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Disengagement from Risk Management Practices in Software Development Projects: Framing Effects

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Abstract

Many software projects fail: they take more time than they were intended to, go over their budgets, and do not achieve the intended functionalities. Software project failures occur, in part, because software project managers (SPMs) often fail to manage project risks. Researchers have developed many risk management prescriptions to guide SPMs, including risk checklists, frameworks, practices, and risk response strategies. However, research has shown that SPMs do not use these prescriptions widely. This study addresses the research question: why do many SPMs not fully engage in formal risk management? The question will be answered using a case study approach. The findings will extend our understanding of software project risk management by demonstrating why SPMs sometimes act so differently from formal prescriptions.

Keywords: Risk Management, Software Development Projects, Prospect Theory, Framing Effects

1 Introduction

Failure is a common feature of the field of software development (Dwivedi et al. 2015). According to the Chaos 2020 Report, only 31% of software projects were considered successful by being completed on time, within budget, and with all the required functionality; 50% were over budget, over time, and lacked the desired functionalities, while the remaining 19% were cancelled or terminated before completion (Johnson 2020). The costs of failed software development projects are enormous. For example, the Cost of Poor Quality Software report stated that $130 billion in the US is wasted annually on troubled projects and $47.5 billion is wasted on cancelled projects. It also showed that approximately $2.84 trillion is lost in poor-quality software (Krasner 2018).

Software project failures occur, in part, because software project managers (SPMs) fail to adequately identify, assess, and monitor risks that can and often do materialize (Tamburri et al. 2021). It is worth noting that risk is an abstract concept. It refers to the potential of realisation of negative outcomes of an event (Bannerman 2008). Risks are often grouped; for example, it is common to group risks into users, system requirements, planning and control and team (Wallace et al. 2004).

The importance of managing risks led to a stream of research beginning in the 1970s on software project risk management (SPRM) (Boehm 1991). To date, most SPRM research has focused on advancing normative knowledge to guide SPMs (Moeini and Rivard 2019a), including developing checklists, frameworks, process models, and risk response strategies (Bannerman 2008). Normative knowledge is disseminated to SPMs through formal prescriptions (Kutsch and Hall 2005). These prescriptions have received empirical support from many studies for their efficacy (e.g., de Bakker et al. 2012). Over the past years, many prescriptions have been integrated into project management training materials, such as the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) Guide (Moeini and Rivard 2019a).

However, RM researchers have found that SPMs do not always follow normative RM prescriptions (de Bakker et al. 2010). Surprisingly, RM practices are among the least implemented practices in information systems (IS) projects (Varajão et al. 2017), with only 52% of practitioners using them in their IS projects (Reed and Angolia 2020). Moreover, SPMs are known to disengage from RM practices in IS projects over time (Kutsch et al. 2013). This deficiency was also stressed by the PMI, which found that only 27% of surveyed organisations reported that they "always" use RM practices (PMI 2019).

Despite extensive research on SPRM, there are relatively few studies on why SPMs do not conform to the formal prescriptions of RM (Moeini and Rivard 2019a). This study addresses this by asking the following research question: why do many SPMs not fully engage in formal risk management? This study focuses on advancing non-normative (or experiential) knowledge on SPRM, aiming to understand how SPMs actually manage risks and why they sometimes do so differently from normative prescriptions. The following section reviews the literature on experiential studies of SPRM.

2 Literature Review

Experiential studies suggest that SPMs sometimes behave differently from normative prescriptions and disengage from RM (Moeini and Rivard 2019a). The predictors of such disengagement include risk perception, the overall value or cost of RM (Kutsch and Hall 2009), pressure from stakeholders (Kutsch and Hall 2005), and the ability to control risk (Kutsch et al. 2013).

Other studies have focused on testing the relationships between the identified factors and a specific risk management-related decision. For example, Moeini and Rivard (2019b) hypothesized that risk response decisions are influenced by SPMs' risk perception, perceived pressures for/against risk response and perception of control over enacting it. Another study found that SPMs with concrete mental construals identify more risks and are more willing to respond to risks than SPMs with abstract mental construals (Lee et al. 2019).

Several studies have attempted to identify what affects SPMs' risk perception. Risk perception is influenced by factors such as culture (Mursu et al. 2003) and doubts over the accuracy of risk estimates (Kutsch and Hall 2009). Risk perception is also affected by one's project role; for example, SPMs, users, and senior executives have different perceptions of risk factors (Liu et al. 2009). Perceived control over risk mitigation actions (Kutsch et al. 2013) and expertise (Du et al. 2006), have also been suggested to influence risk perception. A low level of perceived control and a high level of expertise increase risk perception among SPMs (Du et al. 2006), while a high level of self-efficacy leads SPMs to underestimate the risks in troubled IS projects (Jani 2011). The impact of SPMs' risk propensity on risk perception has been studied, but the results showed a limited or insignificant relationship (Huff and Prybutok 2008).

The above discussion shows that risk perception is an important factor influencing SPMs' risk management-related decisions. However, the nature of the relationship between risk perception and decision making is difficult to determine (Williams and Noyes 2007). An important factor that affects decision making through risk perception is problem framing (Sitkin and Pablo 1992). However, problem framing has not been studied in the context of SPMs' risk management-related decisions. Therefore, this study uses the concept of problem framing to expand the theoretical understanding of SPMs' risk management-related decisions. The next section explains how framing influences the decisions of SPMs.

3 Theoretical Foundations and Research Model

Figure 1 presents the theoretical model proposed in this study. This model explores how SPMs' framing of project information can affect RM engagement. It involves four main concepts: framing, reference points, information presentation format and RM engagement, which are described in the following sections.

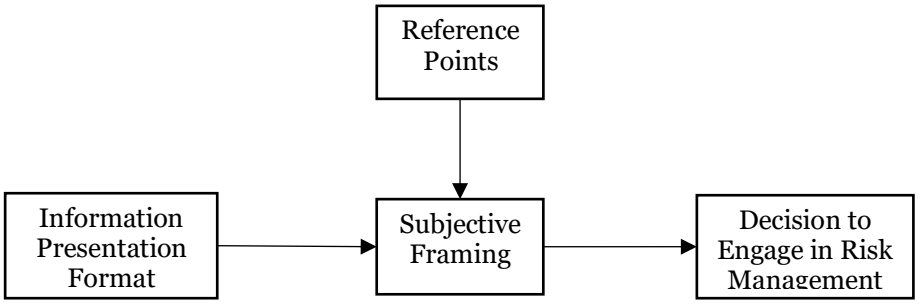

Figure 1: Theoretical model

3.1 Framing

The concept of framing plays a central role in this model. This concept originates from prospect theory and describes that the way a problem is framed can affect the decision being made (Tversky and Kahneman 1981). For example, when evaluating the progress of a troubled project, project managers can look ahead to how much work remains (e.g., 30% incomplete) or look back to how much work is done (e.g., 70% complete) (Karevold and Teigen 2010). Such different descriptions of project progress, but logically equivalent, are referred to as frames. Thus, project managers who adopted the "looking back" frame were willing to continue the project, whereas project managers who adopted the "looking ahead" frame were more interested in discontinuing it (Karevold and Teigen 2010). When different descriptions (or frames) of the same problem lead to different decisions, we can call this as *framing effect* (Tversky and Kahneman 1981).

The framing effect has been successfully applied in many areas of IS research (e.g., Jorgensen and Grimstad 2012; Mohanani et al. 2014). In these studies, however, frames were imposed by researchers. In real decision problems, information is ambiguous and requires self-generated interpretation (Wang 2004). So, understanding decision-making requires understanding how decision-makers frame decision problems themselves; this is called "subjective framing". Therefore, this study proposes that the decision to engage in RM may be influenced by SPMs' subjective framing of project information.

The framing effect can be categorized into three major types: risky choice framing, goal framing and attribute framing (Levin et al. 1998). In risky choice framing, the outcomes of a potential choice involving options with different risk levels are positively or negatively framed. Goal framing focuses on either the positive consequences of an action to achieve a specific goal or the negative consequences of not performing it. Attribute framing occurs when the evaluations of an object are based on attributes that are framed in positive or negative terms.

This study proposes that all three framing types (attribute, goal and risky choice) could be used by SPMs when engaging in RM. However, project attributes (e.g., application area, scope, etc.) and non-project attributes (e.g., perceived pressure from senior management) have been found to affect decision making in various software project contexts (Li et al. 2020). Benschop et al. (2011) concluded that goal framing was mostly used by project managers in relation to specific project attributes. Moreover, the attribute framing paradigm is less complex than the risky choice framing paradigm (Levin et al. 1998). In attributes framing, a single attribute is the subject of the framing manipulation. It does not include manipulation of risk. In contrast, risky choice framing consists of a set of options with different risk

levels. Therefore, this study assumes that attribute framing is the most common framing type that will be applied by SPMs when forming their project frames.

3.2 Reference Point

The above example demonstrates that project progress can be described in terms of completed or remaining work. When does a project manager describe or frame the project progress by remaining work rather than completed work? This depends on the reference point chosen by the project manager. Focusing on "remaining work" implies that the project manager compares the actual progress value to higher reference values. With "completed work" the reference point is located below the actual progress value (Karevold and Teigen 2010). In this study, a reference point can be defined as a prominent value that affects an SPM's view of a project (Tversky and Kahneman 1981). Therefore, this study proposes that SPMs frame the project information based on a reference point and changing the reference point changes how they perceive or frame project information. The choice of reference points is influenced by experiences, current status, and aspiration levels (Wang and Fischbeck 2004).

3.3 Information Presentation Format

The information presentation format (IPF) is the way by which project information is disseminated to SPMs (Shaft and Vessey 2006). Information systems research has long stressed the importance of IPF to decision making (Kelton et al. 2010). For instance, Hazır and Shtub (2011) investigated the effect of different IPFs, including tables and graphics, on project managers' project control decision process. The results showed that variance graphs and numerical tables are more effective than S-Curve in controlling projects. IPF can affect decision making by influencing a decision-maker mental representation of the problem. It also influences how information is processed and the processes used to make a decision (Hazır and Shtub 2011). Therefore, this study proposes that IPF may influence how SPMs form their project frames.

3.4 Engagement in Risk Management

Engagement in RM is not a binary choice of engaging in or disengaging from RM. Rather, engagement is a continuum from informal to formal. The formal approach is characterised by a systematic process that includes all the steps described in the normative prescriptions (i.e., risk identification, risk analysis, risk response and risk monitoring and controlling), using normative RM tools and techniques (e.g., risk checklists, SWOT analysis, etc.) and documenting all the aspects of the RM process) (Moeini and Rivard 2019a). The informal approach is characterised by relying more on intuition when managing project risks, disengaging from the RM process at any point and the relative absence of documented RM process (Kutsch et al. 2013). Engagement in RM can be assessed based on at least three dimensions: resources (funds and effort allocated to perform RM activities), frequency (how often RM activities are performed), and methodology (tools and techniques used to perform RM activities) (PMI 2017).

This model helps explain how SPMs may decide to engage more or less in formal risk management. The following section discusses the methodology used in conducting this study, including the method for collecting and analysing the data.

4 Research Design

This study is conducted under the postpositivist paradigm. The post-positivism paradigm "straddles both the positivist and interpretivist paradigms" (Grix 2018, p. 86), so choosing this paradigm provides the study room for induction and subjectivity. The case study methodology is chosen for this study, based on Yin's argument that case studies are suitable when investigating a phenomenon in its real-life context and when "why" or "how" questions are being posed (Yin 2018). Multiple case studies about the RM experiences of individual SPMs will be developed. Each case study will be about a single SPM, who will be asked about his or her RM experiences, which project attributes influence/d their decisions, and how they decide to engage in risk management.

4.1 Data Collection

Interviews are the main primary data source used in this study. The participants will be RM practitioners who have responsibility for managing project risks in their organizations. While this study collectively calls them "SPMs", they could have different titles: programme manager, risk specialist, team leader, etc. Purposive sampling is used to select the participants for this study, based on the following criteria: SPMs should be currently working in the IT and telecommunications industry and have at least two years of work experience in managing software projects. A minimum sample size of at least 8

participants is required. This number will allow data to vary across these dimensions that may influence their RM approaches: firm size, presence or absence of project management certification, and extent of overseas experience. However, these facets of organisational context will be controlled when interpreting the research results. The upper limit depends on theoretical saturation, which means that data collection will stop when themes and comments are being repeated by participants (Patton 2002).

4.2 Data Analysis

Interviews will be analysed using template analysis, which is a systematic technique for thematically analysing qualitative data (Brooks and King 2014). This technique allows for defining a priori themes (aspects of the phenomenon being investigated are of particular interest) prior to the analysis process. However, those a priori themes that appear irrelevant are redefined or removed as the template is modified through data analysis. Additionally, new themes, which emerge from data, may be added to the template.

In this study, the use of template analysis allows for analysis to be initially guided by our research focus on the SPMs' subjective framing of the decision to engage in RM as described in the proposed theoretical model (Figure 1) and, therefore, it is an important starting point for the data analysis. The main steps conducted in data analysis are as follows: defining a priori themes, familiarising with the data, preliminary coding, creating coding template, applying the template to additional data and modifying it in an iterative process, and applying the final coding template to the entire data set (Brooks and King 2014). Expected results and contributions will be discussed in the following section.

5 Expected Results and Implications

This study extends our understanding of SPRM. RM researchers have long stressed that SPMs do not always conform to normative prescriptions (Moeini and Rivard 2019a). Therefore, this study adds to this discourse by demonstrating why SPMs may decide not to fully engage in formal risk management. This study also extends the existing research on framing by testing this concept in a new context, that is SPRM. Further, this study addresses the main limitation of previous framing studies, which is that they have largely focused on how decision-makers react to framed problems (Zhang et al. 2020). Instead, this study takes a different approach by looking at how decision-makers, in real-life situations, frame decision problems.

This study also offers the opportunity to design interventions that can improve the practice of SPRM. RM researchers argue that SPMs often rely on their intuition when managing project risks. Intuition is heuristic driven and thus depends on mental shortcuts for making decision making more quickly (Moeini and Rivard 2019a). Therefore, project management training material could be designed to acknowledge the heuristics that SPMs indicate their use is effective. On the other hand, using heuristics sometimes leads to systematic errors in decision making, which is called "cognitive biases" (Tversky and Kahneman 1981). Therefore, project management training material could be designed to include guidelines to increase SPMs' self-awareness on how they use their intuition with reduced biases.

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