IS PERSONALITY A KEY ELEMENT OF SIX SIGMA PROJECT SUCCESS?

Nancy W. Ashley
2710 Crimson Way, Washington State University Tri-Cities, Richland, WA 99354
509-372-7359 nashley@tricity.wsu.edu

MaryAnne Winniford
1202 Chipeta Ave., Grand Junction, CO 81501
970-245-2246 mawinniford@gmail.com

ABSTRACT

Many quality improvement techniques, including Six Sigma, total quality management, quality design teams, and quality circles, rely on teamwork. While there is a large body of research on personality and teams, little has been incorporated into operations quality management theory and practice. This paper provides a research model for the effects of personality on team projects and Six Sigma project success, as well as the methodology and interview guide for a case study to be conducted during the summer of 2013. Results from the case study will be provided at the November 2013 DSI Conference presentation.

Keywords: Six Sigma, personality, team, project management

INTRODUCTION

In 1986, Six Sigma techniques were developed and implemented at Motorola to correct poor quality, saving Motorola $2.2 billion in four years. Since then, Six Sigma has spread around the globe and expanded in scope beyond process improvement to also address new product development. However, the persistence of Six Sigma projects that do not deliver benefits (Chakravorty, 2010) suggests that there is more to be learned about the implementation of Six Sigma within organizations.

There are many studies that have found important context elements leading to Six Sigma project success (e.g., Choo, Linderman, & Schroeder, 2007; Linderman, Schroeder, Zaheer, & Choo, 2003; McAdam & Lafferty, 2004; Schroeder, Linderman, Liedtke, & Choo, 2008; Zu, Fredenhall, & Douglas, 2008). For instance, leadership engagement, strategic project selection, use of improvement specialists, structured methods, and psychological safety have been found to be key elements for project success (Choo et al., 2007; Schroeder et al., 2008).

The influence of the personalities of team members on the success of team projects has a long history of fruitful research, but has not been examined in relation to Six Sigma project success. Because Six Sigma projects are conducted by teams, personality could be an important element of project success. This research project seeks to extend Six Sigma theory by examining the personalities of Six Sigma team members as an additional element that may be important to Six Sigma project success.
This research addresses the following questions:

- Is team member personality a key element of Six Sigma project success?
- Are personality traits mediated or moderated by other variables in influencing project success?

The literature about the effects of personality in team projects is reviewed next. Following that is a presentation of the Input-Mediator-Outcome model that is used in the research, and finally a description of the case study methodology that will be used to gather information during the summer of the summer of 2013. The cases will be analyzed and reports written during the summer of 2013, and the results will be reported at the November 2013 Decision Sciences Conference.

**LITERATURE REVIEW OF PERSONALITY EFFECTS ON TEAM PROJECTS**

Six Sigma projects are executed by people working in teams. Various personality traits of team members have been identified as indicators of team effectiveness in quality improvement (Schroeder, Linderman, & Zhang, 2005). Researchers of operations management and quality improvement are increasingly recognizing the importance of elements of human behavior such as personality in team composition in their models (Boudreau, Hopp, McClain, & Thomas, 2003; Detert, Schroeder, & Mauriel, 2000). Yet Dean and Bowen (1994) found relatively little in the literature to guide the selection of team members in quality improvement projects.

Six Sigma emphasizes the role and training of team project leaders called Master Black Belts, Black Belts, and Green Belts (Zu et al., 2008), and recognizes that these role models influence their peers (Linderman et al., 2003). The extensive research on the effects of personality on leadership in team projects is also considered in this study.

**Personality Traits and Team Composition**

Team composition is an important element of team effectiveness, as has been shown in both quality improvement research (Kichuck & Wiesner, 1997) and in other team research (Schilpzand, Herold, & Shalley, 2011; LePine, 2003; Gustavsson & Baccman, 2005). Various team member characteristics have been studied using laboratory studies, field research, case studies, and meta-analyses of previous research.

Both surface-level characteristics, which include demographics such as race, gender, age and other characteristics, and deep-level characteristics, which include personality, values, and attitudes have been studied (Harrison, Price, Gavin, & Florey, 2002; Bell, 2007). Deep-level characteristics have been found to be more predictive of team performance than surface-level characteristics (Harrison et al., 2002). Personality measures have been found to be predictors of individual job performance in meta-analytic reviews (Barrick & Mount, 1991; Tett, Jackson, & Rothstein, 1991), as well as predictors of leadership (Judge, Bono, Ilies, & Gerhardt, 2002) and team performance (Barrick, Stewart, Neubert, & Mount, 1998). Bell’s (2007) meta-analysis found that the predictive value of deep-level characteristics of team composition varied between laboratory studies and field research. In the laboratory, general mental ability and emotional...
intelligence predicted team outcomes, whereas in the field, personality characteristics predicted outcomes. As we propose to do field research in this case study, Bell’s study supports our focus on personality characteristics.

Personality traits of interest to researchers have changed over time. Current research has focused on personality typologies that measure more than one personality trait, like the Big Five (or Five Factor) Model (McCrae & Costa, 1987; John, Donahue, & Kentle, 1991). The Big Five model is widely used in studies of team composition, as well as in studies of leadership (Judge et al., 2002). Another aspect of personality is studied by Boone, Van Olffen, and Van Witteloostuijn (2005), who give attention to the role of locus-of-control – the personality characteristic that determines the extent to which individuals believe they can control events that affect them.

The Big Five model identifies the extent to which the individual is conscientious, agreeable, extroverted, emotionally stable (this characteristic is also referred to by its negative pole as neurotic), and open to experience (McCrae & Costa, 1987). In addition to how individual personalities affect project outcomes, there is the question of the “personality” of the group. These higher-level scores are created through aggregation of individual scores. Group scores on personality variables may include averaging scores on each trait, or recording the highest (or lowest or median) score of any individual on a trait, or measuring the variance (dispersion) of scores in the group. There is research to support the superiority of both homogeneity and heterogeneity of group trait scores, under different conditions and for different reasons (Kichuk & Weisner, 1997).

**INPUT-MEDIATOR-OUTCOME MODEL OF TEAM PERFORMANCE**

The Input-Mediator-Outcome model (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Mathieu, Maynard, Rapp, & Gilson, 2008) is utilized as a research model for exploring the effects of personality traits and key elements of Six Sigma project success, as can be seen in Figure 1.

**Input: Personality Variables and Contextual Elements of Six Sigma Project Success**

The research regarding personality effects on team performance is extremely diverse -- many variables have been shown to mediate or moderate how personality relates to team outcomes. Personality variables and their predicted effects on team projects based on previous research are summarized in Table 1 for space considerations.

While this study focuses on the influence of personality, it must also take into consideration context variables that have already been found to be significant in the success of Six Sigma projects. Nair, Malhotra, and Ahire (2011, p.530) describe five key elements of Six Sigma project success:

In particular, leadership engagement refers to top management championing of specific Six Sigma process-improvement projects …. Strategic project selection refers to formal mechanisms employed to evaluate the feasibility and impact of Six Sigma process improvement initiatives. Structured method considers the use of the DMAIC (Define, Measure, Analyze, Improve, and Control) approach within Six Sigma process-
improvement projects, and psychological safety represents the shared belief regarding risk taking among team members… (Edmundson, 1999). Improvement specialists refer to a team comprising professionals with certified Black Belt qualifications or equivalent competencies and employees who have substantial process knowledge and may have had Green Belt training.

FIGURE 1. Effects of Personality and Six Sigma Elements on Team Project Performance

These key elements of Six Sigma project success will be included as input in order to explore the most significant components contributing to project success (effects noted in previous literature are summarized in Table 1), and possible interactions between the key elements and personality. Both the personality variables and the key elements of success in Six Sigma projects are included as input in the research model shown in Figure 1.

Mediating and Moderating Variables

A mediator is a variable that is influenced by an input variable, which in its turn explains an effect in outcome. In this study, mediating variables are those associated with personality traits relevant to team project outcomes. An example of a mediated personality trait is that agreeableness influences productivity, and productivity directly relates to team project performance. Productivity mediates, or explains, the influence of the personality trait agreeableness on the outcome project success.

In addition to mediating variables, several moderating variables have been found to explain why projects with otherwise similar input have differing output under different conditions. A moderating variable interacts with the input variable so that the direction or strength of the outcome is impacted. An example of a moderating variable is project uncertainty: structured methods correlates positively with team project performance unless there are conditions of significant project uncertainty, when structured methods have a negative effect. Project
uncertainty moderates the influence of the input structured methods, but unlike a mediator, project uncertainty is not caused by the use of structured methods. The moderating variables come from two fields of research – personality in team projects and elements of success in Six Sigma projects (Nair et al., 2011).

The consideration of mediating and moderating factors is supported by Boone, Van Olffen, and Van Witteloostuijn (2005). They suggest that previous studies may have been inadequately analyzed to account for such mediating factors, leading to the incorrect conclusion that individual characteristics such as personality were not important. Kozlowski and Ilgen (2006) argue that the research foundation for the role of characteristics such as personality on team composition is still in its infancy. The complexity of the team composition environment leads Mathieu et al. (2008) to plead with researchers to avoid simplistic studies of a few variables, but rather to embrace the complexity of team environments, and to utilize when appropriate qualitative methods along with quantitative methods in order to avoid overlooking important contributing or mediating factors.

Research has found that moderators of personality traits in team projects include variables such as team leadership, project complexity, and project uncertainty. Mediators of personality traits include team communication, team productivity, team creativity, team leadership, and leader contribution to group success. The support in the literature for these mediators and moderators is shown in Table 1.

Six Sigma projects take place in contexts with varying levels of uncertainty and complexity. Nair et al. (2011) found that two elements that have been thought to be positive contributions to project success – the use of improvement specialists and structured methods (Choo et al., 2007; Schroeder et al., 2008) – had negative influences on project processes under various combinations of project uncertainty and complexity. Complexity and uncertainty have also been identified in the personality and team project literature as moderators of certain personality traits on project success, as shown in Table 1.

The presence of project uncertainty and complexity as moderating variables in both the personality and team project literature and the Six Sigma project success literature makes these moderator variables particularly pertinent to this study. These moderating and mediating variables are included in the research model in Figure 1.

**Outcome Variable: Team Project Performance**

Six Sigma projects are distinguished by their focus on measurable project effectiveness as an outcome. Researchers of the effect of personality on team projects have frequently considered other team outcomes in addition to project effectiveness (Mathieu et al., 2008). These include outcomes such as creativity, communication, productivity, social cohesion, and viability. Some of these outcomes, for instance viability and creativity, may serve as mediators in one study, and as project outcomes in another study. Beal et al. (2003) provide a helpful discrimination between project behaviors (that could include creativity, communication, productivity, social cohesion, and viability) and the outcomes of those behaviors, such as team performance. We construct a
### TABLE 1: Influences of Research Variables on Outcome of Team Project Performance (TPP)

<table>
<thead>
<tr>
<th>INPUT VARIABLES</th>
<th>INFLUENCES OF VARIABLES ON TPP (TEAM PROJECT PERFORMANCE) BASED ON CITED LITERATURE (Mediators and Moderators underlined)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personality Traits:</strong></td>
<td></td>
</tr>
<tr>
<td>All Big Five traits</td>
<td>High heterogeneity of scores positively related to TPP (Mello &amp; Ruckes, 2006).</td>
</tr>
<tr>
<td>Extraversion</td>
<td>Positively related to TPP (Barrick et al., 1998; Neuman &amp; Wright, 1999).</td>
</tr>
<tr>
<td></td>
<td>High variance of scores positively related to TPP (Mohammed &amp; Angell, 2003).</td>
</tr>
<tr>
<td></td>
<td>Medium-level team scores positively related to TPP (Barry &amp; Stewart, 1997).</td>
</tr>
<tr>
<td></td>
<td>Positively related to Team Leadership which mediates relationship with TPP. (Judge et al., 2002; Kickul &amp; Neuman, 2000; Colbert, Judge, Choi, &amp; Wang, 2012; Arason, Reilly &amp; Lynn, 2006).</td>
</tr>
<tr>
<td></td>
<td>Positively related to Communication, which mediates relationship with TPP (Mathieu et al., 2008).</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>Positively related to TPP (Bell, 2007; Barrick et al., 1998; LePine, 2003).</td>
</tr>
<tr>
<td></td>
<td>Homogeneity of team scores negatively related to TPP (Kichuk &amp; Wiesner, 1997).</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>Positively related to TPP (Barrick et al., 1998; Neuman &amp; Wright, 1999).</td>
</tr>
<tr>
<td></td>
<td>High individual minimum scores positively related to TPP (Bell, 2007).</td>
</tr>
<tr>
<td></td>
<td>Positively related to Communication &amp; Productivity which mediate relationship with TPP (Mathieu et al., 2008).</td>
</tr>
<tr>
<td>Openness to experience</td>
<td>Positively related to TPP (Bell, 2007; Reilly, Lynn &amp; Aronson, 2002).</td>
</tr>
<tr>
<td></td>
<td>Positively related to Team Leadership which mediates relationship with TPP (Aronson, Reilly &amp; Lynn, 2006; Kickul &amp; Neuman, 2000; Colbert et al., 2012).</td>
</tr>
<tr>
<td></td>
<td>High variance in team scores positively related to Team Creativity, which mediates relationship with TPP (Schilpzand, herold &amp; Shalley, 2011).</td>
</tr>
<tr>
<td></td>
<td>Better predictor of TPP when moderated by Project Complexity (Griffith &amp; Hesketh, 2004).</td>
</tr>
<tr>
<td></td>
<td>Better predictor of Team Leadership, a mediator of TPP, under conditions of Project Uncertainty (Aronson, Reilly &amp; Lynn, 2006).</td>
</tr>
<tr>
<td>Emotional stability/ Neuroticism</td>
<td>Neuroticism (negative pole of Emotional Stability) negatively related to TPP (Kichuk &amp; Wiesner, 1997).</td>
</tr>
<tr>
<td></td>
<td>Better predictor of Team Leadership, a mediator of TPP, under reduced Project Uncertainty (increased project stability) (Aronson et al., 2006).</td>
</tr>
<tr>
<td>Locus of control</td>
<td>High external scores predict TPP when moderated by Team Leadership (Boone et al., 2005).</td>
</tr>
<tr>
<td><strong>Six Sigma Key Elements:</strong></td>
<td></td>
</tr>
<tr>
<td>Leadership engagement,</td>
<td>Positively related to TPP (Nair et al., 2011; Linderman et al., 2003; McAdam &amp; Lafferty, 2003; Zu et al., 2008; Schroeder et al., 2008; Choo et al., 2007).</td>
</tr>
<tr>
<td>Strategic project selection,</td>
<td></td>
</tr>
<tr>
<td>Psychological safety</td>
<td></td>
</tr>
<tr>
<td>Use of improvement specialists</td>
<td>Positively related to TPP (Nair et al., 2011; Linderman et al., 2003; McAdam &amp; Lafferty, 2003; Zu et al., 2008; Schroeder et al., 2008; Choo et al., 2007).</td>
</tr>
<tr>
<td></td>
<td>Negatively related to TPP when moderated by high Project Complexity (Nair et al., 2011).</td>
</tr>
<tr>
<td>Structured methods</td>
<td>Positively related to TPP (Nair et al., 2011; Linderman et al., 2003; McAdam &amp; Lafferty, 2003; Zu et al., 2008; Schroeder et al., 2008; Choo et al., 2007).</td>
</tr>
<tr>
<td></td>
<td>Negatively related to TPP when moderated by high Project Uncertainty (Nair et al., 2011).</td>
</tr>
</tbody>
</table>

**Note:** All input are mean team scores, unless otherwise specified.
research model, seen in Figure 1, in which team project performance is an outcome of mediated and moderated personality factors and key elements of Six Sigma projects.

**METHODOLOGY**

Because our investigation of the effects of personality factors on Six Sigma project success is exploratory, we will use a multiple case study—a research methodology that has been employed by several other operations management researchers (Dewhurst et al., 2003; Grütter et al., 2002; Pagell & LePine, 2002). McCutcheon and Meredith (1993) called for more case research in operations management. The method allows the researcher to investigate closely the potential relationships between personality and other mediating or moderating variables, and ultimately how the variables may affect the quality of outcomes. In-depth analysis of cases can examine the “why” behind the relationships between variables and outcome, which is appropriate for theory development. Using multiple cases allows for comparison in different contexts, can further define variable relationships, and generates a richer discussion of interaction under a variety of situations (Eisenhardt & Graebner, 2007).

Gaining access to companies can be difficult, as case research in Six Sigma requires detailed information to be gathered on what may be considered strategic process improvements. We are fortunate to have our research sponsored by Promontory Management Group, based in Utah. They allowed us to approach their client base to request participation in this study. Eleven sites, each with a number of discrete projects, have agreed to provide access to their information and people. Six of the eleven are manufacturers. Services offered by some of the companies are engineering (including many product designs), newspaper production, on-site project management, supply chain coordination, and distribution. Three are heavily involved with military work; the remaining companies are not. All are for-profit companies; two sites are geographically separated sites of one company (100 miles apart). Some sites experienced significant project failures, while others have had more successes. The sites represent very different settings in terms of location, company size, industry, and the processes undergoing Six Sigma improvement, in accordance with the recommendations of McCutcheon and Meredith (1993). This will allow us to compare and contrast how the research variables may affect Six Sigma processes and outcomes.

The Six Sigma projects to be analyzed have already been completed and assessed concerning project success. There is a wide variance in project size and the conditions of project complexity and uncertainty across projects. Some projects are for product design; some are for process improvement in manufacturing and in services. Approximately 30 projects will be selected from the eleven sites, allowing for exploration of the many variables in the research design. Description of the cases selected will be provided in the presentation of the paper at the November 2013 Decision Sciences Conference, as the final selection of cases for analysis will be made when the sites are visited for data collection in the summer of 2013.

**Structured Interviews**

Structured and semi-structured data will be gathered by interviewing project team participants and others with access to relevant information. As shown in Table 2, measures will be included.
in the interview guide to assess personality input, Six Sigma key elements input, mediating and moderating variables, and the project outcomes. Information will be collected in person when possible, using a branching questionnaire that guides interviewees through appropriate questions based on their roles in projects (see Appendix A). If it is not possible to interview in person, interviewees will be able to access a branching online interview form based on the interview guide. Table 2 shows the variables for which interviews will be the source of information, the interview questions that will measure those variables, and citations for specific variable metrics that are used in the interview.

As discussed in the review of personality literature, research has coalesced around the five-trait model (McCrae & Costa, 1987; Barrick & Mount, 1991; Tett et al., 1991; Judge et al., 2002; Neuman & Wright, 1999, Mathieu et al., 2000; Barrick et al., 1998; Kickul & Neuman, 2000; Griffith & Hesketh, 2005; Schilpzand et al., 2011). The five factors include Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability. John et al. (2008) compared several inventories of the five personality traits and found internal consistency ratings over .75 on each trait, in all inventories reviewed. The Big Five Inventory (BFI) 44-item test to be used in this study has been shown to have high validity, in internal consistency and in self-ratings versus peer-ratings (John et al., 2008; Soto & John, 2009). The test also provides the extra convenience of an online test that can be completed in ten minutes. Another personality measure of interest is the locus of control, for which the Rotter scale will be used (Rotter, 1966).

For each Six Sigma project group, the BFI percentile scores on the five traits and the locus of control scores will be calculated for each of the participants. As discussed in the literature review, each trait will generate several potential group measures, including average group scores, the maximum and minimum scores, as well as the dispersion of scores.

Likewise, the team scores for the key elements of Six Sigma will be calculated for each project team, along with the mediating and moderating variables. Instructions for the scoring and analysis of each of the variables is included in the interview guide (Appendix A), in italics. Project outcomes will be examined in light of these calculated scores.

To ensure that concepts related to the research variables are not missed in the captured interview data, a text analysis tool, NVIVO 10, will be utilized. Morrison and Moir (1998) support the use of text analysis tools in theory-development research projects like this one. Use of NVIVO 10 allows searches on words related to variables, for instance “difficult,” “complex,” “complicated,” “confusing” or “frustrated” might turn up evidence of project complexity. Additionally the tool can be used to code elements of interviews with meaning, such as “failure cause,” allowing the researchers to group data for analysis. Information gained in this way will be used in combination with the more structured measures from the interviews to gain understanding of the influence of the research variables on team project performance.

The company’s determination of whether a project was successful or unsuccessful will be utilized as the measure of the research outcome, Team Project Performance. Nair et al. (2011) also characterized Six Sigma projects as either successful or unsuccessful in a multi-case study. As shown on Table 2, project success or failure will be determined with a question in the interview. In addition to this question, information will be gathered about other performance
outcomes in order to increase understanding of the company’s designation as success or failure. Depending on the type of project, measures could include things like average lead time, 95th percentile lead time, commonality index (i.e., how often can a given design be reused throughout the company), a complexity index (e.g., how many parts are there relative to a baseline for this type of technology). Other examples of project success suggested by Nair et al. (2000, p.530) include “on-time completion, satisfying budgetary constraints, improvements in the critical dependent ‘Y’ metrics (e.g., patient turnaround time, call response time), and financial returns from the project.” Questions to examine possible outcomes are included in the questionnaire, along with scoring and analysis instructions. Percentages of measurable improvements and consideration of relative project budgets will help to understand each project’s designation as a success or failure.

**TABLE 2: Operational Measures of Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Interview Question Number(S)</th>
<th>Citation Supporting Interview Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personality Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Five Personality traits</td>
<td>13</td>
<td>John et al., 1991</td>
</tr>
<tr>
<td>Locus of control</td>
<td>14</td>
<td>Rotter, 1966</td>
</tr>
<tr>
<td>Six Sigma Key Elements Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadership engagement</td>
<td>24,33</td>
<td>Schroeder et al., 2008</td>
</tr>
<tr>
<td>Strategic project selection</td>
<td>25-27</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td>Psychological safety</td>
<td>18</td>
<td>Edmondson, 1999</td>
</tr>
<tr>
<td>Use of improvement specialists</td>
<td>7,8,19a,34a</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td>Structured methods</td>
<td>20,36</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td><strong>MODERATORS AND MEDIATORS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>21</td>
<td>Pinto &amp; Pinto, 1990</td>
</tr>
<tr>
<td>Team productivity</td>
<td>22,29</td>
<td>Gorla &amp; Lam, 2004</td>
</tr>
<tr>
<td>Team Leadership</td>
<td>12,28,16</td>
<td>Walumbwa et al., 2008</td>
</tr>
<tr>
<td>Leader contribution to group success</td>
<td>17</td>
<td>Chemers et al., 2000</td>
</tr>
<tr>
<td>Team creativity</td>
<td>23,35</td>
<td>Gilson &amp; Shalley, 2004</td>
</tr>
<tr>
<td>Project complexity</td>
<td>10,19b,31,34b</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td>Project uncertainty</td>
<td>19c,32,34c</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td><strong>OUTCOME – TEAM PROJECT PERFORMANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-time completion</td>
<td>30b</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td>Satisfying budgetary constraints</td>
<td>30c</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td>Financial returns from the project</td>
<td>30d</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td>Improvements in the measured outputs of the Six Sigma process improvement (measures vary depending on the project)</td>
<td>30e</td>
<td>Nair et al., 2011</td>
</tr>
<tr>
<td>Company determination of project success or failure</td>
<td>30f</td>
<td>Nair et al., 2011</td>
</tr>
</tbody>
</table>
Each case will be examined individually, with the researchers gaining understanding as they move through the projects and sites. Cases will then be compared against each other with consideration of the project variables. Because of the exploratory nature of this investigation, it is assumed that the data requested may change or expand as insight is generated or questions develop.

The ultimate result of this research will be to generate hypotheses regarding the effect of personality and context elements, along with moderating and mediating variables, on Six Sigma project success.

**RESULTS**

Preliminary results of our investigation and analysis will be reported at the November 2013 Decision Sciences conference.
APPENDIX

INTERVIEW GUIDE

Italicized text shows information to the interviewer, or how responses will be scored (if non-obvious) and analyzed, and will not be presented to interviewees. Question numbers correspond to those in Table 2. The interview will be conducted by either a face-to-face human interviewer or by software – both will skip questions and branch as needed. The interviewee will be encouraged to expand verbally upon concepts introduced by the structured questions. These comments will be recorded and analyzed with the use of the NVIVO 10 text analysis tool as described in the methodology.

Each interviewee will be given a unique code for the permanent storage and analysis of their interview responses, and names will be deleted from the data store. Even after the names have been removed, individual interview responses will NOT be made available to company management, nor quoted in research results in a way that will allow identification. Likewise, each company and project will be given a unique code for permanent storage and analysis, and company names and project identifiers will be deleted.

INTERVIEW OPENER

Thank you for making time to participate in this research that explores the possible effects of personality traits to Six Sigma project success. We are studying approximately 30 Six Sigma projects conducted in eleven different companies. Depending on the number of projects in which you have participated, and your role in those projects, you may be asked questions from several types of interviews.

1. Interviewee name: ____________________________
2. Interview date: __________________________________________
3. Company: _________________________ (Each company will be given a unique code)
4. Number of Years with the Company _____________________
5. Male / Female (circle one)
6. Age: __________________

Analysis: Responses of questions 1-6 will be utilized to create a database entry for the respondent. Name will be deleted after an identification code is created. Demographic data may be utilized in later analysis.

7. What level of Six Sigma training do you currently have?
   a. No training in Six Sigma
   b. Green Belt
   c. Black Belt
   d. Master Black Belt
   e. Other training (specify) ________________________________
8. Over the years, approximately how many Six Sigma projects have you participated, in this and other companies? ______
   Analysis: The responses to questions 7-8 above will be compared across projects to determine whether relatively higher or lower Use of Improvement Specialists (proportional to the size of the project) was a factor in the projects in which that individual participated. These answers will be considered in conjunction with the answers to Questions 19a and 34a.

All participants will complete one Opener Interview. The Team Project Interview will be completed for each person involved in every project, therefore a person may complete one or more Team Project Interviews and may branch differently, according to their role in a project.

END OF INTERVIEW OPENER

TEAM PROJECT INTERVIEW

To be completed by each person involved in a project. The project name will be pre-coded, as the projects have been identified prior to the interviews.

9. In this interview, we will be considering the project __________________ (pre-coded).
   If you were involved with more than one of the projects we are examining, please concentrate only on this project for now. Later we will ask about other projects on which you worked.
   Analysis: Project Name response will ensure that individual’s responses are correctly grouped by project.

10. Please indicate the number of members on the team for this project: ____________
    Analysis: The number of members on team will be used as a measure of the moderating variable Project Complexity, with larger teams being considered more complex than smaller teams. This answer will be considered in conjunction with the answers to 19b, 31, and 34b.

11. Which of the following describes your role in or relationship to this Six Sigma project – choose all that apply.
    a. Team Member
    b. Team leader
    c. Champion
    d. Executive Leadership
    e. Other Manager/Supervisor
    f. Other (specify relationship to team)______________________________________
    Analysis: Responses will allow branching to gather appropriate information from individuals with different roles.

12. Name the person considered the team leader for this project. If there was more than one person you consider a leader, please choose the person who had the strongest leadership
influence on the team. [Name will be converted to a code, the code stored and the name deleted.]

Analysis: Inconsistency of the responses to question #12 within a team may suggest lower levels of Team Leadership, a mediating and moderating variable of Team Project Performance. This answer will be considered in conjunction with the answers to Questions 16 and 28, which also measure Team Leadership.

If Team Member, then complete the “Personality Traits Interview” (unless already completed) and “Team Member Interview”
READ: You will take the Personality Traits Interview and a Team Member Interview, which will take about 30 minutes. You may take more than one Project Interview and follow-on interviews if you were involved in more than one of the projects we are examining. We appreciate your time to help us improve the Six Sigma processes in your company.

If Team Leader, then complete “Personality Traits Interview” (unless already completed) and “Team Member” AND “Project Context Interview”
READ: You will take the Personality Traits Interview, the Member Interview, and the Project Context Interview, which will take about 60 minutes. You may take more than one Project Interview and follow-on interviews if you were involved in more than one of the projects we are examining. As a leader of Six Sigma teams, your information and viewpoint will greatly assist us to define and improve the Six Sigma processes in your company. We appreciate your help.

If Manager/Supervisor, Champion or Executive Leader, then complete “Project Context Interview”
READ: You will take the Project Context Interview, which will take about 30 minutes. You may take more than one Project Interview and follow-on interviews if you were involved in more than one of the projects we are examining. As a (manager/champion/executive) for Six Sigma teams, your information and viewpoint will greatly assist us to define the Six Sigma outcomes in your company. We appreciate your help.

If Other, probe for best selection of interviews
READ: Your role seems closest to the __________, so you will take the __________ interviews. It will take approximately _____ minutes. We appreciate your help in defining the processes and outcomes of this project.

END OF TEAM PROJECT INTERVIEW

PERSONALITY INTERVIEW

A person takes only one personality interview. They may take one or more Project Interviews, depending on how many projects on which they have served.
Please complete the following two personality tests, both of which have been determined by researchers to be relevant to team project success -- the Big Five Inventory and the Locus-of-Control scale. These inventories will take approximately 10 minutes, total. The Big Five measures the degree to which a person is conscientious, agreeable, extroverted, emotionally stable, and open to experience. Locus of control is a personality characteristic that determines the extent to which individuals believe they can control events that affect them.

13. Big Five Inventory of Personality Traits

How I am in general:

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disagree</td>
<td>Disagree</td>
<td>Neither agree nor disagree</td>
<td>Agree a little</td>
<td>Agree strongly</td>
</tr>
</tbody>
</table>

I am someone who…

1. ___ Is talkative
2. ___ Tends to find fault with others
3. ___ Does a thorough job
4. ___ Is depressed, blue
5. ___ Is original, comes up with new ideas
6. ___ Is reserved
7. ___ Is helpful and unselfish with others
8. ___ Can be somewhat careless
9. ___ Is relaxed, handles stress well.
10. ___ Is curious about many different things
11. ___ Is full of energy
12. ___ Starts quarrels with others
13. ___ Is a reliable worker
14. ___ Can be tense
15. ___ Is ingenious, a deep thinker
16. ___ Generates a lot of enthusiasm
17. ___ Has a forgiving nature
18. ___ Tends to be disorganized
19. ___ Worries a lot
20. ___ Has an active imagination
21. ___ Tends to be quiet
22. ___ Is generally trusting
23. ___ Tends to be lazy
24. ___ Is emotionally stable, not easily upset
25. ___ Is inventive
26. ___ Has an assertive personality
27. ___ Can be cold and aloof
28. ___ Perseveres until the task is finished
29. ___ Can be moody
30. ___ Values artistic, aesthetic experiences
31. ___ Is sometimes shy, inhibited
32. ___ Is considerate and kind to almost everyone
33. ___ Does things efficiently
34. ___ Remains calm in tense situations
35. ___ Prefers work that is routine
36. ___ Is outgoing, sociable
37. ___ Is sometimes rude to others
38. ___ Makes plans and follows through with them
39. ___ Gets nervous easily
40. ___ Likes to reflect, play with ideas
41. ___ Has few artistic interests
42. ___ Likes to cooperate with others
43. ___ Is easily distracted
44. ___ Is sophisticated in art, music, or literature
BFI SCORING INSTRUCTIONS

To score the BFI, first reverse-score all negatively-keyed items:

Extraversion: 6, 21, 31
Agreeableness: 2, 12, 27, 37
Conscientiousness: 8, 18, 23, 43
Neuroticism: 9, 24, 34
Openness: 35, 41

To recode these items, subtract the score for all reverse-scored items from 6. For example, if the score was 5, compute 6 minus 5 and the recoded score is 1. That is, a score of 1 becomes 5, 2 becomes 4, 3 remains 3, 4 becomes 2, and 5 becomes 1.

Next, create scale scores by averaging the following items for each Big 5 domain (where R indicates using the reverse-scored item).

Extraversion: 1, 6R 11, 16, 21R, 26, 31R, 36
Agreeableness: 2R, 7, 12R, 17, 22, 27R, 32, 37R, 42
Conscientiousness: 3, 8R, 13, 18R, 23R, 28, 33, 38, 43R
Neuroticism: 4, 9R, 14, 19, 24R, 29, 34R, 39
Openness: 5, 10, 15, 20, 25, 30, 35R, 40, 41R, 44

14. Locus of Control Scale

For each question circle the statement that you agree with the most.

1. a. Children get into trouble because their patents punish them too much.
   b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.
   b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
   b. There will always be wars, no matter how hard people try to prevent them.

4. a. In the long run people get the respect they deserve in this world.
   b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries

5. a. The idea that teachers are unfair to students is nonsense.
   b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
6. a. Without the right breaks one cannot be an effective leader.
    b. Capable people who fail to become leaders have not taken advantage of their
       opportunities.

7. a. No matter how hard you try some people just don't like you.
    b. People who can't get others to like them don't understand how to get along with others.

8. a. Heredity plays the major role in determining one's personality
    b. It is one's experiences in life which determine what they're like.

9. a. I have often found that what is going to happen will happen.
    b. Trusting to fate has never turned out as well for me as making a decision to take a definite
       course of action.

10. a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
    b. Many times exam questions tend to be so unrelated to course work that studying in really
       useless.

11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
    b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.
    b. This world is run by the few people in power, and there is not much the little guy can do
       about it.

13. a. When I make plans, I am almost certain that I can make them work.
    b. It is not always wise to plan too far ahead because many things turn out to be a matter of
       good or bad fortune anyhow.

14. a. There are certain people who are just no good.
    b. There is some good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.
    b. Many times we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who was lucky enough to be in the right place
    first.
    b. Getting people to do the right thing depends upon ability. Luck has little or nothing to do
       with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither
    understand, nor control.
    b. By taking an active part in political and social affairs the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental
    happenings.
    b. There really is no such thing as "luck."
19. a. One should always be willing to admit mistakes.
   b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.
   b. How many friends you have depends upon how nice a person you are.

21. a. In the long run the bad things that happen to us are balanced by the good ones.
   b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort we can wipe out political corruption.
   b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.
   b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.
   b. A good leader makes it clear to everybody what their jobs are.

25. a. Many times I feel that I have little influence over the things that happen to me.
   b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.
   b. There's not much use in trying too hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.
   b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.
   b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.
   b. In the long run the people are responsible for bad government on a national as well as on a local level.

**LOCUS OF CONTROL SCORING INSTRUCTIONS**

Score one point for each of the following:
2. a, 3.b, 4.b, 5.b, 6.a, 7.a, 9.a, 10.b, 11.b, 12.b, 13.b, 15.b, 16.a, 17.a, 18.a, 20.a,
21. a, 22.b, 23.a, 25.a, 26.b, 28.b, 29.a.
A high score = External Locus of Control
A low score = Internal Locus of Control

Analysis: Scores for all personality traits will be analyzed in conjunction with others in their project team, including finding median, maximum, and minimum scores, as well as homogeneity and heterogeneity of scores within a team. These scores of the input Personality will then be considered in relationship to mediating and moderating variables and the outcome of Team Project Performance. The scores will also be considered in relationship to the other input variables of Six Sigma key elements.
Branching: Both Team Members and Team Leaders continue on to the Team Member Interview

END OF PERSONALITY INTERVIEW

TEAM MEMBER INTERVIEW

A Team Member interview is completed for every project on which a person served as a member, therefore, they may complete several team member interviews.

This interview will take approximately 20 minutes. Please answer the questions as best you can and as honestly as possible. If you are not sure, please use your first choice or best estimate. There are no right or wrong answers: this is about your experience.

In this interview, please consider only the __________________________ project. (pre-coded project name)

15. List project member names, to the extent you remember and know them. This will assist the researchers in analyzing project teams as a group. Names will be converted to codes, and the names will be deleted before the data is permanently stored or analyzed. [Names listed here which correspond to other interviewees will be converted to codes consistent with the code used with that individual’s interview. Names will then be deleted from the research database.]

Analysis: Responses will ensure that responses are correctly grouped by project.

16. Please rate the person you identified earlier as the team leader on the following aspects. These 8 questions use the five-point scale shown below:

1                        2                         3                        4                         5
highly                highly
unlikely          likely

Self-Awareness
__ 1. Seeks feedback to improve interactions with others.

Relational Transparency
__ 3. Says exactly what he or she means.
__ 4. Is willing to admit mistakes when they are made.
Internalized Moral Perspective

__ 5. Demonstrates beliefs that are consistent with actions.

__ 6. Makes decisions based on his/her core beliefs.

Balanced Processing

__ 7. Solicits views that challenge his or her deeply held positions.

__ 8. Listens carefully to different points of view before coming to conclusions.

Analysis: Add the scores across the team, and divide by the number of team members, excluding the Team Leader and his/her scores. High scores will suggest high levels of the mediating and moderating variable Team Leadership, considered in conjunction with the identification of the team leader. This answer will be considered in conjunction with the answers to Questions 12 and 28, which also measure Team Leadership.

17. Rank order the contribution of each member of your team, including yourself, for as many members as were on your team. (“Most important” means contributions that most influenced your group positively)

1. ____________________________________________ (most important contributor)
2. ____________________________________________ (second-most important contributor)
3. ____________________________________________ (et cetera)
4. (Allow for as many team members as earlier indicated)

Scoring: To determine overall member contribution, add the ratings for one individual across all team members, then divide by the number of team members to standardize. This is the level of Contribution to Group Success for each team member.

Analysis: For those identified as team leaders, compare levels of Contribution to Group Success across projects to analyze whether this variable mediates the effect of personality on Team Leadership, which mediates the effect of Big Five personality traits on Team Project Performance.
18. Use the 5-point scale below to indicate your agreement or disagreement with the following statements:

<table>
<thead>
<tr>
<th></th>
<th>Disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree a little</th>
<th>Agree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly</td>
<td>a little</td>
<td>nor disagree</td>
<td>a little</td>
<td>strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1. When someone makes a mistake in this team, it is often held against him or her.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. In this team, it is easy to discuss difficult issues and problems.</td>
</tr>
<tr>
<td></td>
<td>3. In this team, people are sometimes rejected for being different.</td>
</tr>
<tr>
<td></td>
<td>4. It is completely safe to take a risk on this team.</td>
</tr>
<tr>
<td></td>
<td>5. It is difficult to ask other members of this team for help.</td>
</tr>
<tr>
<td></td>
<td>6. Members of this team value and respect each others’ contributions.</td>
</tr>
</tbody>
</table>

Scoring: Q1,3,5 are reversed. Average the score for each individual, then average the individual’s score across the group.

Analysis: The group score must be relatively high AND the group variance relatively low in order to conclude that the input Psychological Safety was felt in the group.

19. Use the above 5-point scale to indicate your agreement or disagreement with the following statements: [Scales will be made available for easy responding either in person or on an online form.]

a) Overall, the specialists in my group (Black Belts, Master Black Belts and/or Green Belts) greatly enabled our process improvement work.

b) Our project exhibited a very high level of complexity, with many variables and spanning several departments or groups.

c) Our project exhibited very high level of uncertainty, with unknown variables and unclear relationships between variables and outcomes.

Analysis using the above questions:

a) serves as an overview, single score for effect of the input Use of Improvement Specialists. It will be considered along with the answers to 7, 8, & 34a, which also measure this variable.

b) serves as an overview, single score for the moderating variable Project Complexity. This answer will be considered in conjunction with the answers to 10, 31, and 34b, which also measure this variable.
c) serves as an overview, single score for the moderating variable Project Uncertainty. This data will be considered in conjunction with the answers to 32 and 34c, which also measure this variable.

20. Use the above 5-point scale to indicate your agreement or disagreement with the following statements: [Scales will be made available for easy responding either in person or on an online form.]

___ 1. Very little of our project discussion was actually entered into the QuikSigma tool.
___ 2. We very closely followed the Six Sigma structured method of Define, Measure, Analyze, Improve, and Control (DMAIC).
___ 3. The QuikSigma tool greatly enabled our process improvement or design work.

Scoring: Q1 is reversed.

Analysis: Average the score for each individual, then average the individual’s score across the group. The group score must be relatively high AND the group variance relatively low in order to conclude that the input Structured Methods applies to the project. These answers will be considered in conjunction with the answers to Questions 21b and 35, which also measure this variable.

21. Please answer the following 6 questions using the five-point scale shown below:

1                          2                          3                          4                         5
Not at all                                                                                             A great deal

a. I communicate with other members of the project team to . . .
___ 1. Resolve problems related to the implementation of the project (e.g., scheduling changes)
___ 2. Brainstorm about ideas
___ 3. Resolve personality conflicts among project team members
___ 4. Obtain project-related information
___ 5. Gain approval or authorization to perform project tasks
___ 6. Receive feedback about my performance on the project team

b. Please answer the following questions using the 6-point scale below:
   1 = Never,
   2 = once per month or less,
   3 = a few times per month,
   4 = once per week,
   5 = a few times per week,
   6 = once per day or more

I communicate with one or more members of the project team through . . .
___ 1. Project team meetings
2. Written letters, memos or reports of any kind
3. Making an appointment with another team member
4. Telephone calls
5. Informal or unplanned discussions (e.g., just stopping by, in the hall, over coffee)

Scoring: Add scores for 19a and 19b for each team member and divide by the number of team members.

Analysis: Higher team scores suggest higher Communication, which may mediate the effect of Extraversion and Emotional Stability on Team Project Performance.

22. Please rate the following aspects of your team’s productivity, on 5-point scales listed after each aspect:

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Rating Scale</th>
<th>End points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Amount of work done by the team</td>
<td>1= too little : 5= too much</td>
<td></td>
</tr>
<tr>
<td>2. Quality of work</td>
<td>1= low quality : 5= high quality</td>
<td></td>
</tr>
<tr>
<td>3. Frequency of schedule adherence</td>
<td>1= never : 5= always</td>
<td></td>
</tr>
<tr>
<td>4. Frequency of budget adherence</td>
<td>1= never : 5= always</td>
<td></td>
</tr>
<tr>
<td>5. Efficiency of team operations</td>
<td>1= least efficient : 5= most efficient</td>
<td></td>
</tr>
<tr>
<td>6. Effectiveness of user interaction</td>
<td>1= least effective : 5= most effective</td>
<td></td>
</tr>
</tbody>
</table>

Analysis: Higher scores suggest higher Productivity, which may mediate the effect of Agreeableness on Team Project Performance. This answer will be considered in conjunction with the answers to Question 29, which also measures this variable.

23. Use the following 5-point scale to indicate your agreement or disagreement with the following statements:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Not at all</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>A great deal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

a) This team linked ideas that originate from multiple sources.
b) This team searched for novel approaches not required at the time.
c) This team was good at coming up with new ways of doing things.

Analysis: Higher median team scores suggest higher Team Creativity, a mediator of the personality trait Openness to Experience on Team Project Performance. This answer will be considered in conjunction with the answer to Question 35, which also measures this variable.
[Branching: Team Leaders continue to Project Context Interview. Otherwise, the interviewee is presented with a list of the remaining projects for that company. If s/he participated on another project, s/he completes Project Interview and then branches to the appropriate interviews, as indicated. Once the interviewee has answered questions about all projects, the interview is over.]

END OF TEAM MEMBER INTERVIEW

PROJECT CONTEXT INTERVIEW

This interview asks about the context for the project. This interview will take approximately 30 minutes. Please consider only the _______________ project to answer the questions. If you have participated in more than one project, we will ask you about those other projects later.

24. How would you describe the level of top leadership engagement in supporting this project and securing resources for its implementation?
   - None to minimal
   - Below the project’s requirements and expectations
   - Met the project’s requirements and expectations
   - Exceeded the project’s requirements and expectations
   - Don’t know / not sure

   Analysis: Combined with Question 33, measures the input Leadership Engagement.

25. In your view, does this project meet the Six Sigma requirement for a “strategic project?” [One that has financial or strategic implications, and is not based on convenience or lower-level benefits.]
   - Definitely strategic / Somewhat strategic / More operational than strategic / Low level project

   Analysis: Combined with Questions 26 & 27, measures the input Strategic Project Selection.

26. Does the company have a formal mechanism to evaluate the feasibility and impact of potential Six Sigma projects?
   - Yes / No / Don’t know

27. In your opinion, does this mechanism work a majority of the time to pick good Six Sigma projects?
   - Yes / No / Don’t know

   Analysis: Questions 25, 26 & 27 measure Strategic Project Selection.
28. (Skip if Team Leader) Please rate the person you identified earlier as the team leader on the following aspects. These 8 questions use the five-point scale shown below:

<p>| | | | | | | |</p>
<table>
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</tr>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>highly</td>
<td>likely</td>
</tr>
<tr>
<td>unlikely</td>
<td></td>
<td></td>
<td></td>
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</table>

Self-Awareness
___ 1. Seeks feedback to improve interactions with others.
___ 2. Accurately describes how others view his or her capabilities.

Relational Transparency
___ 3. Says exactly what he or she means.
___ 4. Is willing to admit mistakes when they are made.

Internalized Moral Perspective
___ 5. Demonstrates beliefs that are consistent with actions.
___ 6. Makes decisions based on his/her core beliefs.

Balanced Processing
___ 7. Solicits views that challenge his or her deeply held positions.
___ 8. Listens carefully to different points of view before coming to conclusions.

Analysis: High scores will suggest high levels of the mediating and moderating variable Team Leadership. This answer will be considered in conjunction with the answer to Question 12 and 16 which also measure Team Leadership.

29. (skip if Team Leader) Please rate the following aspects of this team’s productivity, on a 5-point scale:

<table>
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<th>Aspect</th>
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<td>1= least effective</td>
<td>5= most effective</td>
</tr>
</tbody>
</table>

Analysis: Higher scores will suggest higher Productivity, which may mediate the effect of Agreeableness on Team Project Performance. This answer will be considered in conjunction with the answers to Question 22 which also measures Productivity.

30. Project outcomes related to project.
   a) Please describe the goals of the project and describe how they were, or were not, met. (open paragraph text)
   b) Was this project completed in the time originally allotted to it? If not, did the additional time required result in a favorable outcome? (open paragraph text)
   c) Did this project meet original budgetary constraints? If not, did the additional funding required result in a favorable outcome? (Open paragraph text)
d) Please describe any financial measures relating to this project: (open paragraph text)
e) Please describe any other benefits, quantifiable or not, that you have seen: (open paragraph text)
f) Please choose one word to describe this project – successful or unsuccessful.

Analysis: Team Project Performance will be determined by responses to 30 f – successful or unsuccessful. Other information provided in this question may be utilized to compare percentage improvements relative to size and cost of projects, in order to gain understanding about project successes and failures.

31. Project Complexity
a) Number of metrics included in project (please include those listed in Question 30a): _______
b) List the autonomous departments or groups included in this project: _______
c) Geographic dispersion of team, groups, departments:
   All co-located
   1-2 groups more than 50 miles apart
   Three or more groups more than 50 miles apart
   Don’t know / Not sure
d) Project Team Size (approximate person-hours): __________
e) Total Project Cost, excluding man hours and including investment: _______

Analysis: These numbers will be compared across projects separately, and as a group with weightings as deemed appropriate, as a measure of Project Complexity, a moderating variable on Team Project Performance. This answer will be considered in conjunction with the answers to 10, 19b, and 34b which also measure Project Complexity. Project cost will also be used in conjunction with other project outcomes to understand project successes and failures.

32. Project Uncertainty
a) How would you describe the technology used to meet the project objectives?
   Mature technology we were currently using
   Mature technology we had to purchase
   New technology we were able to purchase
   New technology we had to create
b) Considering the underlying variables that you ultimately understood to affect the process you analyzed, how well did you initially understand the variables and how they affected the outcome?
   Fairly well: Knew the variables and mostly understood the relationship
   Somewhat: Knew most of the variables but did not really understand the relationship
   Not well: Did not know many of the variables we needed to consider

Scoring: Larger numbers for both a and b suggest more Project Uncertainty. Numbers will be cumulated and divided by the number of respondents for a team.
Analysis: In conjunction with the answers to 19c and 34c, projects will be compared regarding the moderating variable Project Uncertainty.

33. Was there a Champion for this project (defined as high-level management supporter)?
   a. Yes / No / Don’t know
   b. If Yes: What is the title of the Champion? Open text answer
   c. Which of the following tasks were performed by the Champion? Yes/No/Don’t know
      ___ a) Facilitating project selection
      ___ b) Defining project charters
      ___ c) Selecting black belts team members
      ___ d) Securing other project resources as needed
      ___ e) Removing barriers to project completion
      ___ f) Conducting progress reviews or tollgate reviews with black belts

Analysis: Identification of a champion, and more tasks performed will indicate higher levels of the input Leadership Engagement. Consider in conjunction with answers to Question 24, which also measures Leadership Engagement.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree Strongly</td>
<td>Disagree a little</td>
<td>Neither agree nor disagree</td>
<td>Agree a little</td>
<td>Agree strongly</td>
</tr>
</tbody>
</table>

34. (Skip if Team Leader) Use the above 5-point scale to indicate your agreement or disagreement with the following statements: [Scales will be made available for easy responding either in person or on an online form.]

   ___ a) Overall, the specialists (Black Belts, Master Black Belts and/or Green Belts) greatly enabled our process improvement work.
   ___ b) Our project exhibited a very high level of complexity, with many variables and spanning several departments or groups.
   ___ c) Our project exhibited very high level of uncertainty, with unknown variables and unclear relationships between variables and outcomes.

Analysis using the above questions:
   a) serves as an overview, single score for effect of the input Use of Improvement Specialists. It will be considered in conjunction with the answers to Questions 7, 8, and 19a, which also measure this variable.
   b) serves as an overview, single score for the moderating variable Project Complexity. This answer will be considered in conjunction with the answers to 10, 19b, and 31, which also measure this variable.
   c) serves as an overview, single score for the moderating variable Project Uncertainty. Data from this answer will be considered in conjunction with data from 19c and 32, which also measure this variable.
35. Use the above 5-point scale to indicate your agreement or disagreement with the following statements: [Scales will be made available for easy responding either in person or on an online form.]
   ___ a) This team linked ideas that originate from multiple sources.
   ___ b) This team searched for novel approaches not required at the time.
   ___ c) This team was good at coming up with new ways of doing things.

   Analysis: Higher median team scores suggest higher Team Creativity, a mediator of the personality trait Openness to Experience on Team Project Performance. This answer will be considered in conjunction with the answer to Question 23.

36. Use the above 5-point scale to indicate your agreement or disagreement with the following statements: [Scales will be made available for easy responding either in person or on an online form.]
   ___ a) Very little of our project discussion was actually entered into the QuikSigma tool.
   ___ b) We very closely followed the Six Sigma structured method of Define, Measure, Analyze, Improve, and Control (DMAIC).
   ___ c) The QuikSigma tool greatly enabled our process improvement or design work.

   Scoring: Q1 is reversed.

   Analysis: Average the score for each individual, then average the individual’s score across the group. The group score must be relatively high AND the group variance relatively low in order to conclude that the input Structured Methods applies to this project. These answers will be considered in conjunction with the answers to Question 20.

[Branching: The interviewee is presented with a list of the remaining projects for that company. If s/he participated on another project, s/he returns to the Project Interview. Once the interviewee has answered questions about all projects, the interview is over.].

END PROJECT CONTEXT INTERVIEW

REFERENCES


