. (19096) The customer groups must be totally engaged in order to guide the priorities and set the scheules necessary for success. Without this engagement, by-in and ownership suffers. (1401A) The business owns and defines the project, not the IT project team. The IT team needs the continuous business customer team participation to ensure that business value is being created and delivered. Continuous customer participation contributes to shared vision, validated requirements, early feedback of the design and quality, reduced risk and customer buy-in for the product and the required business process changes. (24169)
35	Prj focus is on continuous delivery of incremental bus val	Early successes are of inestimable importance in any IT deployment, particularly since so many deployments fail to ever realize value. (14171)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
36	Prj has clearly stated and measurable goals and objectives	This is important because without clearly stated and measureable goals, you cannot determine the success of the project. (13210) If these are not clearly stated, the team is operating in the dark and cannot deliver what has not been defined. A key question of a PM to the sponsor must be, "How do I know when I'm done?" Otherwise, false expectations or misunderstood goals will lead to a sense of failure even if the team delivered what they thought was required. (16031) Stakeholders need to know what to achieve in order to be successful. (17042) This is critical since the project team needs to clearly understand the scope and goal of the project in order to be successful. It's also very important to ensure that the team is working towards the goals and objectives and does not get distracted or torn into other diretions. (17055) If the project goals and objectives are ambiguous, the results will also be ambiguous at best. You can't build what you don't know you are building. (18064) Without clearly staetd and measurable goals and objectives you will not know when the project is complete or if scope is in control. (18072) Clearly stated and measureable goals and objectives allow all project stakeholders to readily work toward a defined goal, see the benefits and track progress towrd those goals. (20053) Without concensus on these points, it will not be possible to know if and when the project is complete. Scope will spiral out of control. (21042) It is difficult to assess project sucess without tangible goals. (22059) The goals and objectives of the project should be the primary means to say whether the project is successful or not. This does not mean the goals and objectives can't be refined or refocused in an adaptive manner throughout the project to better define success. (24169) Need to be able to measure the projects actual performance when compared to the planed goals and deliverabkes to ensure the project satisfies the orinigal intent and revised intent that it was intended to (26113) Without clear and definable goals, the project is severly at risk to scope creep. thereby, a never ending project which be definition is no longer a project). (27084) Clearly defined and measurable goals and objectives are necessary to determine if the project succeeds or not. (29182)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
36	Prj has clearly stated and measurable goals and objectives	This is essential to establishing a clear, shared vision within the project team and stakeholders for what the project is to accomplish, what a successful outcome looks like and what resources and activiites are most appropriate. It helps the project team rationalize priorities and what activities and decisions are conducive to project success and which ones are not. (2002A) clearly stated and measurable goals are needed to avoid scope creep. (15142) For the project to have any success the PM must know what the objective he is trying to obtain. The work must be geared to that goal. (18040) without the clear strategic goals the project could be difficult to understand it's missions and valour to the organization (22056)
37	Initial sys req for the prj are clear, unambig	Without clear initial requirements, the project risks unclear scope, thus unclear triple constraint and result. (14057) To get the best customer satisfactions and also to avoid scope and effort creep, it's necessary that the expectations are set right (15062) If there is not a clear set of requirement there is not suffiecient scope to apply project management processes (18158) The lack of an adecuate requirements definition could impact in the time and cost of the project. The main requirements are very important to obtain an axis pivot) to the rest of the functionalities that the customer want (22056) Bad requirements lead to bad project results. (25107) makes it a lot easier to manage the project - if the system reuirements are clear then the better chance you have of picking the correct technology and getting the right people on the project (2206B)
38	Schedule for prj completion is detailed and realistic	Detailed schedule, provides the clear picture of where the project is exactly to make crucial decisions (12221) Realistic more than detailed. If the schedule is unrealistic, there will be no way to deliver quality by the expectation of the customer. (14100) details are important in order to create an accurate and realistic estimate. (15142) A relastic and detailed schedule is the ultimate guide of project manager in managing the whole project. (17007) If the schedule is not realistic, then the project will be delivered with run time and may encounter run on in the budget (17194) It is important that an arbitrary date is not given that cannot be obtain as this will lead to resouce problems and increase stress (18040) One needs to have a realistic Project schedule, to encapture, effort, time, and costs (22015)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
38	Schedule for prj completion is detailed and realistic	Each project should has realistic and detailed schedule which implies right resources are booked and available throuhout the project, and all milestones and other activities have been taken to consideration. (22075)
39	Prj has User participation developing a sense of ownership	A successful IT project has a customer base that embrases the results. If the final product does not address user needs, the customer will move on elsewhere to a developer that can meet their needs. (20064) The users need a sence of ownership to contribute to project deliverables at a high level and to embrace the project when it is implemented (22068) If the project team can't achieve significant end-user participation, the project won't be viewed as successful at the end. (24176)
40	Adequate staff with the req knowledge and expertise	Team dedication, environment and upper management support simply do not matter if the required technical skill is not available. There were two very similar statements along these lines - singled this one out to enable selection of the upper management support statement. (19024)

Appendix K

Participant Justifications for Statements Placed as Most Unimportant

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
3	Org embraces a loosely controlled adaptive view	The organization must want the change for the project to be successful. (9024) There should be control within the organisation. It should be able to adapt to change and have procedures in place to deal with it effectively. (13122) I'm not even sure what this means, but rated it as unimportant because I feel that, regardless of the culture of the organization, it is the culture of the team that will drive project success, and the team's culture can certainly be at odds with the corporate culture (the "skunkworks" concept). (16031) Most projects are nose-to-the-grindstone busy. Mumbo jumbo words about continuous training sound nice, but there is no time on many projects. (18064) A "loosely controlled adaptive view" of continuous learning improvement, etc ..... is an ambiguous statement that does not seem particularly relevant. (20053) Even if the organization as a whole is close minded, if someone in upper management says something must be done, it will be done. (21116) Of the all the statements, I feel this is one of the least important. (22059) This statement is not just unimportant, it's downright toxic to project progess and ultimate success.rWords like loosely controlled make for an appealing work environment but tend to emphasize a culture that places insufficient emphasis on a project goal. (24176) This one may depend upon the situation. (develkoping an innovative, new product or implementing a package of standard products in order to improve business process as soon as possible. I feel that a loosely controled organization may lack the fucus / will to get the job done in the timeframe needed. (1401A) continuous learning is good and should probbly be higher but find that you learn from you own experiences and not necessarily for others (2206B)
4	Client org has a cooperative horizontal business culture	project management has to deal with all kinds of clients organizations. the project team's organization is important, not the client's organization (8009) (14031) I'm honestly not even sure what this means. (14100) It does not matter whether the structure of the organization is horizanotal or vertical. The goal is to get the commitment from the stakeholders (15062) THe client organization business culture does not affect the project (17194)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
4	Client org has a cooperative horizontal business culture	Every organization is unique. it is the shared responsibility of the stakeholders wo work within the confines of thier respective organization to actieve the goals of the project. (18108) The focus of an IT project is not on the organizational culture so much as the needs of the customer in order to meet business needs (increase profit, etc.). Business culture is important, but not a show stopper for the development effort. (20064) The polar opposite, Dictatorial organizations, can be ruthelessly efficient in implementing new systems. This would be nice, but it just isn\'t necessary or important. (20150) Good project managment practices will allow a project manager to succeed in all types of organizational structures and cultures. (21042) A strong project manager can adapt to any business structure. (27084)
5	Org culture is people-centric and values f2f comm	Face-to-Face communication is very important to some organizations and not as important to others. Remote communication can be very effective if done correctly. (14100) Every organization is unique. it is the shared responsibility of the stakeholders wo work within the confines of thier respective organization to actieve the goals of the project. (18108) Most of my IT Projects now use offshore teams. provided you have good communications in place either conf calls, video conferenceing, messaging, email etc then face to face is not always needed. depends on the reason for the communication however andf there are circumstances where face to face is the best. (2206B) Face-to-face communication is not necessary for a project to succeed. I\'ve worked on multilple successful IT projects where teams were global, in multiple locations, and sometimes never even met one another face to face. I do believe the organization needs to place high value on frequent contact/communication, but that is different that what the card indicated. (8218) Communication does not need to be face to face. The written word has provided an alternative for thousands of years. It doesn\'t matter what sort of organisation it is. Projects don\'t just work in people centric organisations. (10038) Face to face communication is not realistic in todays world. More and more office are global and you have to be able to communicate as though you are face to face even if you are on opposite coasts, continents, etc. (13210)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
5	Org culture is people-centric and values f2f comm	Not unimportant, as such, but in a force ranking it is less important than some others. I could easily have put half a dozen other items in this spot, and in fact did put many other questions about the value of communication much higher. I do not think face to face communication is unimportant. In fact, i thought virtually every question asked had a degree of importance. (14171) face to face communication is not always necessary to convey important ideas. (15142) It is a nice to have, but have ran several projects without this in place. (20070) My point of view is that a organization that depends of the centralization of resoruces, communications and the main desicions, is condemned to the failure in the projects, if not the time of the project is most probably affected. (22056) An effective project manager will utilize all available technology to keep the flow of communication going. (25107)
8	Org commitment to principles of prj mgmt or capability	Not required to have forwal project management processes. The project execution process should be developed and communicated (12221) Formal project management practices can get in the way in many IT projects, esp. those involving significant analysis and complex reporting. These cry out for adaptive, iterative approaches. Other IT projects, like a server upgrade, are best handled thru \"classic\" PM. (15076)
10	Org employs change mgmt approach minimizes and encourages	Change management is important, but not crucial. (14057)
11	Project work uses adaptive process that is iterative	not a success factor (10020) The project can function without this process (18040) This might be important to some styles of project management such as Scrum but is not essential to all styles. (18072)
12	Delivers the most imp features early in the project	the project schedule is dependent on many factors, importance if a feature is only one factor. (8009) Sometimes the most important benefits come at the end of the project. It\'s nice to get early runs on the board but it\'s not always possible. (10038) In some cases, it is just not possible to deliver the most important features early in the cycle -- it often happens that they necessarily come much later after implementation of interim steps and deliverables that are required as a foundation. I think this is an unrealistic statement (16031)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
12	Delivers the most imp features early in the project	Showing incremental results from start to finish is much more important than providing the biggest benefit up front, (20053) Driving a project based on the feature set is a recipe for failure. Projects need to be rolled out based on the technical requirements, providing stability to the environment first. (15105) Based on the nature of the project, the goals can be achieved at any time of the schedule. As soon as the stakeholders agree, achieving the goals as early as possible is not an important factor. (17042) The important features do not have to be delivered first. Some projects may require it to be able to get support and encouragement but not neccessary every time. (20184) The most important feature could be resulrt of other milestones or features which need to be delivered first (22075)
13	Regular and frequent f2f comm w/ all prj stakeholders	Regular and frequent fact-to-face contact tells me that the customer might be getting too much involvement or communication, and there really is such a thing. They eed to get regular communication but it does not need to be face to face. (8218) Face to face communicaiton is not realistic. It is important to have frequent communication. (13210) Face-to-face is nice when you can do it, but there are other ways to communicate. I work with several distributed teams on my projects. (20070) Face-to-Face communication is often unrealistic due to distance etc. (22068)
14	Uses a test-driven environment to correct problems	Not all projects can be implemented in a test-driven environment. It is nice to test before the actual implementation. but this is not an important factor on the project success. (17042)
15	Team, users, and customers are co-located	Based on my experience, very few projects are co-located these days. Having access to the individual is critical, but they don\'t need to be in the same building or city. (15105) In a large organization the colocation and face to face meeting would be very difficult and in fact with the appropiate communication with the stakeholder, the deliveries and project status could easily obtain (22056) You can have very successful teams that are virtual (22059) In moderd world when a big proportion of the work is being outsorced or offshored, colocation is not always possible, and it is more important for project team to be able to cooperate and communicate in other ways - i.e. tele conferences, shared online tools, etc. (22075)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
15	Team, users, and customers are co-located	Within a project a continous relatioinship between the project team and the other stakeholder is not necessary. Co-location is an advantage (being available) but could also be a disadvantage (disturbance). (16056) Virtual teams work fine as long a communication is regular and of good quality. (19096) I have worked on many projects where work was distributed to differnet locations. Other than communications issues related to time zones, it worked very well. (21005) Co-location when available is very helpful for a project to be successful, but with the technology available today of text messaging, webcams, etc. the team doesn\'t need to be physically located together, they can be \"virtually\" co-located and the project can be a success. (24012)
17	Detailed prj planning w/ well-defined estimates	For many (but not all) IT projects, detailed planning up front is useless and dangerously misleading. SWAGging estimates based on really-rough order of magnitude estimates and comparisons to prior experience are useful for securing funding and gaining go-ahead, but are likely to have to change repeatedly as requirements are clarified thru iterative processes. (15076) Assuming this means an up-front, detailed planning effort, this isn\'t possible to complete to the desired degree of accuracy. There are far to many unknowns in a software development project to be able to create a well-defined plan \"up-front\". The up-front planning should be at the level needed to make the next decision. Detailed planning should be reserved for the near-term work, rolling wave or agile fashion, where it has a chance of being realistic and accurate. (24169)
18	Formal comm procedures established to share information	Formal proceedures are not necessairly critical, but if the project is very large it becomes more important. (19096) A strong projec manager will define the necessary communcition plan in absence of any organizational procedures. (27084) I have found that formal communications such as status reports, sponsor updates, etc. are secondary in value to a continuous, honest dialog between project participants, stakeholders, sponsors and management. Formal communications are often engineered to accent the positive or downplay the negative. Informal communications with committee and involved key stakeholders and sponsors ultimately leads to more exchange of information that is of greater relevance and better represents project status, accomplishments and challenges. Formal communications are seldom given much attention amidst a flood of information from many sources. informal communications tend to be more focused and yield greater value to the sender and recipient of information. (2002A)

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19	Use strong project management practices to control prj	I am currently running an Agile proejct. Probably influences my thinking. I have done waterfall for years before this though, always from a strong command and control approach. Either can work, depends on the situation. (14171) I assumed this refers to trying to \"control\" a project to meet a detailed project plan. Controlling to the initial guess disguised as an accurate & realistic plan of what the project will look like, doesn\'t allow learning by the business/customer or the IT team as the project goes along. (24169)
20	Prj has formal method for documentation & prj reporting	informal documentation methods work as long as progress can be monitored. (15142) I\'ve worked at places that had detailed, rigorously enforced standards for documentation. You can meet all the standards and have the documentation accepted by the documentation librarian without giving anyone much understanding about the design. People have to buy into the requirements to make them work. (20150) While there is a place for formal methods and documentation, sometimes the project and its outcome become secondary to crafting artifacts. The emphasis should be on completing documentation to the extent that it delivers value. As an example, my organization develops formal lessons learned after each project\'s completion. however, there is no mechanism to integrate these learnings into our project management practice. The project participants may incorporate some of the learnings in the way they conduct subsequent projects but the organization is rarely leveraging this hard-won experience to its benefit. There is a wealth of this collected knowledge buried on a shelf or archive file somewhere waiting to be mined. (2002A)
21	PM employs adaptive management style for leading team	not a success factor (10020) A project manager may be a super-controlling, micro manager, if the team works well with that style, the project can be succesfful (21116)
22	Team is self-organizing; changing config as prj progresses	The project manager needs to keep control. The project team should be able to work with the project manager to make change if required but the plan needs to be reviewed in relation to this to ensure that there are no knock-on effects that the projet team may not be aware of. (13122) If the project team is self-organizing, who is going to monitor the execution. Teamroles must be clear as from day 1. Adaptations are possibles through the project manager. (16056) If a team is lacking formal leadership (is self organizing), the effect on the project may be detrimental. Team memebers will not have complete information to the extent that the project manager should. (21042)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
22	Team is self-organizing; changing config as prj progresses	Self-organizing is close to anarchy. Projects using this approach offer an appealing work environment but represent a culture that gives almost no priority to the project goal. (24176) The project team needs a clear, achievable schedule, defined goals and objectives in order to be successful. Schedule, scope and goals cannot be changed as needed. Project framework is needed in order to achieve the promised result and benefits. (17055)
23	Focus of team effectiveness is on the individual competency	Individual competency is important, but not leading in a project. Team work and project manager`s skills have more value. (14057) Trusting in certain individuals is dangerous. If the individual with the great skill leaves, the project is doomed to failure. (18064) Team members effectiveness can be improved as the project moves through each of its phases (26113)
25	Team commitment to serve and involve the prj customers	I think some projects could be considered successful withouth the involvement of the customer. (18072)
28	Team is loyal to the prj and has high level of commitment.	Team members can be (and will be) replaced. (16048)
29	Team has required tech skill, expertise, and knowledge	Skills of the individual members of the project team can be enhanced as required once the project is moving through its phases (26113)
30	Users are cooperative & have positive attitude towards prj	Users can make or break a project, but if the stakeholders desire the project then the stakeholders will help sell it to the users. (9024)
31	Focus of the prj is to develop early business value	No the focus of the project need to be end to end solution and align the plans with the end project objective. (12221) Not always the case as the end result is probably more important (18040) Each project should provide value to the business. However this should not be the focus of the project. (20184) The focus of the project should be to deliver maximum value at the completion. delivering early business value may impede progress on the overall project (21005) While this may apply to some projects, it is not an appropriate general rule. The real business value is in the fully implemented project. (22068) In some instances we spend too much time trying to get something out as quickly as possible, without having taken the time to ensure we\'re doing the right work to meet the business need. (24012) This one also depends upon the situation. Certainly it is important not to let perfection be the enemy of getting product delivered. However, much of my work is package delivery, not waterfall style product development. (1401A)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
31	Focus of the prj is to develop early business value	Why? do that - you may be shorting the project goals and untilmate deliverables with this type of approach (18158) Given that the project has been well conceived and planned, additional focus on early business value is counterproductive. The team, especially the project manager, must support the people who are conveying business value to upper management. Frequently this is a kay factor in maintaining upper management support. It should not, however, be a primary focus. (19024) Business values should be defined outside of the project, not part of the project, It\'s a business requirement, not a project requirement (22015) May not be able to accomplish something early in the project that has business value. (29182)
32	Understand prj requirements emerge as the prj work unfolds	THe project should start with clear work and project scope and should not change as the project progress (17194) Project requirements should be defined, reviewed, approved, and baselined up front, NOT as the project unfolds!! (22015) Requirements should be complete before project execution begins. (25107) I\'m not a big fan of the iterative lifecycles as they seem to allow to much ambiguity into the process. Although I like a solid requirementsgathering process it\'s also important to know that not all requirements are decided there. The approach should be that most requirements are ID\'d up front to allow scoping and planning to happen, but the PM needs to build contingency time into the scheudle to allow for requirements to adjust naturally through the process (16087)
33	Schedule for prj is incremental and fluid	It\'s very difficult to draw a firm boundary on the scope of an IT project. (15062) Too fluid requirements can cause project failure. It\'s important to remain somewhat fluid, but only to the point that project schedule risk can handle it. (16087) The project team needs a clear, achievable schedule in order to deliver on time and fullfill the expectations. (17055) Listed as unimportant because this is largely driven by the project itself. (20064) New customer requirements will require changes to the project plan. (29182) This is unimportant because pre-determined or un-determined milestones are not the objective. The final objective is the final project outcome and deadline (17007)

Stmt No.	Statement (Abbreviated)	Comment as written (participant ID)
35	Prj focus is on continuous delivery of incremental bus val	Why this may be a great goal it may not be acheiveable based on the product/services that are the basis of the project (18158) Given that the project has been well conceived and planned, additional prject team focus on delivering incremental business value is counterproductive. The team, especially the project manager, must support the people who are conveying business value to upper management. Frequently this is a kay factor in maintaining upper management support. It should not, however, be a primary focus. (19024)
37	Initial sys req for the prj are clear, unambig	Requirements were made to be elaborated, changed, and revised. Adaptability is more important. (16048)
39	Prj has User participation developing a sense of ownership	This is unimportant because this ownership will eventually develop as project progress (17007)

Curriculum Vita

Michael J. Doherty

Education:

Applied Mgmt & Dec. Sci. (PhD Candidate) Walden University, Minneapolis, MN		2004- present
Doctoral Coursework	University of Phoenix Online	2003-2004
M.S. Public Policy Analysis	Purdue University, West Lafayette, IN	1980
M.S. Biological Sciences	University of Illinois, Chicago, IL	1978
B.S. Zoology (honors)	Western Illinois University, Macomb, IL	1973

Experience:

Program Director, Associate Professor, Information Technology
Program Director, Business Administration
Marian University, Fond du Lac, WI
August, 1999 - Present

Manage and design the strategic plan for the Information Technology program, which began in fall, 1999. This included direction of the design and implementation of all courses for the program, academic advising, retention, and recruitment of students to the program, supervision of full time faculty and the procurement of equipment and resources for the program. As technology is continually changing, duties of this position also include looking for areas of opportunity where the Marian University IT program can capitalize within its current resource constraints. Additional duties include the teaching of four classes per semester, overseeing student interns, testing and evaluating new software products, reviewing and selecting textbooks and lab manuals, and serving on multiple college committees. This position also includes managing the Business Administration program which primarily involves advising students, monitoring internships, and overseeing the curriculum.

Significant Accomplishments:

- Organized and implemented the first Marian School of Business Friends and Masters Day, an event to connect the School of Business with business alumni and the local business community
- Developed a School of Business assessment activity in TEC 200 Fundamentals of Information Technology
- Developed and began implemented a mixed model of on-line/face-to-face delivery for PACE IT courses
- Established a Computer Forensics Minor as a joint offering between Information Technology and Criminal Justice.

- Served as Department Chair for the Department of Applied Business (2008-09) which included oversight and supervision of the Information Technology, Business Administration and Sport and Recreation Management programs.
- Began the process of establishing policies and procedures for the Marian School of Business Curriculum Committee and served as the first chair of the committee. This included overseeing the process of aligning MAAP/PACE course offerings with other MSB courses
- Added TEC 200 Fundamentals of Information Technology to the Business Core with a new focus and wider perspective of business computing
- Designed, implemented, and maintains the learning outcome data collection system for School of Business assessment activities.
- Added TEC 102 Computer Software Applications to the liberal arts core and transitioned the learning outcomes to be in alignment with its new status
- Recipient of the 2009 Outstanding Academic Advising Award
- Moved towards a consistent emphasis in database technology by making it a component in most IT courses. Database concepts are now a significant component in six of the required ten IT courses in the technology core.
- Added a new emphasis to the IT major (Applied Business Emphasis) in order to attract students interested in merging their business area with technology, and to appeal to Technology College transfers
- Designed a Fundamentals of online learning course suitable for use in the MAAP and traditional program
- Added a course in Web Design and E-Commerce (TEC 214) as an elective for IT majors and a service course for other students in the School of Business
- Explored the incorporation of XML programming and Wireless application design into the course of study by offering one-credit special topics courses in those content areas
- Added a Senior Technology Seminar course to the IT curriculum as a professional development course and a place for program outcomes assessment activities
- Developed the classroom/laboratory design for the IT program classrooms in the Stayer Center
- Developed and implemented the concept of a "flex-lab" as a hands-on learning laboratory for the IT program.
- Established a program for IT students to serve as technicians and consultants to assist the Information Technology department of the college.

Acting Director, Information Technology Department
Marian College, Fond du Lac, WI
June, 2000 – July, 2002

Manage the Information Technology Department for Marian College. Monitor and supervise all day-to-day operations for the department including staff, budget, inventory, job-scheduling and system implementation. The primary responsibility of this acting appointment is to ensure that the technology initiative of Marian College moves forward

and to implement a new organizational structure for the department. This appointment came about because of some resignations of key personnel in the I.T. department and the observation that the department was in need of a management structure that fit the goals and responsibilities of the university.

Significant Accomplishments (2000-01):

- Directed the re-implementation of the college administrative software system
- Implemented a system of competitive bidding for major procurements of IT equipment
- Restructured the IT department into four areas of responsibility: networking and data communications, administrative software support, academic computing and training, and desktop system support
- Established a college helpdesk system and service call tracking system
- Oversaw the redesign of the college web site to improve maintenance and manageability

Significant Accomplishments (2001-02):

- Completed the re-implementation of the college administrative software system
- Directed the set up the new labs in the Stayer Center for Technology and Executive Learning
- Managed the review and redesign of the college network security plan
- Directed the division of the Marian web site into sub-webs that would be maintained by the organizational units involved.
- Completed the implementation of a new financial software package for the college (Great Plains Dynamic)

Program Chair, Computer Information Systems
Ivy Tech State College, Lafayette, IN
September, 1992 - August, 1999

Primary responsibilities included the regular evaluation and updating of current computer courses, design and implementation of new courses for the program, the registration, retention and recruitment of students to the program, and the supervision of all full and part time faculty in the CIS program. Additional duties include the teaching of four classes per semester, testing and evaluating new software products, reviewing and selecting textbooks and lab manuals, serving on college committees, and serving as the alternate representative to ASBCP.

Significant Accomplishments:

- Implemented three new specialties: networking, management information systems, and PC administration and support, for the A.A.S. degree in CIS
- Completely redesigned the curriculum to achieve high placement of graduates (placement reached the 90-100% level)

- Oversaw the growth of the CIS program from 125 headcount and 75 FTE in 1992 to 315 headcount and 225 FTE in 1998. This was during a time when statewide CIS enrollment at Ivy Tech had dropped by 10%
- Acting Chair, Business Division, 1993-94

Associate Instructor of Computer Technology (Part Time)
Ivy Tech State College, Lafayette, IN
March, 1986-September, 1992

Primary responsibilities included designing curriculums and teaching Pascal, C Programming, RPG II, IBM 360/370 Assembly Language, Microcomputer Operating Systems, Micro-Database Management, and Introduction to Microcomputers. Also developed material and taught various short courses for the Business and Industry Training Division, and the Ivy Tech in-service training program.

Significant Accomplishments:
- Developed the C/C++ course for the region
- Wrote and added basic conceptual components to what had been primarily application-based courses.

Deputy Director, Automotive Transportation Center
Institute for Interdisciplinary Engineering Studies
Purdue University, West Lafayette, IN
February, 1988-September, 1992

Duties included managing all personnel, directing and administering all research projects, preparing annual budgets and budget projections, writing research proposals to a variety of federal, state and private sources, marketing of research center products and service capabilities, and creating annual research plans. Also served as principal investigator for most Center research projects. Most of these activities involved the coordination of a wide variety of disciplines and backgrounds from academia, state and local government and research foundations.

Significant Accomplishments:
- Led the Automotive transportation center from a precarious low point in funding to a ten year high, by diversifying the client base and the services offered by the center
- Directed the research and reporting methods for a series of Driving While Intoxicated studies used by state decision-makers to formulate DUI enforcement policy.
- Directed the activities and co-authored the D.A.L.E. (Drug Abuse Learning Environment) software which was used in grades 5,7 and 10 as a part of efforts to prevent drug usage in teens and pre-teens. This software was sold commercially to school systems for 6 years.

Research Coordinator/Program Administrator
Automotive Transportation Center
Institute for Interdisciplinary Engineering Studies
Purdue University, West Lafayette, IN
January, 1981-February, 1988

Prepared policy proposals, fiscal and economic impact reports, needs analyses and evaluation studies in the areas of transportation, automation, and economic development. Led an interdisciplinary research team in the formulation and implementation of focus group interviews testing unique transportation concepts. Directed the writing and statistical analysis of local and national consumer surveys. Designed and conducted seminars and presentations to state legislators, and policy-makers in the area of traffic safety, office automation, and substance abuse policy evaluation.

Significant Accomplishments:

- Wrote a computer simulation of U.S. Oil consumption and needs for the years 1978-2020, based on variety of technological, economic and policy scenarios
- Led an interdisciplinary research team in the testing of a new transportation concept called the Mobility Enterprise. This work involved: the coordination and development of focus group interviews; design of an exhaustive local survey; coordination and analysis of a national survey through J. D. Power and Associates; and the actual design and implementation of the logistical system for delivering the transportation service.
- Designed and implemented the statistical sampling and analysis methodology used for safety belt usage estimates in the state of Indiana.
- Developed the methodology for the first computer needs assessment for county governments. This was a program offered through the Institute to small counties to assist them in the transition from manual to automated record-keeping systems.
- Supervised the sampling methods to be used for DUI policy analysis.

Research Biochemist
G.D. Searle & Company, Skokie, IL
April, 1974-September, 1976

Designed and conducted scientific investigations in the areas of drug metabolism, pharmacokinetics, and radiochemistry. Assisted systems personnel in articulating the analytical needs of drug researchers

Publications and Presentations

Doherty, Michael J. “Hitting a Moving Target....Feelings of Stress, Inadequacy, and Overload in the Age of Online Education”. A presentation to the Online Education Forum of the Wisconsin Association of Independent Colleges and Universities (WAICU), October 2011.

Doherty, Michael J. “Web Page Fundamentals: A Supplement for Fundamentals of Information Technology”, January 2004.

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Doherty, Michael J. "Using Microcomputers: A First Step." A Training Manual for the Industrial Training Division, Indiana Vocational Technical College, Lafayette, IN, January, 1991.

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