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TOWARDS A TYPOLOGY OF AGILE ISD LEADERSHIP

Research in Progress

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Abstract

Leadership influences the success of any project, including agile information systems development (ISD) projects. In fact, agile ISD projects are nowadays the ISD method of choice in practice irrespective of the size of the project - either small or large projects. There, leadership is crucial because it transcends and influences other factors, such as team motivation and commitment. However, knowledge of agile ISD leadership is limited as research in this area is rare. This study aims to reveal how leadership manifests in an agile ISD project, specifically in the setting of large-scale projects. To investigate leadership in an agile ISD project, we conducted a qualitative case study and interviewed 12 agile ISD practitioners from three teams. Preliminary results show that personal attributes, attitudes, and behaviors of the leader are important for agile ISD leadership to be effective. Based on those characteristics, we develop a theoretical framework about leadership for agile ISD projects.

Keywords: Leadership, Agile, Large-scale ISD, Case study.

1 Introduction

This study investigates leadership in agile information systems development (ISD), specifically in the setting of a large-scale project. Research shows that agile methods enhance the visibility, transparency and predictability of an ISD project (Laanti et al. 2011), which in turn leads to higher productivity and better quality software outputs. As a result, agile is nowadays the dominant ISD method in practice for small and medium size projects (VersionOne 2018). However, some large ISD projects have also adopted agile methods (Dingsøyr and Moe 2013). The outcomes of an ISD project are impacted by various organizational and technological factors irrespective of the size of the project. Interestingly, the literature suggests that organizational factors, such as leadership and culture, are more influential on project outcomes than technological factors, such as project management tools or software (Kirsch 2004). Especially, leadership is crucial because it transcends and influences other factors (Shore 2005). However, little is known about how leadership manifests in agile ISD projects.

Considering the wide adoption of agile ISD methods in practice and the importance of leadership for project outcomes, it is surprising that the topic of ISD leadership is understudied (Blincoe et al. 2016; Hoegl and Muethel 2016), specifically in a large-scale agile context. “*Without appropriate leadership, the risk of project failure increases. ...Until now, the topic has been largely ignored*” (Shore 2005, P. 1). In an ISD project - which we define as a complex activity that involves non-routine, knowledge-intensive tasks (Narayanaswamy et al. 2013) - a team with members pos-

sessing diverse knowledge and skills must work collaboratively to accomplish ISD project outcomes. In a large-scale ISD project, leadership is much more challenging as such a project involves several teams as opposed to the single team typical of small-scale ISD projects. While prior research focused on leadership in small teams, this study investigates leadership in large-scale agile ISD projects. Consequently, this study asks the following research question: *How does leadership manifest in an agile ISD team in a large-scale project?* The study contributes to the existing body of literature by providing a better understanding of leadership factors in an agile ISD team that manifest in effective leaders.

The study of leadership in large-scale agile ISD projects is timely for two reasons. First, agile methods have experienced broad adoption (Shull et al. 2009; VersionOne 2018). The wide adoption of agile ISD methods is fostered because of the benefits offered by the methods, e.g., faster time-to-market. Further, a turbulent business environment that results in unstable market conditions and changing requirements has made plan-driven ISD projects no longer workable. Second, existing research on leadership in agile ISD is limited to a few exemplary studies. These studies have investigated leadership in very contextualized environments that cannot easily be transferred to other settings. For example, a number of studies have focused on distributed team settings such as open-source ISD projects (e.g. Eseryel and Eseryel (2013), Xu et al. (2009)), outsourcing ISD projects (e.g. Ng and Walker (2008), Rai et al. (2009)), and virtual ISD projects (e.g. Sarker and Schneider (2009), Thomas and Bostrom (2008)). Hence, it is not clear which aspects are applicable to agile ISD projects specifically in large-scale setting. Therefore, a focused study of leadership in large-scale agile ISD context is needed.

In the next section, we present what is known about agile ISD methods and leadership in agile ISD teams. In the method section that follows, we present our case, data collection, and data analysis along with preliminary results. We conclude with the theoretical and practical contribution of our study.

2 Background

2.1 Agile methods

“Agile refers to a family of iterative systems development methods that value team collaboration, minimal up-front planning, and the flexibility to adapt to changing requirements” (Cram and Newell 2016, P. 154). Agile ISD methods are well suited in dynamic environment where requirements and project scope change throughout the ISD process (Cao et al. 2013; Rigby et al. 2016). An agile ISD method, such as extreme programming (XP) (Beck 2000; Sharp and Robinson 2004), Scrum (Schwaber 2004), Crystal (Cockburn 2002), or Kanban (Anderson 2010) facilitates the responding to changing requirements (Cao and Ramesh 2008; Cram and Newell 2016)). Each project is broken down into cycles of two to four weeks when outputs are delivered to customers (Nerur et al. 2005). Working iteratively enables agile ISD teams to be flexible and adaptive in their development decisions.

Agile methods, which emphasize flexibility and adaptation, apply ‘light’ planning to manage volatile requirements (Lee and Xia 2010). Also, planning and decision-making processes are ongoing and involve both developers and customers extensively (Moe et al. 2009). Practices in agile methods, such as continuous integration (Holck and Jørgensen 2003; Nerur et al. 2005) or test-driven development, enable software to be developed quickly as these practices support faster processes and allow for fixing many software errors at the moment they are detected (Fowler 2006).

Although best suited for a small team with five to seven people (Williams and Cockburn 2003), the agile method has also been adopted in large ISD projects (Dingsøyr and Moe 2013; Ramesh et al. 2010). Research in large-scale agile ISD projects is not exclusively theoretical but has also provided empirical evidence on their effective use (see for example Daneva et al. (2013) or (Lagerberg et al.

2013)). One of the challenges in a large-scale agile ISD project is inter-team coordination. Team members must work effectively not only within the team but also with members of other teams to deliver the ISD project. Thus, a large-scale agile ISD project requires intra-team coordination and inter-team coordination (Dingsøyr and Moe 2014).

The agile ISD team is the core driver for responding to change and creating software outcomes (Faraj and Sambamurthy 2006; Maruping et al. 2009). To work in this manner, an agile ISD team has to possess a number of unique characteristics. The team should work autonomously (Hoda et al. 2013; Lee and Xia 2010), but as an interdependent work group that consists of collaboratively working individuals (Conboy et al. 2011; Nerur et al. 2005) with diverse, but complementary skills (Lee and Xia 2010). The unique nature of an agile ISD team supports the team in being adaptive so that it can master requirement changes by developing software incrementally and iteratively (Martin 2003). Autonomy enables the team to make project-related decisions without higher management approval (Lee and Xia 2010) and, through interdependence and diversity, the team has expertise to work collaboratively in creating software that meets business needs (Conboy et al. 2011; Nerur et al. 2005).

2.2 Leadership and conceptual framework of leadership in agile ISD team

Scholars in management define leadership either as an attribute of a leader or as the process of leading others. These two conceptualizations of leadership (i.e., an attribute or a process) represent two orthogonal views on leadership representing opposite poles of leadership theory (Avolio et al. 2009; Zaccaro et al. 2009). However, both conceptualizations are important and influence team effectiveness (Pearce and Sims Jr 2002). In this study, we adopt the conceptualization of leadership being an attribute of the leader because agile ISD methods are strongly focused on individuals and their behaviors (Nerur et al. 2005). An attribute of a leader is a defining property of the person's ability in leading others. "*As a property, leadership is the set of qualitative characteristics attributed to those who are perceived to successfully employ such influence*" (Jago 1982, P. 315). Defining leadership as an attribute is recognized in the literature as the vertical view of leadership. This view is bounded by the structural assumption of hierarchy which is necessary and inevitable in organizations (Vanderslice 1988).

Focusing on the attributes of leaders, we investigate personal attributes, attitudes and behaviors of leaders (Clarke 2012; Yukl 2006). Leaders with certain attributes can use them to influence the outcomes of an agile ISD project (Shamir 2011; Yukl 2006). In the team literature, formal organizational leaders are normally at the center of interest on leaders attribute, but recently leader attribute studies have been conducted about emergent leaders as one can find them in an agile ISD project (Avolio et al. 2009; Zaccaro et al. 2009). Personal attributes of leaders refer to observable demographic characteristics such as tenure or years of experience, age, or functional and educational background (Elron 1997; Wang et al. 2011). Studies in management literature has investigated these demographic factors such as age (Chaturvedi et al. 2012; Zacher et al. 2011), or gender (Chaturvedi et al. 2012; Hernandez Bark et al. 2014). Results showed mixed findings on influence of those factors in predicting leadership.

While personal attributes are observable, attitudes are non-observable. An attitude is a relatively permanent feeling or belief toward objects, people, groups, or events (Robbins and Judge 2013; Vaughan and Hogg 2005). Attitudes consist of cognitive, affective, and behavioral components; in this study, we focus on the behavioral components, i.e., "*an intention to behave in a certain way toward someone or something*" (Robbins and Judge 2013, P. 71). Therefore, in general we expect that attitudes will affect behavior (Ajzen and Fishbein 1977; Bentler and Speckart 1979).

Behavior, in contrast to attitudes, is overt and more observable (Ajzen and Fishbein 1977). In operational level such as an ISD team, leadership behavior refers to explanatory variables, i.e., the behavior of the leader as reactive actions to response problems (Katz and Kahn 1978; Zaccaro and Horn 2003) The management literature has a rich of studies that describe how leaders need to adapt their

behavior in accordance with specific situation. This is known as contingency theories of leadership (Robbins and Judge 2013) that include for example The Fiedler Model, Situational Leadership Theory, or Leader Participation Model.

In the IS literature, especially in ISD, studies had investigated various forms of leadership focusing 1) on the attitude of leaders, or 2) on the behaviors of leaders. Many of these studies have identified specific leader's traits and behaviors in ISD teams (Clarke 2012; Yukl 2006). For example, a study showed that effective leaders need to possess skills and behaviors to be able to successfully lead different phase of IS project (Skulmoski and Hartman 2010). In their study on leader's behavior, Christenson and Walker (2004) demonstrated that a leader need project vision whereas Kaminsky (2012) identified ten non-technical leadership practices.

Despite that prior research agrees on the influence of leader's attributes on ISD project outcomes, research on leadership in agile ISD projects is still rare. Indeed, the ISD literature takes a narrow focus on a particular collaborative leadership style, known as shared leadership (Avolio et al. 2009; Nicolaides et al. 2014). Shared leadership theory understands the agile ISD team to be fluid (Sharp and Robinson 2004) which means that leader-member relationship tends to be equal (Vidgen and Wang 2009). Thus the leader plays the role of a facilitator and supporter to drive collaboration (Nerur et al. 2005).

Drawing on the shared leadership theory, various labels are given to a leader of an agile ISD team. On the one hand, an agile leader is referred to as a transformational leader who empowers the team (Moe et al. 2009). On the other hand, the literature also conceptualizes leaders of agile ISD teams as servant leaders (Medinilla 2012). Both leadership styles assume specific attributes of the leader especially on the leader's attitudes and behaviors. For example, a transformational leader is inspiring and motivating (Bass et al. 2003; Braun et al. 2013) while a servant leader is humble and empowering (Van Dierendonck and Nuijten 2011). However, the theoretical position has not yet supported by empirical evidence from agile ISD projects.

In summary, we explore the manifestation of leadership in agile ISD team by studying attributes of leaders. The attributes manifest as personal attributes, attitudes, and behavior of the leader.

3 Research Method

3.1 Research design

We conducted an exploratory case study to build a theory of leadership in agile ISD team (Eisenhardt 1989). The case study method allows investigating how leadership unfolds in the context of agile ISD (Eisenhardt 1989; Yin 2009).

3.2 Data collection

We have started collecting data through interviewing ISD teams from two companies. We refer to the companies as Travel and Service (Pseudonym). We selected these companies because they have adopted the agile method in their large-scale ISD projects.

Travel represents the use of agile method within an in-house ISD project with a collocated team. Founded as a subsidiary of one of the largest software companies in the world, Travel has evolved into the world's leading online travel company. The company operates in over 65 countries and continues to expand. By the end of 2016, they had more than 20,000 full-time and part-time employees. Travel has more than 60 offices around the world, and our case is from the Brisbane office, Australia. The Brisbane office is one of the big offices and is supported by IT department as only several Travel's offices have IT department. The IT department employs more than 60 developers. In 2011, the company adopted the agile methods and created a tailored agile method (Fitzgerald et al. 2006) that combines elements from Scrum (Schwaber 2004) and XP (Beck 2000). Initially, the company

only utilized the agile method in small collocated teams, but recently the teams have started working together on large-scale ISD projects. When the interviews were conducted, the teams were working on a full redesign of a hotel travel guide page and the project lasted for about two months.

Service is a global professional service company that serves their clients in more than 150 countries and territories. They offer a variety of services from audit and assurance to consulting and have more than 250,000 professionals around the world who deliver all of the services. Our case took place at Service Australia specifically at the Brisbane office, Australia. One of their services is consulting in technology to assist their clients in dealing with technology, for example ERP management and implementation. Their clients are other companies and government agencies. The company has adopted the agile method for about ten years globally six years in Service Australia. They also uses a variety of agile practices from Scrum (Schwaber 2004), Safe, and Lean (Fitzgerald et al. 2013). Working closely with their clients, they work in small but distributed teams. The average project at Service involves 10-20 ISD personnel although in some cases involve more than 20 staff either locally or globally. In case of offshore development, the team relies on technology for their communication, e.g., Skype and teleconferences software. When the interviews were conducted, the team had just completed an enterprise transformation project for a big bank in Australia.

Access to both companies was negotiated and data collection began in January 2017 and is ongoing. Senior management personnel from the companies provided an entry that bestowed legitimacy and credibility to the researchers for conducting interviews (Patton 1990). Interviews were conducted with agile ISD team members and who represented either leaders or followers. Following the lead in prior research (Rai et al. 2009; Thomas and Bostrom 2008), we understand the leader as someone who plays a formal leadership role such as the Project Manager or other roles in the agile method known as Scrum Master, or Agile (XP) Coach. Followers are represented by various roles in an ISD team such as business analyst, developer, consultant, or tester and in the remainder of the paper we refer to followers as developers.

Theoretical sampling was applied to maximize the variety of participants in this study (Eisenhardt and Graebner 2007). In addition to the pairing of leader-developer, we also looked for participants with mixed experiences in ISD, especially with the agile method, and of different gender. These variables were relevant for our study as they may influence the way how the participants conceived leadership in the teams. A gatekeeper in each company selected participants based on our criteria.

A total of 12 interviews were conducted: eight interviews in Travel and four interviews in Service. The interview participants were of mixed gender (six males and six females), and included four leaders (two from each company) and eight developers. Their experiences in ISD or IT, in general, ranged from one to twenty years and specifically with the agile method from one to ten years. Furthermore, most of them had bachelor degree but majoring in various disciplines.

3.3 Data analysis

All interviews were transcribed and produced over 150 pages of transcripts. The analysis process had begun during data collection when the researcher started reflecting on and interpreting interview data. However, a systematic analysis was conducted after an initial round of 12 interviews was completed. The interview data offers rich insights that can be obtained through immersion in the transcript of each interview. We enrich this immersion process with additional data available to us, including project documentations and press reports.

We followed an inductive approach to analyze the data (Eisenhardt 1989; Eisenhardt and Graebner 2007). We adopted this approach because of two reasons. First, the knowledge on leadership in agile ISD team is still in the nascent stage. Second, given that the knowledge in this area is still limited, we were keen to study the phenomenon of interest, leadership in agile ISD team, through investigating the perceptions of agile ISD practitioners from their own experiences (Denzin and Lincoln 1998; Taylor and Bogdan 1998).

We analyzed the interview data within teams first before we compared across teams. We read each transcript several times and highlighted some section and included comments. Doing this, the data were segmented and grouped into relevant and meaningful text segments for further analysis (Tesch 1990). We developed ‘sensitized concepts’ (Flick 2009) that show manifestations of leadership in agile ISD team from the text, i.e., interview transcripts. We elaborated on the categories and subcategories of the manifestation of leadership expressed by the participants. We attempted to draw the leader’s attributes based on the participant’s experience, and we did this process (i.e., identification of categories and subcategories) iteratively in a systematic and comprehensive way. We analyzed the data through a coding process.

Inspired by the grounded theory coding process of open-axial-selective coding (Glaser and Strauss 1967; Strauss and Corbin 1998), we started coding interview texts to identify 1st order concepts. In this stage, concepts were identified as an abstract representation of the manifestation of leadership attributes in agile ISD team. We attached descriptive labels, using the words taken from the interview where possible, to capture different manifestation of leadership as the core issue in this study (Strong and Volkoff 2010). We identified 43 concepts as 1st order codes in our provisional list that covered the broad set of leadership attributes from our interviews.

As the core categories emerged from the 1st order concepts, we began to reintegrate the categories into an initial list of 2nd order themes. During this stage, we explored the variation of leadership attributes in agile ISD teams and uncovered the relationship between them. This process is similar to axial coding (Strauss and Corbin 1998). For this study, we classified the 43 1st order concepts into to 12 2nd order concepts. Subsequently, the variation and relationship were critically evaluated and verified by the data. Finally, we classified all concepts into larger themes to unify and refine all categories based on our conceptual framework. This process bring us to a higher level of abstraction in theorizing about the manifestation of leadership in agile ISD teams (Urquhart et al. 2010).

4 Preliminary Findings

This study aims to understand leadership attributes in a large-scale agile ISD project. Our preliminary analysis shows that empowerment is the most desirable attribute of an agile ISD team leader. Empowerment was found to be of importance for leaders across all teams. However, the leaders in the teams of Travel and Service varied based on other attributes. Leaders in Travel emphasize on communication and problem solving whereas the Service team leader possess extensive experiences in the agile method. In addition, leaders in Service also act as coaches for their teams. Based on the interview findings, we develop a provisional typology of agile ISD leadership.

At first, we examined the attributes allocated to each leader and ranked them based on their frequency in in the leader-developer settings. Thus, we could identify for each leader a unique set of attributes. In comparing and reflecting on the different emergent leader attributes, one research collaborators said “*Leader type I seems to be quite dominate, like someone who does not take prisoners, like a tiger.*” While we all were amused at first about the description, this comment was a creative spark in such a way that we would also seek to map the other leader types to animals. Indeed, the use of animal names to portray stereotypical attributes of leaders has some parallels. Economists use animal names to stereotype economies, such as ‘tiger economy’ (Corcoran and Arensman 2010).

Thus, through intensive discussion and various reading of animal stereotypes, we decided to draw on three animals regarding types of leadership in agile ISD team: Tiger (large solitary cat), Crane (large bird), and Elephant (big mammal). The leadership typology is presented in Table 1.

Characteristics	Tiger	Crane	Elephant
Empowerment	Dominant	Empowering	Empowering
Communication	Clarity	Clarity	-
Humility	Ego	Humble	Humble
Accountability	Micro-managing	Accountable	Accountable
Emotional Intelligence	Inattentive	Sensitive, empathetic	-
Coaching	-	-	Active
Experience	-	-	Experienced

Table 1. Typology of agile ISD leadership

- Leadership type Tiger**, tiger especially the male adult, is dominant and aggressive animal. Tigers usually hunt alone, and with its deadly teeth and claws, kill their preys (Anonymous 2015). Tigers actively communicate through their tails movement, and sometimes they roar particularly in an aggressive situation. They also communicate through other vocal sounds such as grunts or growls (Mazák 1981). A tiger leadership is dominant in the team. The leader communicates actively to lead the team, tells each member of the team what he has to do and how to accomplish it. However, the leader has a big ego that may negatively affect the team. *“It is something that I struggle with, but not being the expert”* (Engineering Manager-Travel). *“Ego”* (Technical Product Manager-Travel). Because of the self-ego, a tiger leader will dominate the team instead of empowering the team, and accordingly micro-manage the team. The leader always wants to be involved in solving the team problems and it may be of benefit for the team to involve the leader often as tiger leaders have large knowledge and are skillful.
- Leadership type Crane**, crane is a large bird with long legs and a long neck. The bird is a member of the Gruidae family (Johnsgard 1983a). Cranes are adaptive and flexible to their diet; they eat what they find in their habitat according to the season (Low and Ang 2010). In their flock, the crane communicates via a loud sound and body language (Johnsgard 1983c). The crane is one of the animals that often appears in myths and legends (Johnsgard 1983b; Low and Ang 2010). Contrast to the tiger leader, a crane leadership is humble and empowers the team. *“I think you have to be aware that you’ve all got strengths and there are some areas you won’t know the answer”* (Technical Product Manager-Travel). *“I think the empowerment is very pivotal ... to allow every engineer to work effectively to their potential and capacity”* (Developer-Travel). The crane leader communicates with the team clearly and is sensitive to each individual team member or other stakeholders. The crane leader feels also accountable and involved in helping the team to solve problems.
- Leadership type Elephant**, elephant is a smart mammal that has good long-term memory (Potter 2012). As the leader of the herd, known as the matriarch, this animal is of caring nature for the heard. In most cases, the leader is an adult female with many years of life experience (Meyer 2015; Potter 2012). The leader helps young mothers in raising their calves and teaches the mothers what is important for the herd to survive (Meyer 2015). Furthermore, the leader is confident yet wise. Typically, the leader does not micromanage and is open to learning from others even from a junior member of the herd (Potter 2012). Because of the elephant leader’s experience, s/he empowers and actively coaches the team. *“The best Scrum masters I have seen are really act like coaches”* (Director-Service). *“So the analogy of a coach in that analogy speaks to someone who is not necessarily playing in the field, but who is providing direction, motivation, encouragement when needed”* (Manager-Service). Through this helping and empowering and detailed knowledge of agile methodology, the leader helps the team to solve its own problems. Furthermore, although not found as a dominant leader attribute, such a leader is also humble, but feels accountable for the developers’ actions.

5 Conclusion

This study has important theoretical and practical implications. Regarding the theoretical contribution, this study develops a typology of agile ISD leaders in an agile ISD team and investigates the manifestation of leadership, specifically in the context of a large-scale project. This study thus addresses a call for research with high priority topic in large-scale agile development (Dingsøy and Moe 2014). Further, we develop a leadership typology based on leader characteristics in the context of a large-scale agile ISD project. In doing so, we advance the agile ISD literature as well as leadership literature. For the agile ISD literature, we empirically studied leadership in an agile ISD team. Our study therefore contributes to the leadership literature as the ISD team is a unique context that may need different approaches to leadership – a domain in which studies are still limited.

For practice, this study will offer a guideline for agile ISD leaders as well as for companies that adopt the agile method in a large-scale ISD project. This study will reveal the personal attributes, attitudes and behaviors required to lead an agile ISD team effectively. Accordingly, organizations' human resource management policy can be developed based on the leadership typology with particular attention to recruitment, placement, and development.

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