



THE EFFECT OF MANAGING RISK PROCESS IN CONSTRUCTION PROJECTS

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Abstract:

The aim of this study is to get a better understanding for the effect of the set of the risks in the construction projects, in addition to how mitigating these risks in those projects. Indeed risks are frequently playing the same rules, but the nature of project defines the specific risks of the project. The first step in process of risks assessment is identification them. Once risk identification is complete, risk analysis is used to identify the likelihood the risks that have been identified will happen. Thus by using evidence from other research in the area, this study showed the impact of the set of the stages in the risk management process in the construction projects, which were discussed in greater detail in the theoretical aspect of the current study. The findings of the study were revealed the fact that the comprehension of risk and its management has the direct effect of understanding specific issues that involve to the project. In addition to that, the integration of a risk management process at each stage of its stages in construction projects must be oriented to the progress of the project and permeate all areas, functions and processes of the project. In this regard, the most successful project managers maintain open lines of communication throughout their organizations to stay in touch with constituent's needs.

Keywords: *Maturity Stage; Deformation; Young Coconut; Creep-Recovery.*

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1. Introduction

Managing Risk is something that is more frequently associated with bridge building, mechanical engineering, or actuarial science in projects. However, one of the critical aspects of good construction projects planning and management is risk management process in those projects systematically (Raftery, 2003; Loose more & Raftery, 2006). One way of defining risk is that risk is a problem that has not happened yet. Nevertheless, this may be a bit simplistic, it does get to the core of the issue a project manager faces: What are the problems I might encounter while performing this project and how do I avoid them? (Cervone, 2006).

Given the critical nature of this question, one might think that risk management process would be high on every project manager's agenda; unfortunately, risk management is often not given the

attention it warrants (Kerzner, 2013). This does not necessarily mean that the project manager does not consider the issues related to risk, but rather that often project managers only perform a superficial examination of the issues related to risk and then add a margin for risk. This technique, known as using a WAG does not work (Nelson, 2013). The reason is simple: the likelihood a WAG will be significantly underestimated is as equal as the likelihood it will be a valid overestimation (Cervone, 2006).

However, construction project managers often resort to these techniques because the risks in projects are outside of their immediate control (Harris & McCaffer, 2013; Nicholas & Steyn, 2017). Therefore, because a project manager may feel somewhat helpless in dealing with the risk, they approach the issue with a guess figuring it is better than doing nothing at all (Newbold, 1998). This is misguided because all risks can be effectively addressed in one of the several ways. Risk can be (Cervone, 2006): (1) reduced or eliminated by including problem remediation activities into the project plan; (2) transferred to other activities or other responsible parties; (3) absorbed or pooled by simply planning for them; (4) avoided by putting quality control practices and procedures into place.

Among these techniques, some are implemented more easily and less costly than others. For instance, it is easier and less costly to avoid risks in the first place, rather than trying to repair or address problems once they occur. Not surprisingly, when good project managers think about risk management process, they focus on mitigating risk within the project as a whole (Bannerman, 2008; Smith et al., 2009; Thamhain, 2013).

2. Literature Review

Uncertainty is both a reality and great challenge for most projects (Schwalbe, 2015). The presence of risk creates surprises throughout the project life cycle, affecting everything from technical feasibility to cost, market timing, financial performance, and strategic objectives (Loch *et al.*, 2008). Yet, to succeed in today's ultra-competitive environment, management must deal with these risks effectively despite these difficulties (Rose, 2007; Patilet *et al.*, 2012). This concerns executives, and it is not surprising that leaders in virtually all organizations, from commerce to government, spend much of their time and effort dealing with risk-related issues. Examples trace back to ancient times that include huge infrastructure projects (Chan, 2012; Thamhain, 2013). Thus, in the light of the preceding overview, the current study tackled the main stages of the managing risk process that can have a clear effect on managing for construction projects.

2.1. The Managing Risk Process

Managing risk in construction projects is of great importance as displayed in Figure 1 (Schieg, 2006). Although at the start of a project, through the introduction of managing risk process, an increased expense is incurred; this is compensated for, in particular through the advantages of managing risk. In the planning phase, possible risks for the subsequent project success can be identified and reduced through their incorporation into the planning (Winch, 2010). This has in particular effects on the observance of set dates and deadlines and thus also on the maintenance of the project costs. For the principal, observance of its due date for putting into service an operating unit is of great importance (Helmus, 2008).

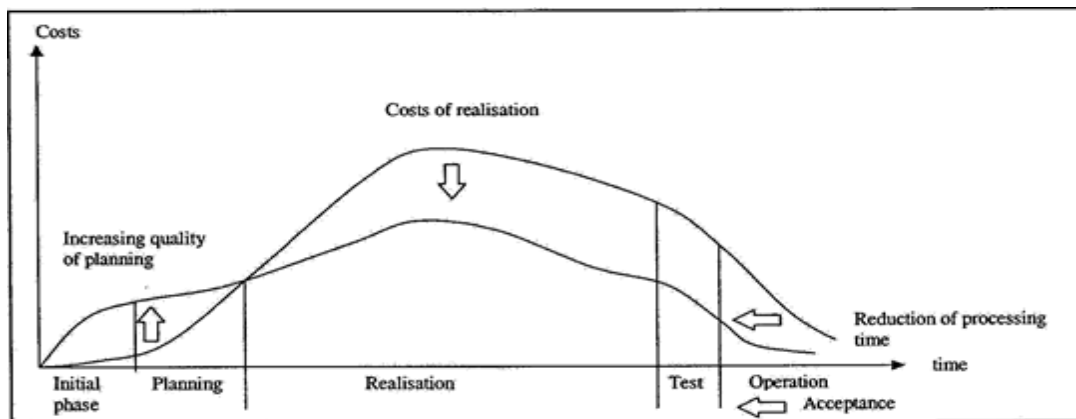


Figure 1: The possibility of using managing risk in construction projects

Source: Schieg (2006)

The risk potential analysis of a project states to what extent project risks influence the risk situation of the enterprise. Risk potential should be estimated without a detailed consideration of the individual risks at as little expense as possible (Vyas&Raol, 2017). Depending on the assessment of the risk potential, the risk management process is set in motion (Nocco&Stulz 2006; De Bakker *et al.*, 2010). Managing risk process comprises the integration of basic principles of risk policy, the establishment of a risk-consciousness as well as the organizational integration. It is an impetus for the risk management and is responsible for the control of risks in full knowledge of the current risk situation (Schieg, 2006; McManus, 2012). Through the managing risk process, transparency increases, many problems can be avoided from the outset through proactive action, the project can be prepared for unavoidable problems. Through this, the consequences can be mitigated, and the project manager retains the control over the project (Richardson *et al.*, 2009; Sparrow, 2011; Vyas&Raol, 2017). Thus, the risk management process consists of stages represented in Figure 2 that have a direct impact on successful construction project management, which will be discussed in the following paragraphs.



Figure 2: Stages of the managing risk process

Source: Organized by the researcher, adapted from Smith *et al.* (2009), Schieg (2006)

2.1.1. Stage 1 Identifying Risks

Risks that are not recognized also cannot be assessed and dealt with. Nevertheless, a complete coverage of the risks is impossible. Therefore, the task of the managing risk process is to cover the essential risks as completely as possible. Risk identification must, therefore, be carried in a way that is both forward-looking and in line with the progress of the project, since before the start of the project, not all risks are completely recognizable and during the project implementation further risks may emerge (Reason, 2016). In principle, creative and guided methods are distinguished. The first type offers the possibility also to discover new kinds of risk. Guided methods use such as checklists for identifying risks, with the aid of which the conceivable types of risk are checked (Schieg, 2006). In projects, in especially the following risks occur, which are broken down according to risk types (Merna& Al-Thani, 2011; Pritchard & PMP 2014):

2.1.1.1. Quality Risks

- 1) Defect in interim results
- 2) Lacking application of project methods
- 3) Too few controls / tests

2.1.1.2. Personnel Risks

- 1) Lack of skills
- 2) Disagreements in the team

2.1.1.3. Cost Risks

- 1) Planning changes
- 2) Complicated project conditions
- 3) Customer fails to pay

2.1.1.4. Set Date / Deadline Risks

- 1) No handover in good time
- 2) The project end is delayed

2.1.1.5. Risks of Strategic Decisions

- 1) Failure to recognize chances
- 2) Lack of ability to consistently use chances

2.1.1.6. External Risks

- 1) Natural occurrences
- 2) Political changes
- 3) Changes in society
- 4) A shift in the market / new markets
- 5) Legal developments
- 6) Shifts in sectoral trends

7) Technological changes

2.1.2. Stage 2 Analyzing Risks

The objective of this stage is to describe the risk situation as completely and precisely as possible and to prioritize the risks. For this, the identified risks are investigated with regard to the probability of their occurrence and the effect on the project. In the first place, a portfolio and a risk costs assessment respectively serves for classification purposes. Criteria must be found, on the basis of which individual risks can be assessed and compared with one another (Smith *et al.*, 2009). A risk must always be described as a damage or loss-entailing event to which a particular value can be allocated. From this, damage or loss assessed in terms of costs and the probability of occurrence, a value for the risk can be calculated (Schieg, 2010; Wackermann, 2010). According to Schieg (2006), the methods of risk assessment are for example:

I. Error, Possibility and Influence Analysis

This is a largely formalized analytical method for the systematic coverage of all possible errors and for the estimation of the risks associated with these. In this, within a team, possible potential errors are determined with the aid of a standard error, possibility and influence analysis form, the consequences are investigated and the causes are established and assessed. Next, the causes of errors are systematically assessed in terms of the probability of their occurrence, the significance for the customer and the probability of their being discovered. Finally, suitable measures are commenced.

II. Risk Portfolio

In the risk portfolio risks are ordered according to the amount of damage or loss and the probability of their occurrence. Accordingly, the effects of the project and the need to take action are evaluated.

III. Risk Team Analysis

The risk evaluation is carried out by the project manager in the context of project control. For the risk team analysis, risks are determined and analyzed according to types and indicators for the occurrence of risk are worked out. From this, possible measures are elaborated and represented and persons responsible for the risk monitoring and notification are determined.

2.1.3. Stage 3 Assessing Risks

The risk assessment comprises the qualitative assessment and quantitative measurement of individual risks including the interrelationship of their effects. With the help of the results of risk assessment, for example, a risk portfolio of a project can be illustrated and compared with others. While for the banking or insurance industry mathematically and statistically exact methods for risk assessment are useful, these cannot satisfy the typical risks in the construction industry (Loosemore&Raftery, 2006). According to Zenget *al.* (2007) and Zouet *al.* (2007), the following methods of risk assessment and risk comparison can also be used in construction projects:

I. Key Performance Indicators

Key performance indicators cover quantitatively measurable circumstances and thus create a basis for comparison. They are preferably consulted for risk assessment if a large number of data and figures must be compared. For the key performance indicators, threshold values from which a risk warning exists are determined. Typical key performance indicators in the real estate sector are average operating costs, average rent, and vacancy rate or average interest on outside capital (Schieg, 2006).

II. Qualitative Assessment

If no objective data is available, risks must still be quantifiable and made estimable. One method is qualitative estimation and weighting. In this, risks are assessed subjectively according to the probability of their occurrence and the amount of damage or loss.

III. Probable Maximum Loss

The procedure of quantitative risk determination primarily aims at estimating the probabilities of dangerous occurrences within a risk scenario. In the evaluation of the risk of major damage or loss, for instance, the maximum damage or loss possible or probable is determined (Chang, 2000).

IV. ABC Analysis

The ABC analysis is based on the recognition that frequently a relatively small number of factors make up the largest share of a whole. The goal of the analysis is, therefore, to find out what factors make up the largest part of the project value and in which therefore a greater planning and control expenditure is justified.

V. Risk Map

The risk map illustrates the risk profile of an enterprise. It is referred to as risk landscape, risk map or risk matrix (McNeil *et al.*, 2015). In a risk map, it can be read with what priority the risks should be approached. In this, the risks that cannot be borne, which could endanger the continued existence of the enterprise, are prioritized. The risk classification in a risk matrix thus enables a differentiated consideration of two classification criteria: (1) the probability of occurrence (2) expected value (Schieg, 2006).

2.1.4. Stage 4 Controlling Risks

Controlling risk is the active influencing of the risks determined in the context of the risk analysis. Measures of dealing with risk can be differentiated between cause-related and effect-related measures (Britzelmaier *et al.*, 2015). Cause-related measures are supposed to avoid or reduce risks, while effect-related measures serve to reduce or safeguard against the amount of damage or loss to be expected in the event of the damage or loss-entailing event (Buertey *et al.*, 2012). Thus,

according to Schieg (2006) who pointed out that the strategies of controlling risk are as the following:

- Avoidance
- Reduction
- Passing on the risk
- Bearing the risk by oneself

2.1.5. Stage 5 Monitoring Risks

The monitoring of risks is the continuous operative control of the effectiveness of the risk control measures. The goal of risk management process is not to eliminate risks completely from the project. The monitoring of the risk helps guarantee that the risk position of the project corresponds to the risk situation strived for (Loosemore&Raftery, 2006; Schieg, 2006; Sadgrove, 2016).

This task is supported instrumentally through analyses of variances. The internal control process is part of the monitoring of the risk. The continuous monitoring of the early indicators and the repeated risk verification are carried out by the persons responsible in each case, no later than the respective milestone deadlines (Adams & Sheridan, 2008). A precondition for this is that a reporting and meeting structure in the organisation and for the project is stipulated. Besides the pursuit of the risk status and the progress of the measures, new additional risks must be included. Risks that have occurred must be documented with the relevant amount of damage or loss; critical situations of the managerial staff must be reported (Kenett&Raanan, 2011; Meeset *et al.*, 2016).

2.1.6. Stage 6 Controlling Goals

In this stage, after the recognition, analysis and assessment of risks, measures for controlling goals must be taken. The control process may be broken down into following sub-processes: (1) determination of the target value (2) determination of the actual value (3) target/actual comparison (4) an analysis of variances (Schieg, 2006). As a permanent process, in the context of the monitoring, the risk identification, analysis, and controlling are checked to find out whether the risk control is implemented in due form. In the event of variances between the actual risk situation and the risk situation strived for, steps must be commenced to specify the causes. Based on these recognitions, the risk strategy must then be adapted or revised. Consequently, by monitoring the risk it is guaranteed that standards set of risk management process are taken into account (Moraru, 2012; Rausand, 2013).

3. Managing Risk in Progress of Project

Responsibility for carrying out the chance and managing risk is borne by the project manager. The duty of the project management in the event of risk identification is to discover any emerging risks of a construction project and include these in a risk catalogue (Smith *et al.*, 2009). For this, in practice, risk checklists that have been drawn up based on empirical values from comparable construction projects serve as ordinary auxiliary means. In the project control area, in particular, the following should be mentioned (Schiegh, 2006):

- 1) Plan of services
- 2) Pursuance of set dates/deadlines and progress

- 3) Pursuance of costs
- 4) Quality assurance
- 5) Analysis of contracts

In order to encourage the willingness to adopt risk management process in the construction industry, standard risk checklists should be drawn up, with the help of which the project manager is only required to “tick off” the standard risks occurring. A quick instruction for project managers and teams that is easy to implement should result, which makes it possible to deal more easily with project risks (Schiegh, 2006; Cleden, 2011). The necessity to install a risk management process as early as possible results from the fact that risk potentials exist, at least in a rudimentary form, already before or at the start of the project and are recognizable; however, their effects and damage only come to light in the subsequent progress of the project (Raftery, 2003). For this reason, the risk management process should be established and integrated into the entire project system as a permanent (sub-) task of the project management. In this, the identification, analysis and assessment of risks must in each case be geared to the entire project and to special aspects of the individual project phases (Meredith & Mantel Jr, 2011). Generally, the progress of a project can be divided up into three phases (Schiegh, 2006): (1) Start-up phase (2) Manage phase (3) Close phase.

In this, typical risks occur in the corresponding phases. They must be integrated into the risk management process in order to prevent the progress of the project from being disturbed (Reason, 2016). For dealing with chances and risks in projects, the following principles apply (Wieczorek, 2012; Lundgren & McMakin, 2013): (1) Responsibility for carrying out the chance and risk management is borne by the project manager. (2) Only taking risks that one can influence oneself. (3) Avoiding or safeguarding against risks that are influenced by others (customers, subcontractors). (4) As far as possible, passing on risks taken. (5) The consideration of chances and risks is a part of the project reporting.

In the following, with the aid of specific questions characteristic of the individual phases, it is shown where the tasks of risk management process integrated into the progress of the project lie. Some questions are stated as examples, in which the type and scope of the questions can be expanded and supplemented at will. In this, the project breakdown carried out summarizes the project phases of the scope of services of project management (Del Cano & de la Cruz, 2002), which was developed for project management by the AHO commission of experts in three phases (Schiegh, 2006).

3.1. Tasks of the Managing Risk Process

Start-Up Phase (Project Preparation; Planning)

The start-up phase corresponds to project steps 1 and 2 from the scope of services of the project control (section 204 AHO2) (Schiegh, 2006). In the start-up phase, the focus of managing risk above all is on the check of the contractual and general circumstances of the project environment. The task of risk management process is to recognize possible risks that can disturb the actual progress of the project (Makombo, 2012). In this site, risk management process should investigate the following typical questions for identifying potential risks (Stoneburner *et al*, 2002):

- 1) Does clarity about the project structure exist?

- 2) Are the project goals clearly defined?
- 3) Are there specific contractual features?
- 4) Is a concept of use available?
- 5) Do gaps in services exist in the contracts?
- 6) Have the set dates/deadlines for the application for subsidies been complied with?
- 7) Have the future planners, advisers and consultants been selected and commissioned?

The scope of services of the project control comprises for certain partial services, such as e.g. the creation of a user needs the programme, already comprises an analysis and assessment of the risks associated with this (Schiegh, 2006).

Manage phase (preparation of the implementation and implementation)

The task of the managing risk process in the individual implementation phases of the project are characterized by the objective content of the project progress. In principle, during the project implementation, it is essentially a question of observing known risks from the start-up phase and their changes (Yeo & Ren, 2009). The effect of the measures taken to deal with risk must be assessed and additional risks must be analyzed regularly and in a results-oriented way. For the manage phase, the following risk questions are characteristic (Schiegh, 2006):

- 1) Does the principal comply with its duties to collaborate?
- 2) Will the principal accept the entire project without serious defects?
- 3) Are all resources available as planned?

Close phase (project completion)

The project end is reached upon the performance of the service and the handover (acceptance) of the structure to the principal (like real estate developer). It becomes particularly critical if the principal refuses to accept the completed solution because the project result is not in accordance with its objectives (Schiegh, 2006). The managing risk process can help avoid such “failures” by pursuing the questions in the close phase (Mosey, 2009; PMP, 2011): (1) Is the contractually owed service “capable of being accepted”? (2) Were the contractual contents and undertakings fulfilled? (3) Is a complete project documentation (records of meetings, correspondence, released project documentation etc.)?. For the further development of the managing risk process, it is important that stock is taken of the reflection on the progress of the project. In this, relevant questions are: (1) What identified risks have occurred? (2) What problems that have actually occurred in the progress of the project were not identified as risks and why not? (Loch *et al.*, 2011; McNeil *et al.*, 2015).

3.2. Risks in Personnel Sector

Structural upheavals in the world of technology, as well as dynamic changes in the sales markets, can only be mastered successfully if the employees of an enterprise identify with this and are committed to this. Especially, for enterprises that offer highly qualified services, specialized employees acting on their own responsibility are essential for market success (Paton & McCalman, 2008; McMichael, 2011). For this reason, personal risk management is necessary in order to not have to accept losses in tactical/operative competence and innovative potential through the departure of employees (Millot, 2014). Impressionable risk fields can above all be divided up into

four areas: (1) Bottleneck risk field (2) Departure risk field (3) Adaptation risk field (4) Motivation risk field (Schiegh, 2006). They will be discussed briefly in the next section.

3.2.1. Bottleneck Risk Field

This is a matter of identifying in good time in what areas future top performers will be absent in the future. In this, the following questions stand in the foreground: (1) What are the key qualifications for the future? (2) How will the quantitative need for employees change in the future? (3) How do the qualitative requirements made of the employees change due to new scopes of service or technologies? (4) Are strategically important staff positions safeguarded?

3.2.2. Departure Risk Field

Departures of top performers generally constitute a high-risk potential, in particular in long-term projects in which the project manager is the confidante of the real estate developer (Allen, 2014). The main reasons why employees leave an enterprise are (1) new challenges (2) more responsibility for decisions (3) better professional prospects with regard to career development (4) good future perspectives of the new enterprise (Sveiby, 1997; Ward, 2016). The following factors reduce the risk of departure and should therefore be taken into account by the business management (Schiegh, 2006): (1) good business climate (2) favourable outline conditions for employee development (3) extensive non-material incentives on the part of the enterprise (4) remuneration structures adequate for the performance (5) suitable organizational structures (6) marked allocation of power potentials.

3.2.3. Adaptation Risk Field

Falsely qualified employees constitute adaptation risks. Should leaves of absence be avoided, as a precaution requalification or new qualifications are necessary (Schiegh, 2006). In construction projects here ongoing further training courses of the employees are necessary with regard to technological and legal changes. In construction project management changed scopes of service must be taken into account through a greater consolidation of services in the implementation of construction work (Chapman & Ward, 2003).

3.2.4. Motivation Risk Field

Diffident services in many cases constitute a significant risk. Burnt-out employees or employees who have resigned in all but name are topical examples. The following behavioural risks are indicative of resignation in all but name (Schiegh, 2006): (1) An absence of own initiative (2) No longer exhaust existing competencies (3) Undertaking less demanding work (4) Overadapted behaviour (5) An absence of constructive criticism (6) Avoidance of conflicts. On the other hand, the possible methods for reducing risks in the personnel sector are: (1) coaching of managerial staff and employees (2) creating motivation by granting more freedoms and self-development (3) promoting personal development in a purposeful manner (4) forcing identification with the enterprise through a corresponding corporate culture (Wargborn, 2008; Holmqvist&Maravelias, 2010).

4. Conclusions

Considering the facts that risk management process has an impact on project's goals in the form of quality, time and cost, it should be an open and conscious process through all phases of the project. Thus, the aim of the current paper came to examine the effect of the set of the stages related to risk management process at projects performance within the construction sector. This is to gain an understanding and a clear knowledge about the extent of the effect of these stages if managed properly in the success of construction projects management with minimal risk.

For this purpose and by using evidence from other research in the area; the overall conclusion was that, according to project actors, risk management process is strongly linked to the performance of the project in terms of quality, time and budget or cost. Thus, the effective managing risk process must permeate all areas, functions and processes of the project. Therefore, the aim must be to negotiate risks, assess these or even make these marketable and reduce them emphatically. In this, a decisive factor in its success is, in the end, the interaction of all elements represented. A risk and control culture borne and experienced by all parties involved in the project has the effect of a connecting bracket that can safeguard the effectiveness of the structural and organizational measures of managing risk; the main key to this is the parties involved in risk management process. Effective managing risk process requires commitment and also the risk-conscious behaviour of each individual. The motivation as well as the interplay of the parties involved in the project in the end determines the quality of the work and thereby the project success. However, in each project, residual risks remain. This means that it remains a strategic decision on whether these risks have been taken and can be borne if they occur.

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