



Team leader experience in improvement teams: A social networks perspective

George S. Easton¹, Eve D. Rosenzweig*

The Goizueta Business School, Emory University, 1300 Clifton Road NE, Atlanta, GA 30322, United States



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ABSTRACT

In this research, we disentangle the relationship between several key aspects of a team leader's experience and the likelihood of improvement project success. Using the lens of socio-technical systems, we argue that the effect of team leader experience derives from the social system as well as the technical system. The aspects of team leader experience we examine include team leader social capital (a part of the social system) and team leader experience leading projects of the same type (a part of the technical system).

We examine four different, yet related, dimensions of a team leader's social capital, which we motivate based on the social networks literature. One dimension, team leader familiarity, suggests that social capital is created when team leaders have experience working with current team members on prior improvement projects, and that such social capital increases the likelihood of improvement project success. We develop three additional dimensions, using social network analysis (SNA), to capture the idea that the improvement team leader's social capital extends beyond the current team to include everyone the leader has previously worked with on improvement projects. Contrasting our SNA-based dimensions with team leader familiarity enables us to better understand the impact of a team leader's social capital both inside and beyond the team. We also examine the effect of a team leader's experience leading prior projects of the same type, and consider the extent to which organizational experience may moderate the impact of both team leader social capital and same-type project experience.

Based on analysis of archival data of six sigma projects spanning six years from a Fortune 500 consumer products manufacturer, we find that two of our SNA-based dimensions of team leader social capital, as well as experience leading projects of the same type, increase the likelihood of project success. In addition, we show that organizational experience moderates the relationship between team leader same-type project experience and project success. However, this is not the case for the relationship between the dimensions of team leader social capital and project success. These results provide insights regarding how dimensions of team leader experience and organizational experience collectively impact the operational performance of improvement teams.

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1. Introduction

Recent empirical research in the operations management literature that studies the effects of experience on team performance has found a divergence in results between work teams and improvement teams. Specifically, while a team leader's experience has been found to improve operational performance in both work teams and improvement teams, the predominantly social dimension of team familiarity (the extent to which team members have

prior experience working together) has not been found to matter in improvement teams (Easton and Rosenzweig, 2012; Huckman et al., 2009; KC and Staats, 2012; Moore and Lapre, 2015; Reagans et al., 2005; Staats, 2012). Because of this divergence in findings, and the importance of team leader experience in both work teams and improvement teams, we explore the extent to which there may be social dimensions of a team leader's experience that affect performance in improvement teams. This leads us to use a socio-technical systems lens to develop new hypotheses concerning dimensions of team leader experience and their effects on improvement team performance.

From a socio-technical systems perspective, the effect of team leader experience on team performance derives from both the social system and the technical system. The social system is composed of people and their relationships, while the technical system

* Corresponding author. Tel.: +1 404 727 4912; fax: +1 404 727 2053.

E-mail addresses: george.easton@emory.edu (G.S. Easton), eve.rosenzweig@emory.edu (E.D. Rosenzweig).

¹ Tel.: +1 404 727 3326; fax: +1 404 727 2053.

pertains to processes, methods, materials, tools, and technology (Cummings, 1978; Ketchum and Trist, 1992; Trist, 1981; Trist and Bamforth, 1951).

One aspect of the social system is social capital, which is a central theme in the management literature on social networks (Borgatti and Foster, 2003; Burt, 1992; Granovetter, 1985; Nahapiet and Ghoshal, 1998). Such research on social capital suggests that a team leader's social capital should be related to team performance. As a result, we develop dimensions of team leader experience that focus both on team leader social capital internal to the team using a team familiarity-like measure, and team leader social capital that extends beyond the current team using approaches based on social network analysis (SNA) (Bonacich, 1987; Wasserman and Faust, 1994).

The dimension of team leader social capital internal to the team that we use in this paper is based on recent work-team research by Staats (2012) and Moore and Lapre (2015), which highlights the importance of a team leader's prior experience working with each of the other team members. We refer to this kind of leader-focused familiarity as team leader familiarity. Perhaps it is just team leader familiarity that has an effect in improvement teams rather than team familiarity more broadly as observed in work teams. Work teams and improvement teams differ in important ways, which could plausibly explain the differences in the effects of experience between these two types of teams. Note that improvement teams are generally temporary and tend to focus on experimentation and learning, while work teams tend to focus on delivering products and services and persist over time.

Team leader familiarity captures the social capital associated with the team leader working with the same people over time. That is, the focus of team leader familiarity is on the relationships, developed through shared experience, between the team leader and members of the *current* team. The concept of social capital is broader, however, and we argue that it extends to the prior experience that a team leader has working with a variety of people, whether or not they are members of the team leader's current team. That is, in lieu of working with the same people, what might matter more to improvement project success is the team leader's previous experience working with *different* people on prior improvement teams.

Such a perspective is consistent with research in the management literature on work teams that indicates that boundary-spanning social capital, in addition to social capital internal to the team, is important for team performance (Chauvet et al., 2011; Edmondson and Nembhard, 2009; Faraj and Yan, 2009; Oh et al., 2004). This leads us to develop dimensions of team leader social capital that extend beyond the team and capture the team leader's "connectedness." These dimensions are based on network centrality methods from the SNA literature. Taking such a perspective is consistent with recent calls for more applications of social network theory in operations management research (Borgatti and Li, 2009; Ketchen and Hult, 2007; Kim, 2014; Kim et al., 2011).

Returning to the technical aspect of the socio-technical systems lens, we also hypothesize that the value of a team leader's experience is influenced by proficiency with the technical system. This suggests that characteristics of the team leader's prior improvement projects may also influence the likelihood of project success. Thus, experience leading the same type of project may be important. We consider projects to be of the same type if they require a similar problem-solving approach. We expect the knowledge a team leader gains from leading one type of improvement project to be transferred to future projects of the same type, therefore increasing the likelihood of project success.

We also explore the potential for organizational experience, which includes both social and technical aspects, to moderate the relationship between the different dimensions of team leader

experience that we examine in this paper and the likelihood of improvement project success. In doing so, we address Argote and Miron-Spektor's (2011, p. 5) call to investigate when "different types of experience are complements or substitutes for one another."

While the bulk of the operations management literature on experience and teams focuses on work teams, in contrast, in this research we study improvement teams. We test our hypotheses using six years of data from improvement teams at a large Fortune 500 consumer products firm that has extensively implemented six sigma. Based on logistic regression analysis using a sample of 152 team-based six sigma projects, we find that the relationship between team leader experience and project success can be explained by two of our SNA-based dimensions of team leader connectedness (a social aspect) as well as by project type experience (a technical aspect). We go on to show that while organizational experience diminishes the positive impact of team leader project type experience, it does not alter the relationship between team leader connectedness and project success. These results go beyond previous studies to provide a more fine-grained analysis of the effects of a team leader's experience on the performance of improvement teams.

2. Conceptual development

In this section, we provide the theoretical basis for our hypotheses concerning dimensions of team leader experience and improvement team performance (see Fig. 1). To provide context for the development of these hypotheses, we begin by discussing improvement teams in six sigma systems, and describe in more detail how they differ from work teams.

2.1. Improvement teams in six sigma systems

In six sigma systems, operational improvement is primarily driven by team-based improvement projects. These six sigma project teams are led and/or facilitated by improvement specialists (e.g., black belts) who are rigorously trained in a structured problem-solving framework, and also in the use of statistical (e.g., control charts) and nonstatistical (e.g., flow charts) analysis tools (Choo et al., 2007b; Linderman et al., 2003; Pyzdek and Keller, 2009; Schroeder et al., 2008; Shafer and Moeller, 2012; Swink and Jacobs, 2012; Zu et al., 2008).

The majority of improvement projects in six sigma are led by black belts, who are extensively trained process improvement specialists. Green belts typically receive basic six sigma training, and most often serve as project team members. When green belts lead projects, they usually do so with the facilitation and support of a black belt. Master black belts train and certify black belts, serve as coaches to green belts and black belts, and work to implement six sigma throughout the organization.

In six sigma, improvement teams follow a formal, well-defined problem-solving process that is akin to W. Edwards Deming's Plan-Do-Study-Act cycle (Deming, 1994). The most common form of the problem-solving framework in six sigma is a five-stage process referred to as DMAIC (Define-Measure-Analyze-Improve-Control) (Pyzdek and Keller, 2009). This structured problem-solving framework guides the team in implementing the scientific method to diagnose problems and develop solutions in order to achieve project goals (Linderman et al., 2003, 2006; Zu et al., 2008). The problem-solving process, along with the set of analysis tools, represents standard team-based learning routines by which knowledge can be created, acquired, and implemented (Argote and Miron-Spektor, 2011; Benner and Tushman, 2002, 2003; Choo et al., 2007a,b; Upton and Kim, 1998).

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