



# A comprehensive model of project team technical performance

Wen-Hsing Liu<sup>1</sup>, Jennifer A. Cross<sup>\*</sup>

Department of Industrial Engineering, Texas Tech University, Industrial Engineering Building, Box 43061, Lubbock, TX 79409-3061, USA

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## Abstract

Project teams are commonly used within organizations and have been widely studied. Yet, there is still no consensus on how to define project team success and which factors contribute most strongly to success. This study sought to develop an initial, comprehensive model of project team technical performance, using a diverse sample of 133 teams, and employing regression analysis and structural equation modeling. *Effectiveness*, *efficiency*, and *innovation* were found to be the primary dimensions of technical performance. Each was predicted by a different set of factors, with few factors predicting multiple dimensions. *Management support*, *cooperation*, and *communication* were positively related to *effectiveness*; *efficiency* was positively related to *goal clarity*, *cooperation*, and *team harmony*, but negatively related to *team diversity*; and, *innovation* was positively associated with *knowledge/skill* and *cohesion*, but negatively associated with *team harmony*. Future research should identify additional influential factors and further explore the relationships found in this study.

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## 1. Introduction

With the current rapid change in information technology and the increasing global competition in the marketplace, project teams are often used to deal with organizational demands which have larger scope beyond the capability of individuals (Paris et al., 2000), to do tasks faster, better, and with more flexibility (Thamhain, 2004), to work dynamically and creatively toward the desired goals (Bhatnager, 1999; Jassawalla and Sashittal, 1999; Thamhain, 2004), and to overcome other challenges posed by today's diverse and complex work environments (Lewin, 1951).

Due to their critical importance within organizations, as well as the continued low success rate of projects (e.g., Kendra and Taplin, 2004; Standish Group, 2009), project teams have also

been widely studied by organizational researchers. However, there is still a lack of consensus on how to define project team success and which factors contribute most strongly to success. It appears that several advancements in knowledge are needed to enable organizations to better manage project team performance. First, the best set of outcomes which can be used to evaluate the technical performance of project teams is not clear because project success has been defined and measured diversely in different studies (Belassi and Tukel, 1996; Griffin and Page, 1993). Second, there is a lack of agreement on the key factors which are most strongly related to the project team outcomes. Most individual studies have focused on one or a few factors of interest for project team performance. Only a few studies have considered a whole set of key factors affecting project team performance from different aspects (Sivasubramaniam et al., 2012). In addition, most studies have used only one particular type of project team, instead of diverse types of project teams. Finally, the existing studies have reported inconsistent results regarding the relationship between the input/process factors and outcome factors (Balachandra and Friar, 1997). The mixed results

<sup>\*</sup> Corresponding author. Tel.: +1 806 742 3543; fax: +1 806 742 3411.

E-mail addresses: [wenhingliu@yahoo.com](mailto:wenhingliu@yahoo.com) (W.-H. Liu), [jennifer.cross@ttu.edu](mailto:jennifer.cross@ttu.edu) (J.A. Cross).

<sup>1</sup> Tel.: +1 806 742 3543; fax: +1 806 742 3411.

have increased the difficulties of managers in improving project team performance. Therefore, it is necessary to develop a general concept of how to best evaluate project team performance, to identify the vital few factors which are most strongly related to project team performance, and to analyze the relationships between key factors and outcome factors. This study aims to make a contribution toward filling these gaps by identifying the factors which are most strongly related to technical system outcomes in project teams.

This study seeks to develop an initial, comprehensive model of project team technical performance, by first identifying key measures of technical performance and then identifying the factors that most significantly influence these measures. A diverse sample of 133 project teams from different industries is used to test the model through regression analysis and structural equation modeling. The remainder of the paper is organized as follows: Section 2 provides the literature review while Section 3 describes the study methodology; Section 4 presents the results, followed by a discussion of the findings, areas for future research, and study limitations in Section 5.

## 2. Literature review

Despite the large body of prior research on project teams, there have been few attempts to integrate findings in a formal way to develop overall conclusions about how project team success should be measured and what factors most strongly influence success. Sivasubramaniam et al. (2012) used meta-analysis to identify key factors which influence the performance of a specific type of project team (new product development), finding that team leadership, team ability, team tenure, internal and external communication, group cohesiveness, and goal clarity were the most influential factors. Chiochio and Essiembre (2009) focused on a single relationship, between cohesion and performance, in their meta-analysis of project teams, identifying a positive and strong correlation between these two variables. In addition, there have also been a few meta-analyses of success factors (not necessarily related to the team) for specific project types, including new product development projects (Evanschitzky et al., 2012; Henard and Szymanski, 2001; Montoya-Weiss and Calantone, 1994) and information technology projects (de Bakker et al., 2010).

Finally, there have been several meta-analysis of teams in general, which have typically focused on one or a few relationships, for instance the impact of team composition (Bell, 2007; Peeters et al., 2006), team diversity (Bell et al., 2011; Horwitz and Horwitz, 2007), leadership behavior (Burke et al., 2006), cohesion (Chiochio and Essiembre, 2009), and team process (LePine et al., 2008).

The current research used a meta-analysis of previous studies of project teams in organizations, regardless of project type, (Liu, 2012) to define project team technical performance and to develop a set of hypotheses regarding the most influential factors affecting technical performance. A systematic review was conducted on project team research in organizational settings published between January 1980 and April 2010. This review resulted in 95 project team papers

which are qualified for the research question, and 65 papers which include 17 input and process factors and 5 outcome factors were selected for the further analysis. Outcome factors were determined by comparing the frequency of outcome measures used in project team studies, while process factors were determined by comparing the effect size and the number of publications focused on each factor. Meta-analysis (Hunter and Schmidt, 2004) was then used to determine a more accurate estimate of the effect size by correcting error in each study and using sample size as the weight for each effect size. The results of meta-analysis (Liu, 2012) suggested 12 factors which have significant and positive relationships with project team outcome performance, and they are further used as the hypotheses for the comprehensive model.

The preliminary research model (Fig. 1) was developed based on three technical outcome factors and 12 factors selected from meta-analysis results and organized in an input-process-output framework (McGrath, 1964). These 12 factors were further categorized into the type of input and process factor based on the framework proposed by Cohen and Bailey (1997). Input factors include the characteristics of the internal environment in which the team operates and the features of team members and the project work. Process factors describe the internal interaction among team members and external interaction between team members and other stakeholders. They also include shared understandings, beliefs, or emotional tone within teams (Cohen and Bailey, 1997). Output factors were grouped into technical system outcomes and social system outcomes. Technical system outcomes evaluate the quantity and quality of products or project work, and social system outcomes evaluate knowledge and skills obtained by team members, as well as attitudes and relationships improved during the project process. The present study focuses specifically on technical system outcomes. Fig. 1 summarizes the hypothesized relationships to be tested in this research.

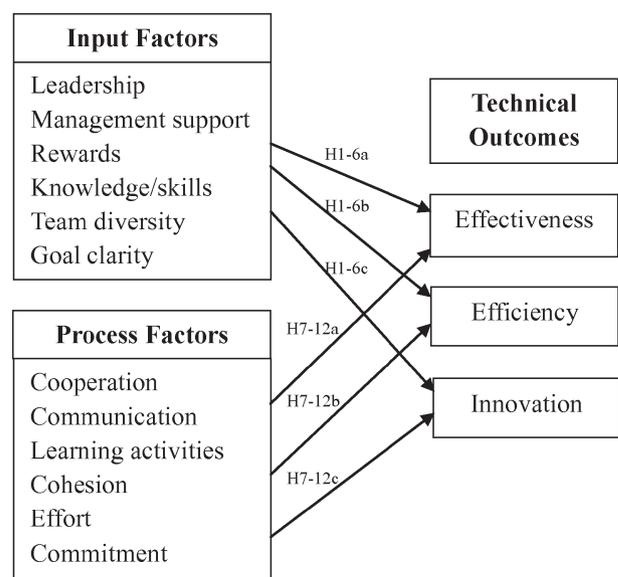


Fig. 1. Summary of research hypotheses.

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