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Team Quotients, Resilience, and Performance of Software Development Projects

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ABSTRACT

Past studies have examined actions and strategies that software project teams can take to reduce the negative impact of uncertainties, such as changing requirements. Software development project teams often have to be flexible to follow the pre-defined plans and strive to meet project goals. Sometimes uncertainty may go extreme to temporarily slow projects down and set project teams into reduced productivity. Project teams should be resilient to recover from the reduce productivity condition and move forward toward predefined goals. This study focuses on understanding the importance of team resilience for software project teams and exploring the antecedents of team resilience. Specifically, we investigate the impacts of intelligence and emotional quotient on team resilience capability, the extent to which project team can recover from the impediment and move forward. This is a research-in-progress work. A future empirical test plan has been discussed at the end.

Keywords

Team intelligence quotient, Team emotional quotient, Team resilience, Team performance, Software development projects

INTRODUCTION

Uncertainty is one major cause of low software development project performance (Jun, Qiuzhen and Qingguo, 2011; Liu, Chen, Chen and Sheu, 2011; Nidumolu, 1995). Past studies have emphasized the importance for software project teams to react to project risks to ensure final performance (Bannerman, 2008; Hu, Zhang, Ngai, Cai and Liu, 2013; Wallace, Keil and Rai, 2004). It is concluded that project teams have to possess certain capabilities and new types of control to ensure performance under a highly uncertain context (Harris, Collins and Hevner, 2009). Several capabilities have been identified for software development project teams to react to uncertainty, including team flexibility (Chang, Wong, Li, Lin and Chen, 2011; Lee and Xia, 2005; Li, Chang, Chen and Jiang, 2010), absorptive capacity (Matusik and Heeley, 2005; Roberts, Galluch, Dinger and Grover, 2012; Tiwana and Mclean, 2005), dynamic capability (Hsu, Lin, Wang and Chen, 2012; Mathiassen and Vainio, 2007), and others.

While some turbulence forces project teams to alter their goals or paths to the goals, some extreme uncertain factors may totally disable the project teams temporarily. For example, the team may not function normally when there is a total unexpected failure or a sudden reorganization. Under these situations, project teams stop functioning temporarily and require a certain period to return to normal condition. The project team cannot meet the expected goals within predefined schedules and costs when teams are not able to bounce back to the regular condition and function normally. The resilient individuals can bounce back to normal condition from stressful experience quickly and effectively (Tugade and Fredrickson, 2004). Since individuals often work more productively and actively in teams than working individually, Mistry, Stoverink and Rosen (2015) propose a model of team resilience describing a team's ability to bounce back from adverse events. Different from flexibility which focuses on how a team can improve solutions to emergent problems or changing requirements, to react to external turbulences, resilience capability focuses on returning to the normal functioning level and keep moving to the original goal. To return to a normal condition, members in one team need to absorb the negative impact from external or internal impediments, adjust themselves quickly based on the new conditions, bounce back to the normal functioning level, and learn from this process to build a more robust team (Bhamra, Dani and Burnard, 2011). However, past studies in IS research

largely focus on other capabilities and limited attention has been given to team resilience capability. Therefore, this study attempts to clarify whether project performance is contingent on teams' resilience capability.

Given the importance of team resilience capability, what constitutes such capability is then critical. Many teams cannot react to the impediments from external or internal because they cannot deal with it cognitively or affectively. Specifically, the team either cannot take appropriate actions or is unable to escape from the negative emotion (Stephens, Heaphy, Carmeli, Spreitzer and Dutton, 2013; West, Patera and Carsten, 2009). Therefore, we argue that the project team needs to possess high enough intelligence quotient and emotional quotient. For intelligence quotient, members need to acquire information to understand the condition, process information quickly to identify the future paths, and take action. On the other hand, for emotional quotient, members in project team need to be aware of other members' emotion and manage the negative emotion effectively.

Through clarifying the above issues, this study contributes to the software project management area by introducing the concept of resilience and highlighting two critical antecedents of this capability. The rest of the paper is organized as follows. In the second section, we review the relevant theories and concepts briefly. We then introduce the proposed research model and hypotheses. Lastly, we describe the research design in the next stage of this on-going study and provide a conclusion.

THEORETICAL BACKGROUND

Team Resilience

The concept of resilience has its origins in the theory of ecology. When random events occur, there are two kinds of behavior of the ecological systems: resilience and stability. Resilience refers to the ability of systems to absorb change and disturbance, and stability represents the ability of systems to return to an equilibrium state after a temporary disturbance (Holling, 1973). Resilience has been studied in the field of individual psychology. Psychological resilience is defined as an individual's ability of successful adaptation to life tasks after facing social disadvantage or highly adverse conditions (Finn and Rock, 1997). Wangberg and Banas (2000) note that self-esteem, optimism, and perceived control form a "resilient personality." Individuals with higher levels of resilience have higher levels of openness toward an organizational change. In organization theory, resilience refers to the ability to absorb strain and continue functioning in the face of adversity (Sutcliffe and Vogus, 2003). Similarly, Coutu (2002) defines resilience as an adaptive system that enables an individual to ''bounce back'' from a setback or failure. As the concept of resilience applied to the workspace, a resilient employee can rebound to a higher level of motivation after an untoward event (Richardson, 2002). A resilient individual usually firmly accept reality, strongly believe that life is meaningful, and has an ability to adapt to significant change (Coutu, 2002). When confronted with increasing complexity and uncertainty from a disruptive change of environments, an organization has to strengthen the capacity of resilience in response to the threat. It reflects that an organization requires information exchange, communication, and coordination to integrate the multiple levels of system operation and decisions (Comfort, Sungu, Johnson and Dunn, 2001).

Conceptualized at the team level, team resilience serves to the capacity to bounce back from failure, setbacks, conflicts, or threat that a team may experience (West et al., 2009). As complexity and uncertainty increase in the competitive environment, it becomes difficult to predict the future states that a team faces. Moreover, the presence of an external threat and the increased stress reduce the communication channels, the amount of utilized information, and interaction among team members (Gladstein and Reilly, 1985). Under the threatening conditions, a team has difficulty to coordinate and establish effective ways to perform tasks. Resilient people are characterized by a staunch view of reality (Coutu, 2002), they are more likely to react immediately and identify recent setbacks in the workplace. Therefore, team members would be confident of their capacities to handle the situations and be motivated to face the obstacles and adversities (Sutcliffe and Vogus, 2003). Tugade and Fredrickson (2004) also note that resilient people with positive emotions can rebound and find positive meaning from stressful encounters.

Team Intelligence Quotient

Intelligence quotient (IQ) is a representation of individual's intelligence level, reflecting people's powers of observation, memory, thinking, imagination, creativity and problem analysis and ability to solve problems. IQ can also be expressed as a human mastery of knowledge. Team IQ is demonstrated by information acquisition, dissemination and use in project team (Akgün, Dayan and Di Benedetto, 2008). In this study, team IQ includes to

four dimensions: information acquisition, information dissemination, information implementation, and responsiveness (Akgün et al., 2008). Project team members use their capability to perform the tasks, such as acquisition, interpretation, dissemination and utilization of information and knowledge. Effective utilization of needed information can lead them to achieve the ultimate goal or perform a specific function (Moorman, 1995).

Information acquisition capability refers to gathering data from various sources, including customers, competitors, new members, external environment, and so on (Açıkgöz, Günsel, Bayyurt and Kuzey, 2014; Akgün, Lynn and Yılmaz, 2006; Wiklund and Shepherd, 2003). It involves environmental investigation, intelligence activities and importation of information during the project (Keh, Nguyen and Ng, 2007). Teams can collect information from both of subjective and objective sources. Subjective sources include direct contacting with people and collecting information regularly (Smeltzer, Fann and Nikolaisen, 1988). Subjective sources are more directly correlative to the project team members (Cooper, Folta and Woo, 1995). Objective sources refer to gathering information without human contacts (Smeltzer et al., 1988), such as newspapers, competitors' activities or even re-examination of the information collected in previous studies (Sawyerr, Ebrahimi and Thibodeaux, 2000).

Information dissemination capability refers to sharing information within groups and organizations by using formal ways like memorandum, reports, or meeting face to face. Information may also be disseminated by informal ways such as talking to each other at coffee-breaks, discussing at the launch time, hallway meetings (Açıkgöz et al., 2014; Akgün et al., 2006; Wiklund and Shepherd, 2003) and other methods that can propagate information to all relevant departments, teams and individuals (Liao, Welsch and Stoica, 2003). Quick distribution of information is crucial for team members to get the same conceptions or information from each other. They can discuss and translate their opinions concerning the problems frequently and then provide effective solutions to the problems (Leonidou and Theodosiou, 2004). The most important issue for information dissemination is to assure that all the members have the same information they needed in the project.

Information implementation capability is uncovering and correcting problems by collective utilization of relevant information (Akgün, Byrne, Lynn and Keskin, 2007; Akgün et al., 2006; Chou, Chang, Cheng and Tsai, 2007). Information implementation can increase the amount and variety of information of decision making (Shane and Delmar, 2004), help team members prioritize information by serving as a form of organizational memory to solve problems encountered in the project (Song, Wang and Parry, 2010), and simplify and integrate the information to reduce the complexity of the project (Castrogiovanni, 1996).

The three capabilities mentioned above denote a team's capability to process information (Akgün et al., 2008). However, it would provide little or no help if a team couldn't use the information to react to the environment. Responsiveness shows a potential reaction and sensitivity to the external environment. For example, customer needs continually change over time, ongoing tracking and responsiveness to changing needs lead to a high quality product, service, and better performance (Jaworski and Kohli, 1993). The information development project team's ability in response to business and technology changes has a decisive importance in project success (Lee and Xia, 2005). Thus, a team should show these four capabilities for high IQ.

Team Emotional Quotient

Emotional Quotient (EQ) is an index of emotional self-control (Salovey and Mayer, 1990). Emotions in the workplace, as well as EQ in a team level, have become a crucial topic in management (Ashkanasy and Daus, 2002). EQ has an impact on the three critical reflection processes: problem analysis, theorize cause and effect relationships, and action planning (Clarke, 2010). Team EQ is the base of the capability of a team that can manage emotional processes by developing a set of norms (Druskat and Wolff, 2001). In this study, team EQ consists of two dimensions: emotional awareness and emotional management.

Emotional awareness is defined as awareness of one's emotional state, in other words: sensing and understanding what other team members' feeling are (Boyatzis, Stubbs Koman and Wolff, 2008). Awareness of one's own emotions is an individual's ability to discuss and disclose the emotion they experience (Jordan and Lawrence, 2009). Whether is positive emotions or negative emotions, a person who has high emotional self-awareness can control his experience of intense emotions (Silvia, 2002). With high emotional self-awareness, team members can communicate effectively with others. Awareness of others' emotions is a basic ability to get along with others. To handle negative emotions, a person has to read, distinguish, and effectively respond to the emotion expressed accurately (Jordan and

Lawrence, 2009). Those who have high emotional group-awareness can recognize team members' emotions and influence team cohesion quickly.

Emotional management refers to monitor and regulate mood states, control the emotional impulses, respect and cooperate with other team members, as well as to resolve differences (Boyatzis et al., 2008). Emotional management includes the management of both own and others' emotions. To manage own emotions, a person can hold back on the instant response, delay judgments and then to express his/her manner in a considered way (Jordan and Lawrence, 2009). Conflict always happens in teams because coworkers might have different perspectives or goals. Members who can control their emotion well spend less time or energy to deal with conflicts (Fisher, 2000). Emotion management is essential for maintaining a good relationship among team members. Therefore, management of others' emotions reflect on team members' behavior and create a better working environment for the project (Jordan and Lawrence, 2009).

PROPOSED RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

Based on the previous literature, we propose that having sufficient team IQ and team EQ is highly correlated with a team's ability to bounce back when facing threatening situations, which has a positive impact on team performance. Figure 1 shows the research model of this study.

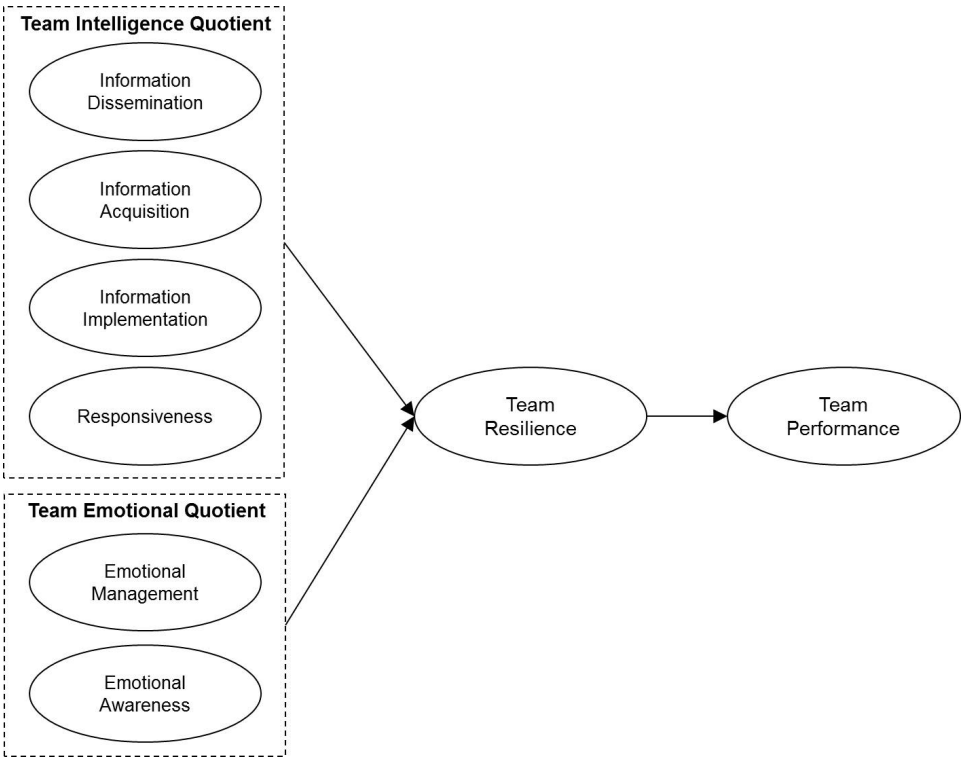

Figure 1. Research Model

In this study, we define team performance as the successfulness of the project, i.e., the level to meet the requirements and objectives of a project team (Jones and Harrison, 1996; Markus and Mao, 2004). Team performance is usually measured by the effectiveness and efficiency. Effectiveness refers to the system quality of the work, and efficiency refers to the extent of meeting the project budgets and schedules. According to Markus and Mao (2004), team performance includes functional and relational performance. Functional performance refers to the quality level of the requirements, the information, and the resulting system. Relational performance refers to the users' level of satisfaction, their perception of the project team's credibility, and their commitment to adopt and use the system.

Team resilience reflects a positive team capacity that helps the team to repair and bounce back from potentially stressful situations (West et al., 2009). If a team can thrive under highly stressful situations, adapt to significant change, and recover from a negative experience, it is likely to endure less damaging effects. A resilient member can use more effective coping mechanisms and strategic behaviors that can be conducive to growth, development, and future advancement to bounce back from adversity (Youssef and Luthans, 2007). Moreover, resilience has been shown to be related to performance in the workplace (Coutu, 2002; Luthans, Vogelgesang and Lester, 2006). Therefore, we propose the following.

Hypothesis 1: Team resilience is positively related to team performance.

After encountering disaster, people need as much information, knowledge, and understanding as possible to help them reduce uncertainty (Reich, 2006). Learned resourcefulness, ingenuity, and the imaginative use of materials are all related traits and characteristics that enable individuals to devise creative responses to unprecedented challenges (Lengnick-Hall and Lengnick-Hall, 2002). In an organization setting, managers respond to uncertainty by a large amount of information acquisition, generation of new ideas and knowledge integration. Equivocality that arises from ambiguous issues and different frames of reference can be reduced by information acquisition and utilization of rich media for communication (Daft, Lengel and Trevino, 1987). Sheremata (2000) proposes that increasing the quantity and quality of ideas, knowledge, and information and integrating these materials into collective action will lead to successful new product development. With capabilities to acquire and process relevant information, team members can learn more about the situation and fully utilize their resources to deal with uncertainty. Therefore, we hypothesize the following.

Hypothesis 2: Team IQ is positively related to team resilience.

Emotions can shape the cognitive processes that influence behavior, such as attention, thought, memory, and decision making (Morris and Keltner, 2000). With expressions of emotion, relationship partner can provide more information about the situation, how to respond, and the influence of each other (Keltner and Haidt, 1999). Thus, team members can help each other better understand their feelings and needs to gain a sense of control over these emotions (Ryff and Singer, 2000). With more precise knowledge about how they feel, individuals are more likely to find out solutions to deal with distress and become more resilient (Kashdan, Ferssizidis, Collins and Muraven, 2010).

Also, learning and growing after facing adversity is facilitated by relationships with others (Stephens et al., 2013). Caring relationships with other relatives and access to broader social networks are associated with buffering individuals from adversity and allowing them to bounce back from setbacks (Masten and Reed, 2002). It is important for resilience that an individual can connect and interact with others. With high-quality relationships, the team members are more likely to understand difficult situations and make a more comprehensive decision (Carmeli, Friedman and Tishler, 2013). Therefore, we propose the following.

Hypothesis 3: Team EQ is positively related to team resilience.

RESEARCH METHOD

We plan to conduct a questionnaire survey to examine the proposed model and hypotheses. The target sample of this study is the managers who have ever involved in the information system development projects. Most of organizations use information systems to manage business activities and assist in making decisions, for example, management information systems, enterprise resource planning, e-commerce, or mobile application. These organization might associate with industries of information technology, finance, manufacturing, service and so on. We investigate the duration, size, budget of the projects, and the size of their organizations to examine the impact of these factors as well. This research includes eight constructs: information dissemination, information acquisition, information implementation, responsiveness, emotional management, emotional awareness, team resilience, and team performance. We will adopt items from the previous literature and revise measurement items of these constructs to capture the respondents' perceptions. The indicators use seven-point Likert scale, which is ranging from 1 (strongly disagree) to 7 (strongly agree). We distribute the survey packages to the respondents through the paper and on-line questionnaires and apply partial least square (PLS) with a bootstrapping technique to examine the proposed model.

CONCLUSION

This research aims to (1) examine the effect of team resilience on team performance; (2) explore the possible factors that will enhance team resilience. A questionnaire will be designed and data will be collected in the next stage. We expect that this study will provide the following contributions. For the academia, we introduce the concept of team resilience into the ISD project team. If team resilience is important to preserve the project performance, we desire to identify the role of team IQ and team EQ as the facilitators of team resilience. For the practitioners, managers have to build up a positive work environment to enhance the capability of resilience. This study has a few limitations including limited targeted participants in IT development projects and single respondent bias, etc. Also, we only capture the notion of team resilience which drives better team performance in this study. We should consider other external factors leading to the project success in the future study.

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