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Relationship between the interactive use of control systems and the project performance: The moderating effect of uncertainty and equivocality

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Abstract

Information system development (ISD) projects are knowledge-intensive settings that involve varying levels of uncertainty and equivocality. The objective of the present paper is to better understand how project managers can enhance ISD project performance by adapting their level of interactive use of a project's control system (PCS) to the project's uncertainty and equivocality. While interactive use of PCS can enable project managers to personally engage themselves in the project team members' work by regularly discussing project feedback information in face-to-face meetings, it can also be costly in terms of the time and attention it requires from project participants. These relationships were examined via PLS and Fisher test analyses of survey data collected on 93 ISD projects. The results indicated that PCS interactive use enhanced performance when project uncertainty and equivocality were high, but deteriorated it when they were low.

Keywords: Uncertainty; Equivocality; Information processing; Project control; Interactive use; Formal control systems

1. Introduction

1.1. Background

Information system development (ISD) projects are knowledge-intensive social contexts, which require creativity and where team members need to interact, share information and coordinate tasks. They also often involve representatives of future system users and the organization's management, as well as internal and external IS professionals, all of whom may have different backgrounds, technical skills and personalities. As such, ISD projects are usually characterized by the existence of divergent perspectives, conflicting expectations and misunderstandings among the participants (Havermans et al., 2015). Moreover, unclear and moving project objectives, unexpected issues that often arise, difficulties in predicting the potential impacts of various decisions and actions render ISD projects even more complex. As such, research on ISD project management has extensively studied the concept of uncertainty and the related concept of risk, with a view to improving IS project management techniques (Nidumolu, 1996; Barki et al., 2001; Tiwana and Keil, 2004; Wallace et al., 2004a, 2004b; Han and Huang, 2007).

Uncertainty is generally defined as the lack of information for managing a given task (Galbraith, 1973). As such, its resolution in ISD contexts requires that project members gather the information needed to answer their questions. However, it may not be possible to resolve some of the issues encountered in a project by simply gathering *more* information. For

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example, if a shared vision of the system to be developed is lacking, the issue is not related to uncertainty (or a lack of information), but rather to equivocality (a lack of understanding). Equivocality is however a concept that has not been closely examined in ISD project contexts (Levander et al., 2011).

1.2. Problem discussion and objectives

According to the information processing literature, organizations can be viewed as information processing systems whose objective is to reduce uncertainty (Galbraith, 1973; Tushman and Nadler, 1978). Given the generally well-accepted definition of uncertainty as the lack of information to achieve a given task (Galbraith, 1973), organizational theorists agree that its resolution requires that managers ask appropriate questions about a task, and answer them by collecting the required information. Based on Weick (1979); Daft and Lengel (1986) argue that, more often than less, organizational participants disagree about the right questions to ask due to differences in their perceptions, backgrounds and interests. As a result, questions that need to be asked regarding a given organizational situation might be unclear and the type of information to be gathered may be unknown. To cater for such situations, Daft and Lengel (1986) have introduced the concept of equivocality as an important factor that relates to a lack of clarity and confusion that can exist in a situation and which can affect information processing in organizations.[1]

Equivocality in ISD project contexts was conceptually discussed by Kydd (1989), but since then has not been empirically examined, perhaps partly due to a lack of validated measures of equivocality in ISD contexts. As a consequence, project characteristics that can lead to difficulties and a certain lack of clarity in ISD tasks, such as changes in user requirements, large project scopes, lack of expertise, or a challenging technology, have been generally attributed to uncertainty (Nidumolu, 1996; Rai and Al-Hindi, 2000; Lee and Xia, 2005). On the other hand, equivocality has been studied in projects outside the ISD context, including Research & Development projects (Gales et al., 1992; Gales and Mansour-Cole, 1995; Sicotte and Langley, 2000) and construction projects (Chang, 2001; Levander et al., 2011). According to many researchers in the latter two domains, project uncertainty is distinct from equivocality. A similar argument would suggest that a given ISD project can also be characterized by different levels of uncertainty and equivocality. For example, if the organization where the IS will be implemented is new to the ISD team members, they would need to collect information about organizational processes and their interrelationships in order to reduce the project uncertainty. However, if the future users of the new system express different needs or do not share management's vision of the new system, then the issue would be not only one of uncertainty, but also one of equivocality. That is, in such a situation, ISD team members are likely to encounter different interpretations of the desired system from the parties involved, rendering the ISD task more ambiguous. In this case, while collecting *more* information about user needs may reduce uncertainty, it will not help address the project's equivocality. Reducing the latter is likely to require that all participants, including user and management representatives, engage in rich communications in order to collectively define the new system. Such a project can be said to be characterized by high levels of both uncertainty and equivocality. Thus, by itself, the concept of uncertainty is not sufficient to fully capture the challenging and more ambiguous aspects of ISD projects.

As noted by Henry (1995), however, while ISD project participants may realize that they need to discuss their different views to reach a consensus, they might not invest the needed time and effort for doing so, unless they are motivated. This suggests that project managers should play an active role in bringing project participants together, facilitating their discussions and integrating their viewpoints, otherwise, equivocality in a project may remain unresolved. Indeed, Levin et al. (1998) and Tsoukas and Chia (2002) have noted that, as leaders, project managers can influence how team members perceive project issues and respond to them by framing the situation in a specific way (Levin et al., 1998), and are therefore able to influence the sense making processes of their teams. In addition, the management control literature also suggests that *how* managers use project control systems (PCS) such as project plans, budgets and follow-up reports, reflects the degree of their personal and formal involvement in facilitating the integration of the project participants' work and perceptions (Davila, 2000). Thus, when project managers establish frequent and personal discussions of the information reported in a PCS, their involvement can be viewed as high, and would correspond to a high level of PCS *interactive* use. On the other hand, if they were to discuss PCS information only on an exceptional basis, their level of involvement would be more limited, representing a low level of PCS interactive use (Simons, 2000; Ferreira and Otley, 2009; Mundy, 2010).

Given the above ideas, and based on the information processing literature and contingency theory, managers who adapt their level of interactive use of the PCS to the project levels of uncertainty and equivocality can be expected to achieve better results. That is, when project uncertainty and equivocality are both high, a project manager can employ higher levels of interaction with project team members in order to better make sense of the project's control information and issues, and encourage joint development of solutions. On the other hand, when project uncertainty and equivocality are low, too much interaction to discuss project control information might not be needed, and would result in wasted team time and effort, as well as information overload (Chong, 1996), which in turn can negatively affect project performance.

While past research has examined the composition of formal project control systems (Nidumolu, 1996; Kirsch, 1997; Ditillo, 2004; Mignerat and Rivard, 2012), it has not focused on *how* project managers deploy such systems in order to influence their teams' information processing capacity (for exceptions,

[1] Equivocality has also been referred to as ambiguity (Daft and Lengel, 1986; Schrader et al., 1993). It is important to note that equivocality is different from complexity, which is generally viewed as a broader concept that incorporates uncertainty and equivocality Bystorm, 2002, as well as other dimensions such as interdependencies within a project (Qureshi and Kang, 2015).