Comparison of Various Tools and Techniques used for Project Risk Management

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ABSTRACT

Large-scale projects should receive extra attention since they have several sources of risk across the entire project life cycle, making project risk management an essential component of their implementation. Important strategic choices are made during the planning stage of a project's life cycle; as a result, this stage requires expert risk management to enhance the identification and implementation of appropriate reaction measures. A survey of recent project risk management research is included in this paper. By using its many processes, projects lessons learned, and projects debriefing procedures, it gives an overview of the fundamental ideas in risk management. It takes into account project risk management utilizing the risk breakdown structure approach. This article can serve as source material for additional research because it refers to related fields of risk management in major projects.

Introduction

In recent years, several business sectors have also incorporated project management into their organizations. Project management is an established discipline in conventional industries (Hodgson, 2002). Project managers are becoming more important in the implementation of senior management's business strategy (Brown, 2008). Despite the acknowledged importance of project success for organizations, a sizeable portion of projects continues to miss deadlines, go over budget, fall short of specifications, provide subpar solutions, misjudge risk, or fail to satisfy clients or strategic needs. Because of this, project management failure continues to be a topic of great interest in current project management literature.

As a "measure of the chance and consequence of not attaining a specific project goal," project risk can be described (Zwikael & Ahn, 2011). By identifying and ranking probable risk events, creating a reaction strategy, and actively monitoring while a project is being carried out, risk management dynamically reduces risk levels (PMI, 2013). The risk register is one of the most often used risk management tools in project management. This serves as a store for any hazards that have been recognized, together with data on risk likelihood, effect, and countermeasures.

Management accounting is regarded as a tool that reduces the impact of unforeseen events or stops them from occurring. Consequently, risk management aids in the success of the project as a whole (de Bakker, Boonstra, & Wortmann, 2011; McClure, 2007). The Project Management Body of Knowledge [PMBOK], for example, has made risk management a key component of some of the most widely used industry standard practices. Systems Development Life Cycle, Integrated Capability Maturity Model (CMMI), Information Technology Infrastructure Library (ITIL), and PRINCE2).

Research Objectives and Issues

This paper's main objective is to examine how risk is categorized and handled in the context of project management using risk registers and related technologies. It also examines the efficiency of several risk management instruments used in the most well-known project management approaches, like risk registers and others. These are some possible research queries:
RQ1. How do the main project management approaches approach the idea of risk?
RQ2: To what extent do project management techniques' tools help with effective risk management?

Search Techniques

Because of the empirical nature of the research's design, experience may be used to gather the information necessary to answer the study's research questions (Bryman & Bell, 2011). The data used in the analysis was taken from studies, papers, and publications that were published in prestigious project management and risk management journals. This article analyses the relevant literature to the research topics; the study is exploratory and is carried out via a literature review.
A qualitative approach is recommended for the exploratory research questions. The comprehension of the project risk management process and the creation of a theory beneficial for organizations will be facilitated by a qualitative approach and an inductive perspective as a consequence of the data analysis (Saunders, Lewis, & Thornhill, 2009).

Discoveries and Analysis

The majority of writers define "risk management tool" broadly, covering not just specialized tools like risk registers but also procedures and behaviors that are likely to aid in managing risks in projects. Certain tools are used in risk management procedures by organizations with greater project management performance (Ackermann, Eden, Williams, & Howick, 2007; Raz & Michael, 2001). With variances in technique, such as variation in the amount of detail or assignment of tasks to stages and phases, the tools facilitate the execution of a widely accepted process. These techniques involve ranking and categorizing hazards, determining the risk effect, and periodically reviewing documents (Raz & Michael, 2001).

Table 1 Tools with the highest contribution to the risk management process (Raz & Michael, 2001)

Tool description	Group	Tool description	Group
T1 Checklists	Identication	T20 Periodic reporting of risk mitigation plans	Tracking
T2 Brainstorming	Identication	T21 Periodic trend reporting	Tracking
T3 Risk documentation form	Identication	T22 Critical risk reporting to senior management	Tracking
T4 Periodic risk reporting	Identication	T23 Analysis of trends, deviations and exceptions	Control
T5 Risk probability assessment	Analysis	T24 Project replanning	Control
T6 Risk impact assessment	Analysis	T25 Procedure for closing risks	Control
T7 Risk time frame assessment	Analysis	T26 Contingency plans for risk mitigation failure	Control
T8 Risk classification	Analysis	T27 Cost-benefit analysis during risk control	Control
T9 Ranking of risks	Analysis	T28 Cause and effect analysis during risk control	Control
T10 Graphic presentation of risk information	Analysis	T29 Prototyping	Background
T11 Responsibility assignment	Planning	T30 Simulation Background	Background
T12 Planning for risk mitigation	Planning	T31 Benchmarking Background	Background
T13 Time-limited action-item lists	Planning	T32 Requirements management	Background
T14 Cost-benefit assessment during risk planning	Planning	T33 Subcontractor management	Background
T15 Cause and efect analysis during risk planning	Planning	T34 Configuration control	Background
T16 Project replanning for risk mitigation	Planning	T35 Quality control	Background
T17 Revision of risk assessments	Tracking	T36 Quality management	Background
T18 Periodic document reviews	Tracking	T37 Training programs	Background
T19 Periodic risk status reporting	Tracking	T38 Customer satisfaction surveys	Background

In their 2012 study, Besner and Hobbs looked at risk management from an empirical angle, or from a collection of instruments that were utilized to control risks. This toolkit was created based on the findings of a significant global survey on what project managers do that was financed by the PMI Research Department. The interaction between risk management and uncertainty is measured by Besner and Hobbs (2012) using a sample of 1,296 seasoned practitioners.
According to practitioners who responded to this poll, little is used in the way of quantitative risk management techniques. Participants in the poll believe that by utilizing risk management

approaches, tools, and procedures more or better, there is still a significant potential to improve project performance.

The use of project management and project success are positively correlated, according to recent studies that confirm empirical data. Additionally, the survey's findings imply that some success aspects are linked to risk-related behaviors. Implementing formal PM procedures enhances project performance (Papke-Shields, Beise, & Quan, 2010).

Project risk management is centered on the idea of risk efficiency. All risk management procedures use up important resources and may result in additional project risks that must be successfully addressed. Based on the predicted benefit to the project as a whole, the degree of expenditure in risk management within projects needs to be questioned and justified (Chapman & Ward, 2007). The difficulties dealt with by the risk management method are ambiguous, though. If a risk does not materialize, it may be because effective risk management or incorrect risk identification prevented it from happening in the first place. Can this underspending be justified in terms of the project budget if that is the case?

The project management manual that is most often used by worldwide enterprises is the Project Management Body of Knowledge (PMBOK®) issued by the Project Management Institute (PMI). By adopting these project methods to the operations management and organizational strategy of the organization, many organizations utilize this guidance to create their project methodologies. One of the ten project management knowledge areas in the PMBOK of PMI is project risk management (PMI, 2013). The International Competence Baseline (ICB) of the IPMA; the 5th edition of the (APM) Body of Knowledge (BOK); the UK Professional Body for Project Professionals; PRINCE2®; the (P2M)Association of Japan (PMAJ); and the Scrum Agile Standard are just a few examples of well-known methodologies and guides that Ghosh et al. (2012) analyze and compare with the project risk management PMBOK of PMI.

Table 2 Suggested enhancements to the PMBOK guide in the risk management knowledge area from other guides and standards, adapted from (Sam Ghosh, Danny Forrest, Thomas DiNetta, Brian Wolfe, & Danielle C. Lambert, 2012)

International Competence Baseline (ICB) of the IPMA	PRINCE2	(P2M) Association of Japan(PMAJ)	(APM) Body of Knowledge (BOK), 5th edition, UK Professional Body for Project Professionals	Scrum Agile Standard
1. Risk and opportunity are managed by PM in ICB. PMO manages it in PMBOK. 2. Risk-taking the attitude of the corporation adds to EEFs and influences project selection. PMBOK briefly notes risk tolerance (pg. 276). 3. Successive principle adds to TT of Develop Project Plan. Dr. Lichtenberg proposed to keep the plan simple by looking at the total project (Kekkonen, 1997).	1. PRINCE2 focuses on key risks: PRINCE2 emphasizes key risks in a project. PMBOK is more comprehensive (Siegel, 2004). PRINCE2 identifies why projects fail and it aims to reduce the failure rate by removing the reasons for failure through management, control, and proper use of tools and techniques. 2. Enhances input to processes in Risk KA by identifying causes of failure. It uses 5 steps of risk management using Identify, Assess, Plan, Implement and Communicate (Turley, 2000). PRINCE2 focuses on risk areas more than PMBOK.	Enhances TT of Risk KA. The project can be terminated if it fails to realize business value and corporate objectives (Zeitoun, 2011). This is not covered in PMBOK.	1. Value management: Defines what value means to the organization or individual project. This can enhance PMBOK inthe Planning PG and the Monitoring and Controlling PG. Identifying not only risks but also opportunities within the project will increase the chance of success. PMBOK does not cover even the text level (Morris, 2007). 2. The Project Risk Management KA can be enhanced by Modelling and Testing in the Planning PG. PMBOK sparsely covers modeling and can benefit from the potential time and cost savings effective models and tests could offer.	Both PMBOK and Scrum provide methods for handling risk. PMBOK introduces a set of risk management guidelines from identification through closure by monitoring and buying down the risk as the project progresses. Scrum strategically attacks and closes risks in each Sprint. Tasks can be shifted to start early or later based on the discretion of the Product Owner to buy down risk early or push it out. Scrum proactively and iteratively manages risk before it becomes an issue. Risks are identified and planned in Sprint Plan. Risks are closed in Sprint Retrospective. Product Owner manages risks and executes backlog. Enhances Risk KA and Monitoring and Controlling PG. Enhances TT of many of the processes in Risk KA by providing a way to identify, plan, and respond to risk.

It is important to keep in mind that not all projects are impacted by risk in the same way; instead, it relies on how well collective managerial activities address certain variables. The findings of Thamhain's (2013) study are used to explain why certain companies are better at seeing risks early in the project life cycle and decoupling risk variables from work processes before they affect project performance. Field data indicate that a complex web of factors relating to the work process, organizational environment, and people are needed for effective project risk management (Thamhain, 2013).

The appeal of risk matrices can be attributed to their seeming transparency and simplicity. However, such ostensibly straightforward techniques could include significant mathematical errors and inconsistencies. Different risk assessors may give the same exposure to wildly different scores (Ball & Watt, 2013). Reflection and learning do not lessen the effects of these disparate evaluations, which are caused by fundamentally distinct worldviews, beliefs, and other psychosocial variables.
Marmier, Gourc, and Laarz (2013) provide a decision-making tool to assist the project manager in determining the optimal course of action for increasing the project success rate while minimizing risks. To create risk management recommendations, some writers integrate content analysis with cluster analysis or decision trees (Holzmann & Holon, 2012).

For risk prioritization, scientific decision analysis techniques may be a better option than the well-liked but ineffective RMs. The creation of routinely updated lessons learned databases may also offer quantitative, accurate information to gauge the likelihood of prospective incidents.

Conclusion

Despite being the best in class among all methods and guides now in use, the PMI project management guide might benefit from including certain early risk detection tools and approaches from less popular project management methodologies like Scrum. These improvements will help to lessen project uncertainty. Additionally, the efficacy of risk management may be increased by using tailored approaches developed by experts in certain sectors. Quantitative information to assess the likelihood of unknown events is provided by the data published by the authors of the approaches that have been modified. However, decision analysis techniques are a better option than the erratic but frequently employed risk matrices. Although decision analysis tools can give objective data to help risk management as an alternative to the use of risk matrices with all of its inherent limitations, they may be initially challenging to accept.

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