



**Risk management in relation to project success on the  
construction projects in UAE**

إدارة المخاطر فيما يتعلق بنجاح المشاريع في مشاريع البناء في الإمارات العربية  
المتحدة

by

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of the requirements for the degree of  
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## **Abstract in English**

The risk management is one of the most important process in the project management. Recently, the focus increased in the risk management as it is crucial to achieve successful projects. In this dissertation the relationship between the risk management and project success is examined in the construction sector in the UAE. A model was created to examine this relation by reviewing and conducting comparative analysis between various risk management models and standards.

Then, questionnaire was developed and sent to the respondent from the construction field, the obtained data were analyzed using SPSS. Where the reliability, correlation and regression test took place.

In this paper five hypotheses were proposed and all of them were examined and found valid.

As a result, one of the most important process in the risk management process is identifying the risk as it is the first process and without it the following process can't be carried out.

## Abstract in Arabic

إدارة المخاطر هي واحدة من أهم العمليات في إدارة المشروع، وفي الآونة الأخيرة إزداد التركيز في إدارة المخاطر نظراً لدوره الفعال في تحقيق المشاريع الناجحة. في هذه الأطروحة سوف يتم إختبار العلاقة بين إدارة المخاطر ونجاح المشروع في قطاع البناء في دولة الإمارات العربية المتحدة. حيث تم تطوير نموذج لدراسة هذه العلاقة عن طريق إستعراض وإجراء مقارنات بين مختلف نماذج ومعايير إدارة المخاطر. حيث تم إعداد الاستبيان وإرساله إلى الفئة المستهدفة من المدراء والمهندسين العاملين في مجال إدارة المشاريع في البناء في دولة الإمارات العربية المتحدة، ومن ثم تم تحليل البيانات التي تم الحصول عليها باستخدام برنامج تحليل البيانات الإحصائية.

حيث تم إختبار الفرضيات الخمس المقترحة بإستخدام آليات كالإعتمادية والإرتباط والإنحدار. ونتيجة لذلك، تبين صحة جميع الفرضيات المقترحة واستنتج إن أحد أهم العمليات في عملية إدارة المخاطر هي تحديد المخاطر لأنها العملية الأولى وبدونها لا يمكن تنفيذ العمليات التالية.

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## 1.0 Introduction

This is the first chapter for this study, this chapter will explain in what is the definition of project management and what is it in general. Risk management definition and adoption in the project is explained. Then the three aims and objectives are determined for this study, followed by three research questions. Then the research problem is mentioned followed by thesis map where the eight chapters of this study are mentioned.

### 1.1 The research agenda in project management

According to Shi (2011) project management has evolved and it is becoming a dominant management tool in the most industries, initially it was part of engineering. In the recent few years many organizations moved from the operation to the project management in order to adopt it as competitive advantage strategy (Maylore et al. 2006). Nowadays, project management becomes the most dominant model in a lot of organizations where it is used to implement the strategy, continues improvements, business development and development of products. Hence, it has been observed by researchers that the implementation of project management has added substantial value to the organizations.

Svejvig and Andersen (2015) added that project management has become substantially important to the economic growth and the project work has been increasing in several industries and countries. Nowadays, projects are used for structuring the work in organizations. Although projects have been increasing dramatically, the methodologies and conceptual frameworks have not changed as they were subjected by the rationale viewpoints, hereafter the conventional project management has been criticized due to its limitation practically (Koskela and Howell 2002). That is, scholars have been thinking to find a new approach of project management which can overcome the deficiency of the classical project management as well as overcoming the challenges of implementation the project management in real life and overcome the challenges which caused poor project previously. As a result of this thinking the scholars have developed a lot of new approaches, for instance conceptualizing the project as a temporary organization instead of considering it as a tool as well as considering the project management to achieve effectiveness, innovation and efficiency for the organization (Svejvig and Andersen 2015).

Winter et al. (2006) mentioned that the growth project works in recent years have been one of the most influenced factors for organizational factors, the project management standards adoption has been increasing across many organizations. As mentioned beforehand the project management was a sub-discipline of engineering, but nowadays is independent and it includes models such as portfolio management as well as program management. These models are utilized to implement strategy in the organizations and continues improvements

as well as business transformation. Likewise, it is used in community development, infrastructure and transportation, therefore project management practices have become substantially essential as they facilitate and organize the work by projects as well as programs (Child and McGrath 2001). Regardless of the increasing and development in adoption of project management in practice, however, project management models continuously receive criticism due to its inadequacy in practical.

## 1.2 Projects

### 1.2.1 What is a project

As per Pinto and Slevin (1988) mentioned that project is when group of individuals work with each other and they have resources to attain defined goals. While Chang et al. (2013) defined the project as distinctive system which intends to achieve defined outcomes and objectives. Turner and Muller (2003) reported project is endeavor with organized resources, materials and budget in an efficient way to achieve determined scope and requirement within specific time and budget in order to attain beneficial goals, which may be quantitative or qualitative. Project must have a specific time beginning and ending, it has interconnected works and complex tasks with determined budget as well (Pinto and Slevin 1988).

### 1.2.2 The notion of project risk management

As each and every human action is entitled with risk, project is an endeavor which is known with its inherent implication of uncertainties and risk. In projects risk occurrence can be as an event which mostly impact the objectives of project negatively, it is measured by two criteria, likelihood and consequences (Baccarini et al. 2004). Olsson (2008) added that the notion of risk in project management has developed in recent decades and has become one of the important discipline in the project management, risk is considered the likelihood of loss occurrence. Some authors describe the risk as an obstacle to obtain successful projects, while others relate the risk to the chance and probability of failing or loosing.

## 1.3 Aim and objectives

This research is carried out with the aim to test the effect of the risk management of the project success.

The objectives are as followings:

- Investigate the literature in project success, project failure and risk management.
- Identify the relation between project success and risk management.
- Review the project risk management models and choosing the model which leads to project success.

## 1.4 Questions

- Does project success get influenced with the risk management?
- What is the type of the relationship between risk management and project success?

## 1.5 Research problems

The implementation of risk management in construction projects in UAE in order to reduce the project failure. This paper shall increase the awareness of the risk management implementation in the construction projects.

## 1.6 Thesis map

Chapter 1: Introduction

Chapter 2: Literature review

Chapter 3: Conceptual model

Chapter 4: Research methodology

Chapter 5: Questionnaire

Chapter 6: Data analysis

Chapter 7: Discussion

Chapter 8: Conclusion and recommendation

## 2.0 Literature review

### 2.1 Introduction

The following literature review is conducted in order to examine the relationship between risk management and project success in construction industry in UAE. Hence, there are two main variables first the risk management and the second is project success. In general, it is perceived that risk management has a positive impact in project success. In this study we will look in detail to the all factors from the risk management that impact project success and we will analyze to what extent it impacts project success. Mainly focusing in the construction projects, and there are other aspects also explained such as types of the project and project lifecycle and complex projects. Project success and failure are explained thoroughly, then finally processes of risk management are explained.

### 2.2 What is project

Shenhar et al. (2001) mentioned that projects have become important to the organizations as they are integrated with the organizations strategy, the outcome of the projects are integrated in such a way to enhance the strategy of the organization, thus the organization attain the short and long term objectives. Projects have become the most significant attribute in the organizations, they used to provide solutions for all sort of works small and large as well (Engwall 2003). Cova and Salle (2005) noted that projects are complex operation implies several activities, services as well as products planned in a distinctive approach in order to create capital assets which attempt to deliver benefits to the client in a determined time. Cano and Lidon (2011) mentioned that the in the initial phase of an project the requirements and the specifications are determined as well the size, scope and the complexity. Projects are temporary endeavors are carried out to achieve determined goals, which are meant to accomplish outcomes, it has starting followed by executions and then closing. The outcome of the projects may result of making the organization better than the competitors and having better products offers and facilities as well as enhancing the organizations internal performance, throughout the execution of the project complexity varies due to uncertainty (Stal-Le Cardinal and Marle 2006).

Shenhar et al. (2001) emphasized that in many projects if not the all, projects are created to provide new outcomes which could be change in the organizations, products, establishing new organizations, expanding or developing manufacturing process. Projects provide to the organizations the necessary development in order to compete with the competitors, hence be distinct in the market or at least survive with the competitive environment. Engwall (2003) has explained that the projects are used as a mechanism which facilitates integrating of cross-functional amalgamation. Such as, comparing permanent organizations with the distinctive temporary organization, contractual set up for the hierarchies compared to the market, team working together with limited time in order to achieve the deadline, tools that are used to build a system to develop products, the regular

form at nowadays in IT organizations and the main units of analysis which are used for understanding the complex products, complex systems and high cost products. Project is carried out in order to provide benefits and change, hence it has three main characteristics: first it unique, which means it is different from the all the previous projects as well as there will be no projects in the future with the exact outcome. Secondly it is carried out by utilizing unique processes, which means no project before or even after it will be using the similar approach. Third, the most distinction it has stipulated start as well as end (Turner and Muller 2003).

### 2.3 Types of projects

Projects vary from one to another and they can be classified in term of their characteristics, some of them are from construction field as well as organizational change information while others are from telecommunication engineering technology projects (Muller and Turner 2010). Shenhar et al (2001) mentioned that the projects can be classified in four main levels as followings, low technology projects are projects associated with existing technologies for example rebuilding old products, construction and building roads. Then the medium technology projects which emphasize on the established and existing technologies and enhancing as well as adding new features to them, these can be industrial projects, they focus on developing the existing products and enhancing innovation. Third is the high technology projects, these are associated with project which use new technologies, however, the technologies were available before the high technologies projects, this can be applicable for developing new computers. Finally, the super high technology projects, these are new projects entirely. That is, they don't use and existing technologies, hence, the technology is developed within the project lifecycle. This sort of projects are rare and they are usually done by large organization and only few organizations are interested in these sort of projects, they can be government organizations (Shenhar et al 2001).

Sanchez et al. (2009) distinguished between the internal projects and external projects, internal projects are focused in increasing the performance of the organization in various aspects, for instance maintenance projects, resolving problems and research and developments. While the external projects aim to deliver the best service or product in order to get customer satisfaction.

### 2.4 Complex project

As per Baccaini (1996) complex projects have various interconnected components, works, activities, specified elements and extreme interrelationship and connections. Traditional project management techniques can't be applied to the complex projects, emerging of complex projects have increased recently. This emergence required new techniques and approaches in order to manage the complexity in such projects (Williams 1999), hence, researchers try to investigate the challenges associated with complex projects (Ahern et

at.2014). Practitioners classify projects into either simple or complex projects, due to the managerial difficulties. Moreover, there are two sorts of complexity in the projects, technological complexity as well as organizational complexity. Organizational complexity is manifested in the complex organizational structure where there are various fragmented separated sections, the more the separation and fragmentation the more the complexity. The separation can be seen when the hierarchy structure is too deep, this is called the vertical separation. On the other hand, the horizontal separation is also called organizational units, this is related with the quantity of the department and divisions, it is concerned with allocation of the tasks (Baccarini, 1996).

Baccarini (1996) added that the technological complexity is related with the process, the process converts inputs to outputs by using knowledge, materials and skills with experience. Furthermore, projects can be classified into simple or complex based on their attributes, identifying this will affect planning and coordination and determining objectives as well as choosing the right inputs. Therefore, if the project is complex the associated cost and time will be increased (Baccarini, 1996).

## 2.5 The project lifecycle

As per Pinto and Slevin (1988) the project life cycle has four phases:

The first phase is the conceptualization where the strategic requirements are identified by the higher management. Normally, in this phase the preliminary objectives are produced as well as exploring the resources availability to attain the objectives. During this phase the feasibility decision is included in order to address the following queries: What is the problem? Is this project sufficient to create solutions for this problem? What are the objectives and the outcome of this project? Are there enough resources to carry out this project?

Second phase is called the planning phase. This phase starts upon the agreement of the top management to launch the project. In this phase many formal planes are developed in order to achieve the stipulated objectives which were established initially. Planning is usually used to address the availability of required resources and the budget as well as to allocate the tasks and activities.

The third phase is referred to the Execution phase. In this phase the actual work is carried out. The resources and the materials are procured which are turned into planned project outcomes. In this phase the performance is measured continually in order to track the actual work and the performance against the planned tasks outcomes.

Finally, the fourth phase in the project life cycle is defined as the Termination phase. When the project is over, the project team work is released and assigned to other tasks,

furthermore the resources that were held for the project will be returned to the organization, and the project will be handed over to end user.

## 2.6 Risk management

According to Huang et al. (2004) risk in the project is a problem which might occur in the future and it will impact project success and results loss. As per Dey et al. (2007) risk is a future event which is not controlled by the project manager and it has a negative consequence on the project objectives. While the issue is at the present so it can have solved, on the other hand risk might occur in the future so it is a future problem. Thus, to have successful project, the project manager must seek to deal and solve the problems before their occurrence instead of waiting for them to occur. Indeed, all risk can't be identified before their occurrence, nevertheless, most of the problems can be identified even before their occurrence. According to De Bakker et al. (2011) as the uncertainty and unforeseen are inherent in the projects, project management is important in the project management because it mitigates and prevents the effect of those uncertain events.

Wang et al. (2007) mentioned that risk management is concerned with addressing the risks which affect the project, in order to take actions to manage them. Furthermore, PMBOK consider risk management in the ten focuses categories. Risk management process normally are identifying the risk, analyzing the risk and response to the risk, risk response has four options, accepting the risk, mitigating the risk and transferring to other party.

As per Sandhu (2004) project risk management is considered a natural segment involved in project management, risk is different for every stakeholder point of view. Due to complex project environment understanding project interrelation is essential in order to know their implications (Olsson2008). Cervone (2008) mention that one believes that risk management is highly considerable in the projects agenda. Nevertheless, is not given the importance as it is required. This does mean that risk management is ignored by the project manager, risk management is performed with superficial assessment for the risks related to the project. As per Wang et al. (2004) risk management is seen differently from each one perspective, from the perspective of the construction projects it is the chance of occurrence of an event or even multiple events which may occur on any time during the whole process of the project, the effect of the occurred event is negative to the projects goals and objectives.

Alessandri (2004) reported that risk and uncertainty should be considerable by all the decision makers such as board member and managers especially during decision making processes. Risk and uncertainty shall be identified on the suggested actions, then their impact of the objectives to be assessed, and create a contingency action plan. The aforementioned are essential for decision making without them the decisions are not optimum, thus the organization can surpass the competitor in the market.

Zwikael and Ahn (2011) define risk management by the probability of failing to attain project objectives and the consequences of this failure. Therefore, risk management is a tool used to identify risks, establish risk response and consequently monitoring the risks in order to mitigate this since the risk cannot be eliminated, this was asserted by Raz el at. (2002) that risk is always there in the project. As per Mobey and Parker (2002) one of the most important tool to achieve successful project is to identify the potential risks, in order to analyze them in a systematic manner, hence, understanding the vulnerabilities and uncertainties which might occur in future and affect project objectives. This will enable the organization to take necessary precautions and establish contingency plans in order to eliminate or mitigate the impact of the risks upon the occurrence. The use of this risks management tool can be as mentioned by Lam et al. (2007) to examine the project feasibility, thus, avoiding unprofitable projects, identify and analyze risks and mitigate the risks. In all decision making processes the risk management must be consider. Nowadays, the organization has to adopt the risk management due to the rapid market and high competition in the market (Raz el at. 2002), thus exploiting the opportunities and avoid the threats, therefore, coping the competitors (Lam et al. 2007).

The concern of risk management is to have low level of risk instead of high risk level in the projects, because the high level risk project is dangerous for the organization. This happens by identifying threats in order to reduce the losses for the organization and increase the response to the risks (Teller and Kock 2013). Thus, organizations which adopt risks management tend to be more successful than their competitors (Kwak and Stoddard 2004). De Meyer et al. (2002) risk management is used for identification of the risk, measuring the risk and then controlling the risk. For instance, if a contractor is working in middle east for a project then must identify the potential risks such as whether and sand storms, unpredicted political events and other technical issues. Then the risk is given a probability and an approach to deal with the risk such as decision tree or scenario evolutions in order the anticipate the impact of the identified risks. The critical risks contingency plans are established during the project kick off which can be implemented whenever required.

Hillson (2002a) in his paper mentioned all consensus that the projects are exposed to uncertainty which could be technical, commercial or organizational management, they can be external or external. Managing the uncertainty leads to achieve successful project, as this the ultimate desire of any project manager the risk management becomes a key to manage the inevitable uncertainties. When uncertainty occurs the impact is not necessarily negative on project objectives, it can have positive impact on the project objectives as well, the conventional approach of risk management implementation and the widespread perception about uncertainty is focused on the negative impacts threats, the positive impact opportunities is overlooked. As per Kishk and Ukaga (2008) the nature of the projects are inherent with risk, this is because the project is carried out by human, complex and they confront obstacles. Thus, risk management adaptation is a must to achieve successful project, it should be used in a systematic manner and used holistically in the project life cycle. A lot project which did not involve risk management failed, because they did not

identify the risk and therefore did not provide any risk contingency plan (Rozenes et al. 2006).

Hillson (2002a) added that risk management is used to identify then analyze the risk in the project in order to provide a response for the identified risk, this processes is either to mitigate negative events impact of the project goal or get optimum outcome from the positive events occurring in the project. As per Teller and Kock (2013) project management became one of the prominent organization activities. Project outcome measurement is extremely important to the all stake holders. Nevertheless, project success is perceived differently from different parties, in some cases the project is successful as per those who are involved in the project executions, while from the customer's point of view the project is delivered poorly. In the other hand, there are other projects which were considered failure internally as they have consumed huge resources but found a successful project by the customers and increased the organization's revenue later. Even in the same organization each employee can view project success differently, hence, project managers found it difficult to determine criteria for project success. They used to use the simplest method which is meeting the time budget and performance (Shrnhur el at. 1997).

De Bakker (2010) reported that the Y2K problem which took a place during the end of 90's where the companies invested to cope the computers with the change of the minimum from the year 1999 to 2000, they expected the computer will no longer will be functional but when the year 2000 started nothing happened. This raised the debate between the supporter and non- supporter. However, it was difficult to determine if the risk management would have been used the same results would have occurred. The project management professionals argue that the implement the risk management because this what the PM book says and to follow the PM book for the implementation.

Sanchez el at. (2009) indicated that the project risk management is the process of analyzing the project objectives functions relation with project factors or variables such as resources which is uncertain and vary during the project lifecycle. Thus, achieving the objectives is uncertain due to the uncertain variables (Jaafari 2001). Additionally, decision for complex issues results in delaying of decision making and poor controlling in experimenting phase are factors which increase the uncertainty in the project (Sanchez el at. 2009).

Kwak and Stoddard (2004) elaborated that the uncertainty is influenced with ambiguity as well, for instance, ambiguity of project estimation and setting the objectives. They have instated also that being over optimistic and sitting unrealistic objectives is a factor which increases the ambiguity and hence increasing project failure rate. In a steady environment the uncertainty is too high at the first stage of the project throughout the project progress the uncertainty decreases, this is only applicable if there proper follow up and planning. Conversely, in the turbulent environment the uncertainty is always high even during the projects progress, complex projects are also example where the uncertainty level is always high. Risk management assesses the variables continuously and consequently measure the

objectives achievements and change the plans accordingly. This means it must be agile in order to cope with the confrontations (Sanchez et al. 2009).

Elkington and Smallman (2002) found that the risk management adaptation has a strong influence in project success, the more the risk management is considered the more successful the project. Furthermore, involving the risk management in the initial stages of the project has more affect than using it only in late stages, the more earlier the more effective. That is, the risk process should be started and included during scope of work stage. This practice is essential and it does not affect only the project outcome, but it will affect the success of the entire project during the project life cycle as well as the outcome. Hence, Kishk and Ukaga (2008) mentioned if risk management process is ignored during the brief stage, the risks occur in later stages affect the project objectives strongly and the project will be in an impasse.

De Meyer et al. (2002) classify the uncertainty in four main categories as following, variability which is variation which can be anticipated and controlled, the second is the foreseen uncertainty where some factors are known and their impact is predicted, thus, contingency plan can be made to solve the impact of those predictable factors. Third, is the unforeseen is when there are some unpredictable factors which have impact on the project, hence, these factors are dealt with upon their occurrence. Forth, is the chaos or ambiguity where uncertainty is at the highest level therefore factors are completely unpredicted which may lead to the entire project failure, therefore, it is necessary to amend project plan frequently. Junior and de Carvalho (2013) defined the risk as an event that has probability to happen while the uncertainty is unknown event, hence, they argue that mostly risk occurrence is caused by the uncertainty. Nevertheless, factors such as schedule, milestones, budget, lack of resources and poor labors have influence in project risk. Carbone and Tippett (2004) stated that different scholars use various terminologies to represent probability in the risk management, while some use likelihood, others use probability or the probability occurrence as well as frequency occurrence. There is one more term which is exchangeable due to different authors preference which is the impact of the risk or some call it consequence and it is also called by others amount at stake and some call it severity. The impact is the risk consequences on the project in case if occurred.

Elkington and Smallman (2002) added that the risk is treated by different approaches in order to make it acceptable. For instance, first is preventing the risk by carrying out the actions which are opposite to the risk, this results in preventing the negative consequences of the risk and therefore project objectives form the threats. Then the second is the reduction approach where the actions are initiated to mitigate the consequences of the risk. Third is transfer the risk to the insurance company and in some cases mentioning a clause for a penalty. Finally, the contingency plan in this case the once the risk is taken place the actions are predetermined to materialize.

## 2.7 Risk management in construction projects

Risk in its nature is a multifaceted, in the construction risk can be the probability of emergence of any factor or combined factors which has a negative impact on the project, these factors can emerge at any time during the project lifecycle. Uncertainty during determining the project objectives, the lack in anticipation the consequences during the planning. However, the consequences can be worse or even better than anticipated (Wang et al. 2004).

There are different approaches in classifying the risks, risk some time is classified in the construction either internal or external risk factors. Nevertheless, others use different types of classification such as classifying based on risk nature and from where is its originated. Thus, risks can be political, cultural, financial, etc. Zhi (1995) mentioned that risk in construction project are classified into two, first is the internal risks which are the uncertainties inherited in the construction projects then second is the external risks which emerge from the project environment impacts. Thus, overseas projects are exposed to higher external risks, due to the political turbulence and fluctuation in the markets and economy. This will have a tremendous impact in the overseas projects, each and every activity in this kind of projects is associated with risk, this makes risk management very complex and very critical for the project success. In the very early stages before the contract all the uncertainties that matters should be addressed, due to the huge number of the uncertainties as the environment is new to the project team there should be very effective methods for risk management as it is vital in such projects.

Zeng (2007) added that construction projects are difficult to handle due to their nature as the construction environment keeps changing, inherent hazards in construction works, emergence of complex techniques and most important the tremendous pressure on meeting time and cost. As per Akintoye and MacLeod (1997) there are different sources of risks, such as physical, political, logistic, legal and operational. Project objectives may be impacted by these risks, so these risks each of them should be assessed thoroughly and individually then risk premium to be given to each risk. Risk premium is the contingency tolerance.

## 2.8 How to manage the risk

Determining the risks, which factor should be a risk and which is not usually subjective, deciding what risk is derived from the management anticipation for future and the wellness to perform very well in future, this is influenced from the lessons learned from past similar projects (Tah and Carr2001). Classifying the risks is a crucial process in the risk assessment, this process aims to classify the various risks which might occur in the project.

There are various approaches existing which can be utilize to classify the risks. One of the approaches used by authors where risk is classified based in the nature of those factors and their magnitude, hence, they can be classified either primary or secondary risk factors. Others suggested risk breakdown structure which looks into the risk originator and where the risk factor impact will be in the project. One of the proposed approaches is to use the combination of risk breakdown structure as well as classifying them into primary and secondary. Finally, one other approach is to look into the risk factors which are collected from different sources, then classify them according to capability of the contractor, consultant and the client to retain the risks (Tah and Carr 2001).

Risk allocation methods can be one method or combination of methods, these methods are risk acceptance, transfer to another party, avoiding the risk and mitigating the risk. Risk acceptance is the last option when risk cannot be transferred, risk avoiding is not preferable, the likelihood of the impact is minimal, transferring to other party is costly and financial impact is negligible. Avoiding the risk is one of impractical solutions in the construction projects, this may hinder the progress of the project or getting very cost bid from the contractors. Risk mitigation techniques focuses on the occurrence likelihood and consequences, this is carried out by using other contract strategies, redesigning the project, alternative project methods and very detailed site visits and investigations (Akintoye and MacLeod 1997).

## 2.9 Assessment of project risk management implementation on project success

As per Datta and Mukherjee (2001) in order to achieve successful project the risks should be identified during the conception stage. Risk is considered to be an obstacle to achieve project success, hence, the organization focuses in risk management by spending time, effort and funding risk management to achieve successful project (Zwikael and Ahn 2011). Raz el at. (2002) mentioned that risk in the projects is considered as unwanted event which might result in time overrun, cost overrun, failure to achieve project goals, incidents which threats safety, environmental violation as well as failure of the entire projects in all the aspects. Carbone and Tippett (2004) reported that there are a lot of variables which influence project success, in fact having poor risk management implementation leads to project failure.

Aloini et al. (2007) reported that risk management processes mostly are not implemented by the project manager when there is a difference in the project schedule.

De Bakker et al. (2011) mentioned that in the project management activities which are applied based on the project risk management, these activities will lead to the project success. Jiang and Klein (2001) found a study that the risks in the project have a negative influence in achieving a successful software development project. As per Akintoye and MacLeod (1997) looked in the construction projects and found that risk elements affect the project success in terms of budget, schedule and outcome quality, therefore, risk processes should be adopted from the commencement of the project to the closing stage. Zwikael and

Ahn (2011) found that the culture has an influence on how the risk is perceived and dealt with. They have added that risk varies in different industries, therefore different types of risk were found in different companies. If the risk management planning is not carried out for or it was low this will affect the project success negatively. This implies risk management enhances project success by establishing a process to mitigate risk and reduce unforeseen. Risk in the project can be resulted either from the nature of the task if it is complex or implies uncertainty and has a limited timeframe. Additionally, risk can be a result of poor labor or lack of resources or the organization's political and policies (Raz et al. 2002).

Wang et al. (2007) mentioned that risks which pertain to both the contractors and client are the most risks which affect project objectives and therefore project success, while risk pertaining to the vendors, subcontractors, architecture/designer as well as government entities affect the project objectives partially and therefore affecting project success partially. As per Shenhar et al. (1997) and Lipovetsky et al. (1997) project success is measured against the following dimensions, meeting the time, cost and technical and functional specification. Hence, Raz et al. (2002) used the aforementioned as dependent variables and project risk management practices as independent factors with the following variables, identifying the risk in proper manner, analyzing the probability of risk level, planning for risk mitigation, methodic tradeoffs and hiring risk manager.

According to Jun et al. (2011) the resources requirement differs for different projects based on the risk level in the projects whether it is high, moderate or low. Hence, some complicated and mega projects require a well-knowledge project manager or better collaboration as well as better strong communication channels and more sophisticated IT solutions. Raz et al. (2002) found that there was a strong statistical correlation with the project risk management practice and meeting project time, budget and objectives. On the other hand, there was no statistical correlation between project risk management practices and project technical and functional aims. This can be interpreted that the project risk management practices are more focused in meeting time and cost which is the dilemma in the projects and ignoring functional, technical and other aspects.

De Bakker et al. (2011) mentioned that risk management affects the perception of the stakeholders, then by interviewing the stockholders they mentioned that they perceive the project risk management influences project success. Teller (2013) had a study on portfolio risks management and project success and he mentioned that inadequate risks management leads to an increase of the undesired events, which might affect the project schedule, budget and objectives negatively, jeopardizes portfolio objectives. Thus, leading to project failure, therefore, he suggested a portfolio risk management instead of single project risk management in order to attain successful portfolio objectives. Jiang (2002) concluded in his study the risk is negatively related to the project success, he further suggested the different dimension should be adopted instead of only one dimension as part of project risk management in order to obtain greater influence of project management on the risk management process, therefore, detailed determination of risks impact on the project objectives. These dimension could be end user feedback and support, contractor experience as well as the level of project complexity.

Han and Huang (2007) added that the dimension used for software risk management are project structure and the size of the project as well as the technological expertise. Carvalho and Junior (2015) reported that in projects even moderate risk management has impact on attaining successful project by reducing the negative impact of the risk.

## 2.10 Risk pertaining to the client

One of the most important risk as per Wang et al. (2007) is the unrealistic schedule which has a direct impact on project objectives, this leads to an inappropriate schedule during the feasibility stage. Therefore, to attain project objectives and have successful project the client should plan a reasonable project schedule so the contractor will have enough time for designing and planning the tasks, however, the schedule given by the client should not allow for redundant time. Raz et al. (2002) reported that in order to increase the project success, each project is unique and it has to be dealt with in regard to its environment and its type as well as the project characteristics.

## 2.11 Examine the uncertainties effect on time and cost overrun

Risk is always associated with the construction industry, due to the cost and time overrun dilemma (Akintoye and MacLeod 1997). As per Wang et al. (2007) construction projects are unique, because they have complex interdependency, complex technology, long time for execution as well as a risky environment, all of these create risk. As risk can't be eliminated from the project, a successful project is considered when the risk is managed, this can be achieved by identifying and examining the risk initially. Further risk management is an effective tool to identify risk that can affect the project objectives, therefore, avoiding or mitigating those will ensure achieving a successful project. Zwikael and Ahn (2011) mentioned that projects are exposed to uncertainty due to the very tight schedule, inefficient budgeting and variations because of adding new requirements during the project lifecycle.

As per Huchzermeier and Loch (2001) there are different types of uncertainties, such as schedule of the project, market needs, revenues based of the market demand and the outcome performance.

Hillson (2002b) mentioned that to achieve successful project the risk management has to be successful as well, hence, this requires a special tool to identify the risk rather than only listing the risk and addressing the probability and impact. Risk breakdown structure (RBS) which has similarity with the work breakdown structure (WBS) provides hierarchical model which breakup the identified risks into smaller and more detailed. As per De Bakker et al. (2011) risk management has a positive impact on the project performance as a result of developing contingency plan.

## 2.12 Risk identification

Shrivastava (2012), Teller (2013) and Kwak and Stoddard (2004) mentioned that risk identification is one of the most important process in the risk management, risk identification is a tremendous task. It requires a broad knowledge about the project in term of the scope, objectives, clients, and all other stakeholders. The efficient approach is to collaborate with all the stakeholders and keep them engaged and using techniques. For instance, brainstorming can be utilized as it is a proved efficient technique for collecting various scenarios from the stakeholder and then establish a risk list as well as periodic risk reporting (Raz and Michael 2001). As per Carbone and Tippett (2004) risk identification is one of the key success for the project, they argue that in order to achieve successful project risk should be identified in the very early stages. From the definition of the risk management Zou et al. (2007) motioned that there is risk identification, then assessing the risk and finally risk response.

There are different tools available for identifying the project risk such as brainstorming, cause and effect diagrams as well as checklists (Zwikael and Ahn 2011). Kishk and Ukaga (2008) reported that risk can be identified using techniques such as brainstorming, focused group, analysis the past similar project and interviews. As per Ribera and Sieber (2009) decision tree tool is used for identifying each node in the tree and the chance for each node as well, this will create scenarios which can be analysed in order to choose the best option. Within the execution phase the team should be aware of the changes that might occur in the environment and be ready for identifying any foreseen risk in order to take the contingency plan. As per Boehm (1991) and Ahmed et al. (2007) risk identification processes aim to achieves successful project, the analytical techniques are the decomposition, assessing decisions drivers, (Keil et al. 1998; Raz and Michael 2001) and checklists.

In addition to this Hillson (2002a) mentioned tools and techniques for risk identification, such as, brainstorming, questionnaire, influence diagrams, swot analysis, interviews and cause and effect diagrams. Additionally, Hillson (2002b) suggested that the risk factors can

be identified based in the element of risk breakdown structure, the technique can be brainstorming in the workshops conducted for risk identification and checklists.

## 2.13 Risk assessment

As per Carbone and Tippett (2004) risk assessment is measured using the likelihood and consequences of the risk. These both items likelihood and consequences are measured either by project expert or using risk data from previous similar projects. Risk assessment can be determent by using analytical tools such as Delphi technique (Keil et al. 1998), probability and impact assessment (Raz and Michael 2001) as well as event tree analysis (Zwikael and Ahn 2011). Hillson (2002a) asserted that qualitative assessment is used to rank the risk factors, this is done by measuring the likelihood and consequences. Likewise, Fabricius and Buttgen (2015) added that project management measures, for instance, assessment of the likelihood and the consequences of risk help to attain successful project.

Additionally, Quantitative risk analysis can be used as a tool to carry out risk assessment. The term quantitative is used because it provides a numerical figure for the risk factors impact on project goals. Boehm (1991) added that risk assessment is used to measure the loss in both the likelihood and the magnitude for every risk factor as well as measuring the compound risks. Various tools are used, for instance, performance models and statistical decision analysis. Teller (2013) in his project portfolio study reported that risk assessment process segregates the risk level in the project, thus, knowing the whether the project is acceptable or not. Risk is classified based on the type and priority, therefore, the attention is given to the critical risks.

As per Ahmed et al. (2007) qualitative approach is used for risk assessment instead of the quantitative approach, because in quantitative approach getting the data is not easy and mostly not available. Furthermore, in qualitative risk assessment the input is given by an expert, which is more sufficient than quantitative, whereas in quantitative approach is mostly piling up unreliable data.

## 2.14 Risk response

Zwikael and Ahn (2011) asserted that risk management leads to decrease the amount of the risk in the project, that is achieved first by risk identification then by assessing the risk events, establishing risk response and monitor the risk during the project life cycle. They also mentioned that analytical tools used for risk response such as project risk response planning and planning charts as well as influence predictability matrix. As per Teller (2013) risk factors with the higher priority are given higher consideration in order to prevent negative impact on the project objectives. Dey and Ogunlana (2004) in their study reported that private finance initiatives in UK recommends that the best approach to reduce the amount of the risks is to transfer them to another party.

Kishk and Ukaga (2008) mentioned that in order to achieve successful project the ownership and awareness of the risks should be very effective among the stakeholders and the team carrying out the project. Consequently, this influences positively the risk mitigation process and contingency plan as well as handling the project activities, thus, decreasing the likelihood of risk occurrence in reality. Keil et al. (1998) emphasized on the critical role that the top management play, they used the term ‘commitment’ instead of the ‘support’ to highlight their involvement and commitment results in the risk management success. Therefore, they should be proactive from the initiation stage, project life cycle, and until the project close up.

## 2.15 Monitoring and controlling risk

Raz and Michael (2001) mentioned that the software engineering institute which is a pioneer in providing various types of methodologies, illustrates the project risk management model by identifying the risks, analysing them, response and tracking and control. Tracking and controlling can be achieved through the use of different tools, in this paper the word monitor is used instead of tracking.

Monitoring the risks is achieved by using different techniques, such as, continuously revising the risk assessment, sporadically reviewing the documents, reporting risk status sporadically, highlighting the critical risk to top management and sporadically reporting risk mitigation plans (Raz and Michael 2001). In order to control the risks, trends should be analysed to compare actual plan with the planned as well as analysing the exceptions. Carrying out contingency plans when the risk mitigation is not sufficient enough and re-planning the project based on the analysis. Establishing procedures for risk closure and carrying out cost and benefit analysis (Raz and Michael 2001).

One of the key success in the project is to review the risks periodically and then convey the outcome to the concerned stakeholders. The purpose of the risk monitoring is identifying the emerging risks as early as possible, therefore enhancing risk response. Hence, this increases the familiarization with risk response actions, and which identified risk emerged in the project helps building good knowledge which can be used to determine the risk factors in future projects instead of simply padding unrealistic risks (Teller and Kock 2013).

Cervone (2006) suggested strategies in order to monitor the risks in the project, risk assessment should be carried out in a continuous basis. This process is an essential process which leads to project success as it enables the identification of the high priority risks at a certain time in the project by all the project members. Nevertheless, project managers don't favor the idea of flexible planning and changing project response upon emergence of each new event, but changing plans upon availability new data is important for project success. Project risk monitoring provides a learning experience which can be used for future projects.

Furthermore, Hillson (2002a) mentioned that monitoring and controlling is the last process of risk management, where the identified risks are monitored continuously, identifying the emerged risks, review and monitor the risk responses and monitor the changes in risk management through the project lifecycle. Moreover, Hillson (2002a) suggested the following for monitoring and controlling risk management, risk and project review meetings to be carried out to monitor the risks status as well as the status and implementation of the consensus risk response, and the viability of the risk management process to be assessed to make sure it meets the project requirements.

## 2.16 Project success

As per Davis (2014), Mir and Pinnington (2014), and Toor and Ogunlana (2010) different people view the measurement of the projects differently, therefore, the success is not similar for all the stakeholders. Baccarini (1999) added measuring success should be determined before the commencement of the project, to avoid disagreement between different parties in the later stages. Authors such as Baccarini (1999), Munns and Bjeirmi (1996), and Prabhakar (2008) determine project success into two categories, the first is the project management which focuses in the success of the project management process in order to achieve the iron triangle time, cost and quality. Then, the second is the product success which focuses on the success of the product or the outcome of the project. The success of the project management and success of the product success are complementary, for instance, if the project management successes and the product fails this implies that internally project was successful but externally from the customer point of view is a failure (Shenhar et al. 1997, 2001).

Holistically, project success is defined by accomplishing business targets and producing the products or services (Cooke-Davies 2002) achieving the planned objectives (Jugdev and Muller 2006). In the other hand, the project management success implies the success of the processes during the project lifecycle (Jugdev and Muller 2006; Silva et al. 2016). Beside the aforementioned product success and projects management success criteria Muller and Turner (2010) addressed other measures, such as, fulfilment of the outcomes to customer's requirement, by achieving this the customers view project successful. Furthermore, meeting the requirement of the stakeholders as well as attaining all the planned objectives and outcomes increase the chances for the contractor to be awarded future projects.

Rozenes et al. (2006) mentioned that during the project execution the project doesn't progress as per the project plan, there is always some level of deviation between the planned and actual progress. This deviation is because of change in the scope as a variation from the owner, awarding the contract to an inadequate contractor, poor cash flow, poor workers and hence poor productivity, delaying in approvals, poor planning and hiring inadequate subcontractor, all of these are factor which hinder the project success. De Wit (1988) insisted to consider the stakeholders view on the project success measurement criteria. As per Aloini et al. (2007) project success is measured by the comparing the project outcomes with the project goals, customer satisfaction and planned budget.

Belout and Gauvreau (2004) determined the following measurement for the successful projects, the impact of the project outcomes to the customers, the effectiveness of the business context, effectiveness of the project and the impact of the project to the organizational success and finally to lessons learned from the project which will stimulate the preparation for new projects (Silva et al. 2016). De Wit (1988) argued that determining whether the project is successful for the complex project is quite difficult, hence, some complex project considered successful in one segment and failure in the other segment.

## 2.17 Project failure

Project is considered failure upon the termination of the project due to the poor performance, hence, project got ceased. The key resources provider measure and decide the project performance (Shepherd and Cardon 2009). Project is considered failure when it is cancelled or doesn't match the budgeted cost, time and goal. Despite there is a vast consensus for this definition, yet, project is considered failure due to the cancelation and compilation (Linberg 1999). Some confuses project success and project failure, project failure does not mean is the opposite of project success contradictory, if the project management is successful this might result in project success. Project management failure might lead to project failure, while project failure might happen even if there is successful project management is in place (Ika 2009).

The success measures can't be attained in failure project; the failure is resulted when there is no proper base supporting the project. This will result in hiring inadequate project manager, poor support by the management, no support from the stakeholder, poor information exchange (Munns and Bjeirmi 1996), lack of communication, poor handover, poor management, inadequate project management techniques, errors and very high expectation (Taylor and Ford 2006). Projects fail because of poor planning, lack of estimation, failing to implement the activities as planned and human failures, for example when the project management doesn't communicate properly (Attarzadeh and Ow 2008). The project is considered failure when the product or the service doesn't match the client expectation or the project is terminated before the completion of the product development (Taylor and Ford 2006).

Several projects which were on time, cost and quality found failure. This can be illustrated by Ford when they launched their second generation of Taurus car, though it was delivered on the planned schedule on 1995, Ford considered it a failure. Projects failure and success might differ during the project life cycle, nonetheless, in some cases projects are considered failure upon the completion but later found successful masterpiece such the opera house in Australia (Ika 2009).

## 2.18 Project success and failure notion

According to Aloini et al. (2007) the success or the failure of the project is mainly based on person or the way the success or failure was determined for the project. The traditional way to measure the successful project is to measure it against the iron triangle time, cost and quality. This can be true in cases when the market is critical, however, this measure is not applicable for some the projects such as opera house in Sydney (Ika 2009). Opera house exceeded the budget five times and extended the project delivery three times the planned schedule. However, nowadays this consider landmark in Australia (Shenhar et al. 2001; Chang et al. 2013) and is one of the best engineering masterpiece (Jugdev and Moller 2006). This example manifest that the project is perceived as failure when is measure by the project management and a success when measured by the product success (Jugdev and Moller 2006). The benefits of the opera house are being gained after a while of the project compilation, hence, for such project success should be a continues measurement even after the project completed, instead of measuring with the time, cost and performance (Chang et al. 2013).

Prabhakar (2008) added the project success of the project is determined by first; achieving the goals within the planned cost and schedule as well as adding benefits to the organization strategy. Furthermore, the different personals perceive the project success differently such as management, labours and customers. The engineer perceives the project success upon the completion of the technical works successfully and submittal of correct as built drawings, on the other hand the accountant based on the money spent, the architecture based on the appearance, human resources by the employee's satisfaction, for chief executive officer and shareholders by the organization competition on the stock market (Shenhar et al. 1997; Shenhar et al. 2001 and Prabhakar 2008). Additionally, the success and failure measurement may be different based on the project type, such as industry type, complexity, client, size and distinctiveness (Ojiako, Johansen and Greenwood 2008).

As per Amade et al. (2012) successful project is one which meets its requirement and the intended mission, fulfils customer's needs, accomplish technical specifications. Dvir (2005) concluded the measurement of the projects success based on the achievement of the project goals and targets, getting customers satisfaction by meeting their expectations in the short term as well as long-term. Atkinson (1999) reported that project success measurement has two approaches, first is the conventional measurement by considering time, cost and quality. The second is measuring by meeting customers need and expectations, the use of the outcomes, the effectiveness and the outcome impact of the organizations business objectives. Mazur et al. (2014) added that the success in the project is measured by achieving the operational goals and meeting the stakeholder's expectations as well as the project should be successful from the customer's point of view instead of measuring it by the time, cost and quality. The proper setting of the objectives, top management support, strong communication, dealing with uncertainty in proper manner, proper project plan and many other factors which if adopted in the project will not

necessary mean ending up with successful project. Conversely, failing to adopt these factors might lead to project failure.

Dvir et al. (1998) mentioned certain scales in which can measure the project success, these are managerial effectiveness, achieving objectives, business effectiveness, execution effectiveness, technical performance, impact on the organization, value added to the customers, enhance company's capability and impact on the employee's development. According to Belout and Gauvreau (2004) the success is perceived differently among different people, it differs for the customers, employees and the top management as well as shareholders. Dvir et al. (1998) carried out an intensive case study on the defence projects and concluded, the project is successful when it matches the planned goals, produces profits and benefits which lead to the organizational development, enhancing the development of the defence entity and contributing the development of the infrastructure in the country. This supports the argument made above, even if the project is considered failure upon the compilation or the short term it might be a successful project in the long term. Dvir, Raz and Shenhar (2003) asserted that projects success is not similar to the people perception, in many cases the project was finished within the budgeted cost, time and performance. Nevertheless, the project was complete failure because it did not meet customers need and did not add values to the organization that handled the project. Ojiako et al. (2008) mentioned that the project success can be determined either in the end of the project or even years after handing over the project such as Opera house in Australia. Patanakul, Iewwongcharoen and Milosevic (2010) added the successful project bring benefits which enhances the organization's financial status, matches the requirements, creates advantages for the organization over its competitors and creates services meet the customers need.

De Bakker (2010) mentioned that project success traditionally measured against time, cost and meeting the requirements are criticized widely. Nonetheless, this success criteria are used in IT projects papers. The following three points explicit the criticism, first the time, cost and requirements are determined in the initial stages of the project. Second, the perception of the project success is similar for all the stakeholders. Third, once the project is over and service of the product is delivered the success is determined. According to Belout (1998) because projects were adopted technical approaches and ignored the behavioural aspects, thus, the projects were concerned about the mechanistic outcomes. Such as, achieve the planned schedule, attain the targeted financial goals and producing product with good quality. He added also the success is related to efficiency which is getting the optimum outcome for certain resources, the success is also related to the effectiveness which is attaining the planned goals. Thus, the effectiveness of the project is measured differently with the various types of the projects. The project could be measured by different perception, such as project manager perception of project success, sponsors perception of success and sponsor as project manager perception. Kishk and Ukaga (2008) added that project success can be determined by the efficient and effective use of the resources and the satisfaction of the customers.

## 3.0 Conceptual framework

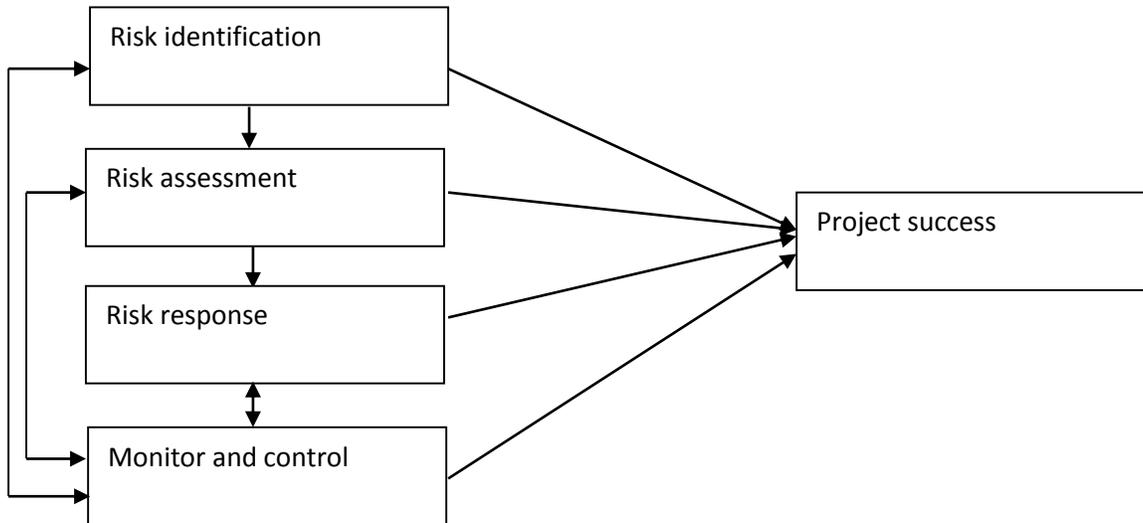
### 3.1 Comparative analysis and research model

Zwikael and Ahn (2011) in their study they used a model which consists of two variables, first is contextual variable the second variable is moderating variable (risk management planning). The first variable illustrates the influence of the both the country and the type of the industry to the risk level, while the second variable is a moderating variable between the risk level and dependent variable (project success).

As per Australian standard the risk management process consists of seven process, initiated by risk identification followed by risk analysis then risk evaluation, communicating and consulting with the stakeholders, finally monitor and control the emerging risk (Ahmed et al. 2007 and Risk Management Standard AS/NZS 4360, 1999).

Six step process for project risk management is an efficient process for managing risks in project. This process has a model with six components, the first step is to develop risk management plan, the second step it to identify the risk factors, then the third is to carry out qualitative analysis if it is required, followed by forth step which is carrying out quantitative analysis if is required, then fifth plan risk responses. These five steps are the activities pertaining to planning of risk management. Then the sixth step is to monitor and control the risks during the entire project lifecycle (PMI 2009; Junior and de Carvalho 2013).

ISO 31000:2009 established a risk management model which can be adopted in the organization. The model is used to support corporate process efficiently. This integrates risk management into the core corporate processes, such as, corporate strategy along with its mission, vision and values. Additionally, it will be part of governance, policy making as well as reporting and planning. The model is established to manage risk by recognizing the internal context of the organization, recognizing the external context for the organization, adopting risk management to the all processes, integrating the risk management into the organization communication channels managing resources. Finally, monitor the model in order to continuously control and improve it (Gjerdrum and Peter 2011). The similar model can be applied on the project level.



*Figure 1: Research model*

Various models were reviewed as mentioned in above comparative analysis and finally it has been decided to adopt the above framework due to its simplicity as it doesn't have any control variables. It is quite straightforward; it has the independent variables which are the processes of the most project risk management models, and the dependent variable is project success, where the elements were cited from the various project success articles. Nevertheless, there was a downside in (Al-Shibly et al. 2013) model which doesn't contain a vital component in the risk management process, it did not include monitoring and controlling, which is on the other hand included in Australian standards for risk management. Concurrently with Australian standard, PMI (2009) and Junior and de Carvalho (2013) explained the PMI risk model which has controlling and monitoring as one of the main processes in the risk management.

This conceptual framework was chosen from (Al-Shibly et al. 2013) paper where they had three independent variables and seven dependent variables, the dependent variables were seven plus the project success variable which was not mentioned explicitly in the model but was mentioned in their questionnaire. In our paper, instead of having eight dependent variables, we merge all of them into one variable which is project success in order to ease the analysis.

### 3.2 Hypothesis 1

As per Carbone and Tippett (2004) risk identification is one of the key success for the project, they argue that in order to achieve the successful project risk should be identified in the very early stages. Raz el at. (2002) in their study they had they consider the following for identifying the risk, risk shall be identified in systematic manner, SWOT is used for risk identification, interviews and (Zwikael and Ahn 2011) brainstorming are utilized to gather information regarding risk identification.

Based on above and aforementioned in the literature the following hypothesis is proposed:

H1: There is a positive relationship between risk identification and project success.

### 3.3 Hypothesis 2

As per Carbone and Tippett (2004) risk assessment is measured using the likelihood and consequences of the risk. These both items likelihood and consequences are measured either by project expert or using risk data from previous similar projects. As per Raz el at. (2002) to attain successful project the risk assessment has to be carried out and risk to be analyzed based on the likelihood and the impact. Risk can be also measured qualitatively by using some software simulation such as spreadsheets and for the complex projects Monte-Carlo simulation (Al-Shibly el at. 2013).

Based on above and aforementioned in the literature the following hypothesis is proposed:

H2: There is a positive relationship between risk assessment and project success.

### 3.4 Hypothesis 3

Zwikael and Ahn (2011) asserted that risk management leads to decrease the amount of the risk in the project, that is achieved first by risk identification then by assessing the risk events, establishing risk response and monitor the risk during the project life cycle. They also mentioned that analytical tools used for risk response such as project risk response planning and planning charts as well as influence predictability matrix. As per Teller (2013) risk factors with the higher priority are given higher consideration in order to prevent negative impact on the project objectives. Deyand Ogunlana (2004) in their study reported that private finance initiatives in UK recommends that the best approach to reduce the amount of the risks is to transfer them to another party. Kishk and Ukaga (2008) mentioned that in order to achieve successful project the ownership and awareness of the risks should be very effective among the stakeholders and the team carrying out the project. Consequently, this influence the positively the risk mitigation process and contingency plan as well as handling the project activities, thus, decreasing the likelihood of risk occurrence in reality. Keil el at. (1998) emphasized on the crucial role that the top

management play, they used the term ‘commitment’ instead of the ‘support’ to highlight their involvement and commitment results in the risk management success. Therefore, they should be proactive from the initiation stage, project life cycle, and until the project close up.

Based on above and aforementioned in the literature the following hypothesis is proposed:

H3: There is a positive relationship between risk response and project success.

### 3.5 Hypothesis 4

Raz and Michael (2001) mentioned that the software engineering institute which is a pioneer in providing various types of methodologies, illustrates the project risk management model by identifying the risks, analysing them, response and tracking and control. Tracking and controlling can be achieved through the use of different tools, in this paper the word monitor is used instead of tracking.

Monitoring the risks is achieved by using different techniques, such as, continuously revising the risk assessment, sporadically reviewing the documents, reporting risk status sporadically, highlighting the critical risk to top management and sporadically reporting risk mitigation plans (Raz and Michael 2001). In order to control the risks, trends should be analysed to compare actual plan with the planned as well as analysing the exceptions. Carrying out contingency plans when the risk mitigation is not sufficient enough and re-planning the project based on the analysis. Establishing procedures for risk closure and carrying out cost and benefit analysis (Raz and Michael 2001). One of the key success in the project is to review the risks periodically and then convey the outcome to the concerned stakeholders. The purpose of the risk monitoring is identifying the emerging risks as early as possible, therefore enhancing risk response. Hence, this increases the familiarization with risk response actions, and which identified risk emerged in the project helps building good knowledge which can be used to determine the risk factors in future projects instead of simply padding unrealistic risks (Teller and Kock2013). Cervone (2006) suggested strategies in order to monitor the risks in the project, risk assessment should be carried out in a continuous basis. This process is an essential process which leads to project success as it enables the identification of the high priority risks at a certain time in the project by all the project members. Nevertheless, project managers don’t favor the idea of flexible planning and changing project response upon emergence of each new event, but changing plans upon availability new data is important for project success. Project risk monitoring provides a learning experience which can be used for future projects. Furthermore, Hillson (2002a) mentioned that monitoring and controlling is the last process of risk management, where the identified risks are monitored continuously, identifying the emerged risks,

review and monitor the risk responses and monitor the changes in risk management through the project lifecycle. Moreover, Hillson (2002a) suggested the following for monitoring and controlling risk management, risk and project review meetings to be carried out to monitor the risks status as well as the status and implementation of the consensus risk response, and the viability of the risk management process to be assessed to make sure it meets the project requirements.

Based on the above the following hypothesis is proposed:

H4: There is a positive relationship between risk monitoring and controlling and project success.

### 3.6 Hypothesis 5

Carvalho and Junior (2015) reported that risk management has positive influence on the project success even if it is not applied very well in the project, hence, identifying risks and dealing with risk as essential in projects. Zwikael and Ahn (2011) in their study about risk management and project success mentioned the following measures for the project success in their conceptual frame work: avoiding time overrun and cost overrun, getting customer satisfaction and attaining project performance. Junior and de Carvalho (2013) in their study the independent variable was project success which was measured by the validating of scope, achieving the desired quality, meeting customer expectations and working as a team. Raz el at. (2002) on their study of risk management on project success had the following measures in the questionnaire to determine the project success as follows: achieving technical objectives, achieving functional objectives and meeting the budgeted cost and time. It is worthwhile to mention the outcome of the risk management on the project, it contributes to holistic success of the project, contributes meeting time and cost, attaining project objectives, getting customer satisfaction, add value to the risk management process in the organization, and contribute in project success for the other projects in same organization (Raz and Michael 2001).

Based on the above mentioned relationship between risk management process and project success, the following hypothesis is proposed which is holistic relationship instead of each process relationship with project success:

H5: There is a positive relationship between risk management and project success.

## 4.0 Research methodology

### 4.1 Introduction

In this paper risk management is studied thoroughly by reviewing the literature, mostly focusing in the articles of international recognized journals. Several risk management standards are introduced. The focus of this study was to assess risk management effect on project success. Survey was used to get the feedback about risk management implementation and project success. In this section the best research approach was chosen which is suitable for this study to come up with result for research questions and achieve research aims and objectives. Research method is chosen in this chapter as well as research strategy. In the last section the most appropriate model is chosen for this research by reviewing various related models, then the hypotheses are proposed as well.

### 4.2 Purpose of the research

Robson (2002) reported that the any study is carried out for a specific purpose in the area that the researcher is interested. The study can be classified as per its strategy; it can be exploratory or descriptive as well as explanatory. Exploratory studies can be used for clarification of certain issue or phenomena. When the researcher is aiming to figure out what is going on that specific event or problem, to come up with new ideas or solutions, or to carry out assessment on the problem in order to make it clearer and easier to find the solutions. As per Saunders et al. (2009) this can be achieved by looking into various literature view on the problem, involving experts to get their views as well as carrying out focus group interviews.

Descriptive approach is used in the studies to describe precisely the conditions, events or people. Nevertheless, descriptive approach can be used to complete a portion of study which is taken from the exploratory or explanatory studies. It is essential to know your problem thoroughly before proceeding to the data collection. When it comes to descriptive surveys, we can always refer to the Domesday Book which explained the England population back in 1085 (Saunders et al. 2009)

Saunders et al. (2009) mentioned that explanatory approach is carried out to test the correlation between different variables, this approach is very important in problems where their relationship between variable is required. This approach can be applied on the quantitative and qualitative data.

In this study exploratory approach is applied. Since the aim of this study is to understand risk management model implementation in the project and it is effect on the project success. Descriptive approach is also adopted since the date first is gathered from the existing literature to understand risk management concept as well as project success notion. Then

explanatory approach is adopted as well, to illustrate the risk management implementation model and its relationship with the project success (Saunders et al. 2009).

### 4.3 Research approach

Theory is used in the studies whether it is mentioned explicitly or not, from the conclusion section it will be clear which theory is used. Nonetheless, knowing what theory is being used in the study is necessary for the researcher to choose the right of the approach. When it comes to the research approaches they are categorized into two approaches, inductive and deductive. In the deductive approach the researcher establishes the theory and propose the hypothesis, then carry out a plan for the study for examining the proposed hypothesis, this approach is used in positivism studies. On the other hand, in the inductive approach the theory is build up from the analysis carried out on data collected. This approach is used in the phenomenology studies (Saunders et al. 2009).

There are two different research methods quantitative and qualitative. Quantitative method is utilized in the collecting data and analysing them, this can be through questionnaire and statistical representation respectively, the data obtained from this method is numerical. In this method the respondents are chosen from field of the study. Statistical tools are the tools which are used to carry out the quantitative method in order to test the variables and hypothesis. Using these methods will lead to objective and reliable outcomes, which can be generalized on the area that respondents were chosen

Conversely, in the qualitative method the data for gathering data which is usually done through the interviews or focused group interviews, the data obtain from this method are not numerical. The data can be words, pictures or even videos (Javalgi et al. 2011). The proposed hypothesis and the tools used to measure them usually are subjective. In this method the research should be involved in the data collection process such as carrying out interviews.

In this paper the theory is clear and the aim of the questionnaire is used to test the hypothesis, hence, the deductive method is used for this paper.

#### 4.4 Research strategy

Research strategy can be defined as the plan that is used by the researcher to get responses for the issues and problems addressed in the paper. There various strategies are used, such as surveys, grounded theory, archival research as well as case studies.

Survey strategy comes along mostly with the deductive approach, the answers are based on questions of where, how and when. Thus, this strategy is usually used for descriptive as well as exploratory studies. Survey is economical and easy way to obtain data from the large population by using questionnaire. Therefore, in this study the survey strategy is used only for data collection, so the mono method is chosen as the is only strategy selected.

## 5.0 Questionnaire

### 5.1 Introduction

The survey is designed to test the validity of the proposed hypothesis, where the hypotheses aim to explore the correlation of risk management with the project success on the construction project in the UAE and the regression test is carried out as well. The questionnaire was prepared into two segments, the first segment was the demographic educational level, their organizational sector, job title and years of experience. The second segment was consisted of four sections to determine the risk management influences on the project success. The first section was about the risk identification followed by risk assessment then risk response, risk monitor and control and project success questions. The number of total questions in the questionnaire are 19 questions. The questionnaire was designed with 5 Likert scale strongly agree, agree, neutral, disagree and strongly disagree coded from 1 to 5 respectively.

### 5.2 Sampling

The questionnaire was sent to respondents through google survey, the confidentiality of the respondents was acknowledged as this paper is used only for academic purpose. Respondents were not asked for their names in order to keep their response anonymous.

As this study is focused in the construction field the respondents were chosen from the construction field with the background in the projects and risk management process, the region was all over UAE as this study is focused in the UAE. The questionnaire was sent to The British university in Dubai students affairs to circulate it to the project management students as most of them are aware about risk management processes and the majority are from construction backgrounds. Secondly, LinkedIn was used to send the questionnaire, proper filtering was used to choose only people from construction background from UAE.

Initially, the questionnaire was sent to 10 colleagues as a pilot test to test the clarity of the questions to the responses, there feedback was taken which was to use simple language and terms which can be understandable from low and top level respondents. Those 10 responses from the pilot test were used as parts of the total responses as the questionnaire was clear for them.

The targeted people were varied from project coordinator to the project director. Most of the respondents were project managers, there was portfolio, program managers, project and planning engineers. This will be discussed thoroughly during the data analysis. It was recommended to all the respondents to circulate the questionnaire with their colleagues from the construction field (snowballing techniques)

### 5.3 Questionnaire instruments

As mentioned beforehand the questionnaire begins with the confidentiality acknowledgment. The total questions were 23 the first segment was about the demographic with 4 questions educational background, type of organization, years of experience and job title. Followed by the second segment which contains both the independents and dependant's variable with their items.

Independents variables are risk identification with 4 questions, risk assessment consists of 4 questions, risk response 3 questions and risk monitoring and contorting with 4 questions. Then, there is one dependent variable with 4 questions with is project success.

The questionnaire was sent to 300 respondents and responses were 124, therefore, the response rate was 41.3% which is a good percentage to get valid analysis. However, there were 5 responses without the full answers they left some of the answers blank, therefore 4 responses were omitted and thus reduced the responses from 124 to 119 responses.

### 5.4 Dependent variable

The project success is the dependent variable, it has 4 items and it was in the last section of the questionnaire. The respondents were requested to answer by the Likert 5-point scale where 1 is strongly agreed and 5 is strongly disagreed.

### 5.5 Independent variables

The independents variables were three, the first is the risk identification followed by risk assessment and finally risk response. The risk identification consisted of 4 items, risk assessment consisted of 4 items, risk response consisted of 3 items and monitoring and controlling risk consisted of 4 items. These three sections were after the demographic segment. The respondents were requested to answer by the Likert 5-point scale where 1 is strongly agreed and 5 is strongly disagreed.

## 6.0 Data analysis

### 6.1 Introduction

In this chapter all the data that has been collected from the survey questionnaire were uploaded in the SPSS. Therefore, the data will be analysed using SPSS in order to test the proposed hypothesis. Hence, first the demographic data will be analysed, then reliability between all the questions will be tested. If reliability is found good, then will proceed with further test the correlation test to test the correlation between the independent variables risk management process and the independent variable project success. Then final test will be regression to test how much dependent variable can be explained by the independent variable.

### 6.2 Descriptive Statistics

As mentioned beforehand the questionnaire was sent to 300 people where only 119 people completed the questionnaire successfully. The questionnaire was sent mainly to project managers in the construction industry in the UAE, they were highly recommended to circulate the questionnaire to the colleagues of friends in the same filed. Most of the respondents were project managers with 64% out of the total respondents. Followed by project engineers 12% and then project directors 10%, program managers were 5 %, planners and planning engineers 3% and 2% for construction managers, portfolio manager and architectures.

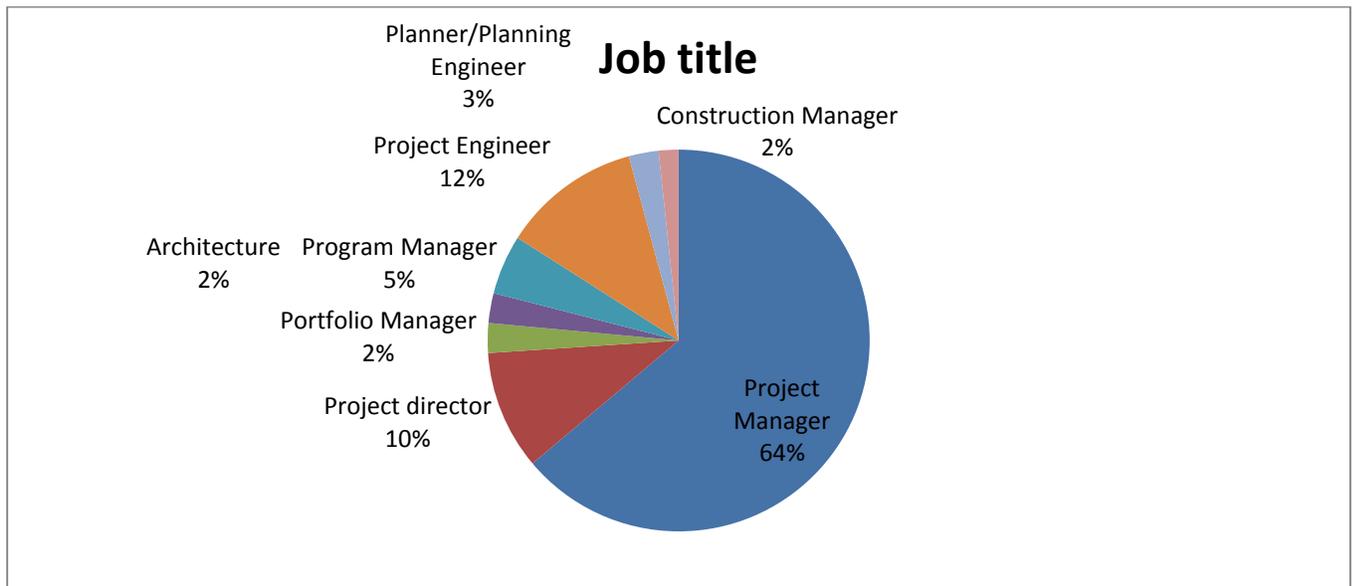


Figure 2: Respondents job title

The respondents were from private, government and semi-government sectors, from the private sectors there were 41%, then from the government 37% and from semi-government 22% as represented in the following figure.

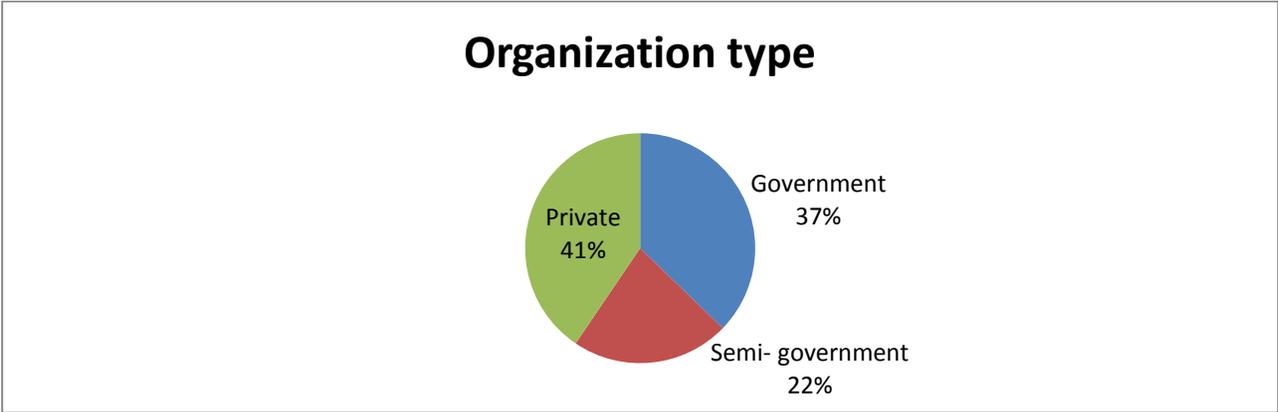


Figure 3: Respondents organizations sector

The respondents were asked to provide their education backgrounds, the majority hold master with 56% followed by bachelor degree 37%, high diploma 4% and Phd 3%.

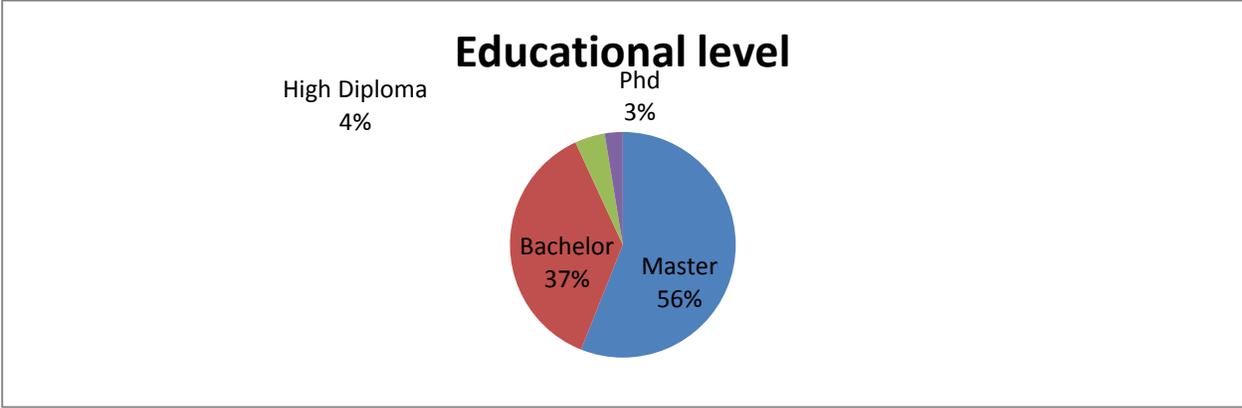


Figure 4: Educational background

The respondents were asked to provide the total experience on the construction field. The majority of the respondents have 7-13 years' experience with 35%, then the respondents

with 14 to 19 years' experience are 30%, respondents with 20 and above experience are 19% and the least are from 2 to 6 years' experience with 16%.

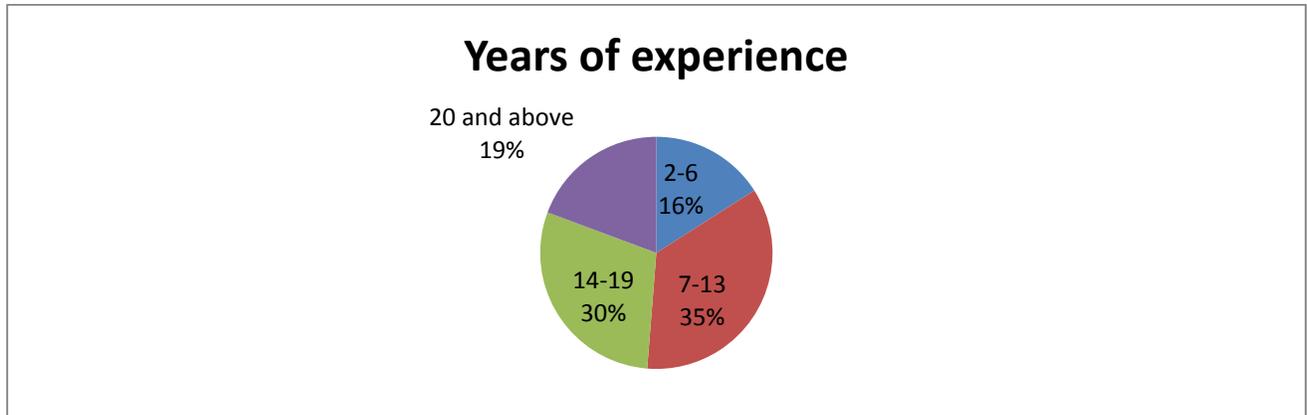


Figure 5: Years of experience

### 6.3 Reliability test

One of the essential measurement for carrying out research is reliability test, this test examines the consistency between the questions (Stainton et al., 2010). ATS (2012) mentioned that in order to measure the internal consistency the Cronbach's alpha value is used to determine this, which can be obtained in the SPSS by carrying out reliability test. Hence, reliability test was carried out for all the 19 questions. In order to get excellent reliability, the Cronbach's alpha should be above 0.9. If the value is more than 0.8 this can be considered good and acceptable for carrying out data analysis on the data obtained from the questionnaire. Cronbach's alpha above 0.7 is acceptable and 0.5 - 0.7 is considered poor, finally Cronbach's below 0.5 is not acceptable for further test as the data obtained are not reliable (Bonett and Wright 2015). For this study the reliability test was carried out using SPSS and cronbach's alpha was found 0.84 for all the 19 questions together, this is a good value and reliable, therefore this will be followed up with the further analysis. However, if the cronbach's alpha value is below 0.7 then it is recommended to use the option in SPSS which enhance the SPSS value by suggesting to delete some of the questions. Since the value in this case was good this option was not used.

Table 1: Reliability test

Reliability Statistics	
Cronbach's Alpha	N of Items
.840	19

## 6.4 Correlation test

In correlation test the relationship between independent and dependent variable is test. The better the correlation the stronger the relationship between the tested variables. There are two measurements in the correlation test in the SPSS, first is the Pearson correlation which is between -1 to 1 and 2 tailed significant. The ideal value for Pearson correlation is 1, above 0.5 is strong correlation, between 0.3 and 0.5 is a moderate, between 0.3 and 0.1 is weak and less than 1 as well as zero indicate that there no signification correlation. On the other hand, if the values are in negative sign then this indicates inverse correlation between variables (Assaf and Al-Hejji, 2006; Nathans el.at ,2012). The significant value should be less than 0.05 for good correlation and less than 0.01 for strong correlation.

The correlation test between risk identification and project success was carried out and the pearson correlation r was found  $r= 0.346$  and significant p was found  $p= 0.000116$ , this indicates a positive moderate relationship between risk identification and project success. This is concurrent with the proposed hypothesis 1.

The correlation test between risk assessment and project success was carried out and the Pearson correlation r was found  $r= 0.273$  which a weak correlation and significant p was found  $p= 0.003$  which is good, this indicates a positive weak relationship between risk assessment and project success. This is concurrent with the proposed hypothesis 2.

The correlation test between risk response and project success was carried out and the Pearson correlation r was found  $r= 0.180$  which a very weak correlation and significant p was found  $p= 0.051$  which is weak, this indicates that is correlation between risk assessment and project success, but it is too weak correlation.

The correlation test between monitoring and controlling risk and project success was carried out and the Pearson correlation r was found  $r= 0.388$  and significant p was found

$p = 0.000013$ , this indicates a positive moderate relationship between monitoring and controlling risk and project success. This is concurrent with the proposed hypothesis 4.

The correlation test between risk management and project success was carried out and the Pearson correlation  $r$  was found  $r = 0.405$  and significant  $p$  was found less than  $0.01$ , this indicates a positive significant relationship between risk management and project success. This is concurrent with the proposed hypothesis 5.

## 6.5 Regression test

Linear regression test is essential in order to understand to independent variable influence on the dependent variable. By knowing this one can predict the change in the dependent variable with regard to the change of the independent variable. For carrying out this test SPSS was utilized to analyze the questionnaire responses. In the regression test the significance is essential, if the  $P$  is not significant then the as mentioned beforehand the correlation will be weak, thus the regression.

For hypothesis 1 the regression analysis was carried out and found that the  $r$  square  $= 0.120$  as shown in the following table, this explains that 12% of the dependent variable project success can be predicted by the independent variable risk identification.

*Table 2: Regression analysis for H1*

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.346 <sup>a</sup>	.120	.112	2.48427

a. Predictors: (Constant), Identification

$F = 15.919$  and  $p$  is less than  $0.01$ , hence project success and risk identification have contribution to the regression test. The following table shows the constant and beta, the constant is  $5.160$  which means that the project success value is  $5.160$  upon the zero value of risk identification. Beta value is  $0.346$  this means the project success value is predicated to be changed by  $0.346$  upon the one unit change in the risk identification.

Table 3: Regression analysis for H1

Coefficients						
Model		Un standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.160	.765		6.741	.000
	Identification	.363	.091	.346	3.990	.000

a. Dependent Variable: project success

For hypothesis 2 the regression analysis was carried out and found that the r square =0.075 as shown in the following table, this explains that 7.5% of the dependent variable project success can be predicted by the independent variable risk assessment.

Table 4: Regression analysis for H2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.273 <sup>a</sup>	.075	.067	2.54693

a. Predictors: (Constant), Assessment

F= 9.459 and p is less than 0.01, hence project success and risk assessment have contribution to the regression test. The following table shows the constant and beta, the constant is 5.782 which means that the project success value is 5.782 upon the zero value of risk assessment. Beta value is 0.309 this means the project success value is predicated to be changed by 0.309 upon the one unit change in the risk assessment.

Table 5: Regression analysis for H2

Coefficients						
Model		Un standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.782	.781		7.400	.000
	Assessment	.309	.101	.273	3.076	.003

a. Dependent Variable: project success

For hypothesis 3 the regression analysis was carried out and found that the r square =0.032 as shown in the following table, this explains that 3.2 % of the dependent variable project success can be predicted by the independent variable risk assessment.

Table 6: Regression analysis for H3

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.180 <sup>a</sup>	.032	.024	2.60487

a. Predictors: (Constant), Response

F= 3.896 and p is 0.051, hence project success and risk response have contribution to the regression test but is not significant enough. The following table shows the constant and beta, the constant is 6.387 which means that the project success value is 6.387 upon the zero value of risk response. Beta value is 0.278 this means the project success value is predicated to be changed by 0.278 upon the one unit change in the risk response.

Table 7: Regression analysis for H3

Coefficients						
Model		Un standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.387	.888		7.191	.000
	Response	.278	.141	.180	1.974	.051

a. Dependent Variable: project success

For hypothesis 4 the regression analysis was carried out and found that the r square =0.150 as shown in the following table, this explains that 15% of the dependent variable project success can be predicted by the independent variable risk monitoring and controlling.

Table 8: Regression analysis for H4

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.388 <sup>a</sup>	.150	.143	2.44084

a. Predictors: (Constant), Monitor and control

F= 20.690 and p is less than 0.01, hence project success and risk monitoring and controlling have significant contribution to the regression analysis. The following table shows the constant and beta, the constant is 4.763 which means that the project success value is 4.763 upon the zero value of risk monitoring and controlling. Beta value is 0.442 this means that the project success value is predicated to be changed by 0.442 upon the one unit change in the risk monitoring and controlling.

Table 9: Regression analysis for H4

Coefficients						
Model		Un standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.763	.762		6.252	.000
	Monitor and control	.442	.097	.388	4.549	.000

a. Dependent Variable: project success

For hypothesis 5 the regression analysis was carried out and found that the r square = 0.164 as shown in the following table, this explains that 16.4% of the dependent variable project success can be predicted by the independent variable risk management.

Table 10: Regression analysis for H5

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.405 <sup>a</sup>	.164	.157	2.42138

a. Predictors: (Constant), Global risk

F= 22.913 and p is less than 0.01, hence project success and risk management have significant contribution to the regression analysis. The following table shows the constant and beta, the constant is 3.451 which means that the project success value is 3.451 upon the zero value of risk management. Beta value is 0.159 this means that the project success value is predicated to be changed by 0.159 upon the one unit change in the risk management.

Table 11: Regression analysis for H5

Coefficients						
Model		Un standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.451	.991		3.481	.001
	Global risk	.159	.033	.405	4.787	.000

a. Dependent Variable: project success

## 7.0 Discussion

### 7.1 Introduction

In this chapter the results from the analysed data will be discussed and will be synthesized with the literature in order to come up with appropriate argumentations and results. The relationship between variables are discussed, the relationship between risk management and project success, the relationship between each risk management processes (risk identification, risk assessment, risk response and risk monitor and control) and project success is discussed as well.

### 7.2 Discussion

The project identification variable correlation was test with the project success and found significant correlation between them. This can be explained that the measures which were used in risk identification have great influence in project success. This is concurrent with Carbone and Tippett (2004) where they stated that risk identification is one of the key success for the project, they argue that in order to achieve successful project risk should be identified in the very early stages. Additionally, Boehm (1991) and Ahmed el at. (2007) mentioned that risk identification processes aim to achieves successful project Thus, this is a vital process for the risk management model, if this part is not carried out properly the entire risk management will not be effective as there are important risks were not identified in this process. In order to identify the risks, the check lists should be used, documentation and lessons learned from the similar project should be used, interview as well as brainstorming tools are essential tools in identifying the risks.

The correlation test was further applied on risk assessment and project success and the correlation was found positive but weak. Nevertheless, in the literature it was found that the risk assessment is an essential process in the risk management model. As mentioned by Fabricius and Buttgen (2015) that assessment of the likelihood and the consequences of risk help to attain successful project. This weak relationship can be justified that the most respondents are not aware about the tools and software that are used in the risk assessment. Furthermore, the questions in the survey were too general about the risk assessment as shown in appendix 1, the questions were whether they use qualitative or quantitative method. However, in the literature mostly they mention the software name that is used to carry out the risk assessment. Such as, event tree analysis and Delphi technique.

From the result of the correlation analysis on the independent variable risk response and dependent variable project success the correlation was found was found positive but weak. Contrary to the literature where risk response was a major process on risk management as implied by Zwikael and Ahn (2011) that risk management leads to decrease the amount of the risk in the project, that is achieved first by risk identification then by assessing the risk events, establishing risk response and monitor the risk during the project life cycle. Risk response should take place when the risk occurs. There are some tools which have positive impact on project success such as, planning charts and influence predictability matrix. In order to have a good risk response the crucial risks should be reported immediately to the top management and should be given high priority. The tools and techniques which were mentioned for risk response in the questionnaire are not the all tools there are some other tools which were not covered in the questionnaire, some of the respondents may not be aware about the tools mentioned in our questionnaire.

From the SPSS correlation test on the independent variable risk monitoring and controlling and dependent variable project success. The relationship between the risk monitoring and controlling was found positive and significant. This is concurrent with Cervone (2006) where he suggested that risk monitoring and controlling should be applied throughout the project lifecycle in order to achieve successful project. Risk monitoring and controlling is one of the main process in most of the risk models and in this paper as well. Risk should be monitored and controlled throughout the project, in risk monitoring and controlling and the process are engaged such as risk identification. Risks don't remain the same throughout the project lifecycle some of risks emerged and identified and there are risks which don't exist anymore as the pertaining activities are completed. In order to carry out risk monitoring and controlling, charts and trends should be analysed to report them periodically, one risk is over it should be closed in a systematic manner as per the risk closure procedure. It is important to report the status of the risk mitigation, the status of the risk mitigation whether the risk mitigation was successful or not, this should be reported periodically. The failure of the risk mitigation means that the risk response action should be taken on that specific event or situation. During the risk monitoring and controlling all the risks are monitored, thus, the top management will not be interested in the risks. Only the critical risk should be reported to the top management in order to expedite finding solutions and taking risk response.

A global variable was created which was named risk management variable which consisted of risk identification, risk assessment, risk response and risk monitoring and controlling. The correlation test was carried out to test the relationship between risk management and project success instead of testing each process relationship as carried out earlier. The

correlation was found positive and significant. This affirms the pervious literature such as Raz el at. (2002) on their study of risk management on project success where they mentioned the following measures in the questionnaire to determine the project success as follows: achieving technical objectives, achieving functional objectives and meeting the budgeted cost and time. The similar questions were used in this study and the correlation was found strong and significant and in the regression test it was found that the project success can be influenced by 16.4% by the risk management. These findings emphasize the important of the risk management on achieving the scope is achieved without any differ from the original objectives, technical specifications, quality, and most importantly avoiding time and cost overrun thus successful project.

The strongest correlation was found for hypothesis 5 which is between the risk management and project success. Though there were some processes with insignificant correlation with the project success but the overall risk management is very effective in project success. Hence, the construction industries should give high priority to risk management and more importantly spread the awareness of the risk management models such as ISO 3001, or to create their own risk management model as per the needs and requirements. The awareness should focus in each process such as identifying risk, assessment, response and monitor and control. Instead of the risk management as a lot, this is suggested in this paper as the findings of weak corrections between some of the project process and project success.

## 8.0 Conclusion

### 8.1 Introduction

This is the last chapter in this study, this chapter will summarise all the findings and results and it will show how the research questions, objectives and aims were achieved. This shall explain how the proposed hypothesis were successfully achieved and accepted. Then the last part will explain the limitation of this study and recommendation for future studies.

### 8.2 Summary

The main aim of this study was to explore the relationship between risk management and project success in construction industry. Hence, in the literature review the project success was reviewed thoroughly from the previous literature and all different measures of project success were mentioned generally in all types of projects. This gave us the ability to proceed further as it was clear what is meant by project success from all the aspects. Additionally, the risk management was reviewed holistically from the previous literature. Then while reviewing the risk management model, various models and standards were found which are used in different projects and region. In all the models the three main processes were mentioned, risk identification, risk assessment and risk response. This implies the importance of these three processes which were included in this study model with additional processes risk monitoring and controlling and project success.

Some questions were posed in the beginning of this study such as, examining the relationship between project success and risk management and the type of relation between these variables. As aforementioned the model was adopted and the survey strategy was adopted in order to obtain the data from the respondent and further analyse them using SPSS. These questions were answered after carrying out correlation test and regression test in the SPSS. It was found that there is a significant relationship between project success and risk management, and this relationship was found positive the more the risk management the more the project success.

This study model can be applied in any type of construction projects as well as any other project to manage the risks in the project. As per the findings of this paper the most important process is risk identification and monitoring and controlling. This is concurrent with the literature that suggests that risk identification is very crucial in the risk management process, as it is the first step. In risk identification all the stakeholders should be involved because there are some risks which cannot be important or can be identified by one party but it can be identified and crucial for the other party as well as crucial for the entire project.

success. Therefore, brainstorming, lessons learned from past similar projects, check lists and other tools and techniques are used to identify risks. In a very simple way if risk factors are not identified the further process cannot apply such as risk assessment and response. The second strong correlation was found with the risk monitoring and controlling, in risk monitoring and controlling all the processes are monitored and redone again periodically as shown this paper model. Risk is identified throughout the project life cycle this is part of the monitoring and controlling. Risk assessment and risk response are monitored and tackled during risk monitoring and controlling. Risk management must be applied in the construction projects as it has a huge influence in exploiting project opportunities and avoid as well as manage the threat.

### 8.3 Recommendation

The biggest dilemma for this study was to get the respondents for the questionnaire. Therefore, it is recommended to conduct more studies in the construction projects targeting bigger number of population. The study was applied in construction industry in general, it was not made specific for any party such as focusing only on client side, contractor or consultant. It is recommended to carry out similar studies and focusing in only one part then we can predict which party is more aware about the risk management and its influence on project success. This can be done by adding a question in the questionnaire in the demographic part which should be about the nature of the organization whether it is client, contractor or consultant. It is also recommended to carry out qualitative studies on risk management and project success. In qualitative study using interview is more effective to collect data with good quality as the person is in front of you and of course he will give the full attention to the researcher to provide the answers and information the researcher requires. Speaking about the quality it is important to mention that in the survey strategy the limitation is to find the respondents and once found most of them don't answer or answer but not focused or interested. Additionally, in qualitative approach the case studies can be used to focus in some real life data or to use focused group to get more ideas and insights about the project management.

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## Appendix 1: questionnaire

<b>General information</b>					
<b>Education:</b> <input type="checkbox"/> Diploma <input type="checkbox"/> High Diploma <input type="checkbox"/> Bachelor <input type="checkbox"/> Master <input type="checkbox"/> PHD	<b>Organization sector:</b> <input type="checkbox"/> Government <input type="checkbox"/> Semi government <input type="checkbox"/> Private	<b>Job level:</b> <input type="checkbox"/> Top management <input type="checkbox"/> Middle level <input type="checkbox"/> Entry level	<b>Years of experience:</b> 20 and above <input type="checkbox"/> 14-19 <input type="checkbox"/> 7-13 <input type="checkbox"/> 2-6 <input type="checkbox"/> One year		
<b>Independent variable</b>					
<b>Risk identification</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly disagree</b>
Risk is identified from the lessons learned, similar past projects					
Check list is used for risk identification					
Risk is identified by interviews					
Brainstorming is used for risk identification					
<b>Risk assessment</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly disagree</b>
Risk is analysed based on its likelihood					
Risk is analysed based on its impact					
Risk is analysed by using qualitative analysis					
Risk is analysed by using quantitative analysis					
<b>Risk response</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly disagree</b>
Planning charts is used for risk response process					
Influence predictability matrix is used for risk response process					
High priority is given to the risks which has high negative impact the objectives					
<b>Risk monitoring and contorting</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly disagree</b>
Trends are analyzed and reported periodically					

Risk is closed systematically as per the procedure					
Risk mitigation status (success/failure) is reported periodically					
Critical risks are reported to the top management					
<b>Independent variables</b>					
<b>Project success</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly disagree</b>
The scope is achieved without any differ from the original objectives					
Project achieved the technical specifications					
There is no cost overrun					
Project is completed within or ahead of schedule					
Project achieved the required quality					