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Exploring project manager insights about IT project success using Q-methodology

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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. The purpose of this Q methodology study was to use views of experienced project managers to explore the contribution of success factors and management approach to project success. This study used a sample of 60 project managers with experience leading or working on IT projects and employed Q-methodology to reveal dimensions of their subjective opinions and identify clusters of project manager participants who shared common viewpoints. The factor analysis of the sample identified three composite factors, which explained 46% of the variance. Two critical success factors emerged as important among all participants: 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 as a critical factor for successful IT projects. This study provided a useful example of using Q methodology to evaluate how research findings align with practice in IT project management.

Keywords: Critical Success factor, Q-methodology, IT Projects

INTRODUCTION

The disappointing rate of success for information technology (IT) projects has been a concern among IT professionals and project managers for over two decades (Tesch, Kloppenborg, & Frolick, 2007; Shenhar, 2008). The first large-scale study of success rates for IT projects in 1994 indicated that only 16% of such projects concluded successfully (The Standish group, 1995). Although success rates have steadily improved since 1994, various research studies classify 30 to 60% of IT projects as failing to meet some success measure (Standish Group, 2009; Glass, 2006; Emam & Koru, 2008; Shenhar, 2008; Sauer, Gemino, & Reich, 2009; Ambler, 2011).

Two of the prevailing approaches for investigating reasons for IT project failure or success over the past 15 years involve the search for critical success factors (CSF) and the impact of alternative project management techniques, such as agile methods. However, there continues to be a lack of knowledge about the relationship between commonly reported IT success factors and how those factors relate to the management approach used for IT projects. The purpose of this study was to use Q-methodology to characterize the viewpoints of practicing project managers and explore the connection between findings from these two research approaches.

BACKGROUND

The search for critical success factors has been a predominant research approach for investigating IT project success and failure since the work of Slevin and Pinto (1987). To date, the list of critical success factors for IT projects includes a vast array of characteristics associated with IT project implementation such as: 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). In fact, the review of the IT project management literature for this study discovered more than 200 different alleged critical success factors. One issue contributing to the large number of suspected CSFs may relate to the difficulty in clearly defining success due to the complexity of IT projects (Baccarini, 1999; Shenhar & Dvir, 2007).

The characterization of a successful IT project can be quite different depending upon perspective. The traditional criteria for measuring involves how well the project meets budget, schedule, and performance requirements, often termed the iron triangle of success (Atkinson, 1999). However, dissatisfaction with restricting project success to such limited criteria led to appeals for expanding the definition of IT project success to embrace subjective criteria such as user and customer satisfaction as well as other social and technical factors (Wateridge, 1998; Bryde, 2008; Kendra & Taplin, 2004; Jha & Iyer, 2007). The movement to develop a broader definition of IT project success occurred at about the same time as the concept of agile project management evolved. A more expanded view of project success seemed to an important element in the growing distinction between the traditional plan-driven approach to IT project management and an agile approach (Fowler & Highsmith, 2001).

Traditional project management employs a management as planned philosophy (Shenhar, 2008), which inherently assumes the project plan, if followed correctly, will lead to project success (Fernandez & Fernandez, 2008). This operational approach naturally supports success

measures based on objective criteria, such as those of the iron triangle. Conversely, agile methods are based upon an implicit understanding that IT projects occur in a dynamic environment where project changes are inevitable and therefore focus more on customer interaction and software linked to business strategy (Boehm, 2002; Augustine, Payne, Sencindiver, & Woodcock, 2005; Nerur, Mahapatra, & Mangalaraj, 2005). Research on the relative merits or drawbacks of the traditional or agile approach to IT project management comprises another large segment of research in the field.

Despite the emphasis in the research literature, IT project management practice does not appear to support either the role of critical success factors or the project management approach as the main determining factor in IT project success. Sauser, Reilly, and Shenhar (2009) claim there is little practical evidence to support a major role for critical success factors in project management success. Furthermore, neither traditional nor agile approaches seem to be a perfect fit for all types of IT projects and in practice project managers often employ features of both methods as a way of improving project performance (Vinekar, Slinkman, & Nerur, 2005; Shenhar, 2008; Reich, Sauer, & Wee, 2008).

After over two decades of research, the role of critical success factors or the project management approach in IT project success remains unclear. The study used Q-methodology to investigate the perceptions of IT project managers regarding (a) how critical success factors may interrelate to contribute to successful IT projects, and (b) how project manager interpretations of those factors are associated with an agile and traditional views of project management. This study also extended the use of Q-methodology by using it as a tool for exploring how research findings align with practice.

METHODOLOGY

This study used Q-methodology and the collective insights and experiences of IT project managers to explore the relationship between commonly reported IT success factors and how those factors related to the management approach used for IT projects. The roots of Q-methodology as a research method for measuring subjectivity goes back to the work of William Stephenson (1935), who proposed inverting normal factor analysis, using the participants as the variables and a set of subjective measurements as the sample. In this way, factor loadings represent a measure of participant subjectivity. Whereas traditional analysis methodologies excel at measuring and correlating objective variables such as budgets, schedules, and quality measures, Q-methodology supports the analysis of subjective viewpoints for common factors and interrelationships (Brown, 1997). Thus, Q-methodology provided a fitting tool for examining how project managers view the relationships among the vast list of critical success factors

Valenta and Wigger (1997), suggest three stages for conducting a study using Q-methodology. The first stage focuses on developing the sample, which in the case of a Q study involves developing the set of statements used in the Q-sort. This is often a two-step process involving collection of a large number of statements on the topic called a concourse and then generating a Q-sample, which is the sample of statements used in the Q-sort. The second stage is data collection, which involves selecting participants (the person-sample) and conducting the Q-sorts. The third stage is the data analysis and interpretation. Data analysis includes “three sets of statistical procedures: correlation, factor analysis, and the computation of factor scores” (McKeown & Thomas, 1988, p. 46). Interpretation is a more subjective process 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 concourse and the Q-sample

In Q methodology, the concourse represents a collection of statements covering the issue under study. According to Brown (2004), "… the collection of items in the concourse should reflect the range of perceptions on a particular topic of interest" (p. 4). For this study, the concourse consisted of statements and findings from journal articles, professional publications, and conference proceedings, proposing critical success factors for IT project success and included statements representing the traditional approach to project management and the agile approach. Critical success factors aligned with four categories corresponding to project manager interactions with the project representing organizational influences, the project management processes employed, roles and behaviors of the people involved, and project attributes. These categories are similar to the project-specific dimensions of IT projects in the descriptive model proposed by Aladwani (2002). The raw data forming the basis for the concourse consisted of 676 statements from the literature characterizing suspected critical success factors for IT projects.

The Q sample is a subset of statements selected from the concourse and used by study participants for rank ordering in the Q sort. This study employed a structured factorial design using statements from the literature on critical success factors and included representation from two project management approaches and four categories of success factors. The total number of statement types in the research matrix was eight (two approaches times four categories of success factors). The Q-sample for this study consisted of 40 statements, five statements from each of the eight cells in the factorial design. Table 1 (see Appendix) presents this study's research matrix and an abbreviated description for the focus of each statement.

The person sample

The person-sample, also known as a p-set or p-sample, represents the participants completing Q-sorts. In Q-methodology, persons represent variables and statements in the Q-sample represent the typical understanding of the term sample. This study used a person-sample consisting of a random sample of 60 project managers from a larger population of 519 project managers who completed Q-sorts. All participants had experience leading or working on IT projects and were members of either 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).

The Q-sorting procedure

The data collection activity of a Q-study is the Q-sort, where a 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 statements representing various critical success factors in the Q-sample and the condition of instruction was to arrange the statements on a grid representing their relative importance (or unimportance) to IT project success based upon the participant's personal experience with IT projects. The collection of participant data took place via an internet web site, using 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 placed the statements into one of three piles, one representing factors important for IT project success, a second pile for factors unimportant for IT project success, or a third pile, labeled neutral representing success factors that were neither important nor unimportant. After completion of the initial division of the statements, the participant received additional instructions for filling a quasi-normal distribution grid from +4 to -4 using the piles of previously divided statements. Participants first placed statements believed to be most and least important at the extremes of the grid (+4 and -4) and then filled in the remainder of the grid with the remaining statements. Figure 1 (see Appendix) presents a depiction of the Q-sorting grid for the 40-item Q-sample.

After completing the Q-sort the participants provided justification for their placement of the statements at each extreme (most important and most unimportant) and completed a brief survey which collected simple demographic and experience data. The software recorded the participant sorting arrangements from the grid, the rationale for statements at the extremes, survey responses, and any additional comments.

Data analysis

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. Data analysis utilized the PQMethod Release 2.11 for Windows software (Schmolck, 2002) which supported correlation analysis, factor analysis, and factor rotation.

After completing the data entry for the Q-sorts from each of the 60 participants, the program calculated the correlations between each person's rankings and created a 60 x 60-correlation matrix. This matrix was the focus of the subsequent factor analysis to identify patterns among the individual Q sorts and generate factors consisting of specific arrangements of Q statements. The initial matrix produced by factor analysis yielded eight unrotated factors, which were a set of factors correlated to individual Q sorts. The initial set of unrotated factors represent an artifact of the algebra involved in the calculations and are difficut to interpret (Kline, 1994, p. 55). The next step in the factor analysis involved a process called factor rotation where each factor is rotated "until it defines a distinct cluster of interrelated variables" (Rummel, 1967, p. 474). Since this study was exploratory in nature, it employed Varimax rotation on factors selected based on eigenvalues and the amount of variance explained by the factors. Eigenvalues are indicators of the amount of variance accounted for by a factor and as a general rule eigenvalues greater than 1.00 are considered significant (McKeown & Thomas, 1988, p. 51). Once factor rotation is complete, 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). In this study, the rotated factors represented clusters or groups of subjective viewpoints about critical success factors.

Upon completion of factor rotation, the PQMethod software provided a summary report consisting of the correlation matrix, normalized factor scores for each factor, an idealized Q sort for each factor, a list of distinguishing statements for each factor, and a list of consensus

statements. The data included in these reports formed the basis for the interpretation of the results.

Interpreting the factors

The interpretation of the results from the factor analysis and rotation focused on how the factor scores aligned with the statements from the Q-sample. Each factor score reflected the degree of agreement or disagreement with the point of view represented by the individual Q-sort statements. In effect, each factor represented a different point of view in the person-sample where positive loadings on a factor indicated a point of view shared with others on that factor and negative loadings reflected disagreement with the point of view (Brown, 2004). According Webler, Danielson, and Tuler (2009), the narrative interpretation of factor loadings is more art than science 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 the categorized critical success factors in IT project success.

RESULTS AND DISCUSSION

The composite factors identified in this study derive from the Q-sorting of 40 statements representing critical success factors associated with traditional and agile project management practice. The statements used for Q-sorting (the Q-sample) are presented in Table 2 (see Appendix).

The following sections will characterize the person sample and present the process used to discover the three composite factors found in this study.

Sample Demographics

Table 3 (see Appendix) presents the demographic characteristics for the 60 person-sample used as well as the demographic data for the entire population of 519 participants for comparison purposes. The average age of the participant in the person-sample 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 4 (see Appendix) presents the range of IT project types with which the participants have experience.

Based upon the characteristics presented in Tables 3 and 4, the person sample used for this study possessed the experience and knowledge in the field required to have insights of "special relevance to the goals of the study" (McKeown & Thomas, 1988, p. 36) as required for a study employing Q-methodology.

Correlation Matrix

The first step in data analysis was the computation of correlations between each of the individual Q-sorts. The formula used for calculating the correlation statistic r was:

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

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 of forced distribution for the sample.

The completed correlations formed a 60 x 60-correlation matrix. These correlations signify the degree of similarity in the arrangement of the 40 CSF statements among the participants. Correlations of +1.00 theoretically represent a perfect positive relationship between two 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. In Q-methodology, the correlation matrix is a transitional phase between the raw data of 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 one another (Brown, 1993).

After generating the correlation matrix, the PQMethod2.11 used the principal components analysis method (PCA) to produce an unrotated factor-loading matrix containing eight factors. Each composite factor was a linear combination of individual Q-sorts and the factor loadings represent the correlation of individual Q-sorts with a given composite 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). The initial eight unrotated factors explained 66% of the variance among the 60 Q-sorts.

Factor Rotation

The last step in factor analysis in a Q-methodology study is factor rotation, which simplifies the factor structure making the factors easier to interpret. The goal of factor rotation is to generate a simple structure by clarifying the factor loadings (Brown, 2009). The concept of simple structure as first proposed by Thurstone (1947), seeks to explain the largest amount variance with the fewest number of factors.

The selection of which factors to rotate among the initial eight unrotated factors screened factors based on eigenvalues greater than 1.00 and the cumulative variance accounted for by the number of factors. In this sample, the first three unrotated 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 selection of three factors since the fourth factor only increased the explained variance by 5% and had fewer than four project manager loadings.

Characteristics of the three factors

The PQMethod 2.11 software automatically identifies Q-sorts that have high loadings on a particular factor 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. The three composite factors indentified in this study accounted for 46% of the variance among the Q-sorts. 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 PQMethod 2.11 software also checks for the degree of correlation among the defining sorts for each composite factor. These correlations represent the overall similarity between the relative ranks of the statements for each factor. The defining sorts for two of the factors (factors 2 and 3) demonstrated a relatively high correlation (0.7154). The high correlation between factor 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.

Determination of the statistical significance for factor loading is an important step in Q method data analysis. For this study, in order for a loading to be significant at the 0.01 level, it must have surpassed 0.41 and a 0.05 level of significance required loadings in excess of 0.31.

The PQMethod 2.11 software also identified both consensus statements and distinguishing statements for each composite factor. A consensus statement is one for which there is no significant difference between any of the factors. Distinguishing statements are statements placed at significantly different spots on the grid for any two factors.

Table 5 (see Appendix) presents the four consensus statements with the rankings (+4 to -4) of each statement for each factor. The consensus statements showed statement number 7 “There is a sustained commitment from upper management to provide resources, authority, and influence for project success” 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 critical success factors 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 importance of loyal team members with a strong commitment to the project ranked minor to neutral for all three factors.

The distinguishing statements for the most important critical success factors for each factor are presented in Table 6 (see Appendix) and the most unimportant success factors for each factor appear in Table 7 (see Appendix). The following paragraphs characterize each of the three factors according to those distinguishing statements

Factor 1 represented a project-person focus and 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 ($p < .01$). Project managers loading on

this factor appear to place a high value on critical success factors associated with the people involved in the project and the characteristics of the project. This factor aligned well with traditionally focused critical success factors. Three of the four 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 were project related such as the importance of clear project objectives (statement 36) and clear and unambiguous system requirements (statement 37). Project managers loading on this factor were generally dismissive of the importance of delivering business value early (statement 31) and did not feel that face-to-face communication (statement 5) was important for project success. Delivering important project features early (statement 12) also ranked lower in importance.

Factor 2 reflects a client involvement focus, and represents a much different perspective than the other two factors. This factor 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 ($p < .01$). This factor is the least negative towards agile related success factors. Project managers loading on factor 2 have a strong appreciation for user and client involvement in the project. Three of the statements ranked as most important 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). Unlike the other two factors, project managers loading on this factor feel that some traditionally oriented critical success factors may be among the most unimportant for IT project success. 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. 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) and that a people-centric organizational culture valuing face-to-face communication (statement 5) is of limited importance to project success

Composite factor 3 best aligned with a traditional project management focus and accounted for the second largest portion of variance (17%). Fifteen project managers loaded on this factor at a level of significance greater 0.41 ($p < .01$). This factor demonstrates a clear preference for the success factors associated with traditional project management. The five statements ranked among the most important align with a traditional approach to IT project management and the three statements felt to be most unimportant for project success were all agile-oriented critical success factors. Project managers loading on this factor demonstrated a preference for process oriented success factors such as 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). Alternatively, unique distinguishing statements identifying the least important critical success factors included some of the key components of the agile approach to IT project management such as co-located work-teams and clients (statement 5), and emergent project requirements (statement 32).

SUMMARY AND CONCLUSIONS

This study used Q methodology to measure the subjective points of view of project managers about the importance of suspected critical success factors for IT project success. 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.

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, this study found three composite factors representing critical success factors focused on specific areas of concern. Project managers loading on the first factor encompassed a view stressing the importance of people involved in project activities including the skill of the project team and the interpersonal skills of the project manager. The primary view among project managers who loaded on factor 2 was the importance of user/client involvement, focusing on the importance of stakeholder participation in the project and an organization that minimizes resistance and problems. Project managers associated with factor 3 emphasized the importance of traditional project management skills associated with controlling and monitoring project progress in conjunction with a detailed planning.

Instead of viewing these composite factors as mutually exclusive viewpoints, it may be more useful to consider these subjective views of critical success factors as families of concern within the project management community. Thus, from this study the following additional critical success factors may also play an important role in successful IT projects:

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

The critical success factors describing the three perspectives presented in this study were similar to some 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).

Finally, with respect to agile project management, this sample of project managers did not generally feel agile-related critical success factors were important for IT project success, although there was some appreciation for a few aspects of the agile approach to IT project management among project managers loading on factor 2,. In fact, 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 2 (see Appendix) presents the average normalized scores for statements by managerial approach.

Another purpose of this research was to illustrate the use of Q methodology to explore the meaning of suspected critical success factors found in the literature among project manager practitioners. The interpretation of the three composite factors seemed to associate the term "critical success factor" with its original meaning. In one of the first published papers illustrating a critical success factors approach, Rockart (1979) noted CSFs were difficult to define and often required subjective assessments. A few years later, Boynton and Zmud (1984) warned systems developers about using critical success factors focused on large numbers of lower operational activities. The implications from this study appear in agreement with those early admonitions. Despite the vast array of IT project critical success factors found in the project management literature, the opinions of practicing project managers suggest there are but a few broad interrelated factors most important for project success.

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APPENDIX

Table 1

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

Table 2

The Q-Sample

The following statements were randomly presented to each participant for sorting. Each statement fell into one of two categories for management approach (agile or traditional) and four categories of success factors (organizational, process, people, or project)

Management Approach x Category of Success Factor	Statement
1: Agile x Organizational	The project takes place in an organization that has a collaborative work environment exhibiting cross-functional cooperation and support.
2: Agile x Organizational	The management of the organization supports close and continuous involvement of the users and other stakeholders with the project team.
3: Agile x Organizational	Organization embraces a loosely controlled adaptive view focused on continuous learning, improvement, and the inevitability of change.
4: Agile x Organizational	The organization has a cooperative horizontal business culture
5: Agile x Organizational	The organizational culture is people-centric and places a high value on face-to-face communication.
6: Traditional x Organizational	The culture of the organization is supportive and helpful for achieving project goals.
7: Traditional x Organizational	There is a sustained commitment from upper management to provide resources, authority, and influence for project success.
8: Traditional x Organizational	There is an organizational commitment to employing the principles of project management or developing a project management capability.
9: Traditional x Organizational	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	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	Project work follows an adaptive process that manages project requirements through an iterative process of project completion.
12: Agile x Process	Project execution and organization delivers the most important features early in the project life cycle.
13: Agile x Process	The project involves regular and frequent face-to-face communication with all project stakeholders.
14: Agile x Process	The project uses a test-driven environment to correct problems and improves integration and adaptability of the work products.
15: Agile x Process	Project team, users, and project customers are co-located and have easy and regular access to one another.
16: Traditional x 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	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance
18: Traditional x Process	There are appropriate formal communications procedures established to share necessary information with all stakeholders of the project.
19: Traditional x Process	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	Project has a formal method for documentation in place to support project reporting.

Management Approach x Category of Success Factor	Statement
21: Agile x People	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	The project team is self-organizing changing configuration and work patterns as the project progresses.
23: Agile x People	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	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	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	The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict.
27: Traditional x People	Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality.
28: Traditional x People	Project team is loyal to the project and possesses a high level of commitment
29: Traditional x People	Project team members possess the required technical skill, expertise, and knowledge.
30: Traditional x People	Users are cooperative and have a positive attitude towards the project.
31: Agile x Project	The focus of the project is to develop early business value.
32: Agile x Project	There is an understanding that project requirements emerge as the project work unfolds.
33: Agile x Project	The schedule for the project is incremental and fluid within the constraints of the final deadline.
34: Agile x Project	Project involves continuous and close participation of the project customer (internal or external)
35: Agile x Project	Project focus is on the continuous delivery of incremental business value throughout.
36: Traditional x Project	The project has clearly stated and measurable goals and objectives.
37: Traditional x Project	Initial system requirements for the project are clear, unambiguous, and obtainable.
38: Traditional x Project	The schedule for project completion is detailed and realistic
39: Traditional x Project	The project involves user participation at a level sufficient for developing a sense of ownership
40: Traditional x Project	The technology involved in the project is such that there are adequate staff available with the required knowledge and expertise.

Table 3

Demographic Characteristics of Project Manager Sample

	Q 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 person-sample (n = 60)

Table 4

Experience of Participants by Type of IT project

Type of IT Project	Q Study Sample		All Respondents*	
	Count	Percent	Count	Percent
Manufacturing and Production systems	28	11%	198	9%
Sales and Marketing systems	14	5%	172	8%
Finance & Accounting Systems	32	12%	288	13%
Human Resources systems	14	5%	155	7%
Decision support systems	19	7%	170	8%
Management information systems	42	16%	350	16%
Executive information systems	17	7%	159	7%
Communication systems	22	8%	173	8%
Groupware systems	5	2%	49	2%
Knowledge Management systems	17	7%	137	6%
Enterprise Resource Planning systems	19	7%	198	9%
Other	30	12%	203	9%

Note: Totals reflect participant involvement in multiple project types

* This represents the professional data for all 519 participants who completed the data collection for comparison purposes with the person-sample (n = 60)

Table 5
Consensus Statements among All Three Factors

Statement	Factor Ranking 1	2	3
7. There is a sustained commitment from upper management to provide resources, authority, and influence for project success.	4	4	3
28. Project team is loyal to the project and possesses a high level of commitment.	1	0	1
22*. The project team is self-organizing; changing configuration and work patterns as the project progresses.	-2	-2	-2
3*. The organization embraces a loosely controlled adaptive view focused on continuous learning, improvement, and the inevitability of change.	-3	-3	-4

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

Table 6

Distinguishing Statements for the Three Composite Factors: Important Success Factors

Stmt No.	Statement	Rank	Normalized Score
	Factor 1 – Focusing on the Importance of Person and the Project Success Factors		
36	The project has clearly stated and measurable goals and objectives.	4	1.88*
26	The project manager possesses the interpersonal skills necessary to build trust, motivate people, and resolve conflict.	3	1.50*
29	Project team members possess the required technical skill, expertise, and knowledge.	3	1.35
27	Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality.	2	1.32*
37	Initial system requirements for the project are clear and unambiguous	2	1.11*
	Factor 2 – Focusing on the Importance of Client Involvement Success Factors		
39	The project involves user participation at a level sufficient for developing a sense of ownership.	4	1.77*
34	Project involves continuous and close participation of the project customer (internal and external)	3	1.42*
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.	3	1.38*
36	The project has clearly stated and measurable goals and objectives.	3	1.33*
	Factor 3 – Focusing on the Importance Traditional Concerns of Project Management		
36	The project has clearly stated and measurable goals and objectives.	4	2.31*
27	Project manager has good project management skills including ability to monitor and track project scope, time, cost and quality.	4	1.89*
19	The use of strong project management practices used to control the project, set milestones, identify critical paths, and meet delivery dates.	3	1.31*
17	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance.	3	1.29*
18	There are appropriate formal communications procedures established to share necessary information with all stakeholders of the project.	2	0.93*

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

Table 7

Distinguishing Statements for the Three Composite Factors: Unimportant Success Factors

Stmt No.	Statement	Rank	Normalized Score
	Factor 1 – Focusing on the Importance of Person and the Project Success Factors		
5	The organizational culture is people-centric and places a high value on face-to-face communication	-4	-1.84
31	The focus of the project is to develop early business value	-4	-1.81*
12	Project execution and organization delivers the most important features early in the project life cycle.	-3	-1.45*
	Factor 2 – Focusing on the Importance of Client Involvement Success Factors		
17	There is a detailed project planning effort consisting of well-defined estimates for budget, schedule, and performance.	-4	-1.55*
38	The schedule for project completion is detailed and realistic	-3	-1.52*
5	The organizational culture is people-centric and places a high value on face-to-face communication.	-2	-1.37*
19	The use of strong project management practices used to control the project, set milestones, identify critical paths, and meet delivery dates.	-2	-1.33*
37	Initial system requirements for the project are clear and unambiguous	-2	1.00*
	Factor 3 – Focusing on the Importance Traditional Concerns of Project Management		
15	Project work follows an adaptive process that manages project requirements through an iterative process of project completion	-3	-1.38
32	There is an understanding that project requirements emerge as the project work unfolds	-3	-1.33*
11	Project work follows an adaptive process that manages project requirements through an iterative process of project completion	-3	-1.18*

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

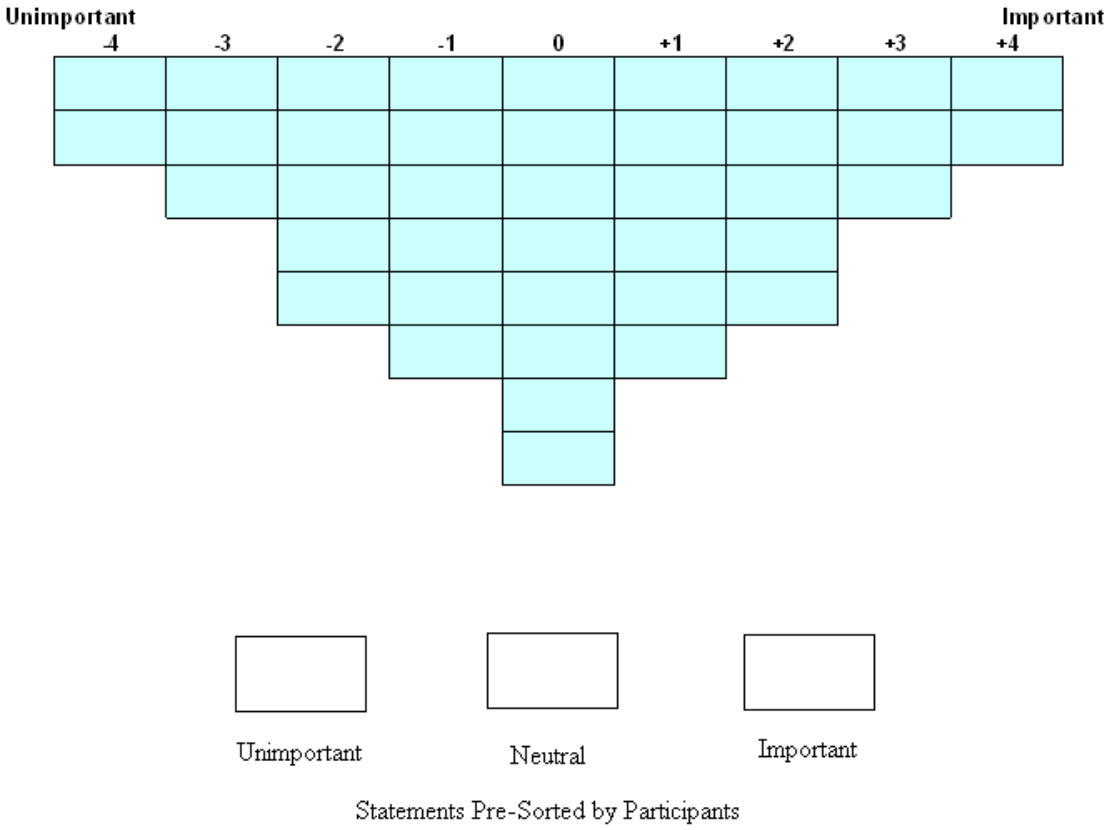

Figure 1. A Sample Q-sorting Grid for a 40-item Q sample

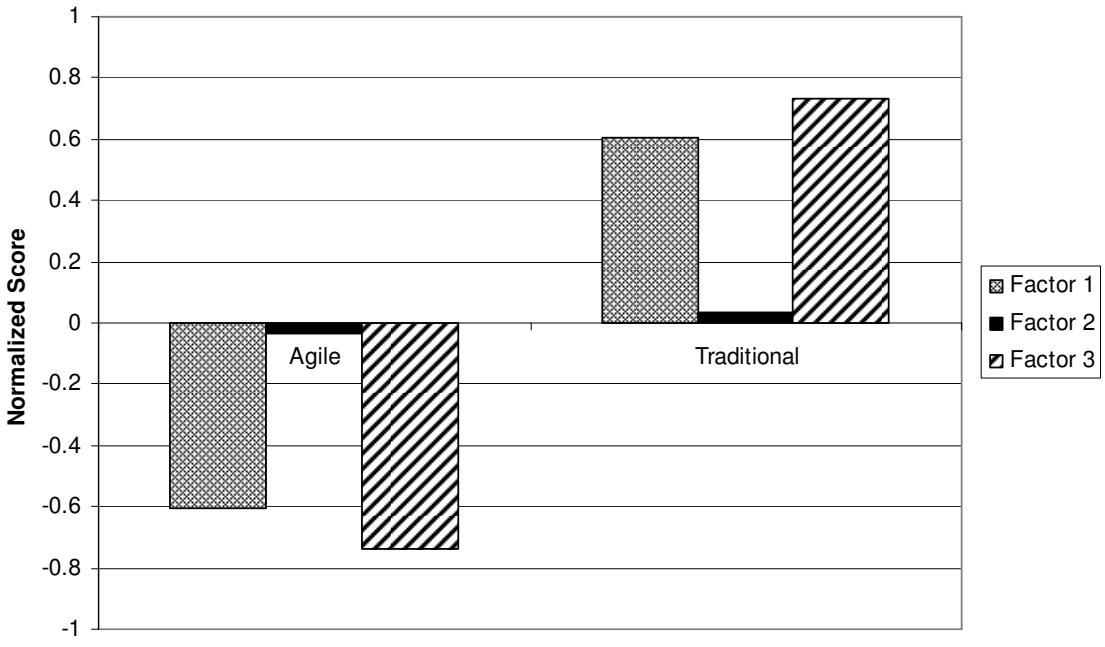

Figure 2. Average Normalized factor scores for Agile and Traditional Success Factors