

Interactive and diagnostic uses of management control systems in IS projects: Antecedents and their impact on performance



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ABSTRACT

We attempted to determine how formal management control systems (MCS) are used by project managers in IS development (ISD) contexts. This involved investigating the antecedents of two types of project MCS use (interactive and diagnostic), and their direct and moderated impact on project performance. PLS analysis of data collected in a survey of 93 projects indicated that project managers' level of discretion positively affected their level of interactive use of project MCS but did not influence their diagnostic use. Our findings also showed that interactive use of MCS enhanced performance when task uncertainty (task novelty and complexity) of an ISD was high, but worsened it when task uncertainty was low. Finally, diagnostic use of MCS apparently increased project performance when an ISD task uncertainty was low, but did not reduce it when task uncertainty was high. Overall, these results were stable across different size projects.

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1. Introduction

Projects are often seen as social settings where there is tension between the need to use a sufficient level of control and the necessity to remain flexible in order to manage factors that contribute to uncertainty. This is particularly true in IS development (ISD) projects where changes in user requirements and/or in technology characteristics frequently occur and usually require alteration of the initial project plans and estimates. According to [15], proper management of an ISD project requires clear task boundaries and well understood individual responsibilities, and the specification of expected outcomes and behaviors. However, Ref. [4] argued that putting too much emphasis on controlling behavior may have deleterious effects by making project team members focus on completing pre-specified tasks and objectives while overlooking the much needed understanding of, and adaptation to uncertainty. Thus, this tension is a major task that project managers often need to undertake, but little empirical research exists about how they do so.

Management control literature suggests that managers can satisfy their need to closely monitor project activities by using

management control systems (MCS) in a diagnostic manner, while creating flexibility and change management by using other MCS interactively. Project MCS are defined as formalized procedures and systems that use information to maintain or alter a project activity [8], and they incorporate planning systems, reporting systems, and monitoring procedures for the project activities.

The diagnostic use of MCS closely corresponds to the traditional monitoring role attributed to formal control mechanisms and aims to ensure that a project's predetermined objectives are met and that corrective action is taken whenever a gap between planned and actual results is detected. On the other hand, interactive use of project MCS refers to using the information provided by a given MCS as a basis for frequent formal discussions between the project's participants. The main objective of this type of MCS use is to identify sources of uncertainty, to challenge initial plans if necessary, and to encourage the proposal of new ideas which may in turn result in revisions to the project's initial estimates. Hence, when used interactively, MCS allow managers to deploy control information as a tool for managing uncertainty and enhancing a project's flexibility.

Thus, the objective of our paper was to address the following three research questions:

- What factors influence the levels of diagnostic and interactive use of project MCS by ISD project managers?
- What impact does diagnostic and interactive use of MCS have on project performance?

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- Is the impact of diagnostic and interactive use of MCS on project performance moderated by the novelty and complexity of an ISD task?

2. Background

The study of management control in ISD projects has been extensively investigated. Overall, past research has found that both formal and informal controls can be used in ISD projects, but that uncertainty and complexity of a project lead to greater use of informal controls and less reliance on formal controls [11].

These findings are based on the assumption that formal controls are rigid and encourage specified behavior to achieve pre-determined objectives, leaving little room for a team to adjust to unforeseen changes in a project. Past research has also assumed that informal controls are flexible and provide project members freedom in determining how to develop a quality system.

However, past research also suggests that the rigidity and flexibility of formal control systems result from the way they are used (diagnostically or interactively) rather than from their formal nature. Accordingly, interactive use of formal MCS tends to make them flexible, whereas their diagnostic use leaves little room for adjusting to changes in the project.

We focused on the use of *project follow-up reports* which provide the project manager with feedback information on the progress of a given project. The project manager can use some of this information in a diagnostic way, while using other data interactively [6].

The objective of interactive use of MCS is to detect, early in the development process, any uncertainty factors. Unexpected resistance from future users of a system is an example of a problem that may need to be faced during the production of system software. If this can be detected early in the process, the project manager can ask top management to increase their support of the new system, by clearly communicating its advantages to the users, or by finding a project champion. However, if there are high levels of user resistance, then it might be useful for the project manager to revise the project's original schedules.

It should be mentioned however that allowing changes in ISD projects without a formal change management system increases the probability of rework and system design changes which may result in schedule and budget overruns, and lead to the development of a system that does not satisfy user requirements. Researchers have therefore proposed change management guidelines for ISD projects in order to avoid unnecessary rework. The interactive use of MCS is a formal change control system via which a project manager can influence and orient the types of changes that will be adopted and exclude those to be avoided, depending on several factors such as the project's scope and the potential impact of these changes, as well as the importance of the project from top management's perspective. As such, interactive use has been found to be well adapted to contexts involving uncertainty [7].

Under diagnostic use of MCS, problems are detected and treated after they occur. This type of use is therefore thought to be appropriate only when uncertainty is relatively low.

The main objective of our effort was to understand the factors that may influence project managers' choice of how they use project MCS and the impact of this on project performance.

3. Research model and hypothesis development

As depicted in Fig. 1, our research model hypothesized that project managers' discretion on project decisions influences the way they use an MCS. The model also hypothesized that there could be both direct and moderated effects of interactive and diagnostic uses of MCS on project performance. More specifically,

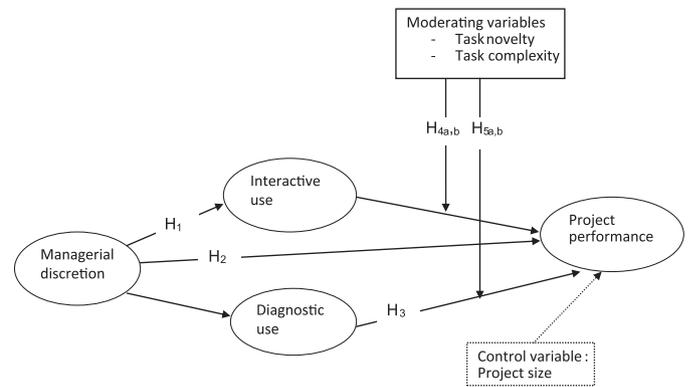


Fig. 1. Research model. Even though we tested the links between: (1) managerial discretion and diagnostic use and (2) interactive use and project performance, there were no formal hypotheses for these relationships because they are expected to be non significant.

the novelty and complexity of the ISD task were expected to moderate the relationship between the type of MCS use and project performance.

3.1. Managerial discretion and interactive use of MCS

Managerial discretion involves the degree of freedom that a project manager has in determining the actions allowed in ISD and how to implement them. A manager who is granted more autonomy will feel responsible about the results, and thus require more detailed and updated control information from team members. To influence their subordinates' behavior, managers need to understand the cause-and-effect relationships between their workers' actions and project performance. As interactive use of MCS allows managers to obtain up-to-date information from different stakeholders [9], found that in firms which promote managerial empowerment, top managers were inclined to use their MCS interactively.

Thus, project managers who have high levels of autonomy will be likely to seek more information from team members in order to understand project activities [10], and control the changes made to the project plans and methodologies by using project MCS interactively. Hence, we hypothesized:

H1. ISD project managers' decisional discretion positively influences their interactive use of project MCS.

3.2. Managerial discretion and diagnostic use of MCS

The use of MCS to monitor project schedules, costs and quality objectives is common practice in ISD project contexts, and is prevalent in ISD projects regardless of the project manager's level of discretion. Hence, no relationship is hypothesized between ISD project managers' decisional discretion and their diagnostic use of project MCS.

3.3. Main effects on project performance

Project managers who have more discretion in their work are more likely to adapt to changing project environments and take greater advantage of new opportunities as they emerge [12]. Further, managerial discretion has been found to positively impact group motivation and project effectiveness. Thus, project managers' level of discretion is likely to provide them with the independence they need to engage in actions they deem necessary for achieving better project performance. Thus:

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