

The Influence of Team Quality Criteria on Team Performance: A Conceptual Model

Vian Abdulmajeed Ahmed, Mazida Ahmad, Mazni Omar and Bikhtiyar Hasan Abdulrahman
School of Computing, Universiti Utara Malaysia (UUM), Sintok, Kedah, Malaysia

Abstract: Software development depends, to a large extent on good team work and level of cooperation among software team members. As a creative technical process, software development requires interaction among human experts in form of a team. Thus, it is imperative to know the factors that are capable of influencing teamwork performance. Among such factors are coordination of expertise, cohesion, communication, mutual support, value diversity, trust and socialization Team Work Quality (TWQ) Model. This study proposes a conceptual framework of TWQ Model which focuses on examining the team work quality criteria within software development teams that have significant influence on the performance of the team. This study uses questionnaire to investigate the impacts of the above factors on team performance. The respondents are software developers from telecommunication industry in Iraq and Kurdistan Region Government (KRG). The analysis of the data will be conducted with the use Structural Equation Modeling (SEM) to examine relationship significance of the identified factors on software development team performance. The proposed framework will be helpful for analyzing the relationship between teamwork quality factors and team performance. It is also, expected the model is considered useful to gain a deeper understanding on factors that influence teamwork performance and also validate the implemented extension of team work model in consistence with earlier work in order to improve positively team performance.

Key words: Teamwork quality, team performance, software development team, software developer, team performance, relationship

INTRODUCTION

Nowadays, information technology and other firms, spend time and money to projects involving software development. Yet, the rate of success of such projects remains low. A lot of studies have been and will be conducted in future to investigate what could be put in place to enhance the success rate of software development projects (Hsu *et al.*, 2012). Given the uniqueness of software development as largely a team effort, software project quality is dependent on good teamwork (Yusoff *et al.*, 2012). Thus, deeper understanding of factors or characteristics that significantly influence the performance of team engaged in software development cannot be over-emphasized.

There are a many factors that affect team performance. As identified in a model by Hoegl and Gemuenden (2001), among the main factors that influenced team performance is the team work quality model by Hegel and Gemuenden (2001) in an investigation on the effect of six factors that Team Work Quality (TWQ) namely: cohesion, balance of member contributions,

communication, mutual support, effort, coordination on the achievement of innovation projects found that TWQ is by and large significantly associated with team performance based on the rating of team leaders, team members and team-external managers. Yet, the effects of the relationship between TWQ and team performance varies by the perspective of the dyad of performance rater such as whether manager vs. team member or leader vs. team members are the raters of the performance. Besides, TWQ has shown a significant association in relation to team member's personal success criteria (i.e., work satisfaction and learning).

Later study by Weimar (2013), examined the impact of extra (TWQ) factors which consist of cohesion, coordination of expertise, communication, mutual support, value diversity and trust and found a significant relationship between TWQ and the success or otherwise of software development projects as measured by team performance in terms of effectiveness and efficiency.

Based on TWQ Model proposed by Weimar (2013), this present study suggests a conceptual model consists of team work quality factors. The model is further

improved upon with the addition of another factor (socialization). The need to have high level of socialization which is found to be indispensable among team members leads to effectiveness of communication among the members that make up a team. Thus, socialization among team members could increase the cohesion and consequently raise the communication level to informal one.

Furthermore, socialization increases the confidence level among team members and creates interpersonal relationships among member of the teams. Lack of risk management, communication and understanding of the requirements are noted as the main factors related to the low rate of success in software development (Farias *et al.*, 2012). Failure to have socialization within team might lead to conflict which may ultimately lead to a lack of communication and satisfaction among team members as well as lowered team performance (Steinke, 2011).

In view of the fact that organizations are relying on team work for timely delivery of product and services to the customers using teams, manufacturing and telecom industries are not exception especially in software development and other business functions such as marketing, Human Resources (HR) and finance (Sudhakar, 2010). Some factors are identified as accountable for software development failure in telecommunication sector. However, lack of people related factors like project management competence, necessary skill-set, good user participation and cooperation between business units, good teamwork are considered significant among these factors (Porrawatpreyakorn *et al.*, 2009).

Since, the wake of reforms and rapid development of software industry, there are still a lot of issues impeding growth within software development environment. Software development processes are facing failure. There are many factors contribute to the failures of the software development project. Human factors are recognizing as a major factor cause these failures. Such human factors include teamwork and other such as skill of workers, planning, risk management (Yusoff *et al.*, 2012; Gupta and Suma, 2013).

Realizing that software development has become a complex creative process which involve human interaction in a team it is essential to understand the teamwork factors that influence level of performance (Hsu *et al.*, 2012) on one hand and determine the priority in which these factors should be considered in order to build effective software team with guaranteed improved team performance (Weimar, 2013).

Thus, this research proposes a conceptual model of TWQ to addresses the following questions: What are the Team Work Quality (TWQ) criteria that impact on

software development team performance? What is the relationship between teamwork quality factors and team performance among software development team members?

To address the before research question, we obtained data from telecommunication organizations of Iraq and Kurdistan Region Government (KRG). This study attempts to investigate the factors within members of software development teams that have significant effect on the performance of the team in telecommunication organizations. This knowledge will be useful for software managers towards building as well as managing the available teams more effectively and apply the knowledge to enhance their organization performance in order produce high quality software.

Literature review: Software development in modern organization setting has assumed the status of complex activities which rely on human commitment for its successful implementation. In addition, projects on software development involved intensive collaborations and knowledge exchanges among team members in the organization. Software development assist software companies in their potential to become more innovative and efficient. As noted by Rosen, two basic processes namely: technological process and social process are involved in software development. It has been found that social process has more effect on software development than technological process. This is due to the reality that software is always developed in a group rather on the individual basis with the basis of every software project being a team.

Defining a team by Gondal and Khan (2008) as a group of few members which have complementary skills, interdependent roles and a common goal to achieve. Teams may as well be defined contextually in terms of a social system rooted in an organization, identity, members of the team are perceived to be a member of the team by themselves and by the others and members who work together on a common task (Hoegl and Gemuenden, 2001).

Alternatively, teamwork involves the activity of many interdependent individuals (Salas *et al.*, 2008). Team performance is defined as the multi-level process that set up when team members are involved in managing their individual task, teamwork and the teamwork processes (Klein and Kozlowski, 2000). Assessing the performance of team can be done in terms of the team level of effectiveness and efficiency. Effectiveness indicates the extent to which a team meets the expected quality of the outcome

(Hackman, 1987). While, efficiency denotes the level to which the team meets time and budget objectives (Hoegl and Gemuenden, 2001).

Due to the fact that software development projects are labor-and knowledge-intensive tasks, teamwork has over time been acknowledged as a crucial condition for the successful design and deployment of software projects. Similarly, software development primarily depends on team effort necessitating the implication of understanding factors or characteristics in software development teams that have significant influences on team performance. This knowledge can be very useful to promote project success (Weimar *et al.*, 2017).

Team work quality is one of the major factors that affect team performance. TWQ has been found to be significantly related to project success factors such as team performance and team member's personal success. Besides, the positive relationship with team performance, TWQ is associated with personal success of team members. Hence, high TWQ leads to team member's satisfaction with their work situation and provides an opportunity for team members to acquire knowledge and skills (Hoegl and Gemuenden, 2001). Thus, it can be concluded that TWQ significantly influences team performance measures of effectiveness and efficiency. Thus, TWQ is affected by quality of interactions within teams through sharing of valuable information that lead to increased collaboration among team members.

MATERIALS AND METHODS

There are three phases of theoretical, empirical and framework validation in the methodology of this research. In the theoretical phase an extensive review of relevant literature was carried out with the purpose of understanding those criteria that can be used to evaluate team performance and work quality with regards to software development in industries domain. The outcomes of the review boil down to the identification of team work quality criteria that can impact on team performance and determine the correlation between team work quality and team performance.

The second phase was on data collection from software developers in telecommunication organization through questionnaires distribution. The sample of this study is 106 respondents drawn different software developers from telecommunication organizations in Iraq and KRG. Structural Equation Modeling (SEM) will be used to analyze the data. The researcher chose to use SEM for its ability to simultaneously carry out factor analysis. The outcome of the second phase is the

Table 1: Research methodology

Phases	Activities	Outcomes
1	Theoretical study	TWQ factors Team performance factors Determine the relationship between TWQ factors and team performance
2	Empirical study Construct instrument Data collection using questionnaire Data analysis using SEM	A proposed conceptual framework Significant direct effects of TWQ factors on performance
3	Framework validation	A validated framework

construction of the conceptual model of TWQ with its significant and direct effects of TWQ factors on performance.

In the third phase, SEM will be used to validate the framework that was developed in the second phase. Table 1 presents the research methodology completely for this study. The outcome of this study is a conceptual framework of TWQ.

RESULTS AND DISCUSSION

A proposed conceptual framework: The conceptual framework that is proposed by this study is based on seven factors namely: coordination of expertise, communication, mutual support, trust, value diversity, cohesion and socialization as shown in Fig. 1.

Communication is a basic element of teamwork. It provides a channel through which ideas, information and timely feedback are shared by the members of the team. Kozak (2013) found that communication is not limited to exchange of vital information; it also ensures that the information is promptly delivered to the right user and decoded in the manner that is intended by the sender. It is therefore important to emphasize that software project failure often occurred when communication is lacking or not understood among the team members and other stakeholders.

Coordination of expertise is regarded as the skill and knowledge management which includes discovery and recognition of a team expertise with the objective of harnessing the team ability in order to achieve the objective of the organization (Faraj and Sproull, 2000). It is therefore, essential to emphasize that when an expertise of a team is located, it will be easier to proffer solution to the problem confronting the team, since, the team member's will be able to bring their skills and knowledge to perform certain tasks. When expertise location is known it can also assist in the assignment of tasks to team members. Evidence has shown that team performance will improve when members of the team know how their expertise is distributed (Lewis, 2003). Besides,

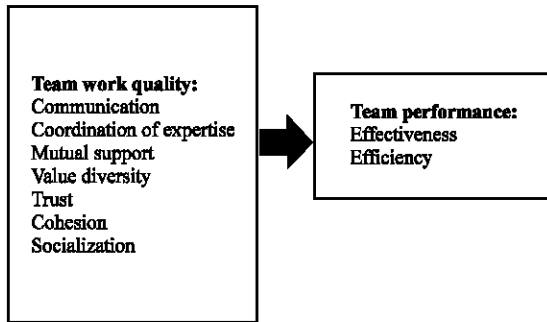


Fig. 1: A proposed conceptual framework

location of team expertise by the team members often helps the members to better anticipate other's behaviors.

Team cohesion refers to the extent in which member's of a team work in unison and keep the desire to continue to work together. Past studies have shown that perceived quality of performance, perceived fairness in communication and team cohesiveness have significant and direct effect on the satisfaction of team members. Results of previous studies have also shown that team that works with cohesion and with relatively high performance goals is more productive than team that works without team spirit (Olaniran, 1996; Zend, 2006).

Mutual support is an important ingredient of TWQ. Essentially, teamwork emanates from the spirit of working mutually with other team members instead of engaging in unhealthy competition (Hoegl and Gemuenden, 2001). However, reasonable and healthy competition can positively influence individual's drive and performance. For instance, software development is a task that requires members of a team to be interdependent but mutual support and cooperation is more important. It is therefore important for the team members to support each other instead of engaging in competition in order to achieve a shared goal.

Trust is the bedrock of a team since it connotes the shared perception that each member of a team will perform his task according to area of expertise and as scheduled. It is essential to emphasize that without adequate trust, team members will engage much of their energy and time in checking, inspecting and protecting each other instead of collaborating to provide value-added ideas and actions through which they can contribute substantially to the effective attainment of organization's goals (Salas *et al.*, 2005).

Value diversity refers to perspectives and beliefs of individual in a team. In other words, value diversity implies that team members are different with respect to

their believe about the mission and goal of a team or in the principles that must be followed in order to achieve the mission (Liang *et al.*, 2007).

Socialization refers to the procedure that is followed by individual in a team to acquire attitudes, behavior and knowledge that are required for participation in an organization. Importantly, socialization helps the team members to know the norms and identity as well as bring cohesion among the team members through which team members will be able to communicate and perform effectively (Ahuja and Galvin, 2003).

Team performance is regarded as the evaluation of the capacity the team members who engage in software development with the purpose of achieving product quality at minimum cost and within time frame. Success can said to be achieved in projects development when the team can deliver with the preferred level of quality at lowest cost and pre-determined time. Three important components are therefore important in software development: product quality, efficiency and effectiveness. In this view therefore, team members, team leaders and stakeholders have varied duties to perform in team performance evaluation. Hence, it is essential for the team performance to be rated internally and externally by different stakeholders (Yusoff *et al.*, 2012). The proposed framework represents a complete causal relationship from the TWQ factors that influence the software development team performance.

CONCLUSION

The proposed framework of this study will help industrial practitioners to comprehend those factors which can help them to improve the performance of software development team towards achieving desired objectives of their organizations. Since, software development has two basic processes of social and technology, it can therefore, be summed up that the social process has more influence than technological process. In addition, since, software engineering project depends largely on performance of team just like any other human endeavors, it is therefore essential to understand those factors that can influence the development of software in particular and performance of the team generally.

Therefore, it is the hope of this study that its framework can be put into practice in other industrial settings such as construction and manufacturing. This is important as many of these organizations use teams for software development as well as in other business functions like HR, marketing and finance with the purpose of building and managing teams more profitably and enhance performance of the organization.

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