

Antecedents and consequences of team potency in software development projects

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Abstract

Developing new software quickly, successfully, and at low cost is critical in organizations. Ways of assessing the effectiveness of development teams has highlighted measures of factors, such as teamwork, group cohesiveness, and team integration, but the use of *group potency* theory (the collective belief of a group that it can be effective) is rare. In our study, we investigated antecedents of and consequences to group potency in software development project teams. By examining 53 software development project teams collected from small and medium-sized software firms in Turkey, we found, that team potency positively affected speed-to-market, development cost, and market success of the product. We also found that trust among project team members, past experiences of the members, and team empowerment had a positive impact on the team potency during the project. Managerial and theoretical implications are discussed.

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1. Introduction

The successful management of projects is critical. However, many software development projects fail to function as intended or fulfill their potential. According to the Standish Group International [25], about 15% never deliver a final product, costing \$67 billion per year. More than 80% are excessively late and over budget [35], and there is a 30% chance of a software project becoming a “runaway.” Therefore, it is crucial to understand what is important in order to complete software development projects on time, within budget, and to meet customer requirements.

One way to improve the chance of a project’s success is by effective management of the *project team processes* (teamwork, cohesiveness, team learning, and communication, etc.) [43]. Thamhain and Wilemon [40] pointed out that software development includes both technical and teamwork issues. DeMarco and Lister [11] called the skills and interactions of software development team members “peopleware” and argued that this aspect of development is the most critical and least understood. However, “*group potency*” has yet to be investigated in software development project teams.

The concept of group potency emerged as a key determinant in understanding group effectiveness and performance in the behavior literature [37]. Group potency is the collective belief of a team that it can be effective: the shared belief of team members as a whole. Since, (a) software development is a complex socio-technical activity, and (b) its tasks are often exacerbated

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by incomplete user requirements and changing environmental demands, it is clear that the strength of the project team lies in the members' sense of collective efficiency in solving project problems through a unified effort. To date, however, we have limited empirical evidence suggesting that team potency and project success are related in software development project teams. Even though the role of a team member's belief in his or her ability to accomplish goals (writing programs) is documented [22], the role of group members' perceptions is less understood.

Therefore, our goal was to investigate the impact of team potency on software development project success. Also, we wished to study, from a managerial point of view, the factors that influence group potency in the teams.

2. Background

2.1. Group potency and software development teams

Group potency extends Bandura's work on self-efficacy (an individual's belief in his or her ability to perform a task; it is situation specific and/or domain sensitive [17]). It contributes significantly to an individual's motivation and performance: the higher a person's self-efficacy, the more likely he or she is to engage and persist in task-related behavior [7].

Even though group potency is rooted in self-efficacy, they are theoretically distinct constructs and have different implications for group performance. Lindsley et al. [32] described group potency as a collective belief that the group can accomplish its tasks successfully, indicating homogeneously shared beliefs of members. In this sense, it is a prospective, rather than a retrospective, judgment of group capability. However, the effect of group or team potency on project teams is missing in both the technology and innovation management literature.

In a team that has high-level group potency, team members believe that they can design, code, and develop a software product, and effectively produce, market, and sell it. A key function of team potency is to mobilize and maintain team efforts to help achieve the project's goals and optimize team performance. Specifically team potency:

- functions as a means of self-regulation by influencing the amount of effort that the team spends on a task and how long it persists when confronted with obstacles or failure. Adler et al. [1] pointed out that, software development processes are typically immature,

chaotic, and unpredictable, thus team members must share ownership and work cooperatively to reduce risk;

- provides the foundation for team motivation as members' actions are based on what they believe rather than what is true. Hertel et al. [23] noted that when team members believed they were unable to accomplish their task, their motivation dropped even though the goals were highly valued and the contribution was perceived as necessary for success;
- influences team functioning. When making a decision to undertake an action during the project, the team should be concerned about the members' confidence in their abilities to use their ability to perform project related activities. They act and risk trying a new method, approach, or behavior, because the members' thought patterns, emotions, and actions are influenced by their collective belief of their effectiveness [14].

Thus team potency is important in the software development project process. However, we have limited knowledge of its antecedents and consequences. To address this deficiency, we used the team effectiveness models used in the group behavior literature, generally based on the input – process – output concept of data processing. The theoretical model of our study deals with inputs (antecedents), team potency (process), and outcomes. We used the interpersonal trust, past experiences, goal clarity, and empowerment measures of Guzzo et al. [21] and the project performance outcomes were speed-to-market, cost, and market success.

3. Hypothesis development

3.1. Antecedents

Researchers have noted the importance of trust in group potency development. Kirkman and Rosen [28] pointed out that team members need confidence and trust in their team members to experience potency. Bandura [6] indicated that trust resulting from perceived shared understanding boosted team potency.

The influence of trust on software development is also well known. Linberg [30], in a case study of software developers in industry, found that high trust among team members influenced the process positively. However, there is little research on the effect of trust on developing team potency in project teams. We posited that interpersonal trust would help a team to develop a belief of efficacy, and increase team potency. Specifically, because a project team consists of people with complementary skills and are mutually accountable for

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