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# Shared leadership and technology tools in ISD process

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## ABSTRACT

Shared leadership has been found to have positive impacts on project outcomes. ISD project teams adopt shared leadership in practice such as in agile methodology. At the same time, ISD teams rely heavily on technology tools to support collaboration because of its inherent knowledge-intensive nature and task complexity. This study addresses the question, how can ISD teams that heavily use information and communication technologies (ICT) technologies be effective in shared leadership process? The task-technology fit theory is used as a theoretical basis for the proposed research model. This study proposes that how ISD teams can match available technology tools with shared leadership behaviors to generate positive impacts on project outcomes. This study outlines two technological functionalities of ICT, empowerment and decentralization, with the needs of shared leadership process in ISD teams. A future empirical study plan is provided, and the potential contribution is discussed at the end.

## Keywords

Shared leadership, Tools, Empowerment, Decentralization, System development

## INTRODUCTION

High competitive pressure and demand for business value and quick results call for outstanding team performance. Past studies find that successful teams encourage team members' participation in decision making (Hempel et al. 2012; Wong et al. 2011), allow team members to take leadership opportunities (D'Innocenzo et al. 2016; Mehra et al. 2006), and engage team members in knowledge exchange and learning process (Maruping et al. 2012). Over the time, organizations find that leadership may not only come from any single person with appointing authority but also from team members who are experts in certain areas and utilize their expertise to lead the team to solve a challenge or problem. Shared leadership is defined as a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both (Pearce et al. 2003). Several trends of shared leadership research emerge in the literature. First, past studies have confirmed a positive relationship between shared leadership and team performance (see the meta-analysis of shared leadership (Wang et al. 2014), a list of SNA in leadership (Nicolaidis et al. 2014), the studies of shared leadership in teams (Carson et al. 2007; Pearce et al. 2002). Second, the role of shared leadership may be more critical than traditional leadership in some circumstances (Pearce et al. 2002). Third, some moderators and mediators have been identified for the relationship between shared leadership and team performance (Ensley et al. 2003; Pearce et al. 2008; Perry et al. 1999; Rolfsen et al. 2013).

Shared leadership has been examined in consulting teams, R&D teams and ISD teams. An ISD team consists of team members from multiple functional areas. Project managers do not possess all the knowledge for the software development process. An ISD process is characterized with intensive knowledge exchange, complex information exchange, high interdependence and moving targets of customer requirements. The nature of the ISD process gives rise of shared leadership in ISD teams. Recent broad adoption of agile methodologies becomes an example of shared leadership in the ISD process. Shared leadership has been found to alleviate the negative impact of value diversity and facilitate team process, leading to project success (Hsu et al. 2017).

The meta-analysis of shared leadership (Wang et al. 2014) indicates that task complexity moderates the relationship between shared leadership and team outcomes. Although the indispensable role of technologies in the work settings

has been well recognized (Oldham and Da Silva, 2015; Kawakami, et al. 2015), little research has been done to explore the role of technology in the shared leadership process and address task complexity challenges. The extensive technology usage of IT tools in the ISD process creates both opportunities and challenges for the enactment and development of shared leadership. The technology in the past IS studies include information and communication technology (ICTs), group support system (GSS), and knowledge management systems (KMS). On one side, information technology enables the data collection and makes the information distribution easy. Team interaction is supported by multiple technology features such as face-to-face meeting and mobile applications. On the other side, technology may become barriers for the enactment and development of shared leadership. In the traditional environment, power distance is perceived high and technology is developed to support traditional leaders without distributing the information to all the team members. In this environment, team members do not have the authority to make decisions and submit changes for the team in workgroup information systems. Conflicts management may be another source of challenge for shared leadership. ISD team members from diverse functions bring different values and priorities to the project. Task-related and relation-related conflicts will bring adverse effects to team collaboration. These conflicts will affect the distribution of information, communication quality, consensus building, and the generation of creative ideas. Dysfunctional shared leadership process including asynchronization of team member responsibilities and system permission, and low team commitment and support because of limited technology functions, role ambiguity, can be detrimental to team performance (Maruping et al. 2004). Additionally, the feeling of being excluded, no credibility and loss of social identity can be prominent for team interaction, leading to poor team performances. Thus, managing the shared leadership process is critical (Sweeney et al. 2018). If technology is incompatible with shared leadership, the adverse outcomes may spill over and directly lead to project failure.

To extend the shared leadership research and study the interaction among shared leadership, technologies, and tasks, this study aims to answer a broad question “How can ISD teams manage shared leadership through technological tools more effectively?” we construct a model based on task-technology fit theory (Goodhue 1998). Following Maruping et al. (2004), we study the functionalities of technology “the specific set of capabilities enabled by technology.” The task-technology theory stresses the conflict of fit, matching appropriate technological functions to the demands of task features. A match improves the task outcomes. Using this theory as the underlying foundation, we draw on shared leadership literature to elaborate how technological functionalities (empowerment and decentralization) support shared leadership.

This study contributes to the literature on shared leadership and IS literature in the following ways. First, past studies have studied the use of technology in managing interpersonal or social processes (for example, Ahuja et al., 2003; Maruping et al., 2004). However, new insights are needed for the influence of IT in shared leadership. Second, another stream of the IS literature examines the role of leadership in information systems adoption and implementation. Little has been done to examine the effect of technology on leadership process and behaviors. Third, leadership literature has typically examined shared leadership by its antecedents, moderator and mediators (Wang et al. 2014). This study focuses on the use of technology by a group who does more than interpersonal interaction or knowledge exchange. Past studies have not adequately addressed the question of how teams best utilize the vast array of technologies to achieve communication, knowledge exchange, and leading-following interactions.

The rest of the paper is organized as follows. The next session will review the theoretical background and the literature on shared leadership, task-technology fitness theory, and technology functionalities. Section 3 proposes the research model and proposes a set of hypotheses. Section 4 discusses the research method and states the plan of the data collection and data analysis. Lastly, we summarize this study and briefly discuss the potential contribution.

## **THEORETICAL BACKGROUND AND LITERATURE REVIEW**

### **Shared leadership**

Organizations with team-based structures increasingly adopt shared leadership approaches to meet the challenges of extensive knowledge work and complex tasks (Sweeney et al. 2018). The critical distinction between shared leadership and traditional leadership, i.e., vertical leadership, is the sources and directions of the leadership behaviors. Vertical leadership stems from an appointed or formally designated leaders, whereas shared leadership stems from any potential members in the team (Ensley et al. 2006). Unlike traditional leadership with only top-down influence behaviors, shared leadership involves bottom-up influence, peer interaction and collaborative process (Pearce et al. 2003). The enactment of shared leadership depends on frequent participation, communication and interactions among members (Carson et al. 2007; Hoch et al. 2017).

Leadership including vertical and shared leadership has been proved to positively affect team outcomes (Hoch et al. 2017; Hsu et al. 2017; Pearce et al. 2002). Shared leadership has been found to be strongly related to team performance (Choi et al. 2017; D'Innocenzo et al. 2016; Pearce et al. 2003; Small et al. 2010). Although vertical leadership and shared leadership are both the critical predictors of team effectiveness (Choi et al. 2017; Ensley et al. 2006; Pearce et al. 2002), shared leadership is a more useful predictor of team effectiveness than vertical leadership (Pearce et al. 2002). Ensley et al. (2006) present the empirical evidence for this conclusion through examining the explanatory value of vertical leadership and shared leadership in venture top management teams. The strength of the relationship between shared leadership and team performance is affected by team and task characteristics. Task complexity moderates the relationship between shared leadership and outcomes (Wang et al. 2014).

ISD teams in an uncertain and rapidly changing business environment naturally formulate shared leadership in team process (Hsu et al. 2017). ISD teams frequently exchange information and have discussions and negotiations with team members and stakeholders to form shared and consistent team goals and solve conflicting requirements from diverse stakeholders. Team members with high-level functional experience or expertise take the leadership role in the communication and negotiation process to reduce fuzziness and uncertainty (Wang et al. 2014). In knowledge and information exchange, ISD team members with high credibility and recognized expertise will take action of leading or directing to formulate a plan for particular issues and problems, which brings about the emergence of shared leadership (Chiu et al. 2016; Hoch et al. 2017). Heterogeneous teams like ISD teams have high process costs because of communication barriers (Shachaf 2008). Thus the characteristics of team diversity and task complexity make ISD team tend to rely on communication and collaboration technologies to facilitate members exchanging information, resolving conflict and finding appropriate solutions during project execution (Lee et al. 2015b; Levina 2005). However, when ISD teams practice shared leadership processes, it is unknown that how technology supports or frustrates the shared leadership process. The task-technology fit theory (TTF) and the expanded examination of technology functionalities will shed some light on the role of technology in the shared leadership process.

### **Task-technology fit theory and technology functionalities**

Task-technology fit (TTF) is the degree to which technology assists an individual in performing his or her portfolio of tasks (Goodhue et al. 1995). Tasks are defined as the actions carried out by individuals in turning inputs into outputs. Task characteristics of interest include those that might move a user to rely more heavily on certain aspects of the information technology. Technologies are viewed as tools used by individuals in carrying out their tasks (Goodhue et al. 1995). Past studies identified different interpretations of technology functions in TTF. Maruping et al. (2004) define the set of capabilities enabled by technology as technology functionalities and suggests that TTF states a match between task features and technology functionalities. Zigurs and Buckland (1998) pointed out three dimensions of technology functionalities, i.e., communication support dimension, process structuring dimension, and information processing dimension.

Technology tools are critical for project planning and execution in ISD teams (Legris et al. 2003). Team members need to conduct effective communication to reach consensus promptly. The face-to-face communication is the most effective approach for team member interactions. However, in many circumstances, team members find it challenging to have a face-to-face meeting because of different task assignments and various schedules. Technological tools, such as real-time communication tools or task (process) control systems, provide information processing and communication support functionalities and facilitate information exchange in a team. The use of technology tools can support managing team process including both social and interpersonal interaction (Maruping et al. 2004) through facilitating team communication (Shachaf 2008), improving knowledge transfer (Roberts 2000), supporting knowledge management (Choi et al. 2010). Efficient collaboration tools with powerful information processing functionalities can help ISD team members use collective knowledge to develop systems, solve problems and generate creative system designs. In the ISD context, shared leadership not only highlights the need for communication support and information processing functionalities, but also scores the need for processing structuring by setting up a process that defines how the team will interact. Technological tools not only facilitate communication and collaboration (Eason 2014) but also boost empowerment and decentralization of decision making (Psoinos et al. 2000).

The improvement of information flow in the use of technology influences empowerment (Doherty et al. 2003). Empowerment is defined as a set of practices, involving the delegation of responsibility down the hierarchy to give employees increased decision making authority in respect of the execution of their primary work task (Wall et al. 2002). Structure empowerment enabled by technologies in the ISD teams is the focus in this study. Kanter (1993) refer structural empowerment as employees' access to information, support, resources, and opportunities in the team.

Structural empowerment allows team members to have access to information and resources when the activities fall within the expertise areas. For example, a bug report and issue tracking system like JIRA allows developers to identify bugs and plan sprints. It is a significant predictor for the success of knowledge-intensive teams (Kuo et al. 2011). Information technology can lead to more empowerment with the leaders providing a supporting context (Davenport et al. 1990).

Decentralization is the extent to which power or authority is shared by people are closest to the action, instead of making all decisions by top managers (Chang et al. 2003). Decision makers will be connected and make collective decisions if the communication cost is low, which means the organization has the character of decentralization (Malone 1997). Technology tools have the function of decentralization by empowering members to influence or make specific decisions (Zoghi et al. 2011). Technology tools enable organizations to communicate information and increase trust among the decision makers through exchange timely decision-related information or knowledge (Malone 1997).

## RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

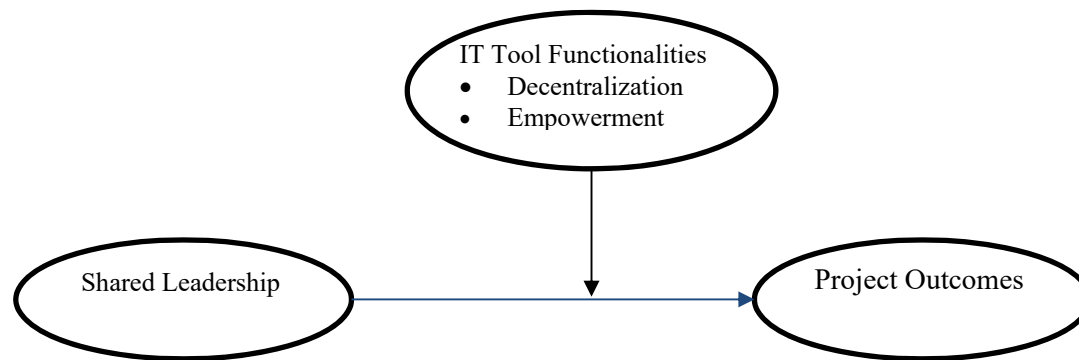


Figure 1. The proposed research model

Shared leadership is a team process where leadership is carried out by the team as a whole, rather than solely by an appointed leader (Perry et al. 1999). Shared leadership, like traditional leadership, includes many different leadership behaviors, such as directive, transformational, transactional, empowering, and aversive (Pearce et al. 2002). Empowering behavior is the crucial factor in the emergence of shared leadership (Carson et al. 2007). It can motivate members to take some responsibility which should have been taken by formal leaders (Hoch et al. 2017). According to the TTF, the fit of technology function and shared leadership will generate positive team outcomes. The understanding of how team members use technology in shared leader processes would be valuable. Based on the TTF, we propose the research model in Figure 1. Technology tools can support empowerment (Psoinos et al. 2000). Although technology cannot contribute directly to the provision of power, technological tools enable decentralization to support shared leadership.

Prior research studies indicate that shared leadership produces a positive impact on team outcomes including team performance (Ensley et al. 2006; Pearce et al. 2002; Perry et al. 1999), team learning (Liu et al. 2014) and team creativity (Lee et al. 2015a). Shared leadership is supported by internal environment characterized with shared purpose, social support, and voice (Carson et al. 2007). In the ISD development process, shared leadership provides an opportunity for team members to utilize their expertise and identify the best solution for a problem or challenge. This opportunity to lead brings unique experience to team members, enhance their commitment to team success and strive to bring different resources to work on complex tasks (Carson et al, 2007). At the same time, when other team members are accepting the peer's leadership and respect peer leader's decision, the team functions effectively on getting the complex tasks done. Shared leadership makes feedback and communication easy and efficient, leading to ISD project success (Moe et al. 2009). Therefore, we propose that

H1: Shared leadership is positively associated with project outcomes.

According to Adaptive Structuration Theory (AST) (DeSanctis et al. 1994), the effects of information technology interact dynamically with organizational structures of which leadership is an important part (Avolio et al. 2000). The context, such as leadership, influences IT tools' interpretation. At the same time, IT tools can modify the team context.

Many advanced information technologies including instant messaging systems, group decision support systems, rapid prototyping, documentation and testing system, bug management tool, project management tools, and other technologies, use sophisticated information management to enable multiparty participation in organization activities. These complex and advanced technology tools have the intent or purpose of promoting participative leadership (Avolio et al. 2014).

IT tools provide the process structuring function of decentralization in decision-making. ISD teams strive to respond to customers' requirements timely and effectively. Communication tools such as a real-time interactive platform or a video conferencing application facilitate knowledge and information transfer (Roberts 2000). The low-cost communication tool enables team members to promote their ideas and discuss with others through feedback. The appropriate system access and controls give team members the freedom of making sub-decisions based on their knowledge and expertise, without worrying about the conflicting decisions from others or unexpected outcomes. Consequently, the alignment of technology tools and shared leadership behaviors will produce better high-quality communication and collaboration, leading to successful project outcomes. In contrast, when IT tools and shared leadership behaviors are not aligned, team members cannot perform shared leadership behaviors. When IT tools reflect a centralized decision-making process, team members do not get access to all the information needed for a decision making. Team members cannot submit any decisions or make changes in the team collaboration system. The unalignment dis-encourages team members to take any actions to lead the team as the situation emerges. Without sufficient communication and right participative decision-making, the quality of system development work decreases. As a result, we propose that

H2a: The interaction between IT tool decentralization and shared leadership is positively associated with project outcomes.

The use of IT tools creates an open environment for ISD team members to participate in leadership (Avolio et al. 2014). IT tools can support the four critical aspects of empowerment, the provision of information, power, knowledge, and rewards to employees (Psoinos et al. 2000). Team members can take advantage of the knowledge and information sharing to achieve project goals successfully (Mehra et al. 2006). Technology tools enable the information disseminated directly from any level of organization, allowing fewer levels in the hierarchy and small power distance among organizational members (Dewett et al. 2001). The delegation of responsibilities or the empowerment enhances the function of shared leadership. Examples of empowerment include providing the team the ability to participate in early project planning, meeting with clients (stakeholders), and freedom to develop problem solutions (Burpitt et al. 1997).

Based on the findings from Nauman et al. (2010), shared leadership is notably effective when team leaders distribute and delegate leadership functions and responsibilities to team members. In the shared leadership process, professional members with specialized expertise need to not only coach other team members on the method to develop system functions but also exert influence on the interdependence characteristic within the delivery of the project. Shared leadership means empowering individuals at all levels and providing them the opportunity to take the lead (Stagnaro et al. 2014). With the support of IT tools, ISD member can have the right to access and use the team information and knowledge. In solving fundamental problems, members can also get more technical or intellectual support from other members through technology tools for group collaboration. However, when shared leadership is low in the ISD teams, the information distribution enabled by IT tools can empower team members to learn the project and make decisions with system permissions. In other words, the empowerment functionality of IT tools may take the place of the shared leadership behaviors and give team members the opportunity to participate in the leadership functions. Therefore, we propose that

H2b: The interaction between IT tool empowerment and shared leadership is negatively associated with project outcomes.

## **RESEARCH METHODOLOGY AND THE NEXT STEP**

In order to explore the relationship between shared leadership and technology functionalities, we decided to use the survey method for data collection. The targeted group is ISD teams that recently completed an ISD project and had some forms of shared leadership behaviors in the process. The sampling method will be snowballing. In an endeavor to avoid common method bias, we plan to use a paired survey design. A project manager will be asked to answer some questions about the team's shared leadership behaviors, and team members will be asked to answer the questions

regarding the use of the technology in the process. All the construct measures are adopted from past studies. We expect to collect at least 90 pairs of survey responses from ISD teams. We plan to use the PLS-SEM method for the data analysis.

## CONCLUSION

This research aims to achieve the goals as follows. First, we want to understand how technology tools, tasks, and shared leadership interact in ISD process. The expected results will inform the teams to find crucial technology functionalities to support shared leadership and minimize the adverse effect of complex tasks. Second, we intend to fill the gap in research regarding the relationship between technology and leadership in addition to the leadership role in technology adoption and implementation. Furthermore, our research framework may serve as a basis for IS and leadership scholars seeking to understand better and further investigate the shared leadership within the ISD context.

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