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On the alignment of the purposes and views of process models in project management

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ABSTRACT

A project manager makes decisions based on what he or she sees and understands. In large, complex projects (or programs), a manager cannot see the entire "territory" between project start and completion and therefore must rely on models or "maps" to support planning and decisions. When it comes to planning and coordinating work, project managers commonly use a variety of process model views such as flowcharts, Gantt charts, responsibility assignment matrices, and narrative descriptions. However, these views may not contain the right information to best support the purpose or decision at hand. This paper investigates the fit between model views (a kind of technology) and the managerial decisions (a kind of task) they support. Through analysis of the literature and case study data, this research identifies: (1) a set of 28 *purposes* for which managers draw upon process models for decision support, (2) a set of 15 *views* of process models, and (3) a set of 56 information *attributes* involved in supporting the purposes and provided by the views. The paper develops new measures of the *sufficiency* and *extraneousness* of the attributes for each purpose and view. Analysis of the evidence suggests substantial misalignment between managers' purposes and tools. Drawing on task-technology fit theory, the paper discusses the theoretical and managerial implications of these results and contributes a new construct, *purpose-view alignment*, which may help explain project success in future studies. The paper also presents insights for researchers and managers on how to develop customized views that are more suitable for particular managerial tasks.

1. Introduction

A project is "a temporary endeavor undertaken to create a unique product, service, or result" (PMI, 2008). In recent decades the number and importance of large, complex projects or programs (hereinafter, just "projects") has continued to grow significantly (Winter et al., 2006). Projects such as the development of ships, aircraft, spacecraft, or information technologies, or the construction of skyscrapers, airports, tunnels, or subways, entail thousands of activities, done by hundreds or even thousands of people, each producing results that enable other activities to occur. Yet, such projects are notorious for cost and schedule overruns, and insufficient management of them wastes the equivalent of billions of dollars around the world each year. Because of their size, complexity, novelty, and attraction of competing interests, such projects are challenging to understand in their intricacies, let alone manage.

To cope with these challenges, project managers and others commonly rely on process models to plan and coordinate project work. A process consists of all of the activities and interactions required to accomplish a project. Unlike many business and manufacturing processes, which strive to do exactly the same thing repeatedly, a project process seeks to do something new, once. Each project must plan and control its unique process (although some projects are unique in more ways than others). For large, complex projects, these managerial tasks cannot be done entirely in peoples' heads and require the help of models. A *process model* is an abstraction of a process that attempts to represent its important aspects. The information captured in a process model may be organized and conveyed to users (planners, managers, workers, etc.) through different *views*. A view captures a subset of a model's attributes and provides a guideline for their presentation (Browning and Ramasesh, 2007). Examples of views include flowcharts, Gantt charts, various network diagrams, narrative procedures, etc.—although in current practice most models use a single view.

Project managers may use one or more process model views for various *purposes*, such as supporting decisions about what work to do, when, and with what resources. For example, they may use flowcharts to help analyze project duration and resource allocation, Gantt charts to assign tasks and report status, and narrative procedures to direct how work is done. Managers use more than

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one model view because each has its strengths and weaknesses: each abstracts a different subset of process information, emphasizing certain data while omitting others. Similarly, different managerial decisions require and benefit from different bits of process information. Ideally, the model view used to support any particular purpose will incorporate the salient information. However, what if this does not happen? What if the view used by a manager does not contain the necessary and sufficient information to support a particular decision? Or, what if the essential information to support a managerial decision is buried in extraneous information? In such cases, it is possible that the efficiency and effectiveness of the managerial decision could be compromised, which might contribute to problems such as cost and schedule overruns, quality shortfalls, or even project failure. According to Bendoly and Speier (2008), it would be valuable to direct research toward the topic of "What information to include/disregard when making specific decisions" (p. 169). What a manager decides depends on what he or she perceives and understands (Bendoly and Swink, 2007), and much of this insight stems from the model views used. The proposition motivating this research is that perhaps managers do not use (or even have) model views (technologies) that are congruent with the purposes and decisions (tasks) they face.

This study draws on task-technology fit theory (e.g., Goodhue and Thompson, 1995) as a basis for exploring the fit or alignment between (a) the purposes for which process models are used in project management and (b) many of the common model views. Based on literature reviews and case studies of several industrial projects, this research identified 28 purposes, 15 views, and 56 attributes of process information. Each purpose required, and each view provided, a subset of the 56 attributes. Next, the paper develops three measures of alignment. The first measures the extent to which each view provides the attributes required for each purpose (*sufficiency*), the second determines the extent to which each view contains superfluous attributes for each purpose (*extraneousness*), and the third combines these to arrive at a composite measure of *purpose-view alignment* (PVA). Alignment or congruence between a purpose and a view thus depends on the presence of a sufficient set of attributes and the absence of extraneous ones. Analysis of the evidence points to a significant misalignment between process model purposes and views.

This paper contributes to the project management literature in several ways. First, it extends *task-technology fit* theory to an important context, that of project management. Second, it introduces a new construct, process model PVA, which has the potential to help explain project success, especially in large, complex projects where managers' tacit, mental models are less likely to suffice. While existing studies have only examined whether or not a project used a particular tool (such as a view) or not, they have not controlled for a tool's appropriate use for a particular purpose. Thus, the study builds contingency theory in project management by moving beyond the question of mere tool usage to the match between tool and purpose. Third, the paper offers new measures and a technique for analyzing alignment based on both the sufficiency and extraneousness of information content. Fourth, the study provides insight into the future development of views which are better aligned with managerial purposes. The development of more appropriate and useful tools would seem to be a critical enabler of improved project management capability.

The remainder of the paper is organized as follows. The next section provides the theoretical foundation, after which Section 3 describes the research methodology. Section 4 reports on the study; Section 5 discusses its limitations, implications, and insights; and Section 6 concludes.

2. Theoretical background

2.1. Process models and their purposes

A *process* is "an organized group of related activities that work together to create a result of value" (Hammer, 2001). In attempts to improve understanding of processes, researchers have developed numerous models that treat them as networks (see (Browning and Ramasesh, 2007) for a review) composed of both *activities* (work packages, decisions, etc.) and *deliverables* (work products, information, data, documents, estimates, prototypes, materials, etc.) that represent the input–output relationships between activities.

A model is an abstract representation of reality that is built, verified, analyzed, and manipulated to support a particular purpose, even if that purpose is merely to increase understanding of a situation (Steiger, 1998). "All models are wrong, but some are useful" (Box, 1979). Models are "wrong" in the sense that none fully represents reality; each model selectively abstracts key information. Decision support models are essential for managers (Shane and Ulrich, 2004), increasingly so as project complexity grows. However, project managers and participants often rely on greatly simplified and disparate models, or even "mental models" (Senge, 1990), as they attempt to describe and control a project (Flanagan et al., 2006). According to Little (1970), models that managers tend to find useful are simple (easy to understand), complete (include important phenomena), robust (hard to get absurd answers from), adaptive (easy to adjust upon the acquisition of new information), easy to control (the user knows what input data would produce desired outputs), and easy to interact with (the manager can quickly and easily change inputs and obtain and understand the outputs). Several of these criteria conflict, such as the competing desires for simplicity and completeness addressed in this study.

Fitness for (or alignment with) a decision or purpose at hand is another important criterion of usefulness. A process model should include the attributes of a process which are deemed appropriate to describe it. However, this determination of appropriateness is always made (explicitly or not) in relation to a particular purpose. For instance, Engwall et al. (2005) found that project managers see canonical, prescriptive process models as having a variety of different purposes. Similarly, a process model fit for one purpose may not be appropriate for another (Browning et al., 2006; Crowston, 2003; Dolk and Kottemann, 1993). For example, a general process model, for use on all of a firm's projects, probably will not contain sufficient details for planning each unique project. Including all such details would be inappropriate for the general model, even if each project needs detailed plans. (The projects might get these details elsewhere.) Thus, the fitness of a process model depends on its alignment with what is appropriate to support a particular purpose.

Some scholars have suggested that managers and others use process models to help make better decisions by first using them merely to increase their understanding of situations. According to Perkin's theory of understanding (Perkins, 1986), understanding requires three things: a purpose for analysis, a model of the process to be understood, and arguments about why the model serves the purpose. Evaluative arguments include model accuracy, simplicity, and conceptual validity and model component sufficiency, necessity, and consistency (Steiger, 1998). In particular, the necessity and sufficiency of a model's components help determine the alignment between a managerial purpose and a model used to support it.

As an aside, it is important to distinguish the purpose of a process model from the purpose of a process itself, which is to accomplish some business result. A firm may have a variety of standard processes for work such as taking orders, developing