

Chapter 1

Introduction

1.1 Introduction

1.1.1 Risk management, An Historical Perspective

The starting point for risk management as a separate field of research was concern for the environment and for human health. The fear and awareness that attracted the attention of the general public in the early 1960s led to increased legislation to minimize the risks for human health and safety. This in turn led to increased interest from the leaders of industry to analyze risks in their business. The founders of the Society for Risk Analysis (SRA) were primarily interested in the impact of chemical risk on human health. The SRA was founded in August 1980 (Thompson et al., 2005, p. 6). The development of what is now known as project risk management emerged in the large engineering projects in the energy sector in the mid-1970s; they included BP's North Sea projects and pipelines in North America. The development continued in a diversity of business sectors where large projects were run. In this period from the mid-1980s until early this century, project risk management focused on finding the common structures for all projects and identifying the different approaches that were needed for each project (Chapman & Ward, 2003). The development that is currently taking place in the field of project risk management is focusing on extending the focus to include the wider scope of uncertainty management (Ward & Chapman, 2003) to incorporate the aspects of individual and cultural influence (Hillson & Murray-Webster, 2005) and the social construction of risk (Stahl et al., 2003) ..

Risk management, as it is currently being applied in the field of construction, has been on the agenda for about 25 years. It has focused in the main on large scale projects with different kinds of complexity related to them, such as technology, international collaboration, geography or finance (Hintze et al., 2004; Jaafari, 2001). More recently, risk management has started to influence an increasing number of companies and not only the largest projects. In spite of this, the small projects in construction do not feature a great deal of systematic risk management (Azinim & Edum-Fotwe, 2006; Simu, 2006).

1.1.2 Reasons For Applying Risk Management

Risk management is all about being able to deliver results with certainty. Risk is most often related to the negative outbreak of an uncontrolled uncertainty that can cause the loss of

lives, money, time or quality/function. For many companies, these motives would be enough to apply risk management in their business.

The benefits of being able to deliver in time, at the right price with the desired function cannot, however, be solely attributed to risk management but instead to effective project management. The additional benefits of risk management are the clear focus on trying to think about what might happen and then manage the project to avoid the negative scenarios, the risks, and making sure that the positive aspects, the opportunities, are actually realised. Risk management is also more explicit about handling changes and the companies that manage them in the most effective way are the survivors and winners. In a construction project that is in a constantly changing environment, risk management should be a key process and an integrated part of project management (Smith et al., 2006).

1.1.3 Sudan Construction Sector

Despite the growth that the construction sector enjoyed during the 1995-2003, the share of this sector to GDP showed a decreasing pattern (fig 1). The share of construction as percentage of GDP averaged 4.7% during 1982-1998 whereas it accounted for 2.7% during 1999-2009. The contribution of other growing sectors (manufacturing and mining) to GDP was greater than what the construction sector did. The oil sector share to GDP was relatively high resulting in the reduction of other sectors shares. However, the contribution of the construction sector to the economy has increased consistently pattern since 1999. The increase in the amount spent on construction was, mainly, triggered by oil production; setting the infrastructure for oil production. The growth of the sector in real terms during 1982-2009 accounted for about 10.8% on average.

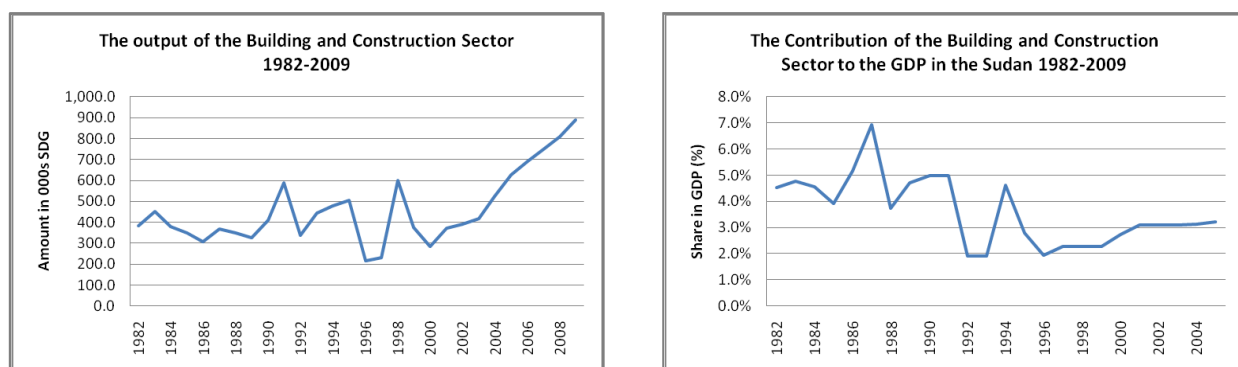


Figure 1.1 Productivity and contribution of Construction sector to the Sudanese Economy 1995-2007 Source: CBOS

In many developing countries nowadays, as it is the case in Sudan, development efforts often focus on the modern construction sector so as to deal with the growing investment programs and to meet pressing needs for urban shelter. Most of the construction work activities take place in the City of Khartoum and some other big cities.

1.1.3.1 Challenges Facing The Construction Industry Of Sudan

The construction industry everywhere, given its special problems and requirements, faces problems and challenges. However, in developing countries, these difficulties and challenges are present alongside a general situation of socio-economic stress, chronic resource shortages, institutional weaknesses and a general inability to deal with the key issues. There is also evidence that the problems have become greater in extent and severity in recent years (ofori, 2000). The situation in Sudan is similar to the general situation in developing countries. The difficulties that face construction industries in developing countries and the proposed solutions have been extensively investigated by the international organizations such the United Nations (1981, 1984), International Labour Office (1987), the World Bank (1984), also by Turin (1973), Wells(1986), Ofori (1990) and (Sultan & Kajewski, 2003 & 2004). The problems and challenges that face the construction and building materials industries in developing countries are common (Sultan & Kajewski, 2003) , Sudan isn't an exception. These challenges include;

- Lack of capacity of the construction sector (Du Plessis, 2002).
- Inefficiency and/or absence of regulatory instruments and professional institutions (UNCHS, 1996).
- Absence or inefficiency of quality assurance system, national standards and quality specifications; meaning that the quality of products and services (i.e building materials and labor force) in the construction industry are questionable (Palalani, 2000), and (Okema, 2000).
- Poor organization of the construction industry with a large number of very small and inefficient firms (Wells, 1986).
- An unfavorable operating environment for construction enterprises, which is further aggravated by complex procedures and regulations, delays in payments, and unsuitable contract documents.
- Contractors capabilities; lack of technical and managerial expertise, lack of adequate finance ,difficulty in obtaining essential resources, materials, equipment and

- skilled personnel, and inadequate supervisory capabilities(UNCHS, 1996),
- Lack of planning at all the levels of the construction process(Wells,1986) ·
 - Low and fluctuating overall levels of construction activity.
 - Lack of capacity and “economic rationality” in design, construction, and the production of building materials (Wells,1986).
 - Lack of finance (UNCHS,1996),
 - Information scarcity and lack of accurate data (Du Plessis, 2002; Palalani, 2000).
 - Under development of the national systems of innovation (Milford, 2000)
 - Inadequate and integrated research and development facilities and programs beside the poor linkage between research and practice (Du Plessis, 2002; Ofori, 1994)
 - High rates of risks and uncertainty (Du Plessis, 2002; Okema, 2000) including; Macro-economic risks and uncertainties, insurance industry risks and uncertainties, site production risks and uncertainties, natural calamities risks and uncertainties, bureaucracy and corruption risks and uncertainties, contract and contractual performance risks and uncertainties, project risk and uncertainty due to public demand, political and insecurity risks and uncertainties, and donor associated uncertainties
 - Corruption: it costs construction industry in the world a huge amount of money (TI, 2005). Construction industries are particularly susceptible to corruption in licensing, taxation and obtaining government contracts, including bribery, fraud, embezzlement, and kickbacks (Sohail & Cailli, 2008). Beside the characteristics of the construction sector, the fragility of economies and ineffectiveness of the legal systems make developing countries prone to corruption (Fewings & Henjewe, 2008).
 - Shortage of skilled labor due to the absence of training programs or the failure to provide adequate rewards (Wells,1986; Ofori,1994).
 - Problems specific to the building materials industry
 - Inadequate capacity and inefficiency in the building materials industry, (Wells, 1986)
 - Building Materials; expensive, high transportation costs, high production costs and energy costs (UNCHS, 1996),
 - Problems in availability of locally produced materials, (Wells,1986)

- Unhealthy reliance on imported materials in face of foreign exchange problems, (Wells,1986)

Imports of building materials are considerable; in many developing countries, a large proportion of building materials are imported. For instance, it is estimated that building materials alone annually account for 5 to 8 per cent of the total value of imports in Africa (UNCHS, 1986). The potential for developing the domestic building materials industry, therefore, would seem large. However, in many developing countries, these potential developments are difficult to realize because of the relatively small size and large fluctuation of present demand, not only at the local level, but also in the national context. Scale economies apply to the production of building materials since large-scale manufacturing results in production feasibility (Elkhalifa & Shaddad, 2008).

Beside the underlying problems facing the construction industry in the developing countries and SSA countries on specific, apparently, the development of the construction sectors seems to be a challenge itself. It has been indicated that unless urgent steps are taken to develop appropriate institutions necessary to facilitate the development of modern and sophisticated construction industry, sub-Sahara Africa will remain a net importer of construction materials and services (Ebohon, 2000).

1.1.4 The construction process

In general, the construction process could be described in five steps; idea, briefing, design, production and maintenance management, Figure 1.2. Depending on the scope of the construction companies' business concept, they enter this process in different phases. For this study, the site managers enter the process at either the design or the production phase and hand over the project at the end of production. The viewpoint in this study is that the phases of idea, briefing and maintenance are the responsibility of the client. This description of the construction process is a general one and several different ways of describing it can be found in the literature. Figure 1.2 A general description of the construction process. In the construction process, it is still most common with competition using a bidding process to obtain the project and finish it. Each of the competing companies submits a tender and the most favourable, according to the client, is the winner. The winner is then the one that continues with the project into the design and/or production phase of the construction process, see Figure 1.2. In some cases, the construction companies are exclusive and do not have to compete through bidding, but in this study these situations are excluded. The cost parameter has the greatest influence. Less often, parameters such as quality, safety and sustainability determine the outcome of the bidding process, although they do have a significant impact from time to time.



Figure 1.2 a general description of the construction process

1.1.5 Application Of Risk Management In Construction

Risk management in construction is used at different levels and with a different focus at the organizational levels in companies. At the highest CEO and board of directors' level, risk management is largely a question of financial risks. The focal point is the certainty of business deliveries and risk management focuses primarily on having the right business portfolio, composed of a variety of different products on different markets. Risk at this level also involves having a sound economy with a positive cash flow or making investments that pay off. It is also the responsibility of management to ensure that project risk management is applied in the organization and to find systems to control this Process.

The larger construction companies have their own solutions for project insurance and have special in-house business units to handle insurance cases. To secure the economy if larger insurance cases occur, the larger companies take out re-insurance in external companies. The smaller companies rely totally on external insurance companies. The premiums are, however, largely dependent on how well the company manages its business, regardless of whether internal or external insurance companies are involved. For companies with in-house insurance, the extent to which the internal insurance is used within the company is important. The less insurance that is used, the more profit that is left in the company. If the construction company performs well and does not incur large losses, the external premium is reduced and this also has a beneficial effect on the bottom line. For damages where the repair or recovery cost never reaches the excess level, there are no basic data. Due to the size of the excess, the hidden data relating to the number of cases are supposedly large and the cost is instead hidden in the project result. This means that, in the case of smaller damage, the profit is lower than it would otherwise have been and this is almost impossible to detect in a systematic manner. The people responsible for the project are aware of this, but the incentive to report cases or to share this

knowledge is limited. As a result, it is really difficult to find out how many errors, or possible risks there really are. This also works as a motive to apply risk management.

For some time now, research in the field of risk management has focused on finding better and more efficient ways to control the risks within projects and organizations. Numerous tools and methods are available and, depending on the industrial sector, the level of sophistication varies. The number of methods that can be used for risk analyses in construction has also increased in recent years (Laryea & Hughes, 2008), but their application in practice is rare (Akintoye & MacLeod, 1997; Azinim & Edum-Fotwe, 2006; Lyons & Skitmore, 2004; Simu, 2006). In the construction sector, risk management is applied through the projects and the methods that are applied are fairly straightforward and often based on subjective judgements. There is a lack of statistics that can be used for quantitative risk analyses and other measures are used instead, often based on experience and intuition. In spite of this, the aim and objective for many risk analyses is to set a figure for the risk, a risk number to relate to other risks, and put it in a risk matrix. The quality of this figure is no more true or valid than the ways it has been calculated, but, if there is a figure, the credibility is greater than a comparable description in words, high-medium-low, for example.

The fundamental characteristic of traditional risk management is that it is a circular, continuous process (Smith et al., 2006) based on identification, assessment, response and control, with a probabilistic approach, while the traditional construction process could be described as a linear sequential process with a deterministic approach (Figure 1.3). The necessary integration of these two different approaches appears to fail when it comes to risk management solutions (Kähkönen, 2007). Kähkönen (2007,) also claims that the prevailing traditional risk management paradigm is “too shallow for providing grounds for successful solutions”. This is another argument in line with the results showing that the risk management system that uses risk matrices is difficult to apply in construction (Azinim & Edum-Fotwe, 2006; Lyons & Skitmore, 2004; Simu, 2006). One method that is used to handle risk management in construction is to gather project staff for certain risk analyses (brainstorming meetings) where the common knowledge from different skills, such as technical, legal, economic and so forth, gives its view of the risks in a certain project. A common view of the total risk is then created and makes it possible to control the most severe risks in the project with the best resources available. This is an effective method as it brings all the stakeholders up to date with all the possible risks in the project. In small projects, the project team is reduced to a minimum and the risk analyses are most frequently made by site managers themselves. The quality of the risk analyses is therefore highly dependent on the site manager’s individual capacity, knowledge and attitudes and his or her approach to risk and risk management. The

risks in small projects, on the other hand, are less extensive than they might be in a larger project. In most cases, there is limited damage to the construction company or the client when there is a risk outbreak in small projects. The amount of money added together for many projects could, however, be considerable. The margins for construction companies are stressed and the cost of construction has increased during the last decade . Every cost that can be cut by a construction company is money on the bottom line. Risk outbreaks cost money, regardless of whether they involve an error causing personal harm or an error causing quality shortcomings or damage to materials. In order to reduce the risk of faults that could cause damage, it is also possible to cut costs. Cost reductions, even small amounts, add up to considerable sums of money on the bottom line for a construction company, especially as the smaller projects represent a large percentage of the business (Simu, 2006).

It has been found that managers in construction do not use the available systems for risk management, with project staff relying predominantly on experience, personal judgement and brainstorming (Azinin & Edum-Fotwe, 2006; Flanagan & Norman, 1993; Laryea & Hughes, 2008; Simu, 2006). According to Flanagan & Norman (1993), there are two kinds of decision maker, those who are averse to risk and those who are risk takers. When it comes to the problems facing the construction industry, with increased costs, ethics and morals and defects in products.



Figure 1.3 The cyclic and continuous view of a formal risk management system.

1.1.6 Effects Of Risk Management

Money is spent in companies to introduce and improve risk management systems with the supposed purpose of increasing profit, reducing uncertainty, reducing accidents, reducing the cost of insurance and minimizing defects in delivered products. It is, however, difficult to find any research about the measured effects. Researchers in the field talk about effective or efficient risk management (Chapman & Ward, 2004; Hillson & Murray-Webster, 2005) and

relate it to project objectives or expected performance, but the results of this research are lacking. As yet, no actual measurements of the effects of risk management processes have been made, possibly because of the difficulty involved in distinguishing risk management from general project management. Risk management systems are used to reduce uncertainties and accidents, as well as defects and faults, as mentioned previously. The performance can then be related to the outcome of the project in relation to the aim of the risk management systems that are used, i.e. accidents, defects, uncertainties and perhaps even costs. The effects of risk management should therefore be measurable through variables or indicators of this kind of project performance.

1.2 Problem Formulation

As the most common and typical project types, construction projects have several characteristics such as specific objects: time restraints, cost restraints, special organizational and legal conditions, complexity and systematic characteristics. For that, each investment project, it is a complex system, especially for the construction project; there are many risk factors and complicated relations, which will influence it. The complicated relations include direct, indirect, obvious, implicit or unpredictable, what is more, the various .

Risk factors will cause different severity of the consequences. If you do not consider these risk factors at all, or ignore the main factors, they will cause damage because of decision-making errors. Quality targets, time targets, cost targets are the three major objectives of construction project management. Especially in the construction project, the time objective is closely and inseparably related to the cost objective. Therefore, we cannot ignore risk management of the effect on time objective caused by risks during construction phase.

According to the above description of the background in this thesis, we know that risk management of construction period is the management on the time limit in uncertain conditions. As the accordance to construction project implementation, the technical and economic analysis is based on the prediction and judgment analysts make of future events. The construction project implementation process can be broken down into several specific parts, and these parts are always affected by the political and economic environment, sources condition, technical development, so there are uncertainty on their future change, What is more, there are limitation on the predictable methods and working conditions. Therefore, the assessment and predicting outcomes will be erroneous results inevitably. This makes possible deviation between actual value and predicting value, which bring about large risk to both the owner and the construction companies. For example, investment or time limit prolonged, productivity under design requirement, rising cost of raw materials, increasing labor fee,

fluctuating product prices, changing market demand, loan interest rate and rate in foreign money, all these unpredictable effect even damage to an investment project. The uncertainties, which can be considered as the reason for postponing time limit for a project in the construction project contract, are the very point of studying time limit for a certain construction project. Only by analyzing the influence, can we make a better predication and control of the schedule and ensure the project complete successfully.

1.3 Aim Of Study

The overall aim of this research is to increase the understanding of risk management in the in Sudan construction industry . Deeper understanding is expected to contribute to the more effective risk management process and, therefore, a better project output and better value for both clients and contractors.

1.4 Objectives Of This Study

There are two objectives of this study:

- To analyze how risks are shared and managed in various procurement options.
- To develop recommendations, which contribute to more effective risk management in construction projects.

1.5 Research Questions

On the basis of the aim and the objectives, research questions have been formulated.

1. what is the process of risk management ?
2. How to apply risk management in construction projects ?
3. What risks are there in construction projects ?
4. How risks can be indentified during construction period ?
5. How risks can be assessed during construction period ?
6. How risks can be controlled during construction period ?

(See figure 1.2)The first three questions as the basis to support last three ones.

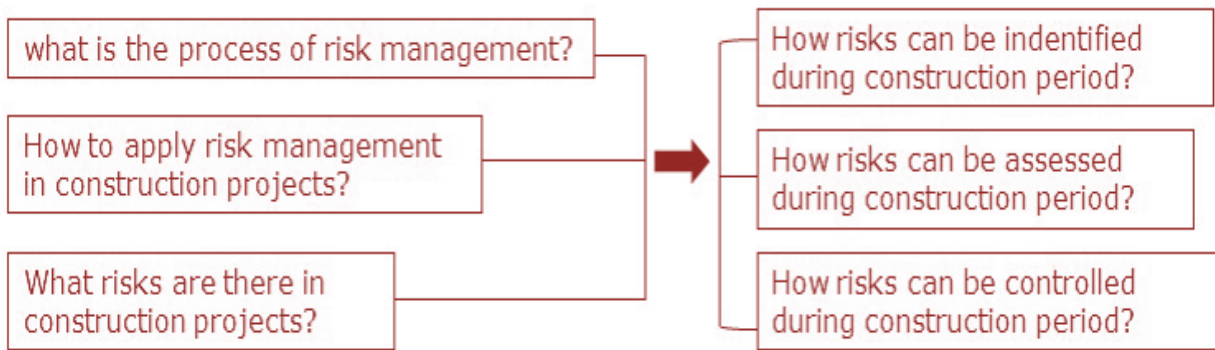


Figure 1. 4 research questions

1.6 Limitation Of Study

This study investigated the factors which may affect projects performance in field of construction management, so the population of study was the main civil engineering contractors in Khartoum, Sudan and their responses were collected.

1.7 Scope Of The Study

The scope of the research was mainly focus on literature review and a questionnaire survey. The survey was conducted in Khartoum, Sudan. The questionnaires will be valid by project team, in order to distribute to respondents.

The questionnaire survey was designed based on factors identified from literature review that contributed to the knowledge of the risks that affect on performance of the project construction . The questionnaire was developed to assess the perceptions of contractors and clients on more risk factors that affect on performance of the project. The developed survey questionnaire was distributed to the targeted respondents in Khartoum, Sudan and their responses were collected.

1.8 Method Of Data Collection

In this study, the methods of data collection were from qualitative and quantitative data, where qualitative data was from books, journals, articles, interviews, reports as primary data and the quantitative data was from the field survey by questionnaire as secondary data.

1.9 Research Methodology

The methodology of this study started by identifying the problem statement, literature review, data collection, analysis of results, discussion of results, conclusions and recommendations. One important way to strengthen a research design is to use both qualitative and quantitative methods.

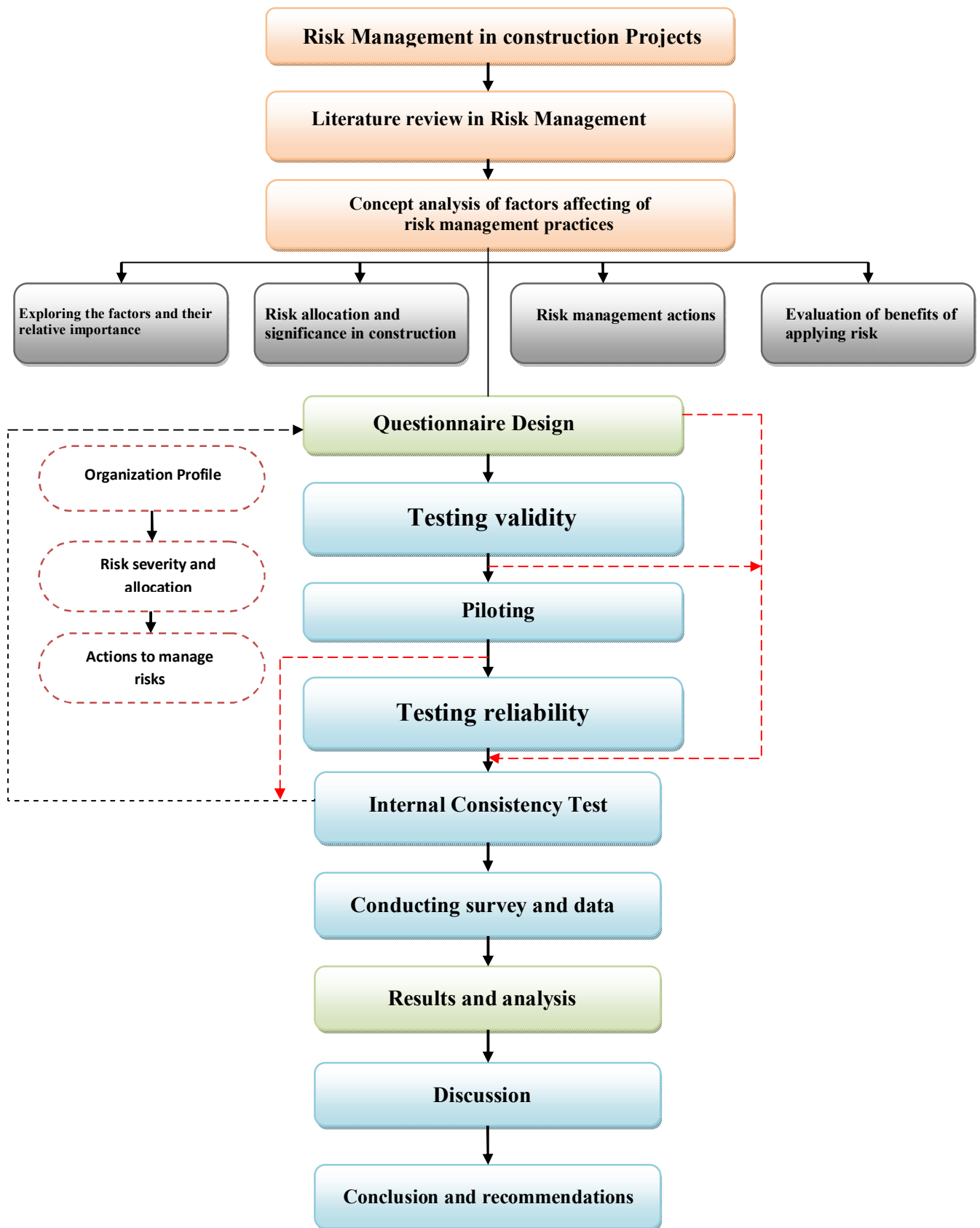


Figure 1.5 Methodology flow chart

1.10 Layout Of The Study

Chapter one is the introduction to the thesis in which the background, problem formulation, aim and research questions can be found. The purpose of this chapter is to help the reader understand why this thesis needed to be written.

Chapter two is the theoretical framework and the state-of-the-art for the area on which this thesis focuses. This chapter gives the theoretical foundation for the thesis.

Chapter three is the guideline the description of the method used to realise the aim of the study. This chapter aims to explain to the reader how the study has been realised to ensure its validity and reliability.

Chapter four contains the results and analyses of the collected data. This chapter aims to present the collected data as objectively and completely as possible for each of the research questions.

Chapter five contains the discussion and conclusions of the study. It also discusses the strengths and weaknesses of the study, as well as the researcher's view of how the results should be used, together with suggestions for further research.

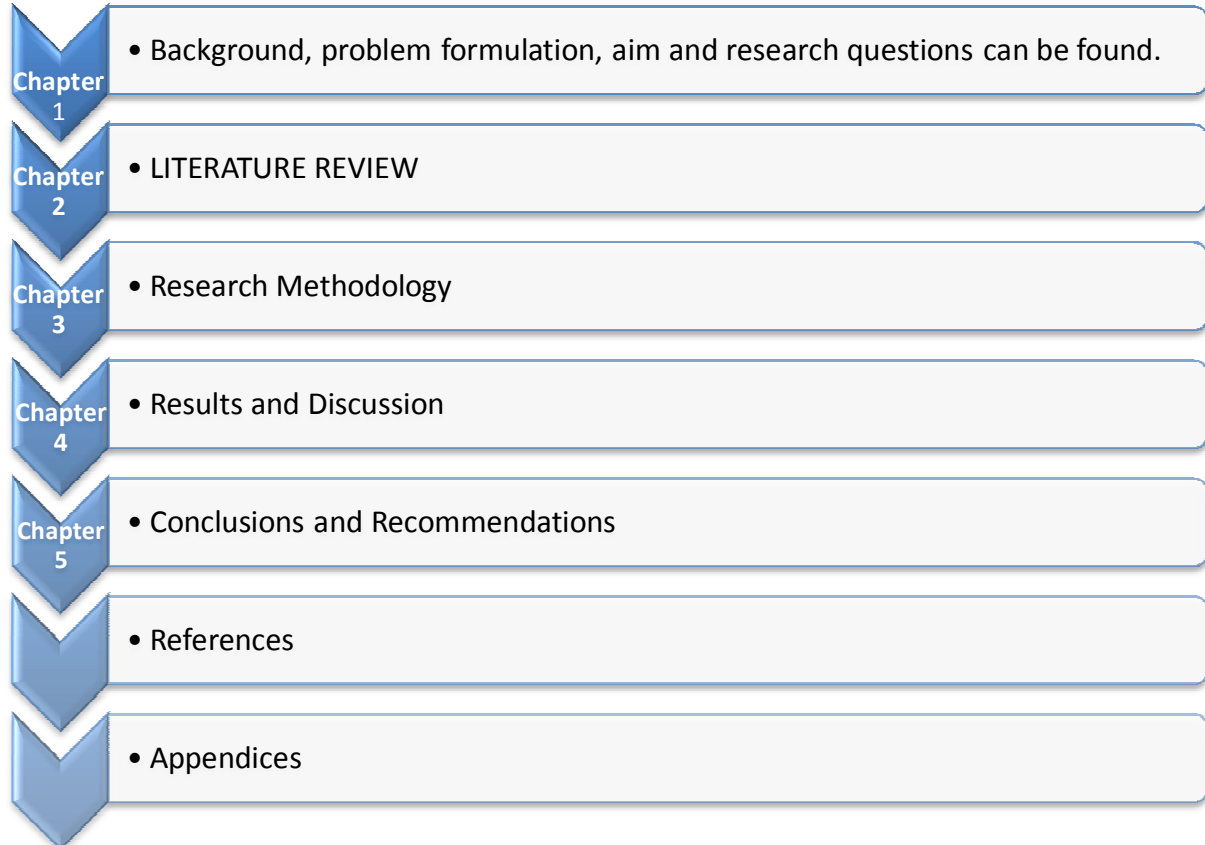


Figure 1.6 Layout of the study .