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Abstract

Agile information systems development (ISD) is characterized by high levels of trust towards developers. However, a broad stream of research points to the presence of pragmatic agile practitioners, who follow agile prescriptions less rigorously and tend to put just as much emphasis on project controls than on trust. ISD project control literature so far explained control activities mostly through agency theory and, to a lower extent, stewardship theory. These theories do not explain well this "middle ground" between trust and controls as they have radical views on actors: agency assumes self-interested utility maximizers; stewardship presumes self-sacrificing stewards. In this study, we introduce signaling theory for explaining control in Agile ISD that allows for more balanced views on developers, and propose an explanatory case study to review the use of three alternative theoretical models in this context.

Introduction

Around the time when the Agile Manifesto was published (Highsmith and Cockburn 2001), several guidebooks (e.g. Highsmith 2002; Poppendieck, M., Poppendieck 2003) have been written with the intention to explain to practitioners how to develop information systems (IS) using the agile method. This was quickly followed by the appearance of distinct, still similar agile variants, such as Scrum (Schwaber 2004), and continued updates (see, e.g., Schwaber and Sutherland 2020). Despite these guidelines, practitioners implement prescriptions differently in terms of how rigorously they are followed. Some moved quite far away from the agile ethos, and heavily customized it to seek business benefits (Zaitsev et al. 2018). From this study's perspective, one important modification by this group is the higher emphasis on control over collaboration, as exemplified by Goh et al. (2012).

It can be safely assumed that some level of control, typically defined as any attempt to align individual behaviors with organizational objectives (Kirsch 1996), is also necessary in agile IS development (ISD) (Dreesen and Schmid 2018; Maruping et al. 2009). Control ensures that the project has the required resources, and can be used to motivate, regulate or adjust behavior of team members (Kirsch 2004). This argumentation and the above definition are aligned with agency theory (Jensen and Meckling 1976) and imply that the purpose of control is to prevent value-appropriation (Wiener et al. 2019). However, another view on control highlighted that it also needs to cater for value-creation through ensuring progress *"by fusing together the complementary roles and capabilities of ISD project participants"* (Kirsch 1997, p. 215). Moreover, it has been noted that in the digital era several key assumptions of agency theory are outdated, and stewardship theory (Davis et al. 1997) has been proposed to replace agency-oriented thinking among researchers and practitioners (Wiener et al. 2019). It has a more generous, self-sacrificing "model of man", that is better aligned with the autonomous, intrinsically motivated agile developers (Highsmith 2002), and it also fits better the supportive, servant role of agile controllers (Project Management Institute 2017).

While pragmatic agile practitioners believe in the philosophical underpinnings of agile, these do not seem to dominate their adoption of the method (Zaitsev et al. 2018). For instance, Goh et al (2012) described how strict work processes and trust can be in harmony in agile projects. Neither agency nor stewardship can explain this double nature of control, these theories explain agile developers' behaviors on two opposing endpoints of a scale. Therefore, our research idea is to look for and apply a third theory that occupies the "middle ground" between agency and stewardship, and allows for more balanced views on agile developers. To investigate this assumption, we propose an explanatory case study that applies alternative theoretical models to explain certain events that otherwise appear unaccounted for.

Theoretical background

It is too simplistic to say that agile is used or not used in ISD projects, as its implementation can be partial and subtle (Conboy and Fitzgerald 2010). Having a pragmatic perspective on agile ISD allows practitioners to depart significantly from agile norms (Zaitsev et al. 2018). Agile can merely be used as a tool to enhance responsiveness to change and interactions among stakeholders (Martini et al. 2016), it can also have a strong focus on scope, cost and time objectives, and stakeholders may blend team autonomy and team diversity with response effectiveness (Lee and Xia 2010). It is not only the organization that can change to fit agile prescriptions, but the method can also be customized so that it better fits business needs (Cao et al. 2009). This implies that agile projects need to carefully balance autonomy, flexibility and responsiveness to change with the benefits control promises, such as reaching budgetary and schedule targets and quality standards (Banker and Kemerer 1992).

According to agency theory, employees are not naturally motivated to do their best for the organization (Jensen and Meckling 1976). In the agency logic, one party, the principal employs another party, the agent hoping for higher value creation than working alone. The agency problem is derived from two assumptions: (1) the principal and the agent have different interests, and (2) there is information asymmetry between them, favoring the latter. This asymmetry is an inherent consequence of agents knowing their own qualities and characteristics better than their principals, and that they are the ones performing the tasks (Bosse and Phillips 2016). Around 90 percent of ISD control literature is based on this theory, seeing control as a means to constrain agents and coerce them to reveal their private information, increasing their efforts and compliance (Cardinal et al. 2017). However, agency theory was criticized as being under socialized, as it neglects social and psychological complexities of human actors (Granovetter 1992). Wiener et al (2019) highlighted five other reasons why the assumptions of agency theory are less valid in today's IS projects. First, while less applicable to the inner workings of agile ISD teams, IT units are nowadays partners rather than suppliers of business representatives that points toward goal congruence between parties. Second, agile developers have diverse backgrounds (Nuwangi et al. 2014) and information asymmetry can be a neutral or even positive consequence of this. Third, knowledge workers in agile projects may be internally motivated as they value their professional growth (Wu and Saunders 2016). Fourth, agile projects give space to open ended innovation and constraints of budget, time, and functionality are less important than in traditional ISD projects (Zaitsev et al. 2020), hence, controlling for these is less common. Finally, agency theory assumes hierarchical work relationships (Bosse and Phillips 2016) that hardly characterize agile teams (Highsmith 2002).

Stewardship theory, as another perspective, may better explain control issues in contemporary ISD projects (Wiener et al. 2019). It assumes that agents are in fact stewards, whose interests are aligned with the principle and the organization (Davis et al. 1997). Stewards are intrinsically motivated, collectivistic, with higher goal congruence with principals than under agency theory (Donaldson and Davis 1991). From a stewardship perspective, the reason for controlling ISD projects is not to prevent value-appropriation, but to create value thorough enhanced communication and collaboration (Wiener et al. 2019).

However, it seems that stewardship theory is insufficiently explaining control in agile ISD for two reasons. First, a literature review by Dreesen et al (2018) as well as a recent case study (Virag et al. 2021) have shown that in agile ISD projects formal controls can be just as common as informal ones. Formal controls, that are used to supervise and monitor, provide clear prescriptions to those being controlled (controlees) (Wiener et al. 2016). The enactment of formal controls is a pragmatic choice: they can increase project performance in certain cases (Tiwana and Keil 2009), such as project efficiency (Henderson and Lee 1992) and project quality (Maruping et al. 2009). Nevertheless, formal controls are more costly and less aligned with the agile philosophy than informal controls, such as clan and self-control. Formal controls

generally limit team autonomy (Piccoli et al. 2004), and are perceived by controlees to be less legitimate than informal controls in terms of perceived fairness, individual autonomy, group identification, and competence development (Walser et al. 2021). Second, stewardship theory does not address information asymmetry between parties (Wu and Saunders 2016). This is an important deficiency because information asymmetry is common in (agile) ISD projects (Virag et al. 2021; Wiener et al. 2019; Wu and Saunders 2016). It can be the consequence of dynamically changing requirements and statuses of tasks, different educational and professional backgrounds (Bergh et al. 2019; Nuwangi et al. 2014), and the fact that agile controllers often lack domain knowledge, and in general considered weak (Shastri et al. 2021).

In response to the above concerns related to the use of agency and stewardship theories, we looked for other theoretical approaches that address the challenges and opportunities of information asymmetry while providing less strongly articulated preconceptions on actors. A theory which seems to fit these demands is signaling theory (Spence 1973) that is one of the key theories addressing information asymmetry (Bergh et al. 2019). The information problem signaling addresses is similar to the one of agency theory. Namely, managers do not have perfect information on the qualities of subordinates and, thus, they do not know how to separate high-quality from low-quality ones (Connelly et al. 2011). Aligned with the agency logic, managers 'under signaling theory' would like to reduce information asymmetry so that they could choose and benefit from high-quality subordinates. Unlike under agency theory, managers believe that subordinates cooperate in reducing information asymmetries, so that their positive qualities could gain publicity. This cooperation takes place in the form of signaling that only occurs in the presence of four conditions (Bergh et al. 2014). First, an *information problem* is necessary that negatively impacts both parties. Such negative impact can be, for instance, adverse selection of human resources. Second, *signal costs*, such as obtaining a degree, need to be sufficiently high and inversely related to the quality of signalers. Low-quality subordinates need to invest in the signal at a higher rate than high-quality ones, due to their lower skills. This rate has to be high enough so that it is not worth of preparing and conveying signals for low-quality subordinates. Third, managers need to set up *Pareto optimizing solutions*. By this, Bergh et al. (2014, p. 1337) mean that "*there exists no other feasible solution for which an improvement for one party does not lead to a simultaneous degradation in one (or more) of the other parties*". In other words, high-quality signalers should be rewarded for their signals and low-quality ones should not be. The last condition is *signal confirmation,* or that managers can subsequently experience that high-quality signalers perform in a way that justifies rewards paid to them.

Methods, anticipated results and potential contributions

We are going to conduct an explanatory single case study following positivist epistemology. Such design is appropriate when both the theories as well as their predictions are explicitly stated before the start of the research (Dube and Pare 2003; Lee 1989). To get a thorough overview of the phenomena, we will rely on multiple sources of qualitative data, such as interviews and e-mail documentation from agile controllers. With regards to data analysis, we intend to follow Yin's (2017) pattern-matching technique by comparing empirical patterns of observations with predicted patterns by the three theories. We anticipate that in addition to preventing value-appropriation based on agency theory and enhancing communication and cooperation following stewardship logic, pragmatic agile practitioners may also enact control activities with the aim to create room for signaling. This is possible because the above-mentioned four conditions needed for signaling could be reached in agile ISD projects. As described earlier, information problems are common in these settings (Nuwangi et al. 2014; Shastri et al. 2021). Progression on burndown charts and user stories could be seen as signals as it may be significantly faster for high quality developers than it is for low quality ones. We predict that setting up pareto optimizing solutions is challenging as in agile ISD task interdependence is high, and the agile ethos is more aligned with evaluating and rewarding team performance than individual performance (Highsmith 2002). As for the last condition for signaling, signal confirmation might be difficult for controllers as they often lack domain knowledge (Shastri et al. 2021), but popular agile practices, such as pair programing and shared code ownership, may allow them to gain expert opinion from peers on individual developers' work performance. We expect our main theoretical contribution to be the introduction of signaling theory in the domains of agile project management and ISD project control. Our study could potentially extend the theoretical landscape of control purposes in ISD research (Wiener et al. 2019) that we deem essential to fully understand pragmatic agile practitioners' intentions with control activities. A possible practical contribution could be describing the extent to which

signaling can replace costly agency-oriented monitoring, and listing conditions under which controllers move away from the value-creation purpose of control explained by stewardship theory.

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