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How to Measure the Effect of Project Risk Management Process on the Success of Construction Projects: A Critical Literature Review

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Abstract:

Problem background: The problem of this research paper is centred on project risk management process and its relation to the success of construction projects. Organizations, project managers and all other stakeholders have been complaining of myriads of challenges on how to identify critical factors that can lead to project success. This issue has made these scholars and practitioners to concern themselves with the issue of project success and try to establish some other appropriate factors that measure project success from early as 1960s. These scholars have identified different critical success factors of construction project but how it is impacted on by risk management process is a research gap that this study will try to fill.

Purpose: The purpose of this research paper is to establish the effect of project risk management process on the success of construction project.

Methodology: The study empirically review literatures on the theoretical framework of project risk management process and its relation to project success in construction industry

Conclusions: The study found out that risk factors have significant impact on the success of constructions project success regardless of the type or complexity of the project. This means that the traditional success factors of cost, scope, time and quality are universally inherent in all construction projects and should always be considered as a base for all other forms of critical success factors however this is not a guarantee of project success since the main weakness of project success is not from the traditional success factors but rather the society that is pressurizing project managers to succeed in all tasks. Therefore, critical success factors are necessities aimed at supporting projects managers in tracking various risk factors associated with projects and make an informed decision.

Recommendations: Therefore, project managers need to develop a more appropriate critical success factor identification technique in order to avoid the problem of over planning or under planning at the start of the project. When the construction project is being planned, an appropriate measuring tool for critical success factor analysis may need to be identified and defined; this is a gap that needs further research. Also, the literature review on was limited to construction projects only and it is not exhaustive thus confirmation of this work may be done in other sectors.

Keywords: *Project, risk, risk factors, risk management, project management, project success, success criteria and critical success factors.*

1. Introduction

1.1. Problem Background

Project management is a tool that helps organizations to execute designated projects effectively and efficiently. (Sandro Azzopardi, 2015). However, despite the globalization and much acquired knowledge for organizations to engage in project management, the use of project management tools and techniques does not automatically guarantee project success (Burke, 2003). This implies that one of the most important functions of Project management is to ensure project success (PMBOK, Guide, 2008). In fact, project managers, organizations and all other stakeholders have been complaining of myriads of challenges on how to identify critical factors that can lead to project success. Project management practitioners and researchers like Baker B.N, Murphy D.C, Fisher D, (1988), Pinto J.K, Slevin DP, (1988), Lechler T. (1998) and others are concerned with why some projects are perceived as failures even when they have met all the traditional standards of success, that is completed on time, completed within budget, and meeting all the technical specifications and yet others are considered successful even after failing to be completed on time and not completed within budget. These issues have made scholars to concern themselves with the issue of project success and try to establish some other appropriate factors that measure project success from early as 1960s. However, despite all this effort to ensure project success, the end result keeps on disappointing stakeholders thus resulting in project failures. (O'Connor M.M, (1990); Standish Group, (1995); and Cooke-Davies

TJ. (2000)). These scholars have identified different approaches of construction project success but how it is impacted on by risk management process is a research gap that this study will try to fill.

The society within which project managers operates, believes in project success and has increasingly become less and less tolerant of failures thus end up exerting a lot of pressure on project managers to minimize the possibilities of project failures (Kishk, M and Ukaga, C, 2008). This increasing pressure on project managers for successful project delivery has forced all those who are involved in projects to concern themselves with related project risks and how they can be effectively managed. (Edward and Bowen, 2005). In fact, Boddy, 2006, confirms that almost all projects including construction projects are exposed to the threats of cost overrun, delayed schedule, failure and desertion and there is likelihood of failing to meet the quality standards and the set objectives of the project. Therefore, the issue of delayed schedule and cost risks makes it absolutely necessary to understand the relation between project risk and project success.

However much project managers do planning, it is not easy to overcome risks or uncertainty (Clifford F. Gray & Eric W. Larson, 2009). In fact, Peter Koen *et al*, (2007), confirmed this when they argued about barriers and/ or risks that can influence the process of project outcome. Koen *et al*, describes these risks as having a cause and effect. These risks they say can be either positive risks which provide opportunities to the organization or negative risks that become a threat to successful project delivery.

1.2. Construction Industry

Construction like other projects starts with conceptualization of idea, planning, design, and financing and this process continues until the project is complete and ready for use (Chitkara, K.K (1998). Construction is typically done on a specified location for a known client. A Project manager normally manages the construction job beside several other people who are involved in one way or another. Some notable characters in construction industry include construction manager, design engineer, construction engineer or project architect supervises it. (Halpin, *et. Al*, 2010).

1.2.1. Types of Construction

Chitkara 1998 & Halpin 2010 identified three sectors of construction industry. These include:

- i. Buildings – this include both residential and non-residential buildings.
- ii. Infrastructure – This include highways, heavy civil or heavy engineering works likes large public works, construction of dams, bridges, railways, highways, water/wastewater and utility distribution
- iii. Industrial – This include things like refineries, process chemical, power generation, mills and manufacturing plants.

The construction project is a becoming increasingly complexity as it involves risks and uncertainty and requires different type of professional skills to develop a well thought out plan at various phases of the project's life-cycle. (Chitkara, 1998). Chitkara says the success of a construction project from execution to finish needs effective planning.

1.3. Main Objective

The main objective of this paper is to empirically evaluate literature on the effects of project risks management on the success of construction projects.

1.3.1. Specific Objectives

- i. Effect of project risk planning strategies on the success of construction projects.
- ii. Effect of project risk assessment strategies on the success of construction projects.
- iii. Effects of project risk mitigation strategies on the success of construction projects.
- iv. Effect of project risk monitoring and control strategies on the success of construction projects.
- v. Measuring the effect of project risks factors on the success of construction project

1.4. Limitations

This study will limit the discussion to the theoretical and empirical study on projects risk management and its relation with project success of construction projects only.

1.5. Research Organization

This research study is organized in the following order; part one of the study discusses problem background, objective of the study and limitation of the study. Part two is about the theoretical framework and part three is the review of the empirical studies and part four gives conclusion and recommendation of the study.

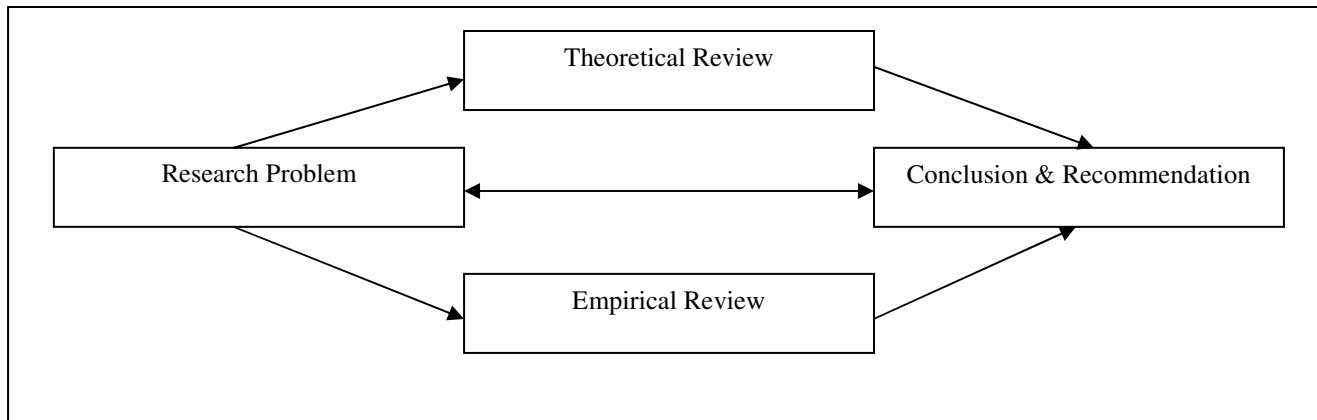


Figure 1

Source: Author: 2015

1.6. Methodology

The study will review secondary data on project risk and project success factors in construction project and draw conclusions and recommendations. Specifically, the study will review journals, books, Articles and magazines on project success and risk factors.

2. Theoretical Framework

2.1. Projects

Pinto J and Slevin D, (1998) and (PMI,2004) argue that the traditional project management involves managing the project planning, organizing, motivating, implementation and controlling resources to achieve specific goals and meet specific success criteria. This view regards project as a task that needs to be finished within a given specification, budget and time schedule. Then what is a project? Different scholars including Kertzer, (2009), PMBOK Guide, (2008), Clifford & Eric, (2006) have tried to define project differently. Though they all tried to define what a project is or is not, these scholars' have agreed on a common thread in their definition. For example, Clifford and Eric defined it as 'a complex, non-routine, one-time effort limited by time, budget, resources and performance specifications designed to meet customer needs'. While, Kerzner and PMBOK Guide, define project as a 'temporary endeavor undertaken to create a unique product, service or result'. But the definitions given by PRINCE2 and Association of Project Management (APM) on the site of ebook.com, looks at projects from business perspectives. PRINCE2 defines project as 'a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business case' while APM defines it as an 'endeavor in which human material and financial resources are organized in a novel way to deliver a unique scope of work of given specification often within constraints of cost and time to achieve beneficial changes defined by quantitative and qualitative objectives'

MPBOK Guide, (2008) states that many organizations define project according to their own understanding and conceptualization. However, all these varied definitions have uncertainty which is inherent in almost all projects due to a consequence of common shared features that characterizes these projects. These features include;

- Temporary nature of project that have a defined beginning and an end and are constrained by scope, cost, time, and quality.
- Uniqueness – projects involve elements that are new and were never done before as mentioned above. This implies that risk and uncertainty is naturally associated with such project.
- Complexity – different projects including technical, commercial, interfaces and/or relational vary in complexity due to size and resources required to be undertaken. These complex issues bring risks to projects.
- People – basically project is about people and it's a group of people who undertake project. This group of people includes project team, project manager, clients, customers, suppliers, contractors and subcontractors are unpredictable and may end up introducing risks and uncertainty into projects.
- Stakeholders – projects involve some dominant group of people who impose requirements, expectations and objectives on the project. These stakeholders may introduce risks at the time of project execution and acceptance either by giving conflicting and/or overlapping requirements.
- Change – all projects involves movement from the present known to the future unknown as they create changes. This movement from present to the future involves risks which is likely to affect the project outcomes.
- Assumptions and constraints – when defining project scope, it is always absolutely necessary to take guess as people make assumptions and design for the future under constraints. These assumptions and constraints may be misleading thus end up introducing risks and uncertainty into projects.
- These risks and uncertainty defines what a project is all about. (Belassi & Tukel, 1996).

Types of projects: Projects are categorized into two according to PMBOK Guide, (2008) these are

- i. Engineering projects – These are either Civil, electrical and mechanical engineering projects whose final deliverables are physical objects like buildings, reservoir, bridge, refinery, pre-production sample etc.

- ii. Management projects – These include intangible items, office move, new IT system, marketing campaign and anything else whose objectives is to produce an end result that is not identifiable as a physical item. PMBOK Guide established that almost all organizations including commercial companies, government departments, charities, non-governmental organizations and other non-for-profit organizations are engaging in these types of projects. These Projects vary in sizes and all of them need thorough planning and management to ensure success. (PMBOK Guide, 2008).

2.1.1. Project Management

According to PMI, (2008), one of the largest contributors to project complexity is the project start and finish date which makes the success of projects being undertaken in any organization to be dependent on risk management strategies throughout the project lifespan. This implies that all types of organization regardless of their sizes are bound to engage in project work. Though these projects under takings differ, their success depends on effective management in order to meet their objectives within the constraints of scope, time; cost, and quality (PMBOK Guide, 2008). However; different projects are facing challenges of risks and uncertainty that affect the project success. (Harold Kerzner, 2006).

Project management scholars like Clarke, (1999) and Lock, (1996), argue that the main purpose of project management is 'to foresee or predict as many of the dangers and problems as possible and to plan, organization and control activities so that the project is completed as successfully as possible in spite of all the difficulties and risks'

This means that every project is prone to risks and it is the work of the project manager to understand this (Clifford F & Erik W, 2008). When undertaking a project, risk management attempts to recognize and manage potential and unexpected issues that may occur by identifying, controlling and limiting its impact on project success (Hamilton, 1996).

The practice of project management is one of the ten knowledge areas of project management that dates back to the time of Egyptian Epoch over thousands of years ago. However, the history of the modern project management can be traced to US in mid-1950s where a US Navy and a private chemical manufacturing company engaged in project management. These two organizations engaged in two distinct issues of project planning and control of projects.(PMBOK Guide, 2008).

The US Navy project was concerned with the control of contracts for its Polaris Missile project in areas of research, development work and manufacturing of parts that were unique and was never undertaken before. This project was characterized by high levels of uncertainty since time and cost could not be accurately estimated, thus ended up depending on chance in estimating project completion time. This estimation of completion time was done mathematically using 'Programme Evaluation Review Techniques' (PERT) which was based on optimism, pessimistic and most likely time scenarios. Initially, the PERT failed to consider cost estimates but after some time, the same approach of estimating time was used in cost estimation. Following these three estimation scenario of PERT (optimism, pessimistic and most likely), become one of the best technique to be applied to projects with a high degree of uncertainty (PMBOK Guide, 2008).

The other case was applied by E.I du pont de Nemours company, a private firm that engaged in the construction of a major chemical plant in US. As opposed to the Navy project, this project was dependent on accurate time and cost estimation. Thus ended up developing Project Planning and Scheduling technique (PPS) which was regarded as being more realistic than PERT in estimation of time and cost. PPS was later developed into Critical Path Method (CPM) which became very popular with construction industry. By the year 1970s, almost all public and private sectors have increased the application of PERT and CPM techniques in the management of large budge, schedule driven projects (PMBOK Guide, 2008).

Come the year 1980s, almost all organizations were concerning themselves with issues of quality, come 90s, this changed to globalization but at the turn of the millennium the focus changed to swiftness as firms try compete and outsmart each other. These competitions brought with it challenges as organization engage in continuous development of complex product or services and process thus emphasizing on the increased use of management theories, tools and technique by both public and private firms in defining plans, managing take –to- market projects and synchronizing team led tasks, schedules and resource allocation (PMBOK Guide,2008).

2.2. Project Success

Defining project success is not an easy task (Robert Goatham, 2015). Goatham in one of his Articles on 'why do project fail?' argued that there is no clear basis for differentiating a success and a failure. He states that scholars and practitioners have attempted to define success from their own understandings and in different ways but they are not similar thus made him to classify project success in five different ways. He called these classifications 'Tiers'.

- i. Tier 1: Project is considered a success if it delivers within the scope in respective of schedule and budget performance.
- ii. Tier 2: Project is considered a success if it delivers scope on schedule and within an agreed budget.
- iii. Tier 3: Project is considered a success if it delivers scope on schedule, within the budget and the expected quality standards.
- iv. Tier 4: project is considered a success if it delivers on all agreed project objectives, be it scope, schedule, budget, quality or outcomes like goals to be achieved or strategic positions to be achieved.
- v. Tier 5: a project is considered a success if the product produced by the project creates significant net value for the organization after the project is completed.

These different classes of project success according to Goatham means that a project's relative degree of success or failure may change over time thus ended up putting them into layers. As shown in figure 2 below;



Figure 2: layers of project success, Source: (Callean consulting ltd, 2012)

The layer is divided into two main parts. Namely;

- Project management success- this is the typical dimension in project objectives. These include executing project efficiently on schedule, on budget, scope, and quality.
- The second part includes product success which creates value for the project upon completion. These are scope, quality, meeting organizational and market needs and achieving the desired outcomes

Goatham opine that scholars and practitioner's disagreement over project success because of two reasons which are interconnected dimension for judging success and failure of projects. These two dimensions is equivalent to tier 4 and 5 of his project success definition.

The issue of understanding project success from the point of view of risks is critical since the goal of any project is typically to offer a product, change a process or to solve a problem in order to benefit the organization (Kerzner, 2006). The basic conventional view of project success states that a successful project is the one that is completed within the budget, on time and quality (PMBOK Guide, 2000). However, this traditional view which refers to success factors as either being "Golden Triangle" or "Iron Triangle" is regarded by critics like Harold Kerzner, 1998, in his book on project excellence in project management, while criticizing this traditional view described it as having deficiencies and went ahead to identify five other criteria that he argues can be used to measure project success. This Kerzner's success criteria include; project completion on time, within budget, completed at the desired level of quality, accepted by the customer and resulted in customers allowing the contractor to use them as a reference.

In fact, scholars like Atkinson, (1999) in his study extended the traditional view of the 'The Iron Triangle' to what he called 'The square root' and concluded that according to his understanding this is what project success criteria meant. Atkinson's square root introduced three additional success criteria which he termed the information system to address the issue of the maintainability, reliability, validity, quality of the information used and benefits as regarded in organizations. These criteria can be measured in terms of improved efficiency, effectiveness, increased profits, organizational learning and benefit of the project to stakeholders. The critics of these three new criteria argue that it is not complete and any one can add new element which is identified to be related to the individual project being measured (Atkinson, 1999).

Further, scholars like Ward and Chapman 2003, Turner 2002 and Turner & Simister 2001, also criticized traditional view of project success as being insufficient since it is based on variability events like cost, time and quality only and gives little attention to other existing ambiguities in projects. Turner discredits it further by arguing that the conventional view is narrow as it reflects only the views of the team members and leaves out all the other stakeholders. He suggests that a project success criterion should include all stakeholder's interest's observed over a given time period. Some practitioners of success factor theory like John F. Rockart developed the success factor in to 'critical success factor' in 1979 but its application to many other sectors happened in 1995. (HBR, 1995)

2.2.1. Critical Success Factors

According to Andersen et al, (1995), this approach was first applied in Norway by Kristoffer Grude, where he worked as the managing Director of an information systems supplier. Andersen states that Kristoffer at first looked at pitfalls and things that causes projects to fail. In support of the theory he introduced critical elements within the context of project environment that needs to be controlled so as to increase the likelihood of a successful project outcome. However, Kristoffer argue that even the existence of these factors in a project is not a surety of a success though their absence may contribute to project failure. They recognized some of the critical factors in the success of any given project as; definition of clear goals, Management support, detailed project plan, a defined control mechanism, Communication- client consultation and acceptance throughout the project lifecycle, Competent and technically able project team, Flexibility of the Project Manager to deal with uncertainty, the project owner taking an interest in the performance and impact of effective risk management practices. This critical success factors approach suggests the control of critical elements within project environment arguing that in any organization certain factors are critical to the success of the organization but still remain skeptical and went on to criticize the control of success factors as not being a surety of project success. (HBR, 1995).

According to Belassi & Tukel 1996 project management involves bringing structure and order to various elements of uncertainty in projects. This they say has made different scholars and practitioners including Martin, 1976, Lock 1984, Cleland King 1983, Sayles & Chandler, 1971, Baker, Murphy and Fisher 1983, Pinto & Slevin, 1989 and Morris & Hough, 1987) develop distinct critical success factors as illustrated in table 1 below;

Sayles & Chandler 1971	Martin 1976	Cleland King 1983	Baker, Murphy & Fisher 1983
<ul style="list-style-type: none"> - Project manager's competence - Scheduling - Control systems and responsibilities - Monitoring and feedback - Continuing involvement in the project 	<ul style="list-style-type: none"> - define goals - select project organizational philosophy - general management support - organize and delegate authority - select project team - allocate sufficient resources - provide for control and information mechanisms - Require planning and review. 	<ul style="list-style-type: none"> - project summary - operational concept - top management support - financial support - logistic requirements - facility support - market intelligence - project schedule - executive development and training - manpower and organization - acquisition - information and communication channel - project review 	<ul style="list-style-type: none"> - clear goals - goal commitment of project team - on site project manager - adequate funding to completion - adequate project team capability - accurate initial cost estimates - minimum start-up difficulties - planning and control techniques - task vs social orientation - absence of bureaucracy

Table 1

Lock 1984	Morris & Hough 1987	Pinto & Slevin 1989
<ul style="list-style-type: none"> - make project commitments known. - Project Authority from the top. - Appoint competent project manager - set up communications and procedures - progress meetings 	<ul style="list-style-type: none"> - project objectives - technical uncertainty innovations - politics - community involvement - schedule duration urgency - Financial contract legal problems - Implement problems 	<ul style="list-style-type: none"> -Top management support - client consultation -personnel recruitment -Technical tasks - Client acceptance -Monitoring and feedback -communication -Trouble shooting -characteristics of the project team leader. -power and politics -Environmental events -urgency

Table 2

Source: Belassi & Tukel (1996)

2.2.2. Critical Success Indicators

Critical success criteria used by the proponents of critical success factors like Andersen is illustrated in Table 3 below.

Success criteria	Interested stakeholders	Time scale when this factor is applicable
Increase stakeholder value	Stakeholders and sponsors	End + yearly
Makes a profit for the owner	Owner	End + yearly
Satisfies owners and sponsors	Sponsor and owner	End + yearly
Satisfies consumers	Consumer	End + yearly
Satisfies users and Champions	Users and Champions	End + yearly
Achieves purpose	Users, Owner and champion	End + monthly
<ul style="list-style-type: none"> - Meet specification - Functionality - Flexibility - Reliability - Maintainability - Elasticity - Security 	Users, champion and team	End + Weeks
Time, cost and quality	Project team and users	End
Satisfies project team	Project team	End
Makes a profit for the contactor	Project team	End

Table 3: success criteria for projects, source: Andersen et al, (1987)

2.3. Project Risks

Almost all projects are prone to risks and it is the work of project managers and project management team to understand the levels of risks on the project and then develop and implement plans to mitigate these risks (PMBOK Guide, 2008). The fact of the matter is that no amount of planning can overcome risks or the ability to control chance events (PMBOK Guide, 2008). The type and amount of risk event vary from organization to organization due to complexity and phases of project.(Clifford & Eric, 2006). A risk does not just happen but rather has a cause and its occurrence will definitely have an effect on cost, schedule and quality of the project.

According to studies done by De Meyer et al. (2002), Wideman (1992) was credited as one of the scholar who made the concepts of risk to be understood. Wideman is recognized for setting out the limits of the field of uncertainty by opposing the elements of the unknown and uncertainty. In Wideman's view, uncertainty is considered as a conceptual field that delimit between what is unknown and what is uncertain. In view of this, the origin of project risks can be traced to the field of uncertainties that plays a vital role in almost all forms of project success (PMBOK guide, 2008).

On the other hand, De Meyer et al, complemented the work of Wideman 1992, and classified uncertainty into four types, these he says are; Variability – which is a random variation that is predictable and controllable around the known objectives of cost and timeframe; secondly; he classified it as Foreseeable uncertainty- where he stated that some few known factors do affect the project in a predictable way thus prompting contingency plans of action to be constituted in case of any eventuality. Thirdly, he classified it as unforeseen uncertainty-where he argued that other unpredictable factors also do influence the project outcome but demand for solutions when and only if they occur. Last but not least, he classified uncertainty as Chaos – which exists when there is total confusion due to the presence of completely unpredictable factors that affect the project outcome. (Mobey& Parker, 2002).

Ward and Chapman, 2003, proposed that the whole idea of project risk should be centered on managing uncertainties, arguing that risk is always a threat or an opportunity of uncertainty events to the project success. Their idea was complemented by Shenhar and Dvir (2010) who argued that factors such as the time frames and deadlines, costs, scarcity of resources, inadequate abilities and competencies, among others are some of the risk issues that affect project outcomes.

Figure3 shows the illustration of risk event graphically

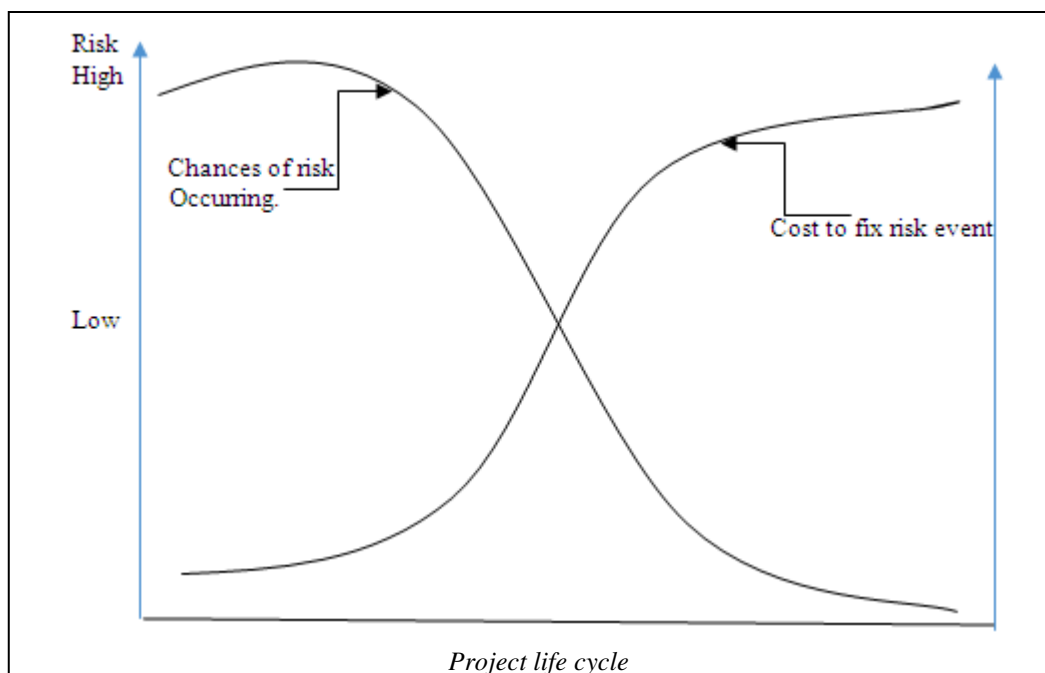


Figure 3: Risk event, source: Clifford & Eric, (2006)

2.3.1. Project Risk Management Process

The issue of effective project risk management processes contribution towards project success is within the framework of project management practitioners. (Thomas & Mullay, 2008). The describe risk management as an instrument of value that is employed by project managers during the planning and execution stages of a project. The instrument of risk management is employed in projects in order to secure project success, regardless of all the unknown and uncertain events that may occur during project execution. In order to determine the value of project management in general for business, it is always important to take into account each individual process element that influences the project outcome

This means that many organizations fail to recognize project within their organization structures and assume that whatever activity which is being undertaken will always succeed. Resulting in no plan of action to identify and analyze the process of risk mitigation and uncertainties associated with projects (PMBOK guide, 2008). In fact, PMBOK guide argues that a good project risk management process depends on supportive organizational factors, clear roles and responsibilities and technical analysis skills. So in order to understand potential risks and assessing risks systematically and quantitatively in anticipation of possible causes and effect, it is important to choose appropriate methods to deal with them (Mobey & Parker, 2002).

The issue of Project risk management process is one of the ten knowledge areas of project management in which a project manager competency is need to ensure project success. (PMBOK guide, 2008). Project Risk Management is aimed at reducing damages and loss, minimizing total cost of risk and identifying, controlling and limiting the effect of the risks (Hamilton, 1996). In order to overcome the issue of risk and avoid conflict in future, it is always prudent to engage in best practices such as communication and risk assessment from the onset of the project specification (Grey, 1995).

Harold Kerzner, (2006), in his contribution towards the theory of risk management in project management, identified six process groupings which includes; risk management planning, risk identification, performing qualitative risk analysis, performing quantitative risk analysis, planning risk responses and monitoring and controlling risks in order to determine how much they change and contribute towards project outcome. In fact, David Hillson, (2003) in his contribution to theory of project risk management opines that effective project risk managers treat risk management as a dynamic part of every project. He ended identifying four important parts which forms the basis of risk management plans. These include; risk identification, risk assessment, risk mitigation and risk monitoring.

2.4. Risk Assessment

Before the process of risk identification, organizations need to assess its potential in terms of the critical business activities including services, resources, manpower, power failures, natural disasters, and illness and so on. Assessing the organization properly will help in identification of the most appropriate factors that are absolutely necessary for undertaking the project. This risk assessment process involves the determination of quantitative or qualitative estimates in identifying potential risk and evaluation of the potential impact of this risk on the project so as to increase the likelihood of project success in meeting cost, performance and schedule objectives. Quantitative risk assessment requires calculation of two components of risk(R); the magnitude of the potential loss (L) and the probability (P) that the loss will occur (David Hillson, 2003). While Qualitative risk assessment is concerned with determining the probability of risk event occurring and the impact the risk will have if it does occur. Impact affects project elements such as schedule, budget, resources, deliverables, costs, quality, scope and performance. (Kim Helman, 2011). The assessment of probability and impact is subjective but needs definitions for it to be an appropriate level of details for any project. (A step-by-step practical guide, 2004). This guide proposes a five-point scale work for almost all project work. The Table 5 below shows this five-point scale;

scale	Probability	Impact
<ul style="list-style-type: none"> • Very low • Low • Medium • High • Very high 	<ul style="list-style-type: none"> • Unlikely to occur • May occur occasionally • Is as likely as not to occur • Is likely to occur • Is almost certain to occur 	<ul style="list-style-type: none"> • Negligible impact • Minor impact on time, cost & quality • Substantial impact on time, cost & quality • Substantial impact on time, cost & quality • Threatens the success of the project

Table 4

Source: A Step-by-Step guide, (2004)

2.5. Risk Identification

The first step in project risk process is the identification of potential risks to the project. Therefore, understanding the scope of the possible risk will help project managers in developing a more realistic and cost effective strategies in dealing with such risk factor. So the success of any project depends on proper identification of all types of risks factors without limit to the obvious. Basically, risks identification is the process of examining the program areas and each critical technical process to identify and document the associated risk. This is both a creative and a disciplined process. The creative process includes brainstorming where the project team prepares a list of everything that could go wrong ((David Hillson, 2003). Hillson suggests the use of Risk Breakdown Structure (RBS) just like Work Breakdown Structure (WBS) where checklists of all potential risks are prepared and evaluation done on the likelihood that those events might happen on during the project lifespan. Thus ended up specifying the main sources of potential risks and categorized them as technical, cost, schedule, client, contractual, whether, financial, political, and environmental and people. The table below gives the risks breakdown structure as suggested by Hillson.

Level 1	Level 2	Level 3	Risk mitigation
Plan move	1. Technical 2. Cost 3. Schedule 4. Client 5. Contractual 6. Weather 7. Financial 8. Political 9. Environmental 10. People	Potential risk	

Table 5: Work Breakdown Structure, source: PMBOK guide, (2008)

The Hillson’s approach helps the project team to identify known risks and plan mitigation strategies; however, this approach is that it is restrictive and less creative in identifying unknown risks and risks not easily found inside the work breakdown structure. (PMBOK guide, 2008).

Further, Boyce (1995) suggests three techniques of identifying risks. These are

- i. Brainstorming
- ii. Interviewing
- iii. Drawing on existing risk database and concludes that these techniques differ in nature and provide the best opportunity in identifying several risks.

2.6. Risk Mitigation

The purpose of risk identification and risk assessment as mentioned earlier is to prepare for risk mitigation. (The owner’s role in project risk management, 2005). This means that the risk management planning is a continuous process and does not stop after qualitative risk assessment, or Monte Carlo simulation or the setting of contingency levels. Risk mitigation plans characterize the root cause of risks that have been identified in the first step and quantified in the earlier phases of the risk management process. Secondly it evaluates risk interactions and common causes. Thirdly it identifies alternative mitigation strategies, methods and tools for each major risk. Fourthly it assesses and prioritizes mitigation alternatives. Fifthly, it helps in the selection and commitment of resources required for specific risk mitigation alternatives and finally communicates planning results to all project participants for implementation. PMBOK guide, (2008) identified four types of risk mitigation strategies that is unique to all organizations. These are risk acceptance, risk avoidance, risk limitation and risk transfer.

- i. Risk acceptance – is a strategy that assumes the risks and does nothing to reduce the effect. This happens when the risk involved outweighs the cost of the risk itself.
- ii. Risk avoidance – this is a strategy which is opposite of risk acceptance. This involves avoidance of exposure to risks whatsoever. This strategy is regarded as the most expensive of all risk mitigation strategies.
- iii. Risk limitation – regarded as the most common risk management strategy in organizations. It limits organization’s exposure to take action. This strategy combines risk avoidance and acceptance in a balanced manner and at times uses the average of the two strategies.
- iv. Risk transfer –this involves handing over risk factor to a third party. For example, an insurance firm.

2.7. Risk Monitoring and Control

This is an ongoing process that systematically tracks and evaluates the performance of risk mitigation actions against established metrics throughout the acquisition process and provides inputs to updating risk mitigation strategies throughout the project lifespan. (PMBOK guide, 2008). Risk control may involve choosing alternative strategies, implementing a contingency plan, taking corrective measures or repeating planning process.

The Table 6 below shows a sample input of risk monitoring and control

Input	Tools & Techniques	Outputs
<ul style="list-style-type: none"> • Risk management plan • Risk response plan • Project communication • Additional risk identification and analysis • Scope change 	<ul style="list-style-type: none"> • Project risk response audits • Periodic project risk reviews • Earned value analysis • Technical performance measurement • Additional risk response planning 	<ul style="list-style-type: none"> • Workaround plans • Corrective action • Project change requests • Updates to the risk response plan • Risk database • Updates to risk identification checklists

Table 6: Source PMBOK guide, (2008)

3. Empirical Study

3.1. Project Risks in Construction Industry

Construction sector is a long term physical assets that operate in markets with high barriers to entry and enable the provision of goods and services ((Cleland and Gareis, 2006). According to Cleland and Gareis, this sector is exposed to high levels of uncertainty which calls for mitigation so as to achieve project objectives and ensure project success. Therefore, all the portfolio of risks associated with all stakeholders in the project life cycle process should be considered. These types of risk issues are characterized by processes such as planning, monitoring and control. The easiest way to identify risk is therefore to analyze and draw a conclusion from projects which failed in the past. Risk management process should be initiated from the onset of the project so as to help in the control of critical factors which can negatively impact project performance. (Tummala and Burchett, 1999).

Hanisch and Wald, (2011) suggest that the environment within which the construction industry operates is vibrant due to the fact that the uniqueness of end product is built on risks and uncertainties. Since the industry changes the natural landscape of earth, it provides human beings with better living conditions. Therefore, the industry is a highly sensitive sector of the economy that comprises a wide range of activities involving alteration and/ or repairs. It is an essentially service industry which obtains its inputs and outputs from various sectors of the economy with which it interacts in a complex way. This industry has a role of planning, designing, constructing, maintenance, demolitions of building and works. Construction industry basically deals with the construction and erection of a building and structures all type of buildings and civil engineering projects such as residential building constructions, bridge erection, railway paving, excavation, demolitions and large scale painting jobs among others.

According to Wells, (1986), almost all developing countries including Kenya, engage in nearly half or wholly in the construction of civil engineering projects such as power projects, irrigations, transport, drainage, water supply and housing projects among others. As these projects pass through different phases of project life cycle, the cost of risk event occurring increases gradually thus affecting project outcome. Such projects are exposed to different sources of risk which can be either internal or external to the organization like inflation, market acceptance, exchange rates and government regulation. Since such external risks are usually considered before the decision to go ahead with the project, they will be excluded from the discussion of project risks. However, external risks pose a great deal of threats to the project and must be addressed. (Clifford & Eric, 2006). The vary characteristics of project teams makes their responses to risks differ, as some are more risk averse than others.

The construction industry faces uncertainty and risks both in developed and developing Countries according to Gale & Fellows, 1990; Ofori, 1990 (as quoted by Rohaniyat Salleh, 2009). Rohaniyat says both Gale, fellows and Ofori identified some risks factors that are inherent in Construction projects and likely to affect project outcome. These risks factors are illustrated in figure 4

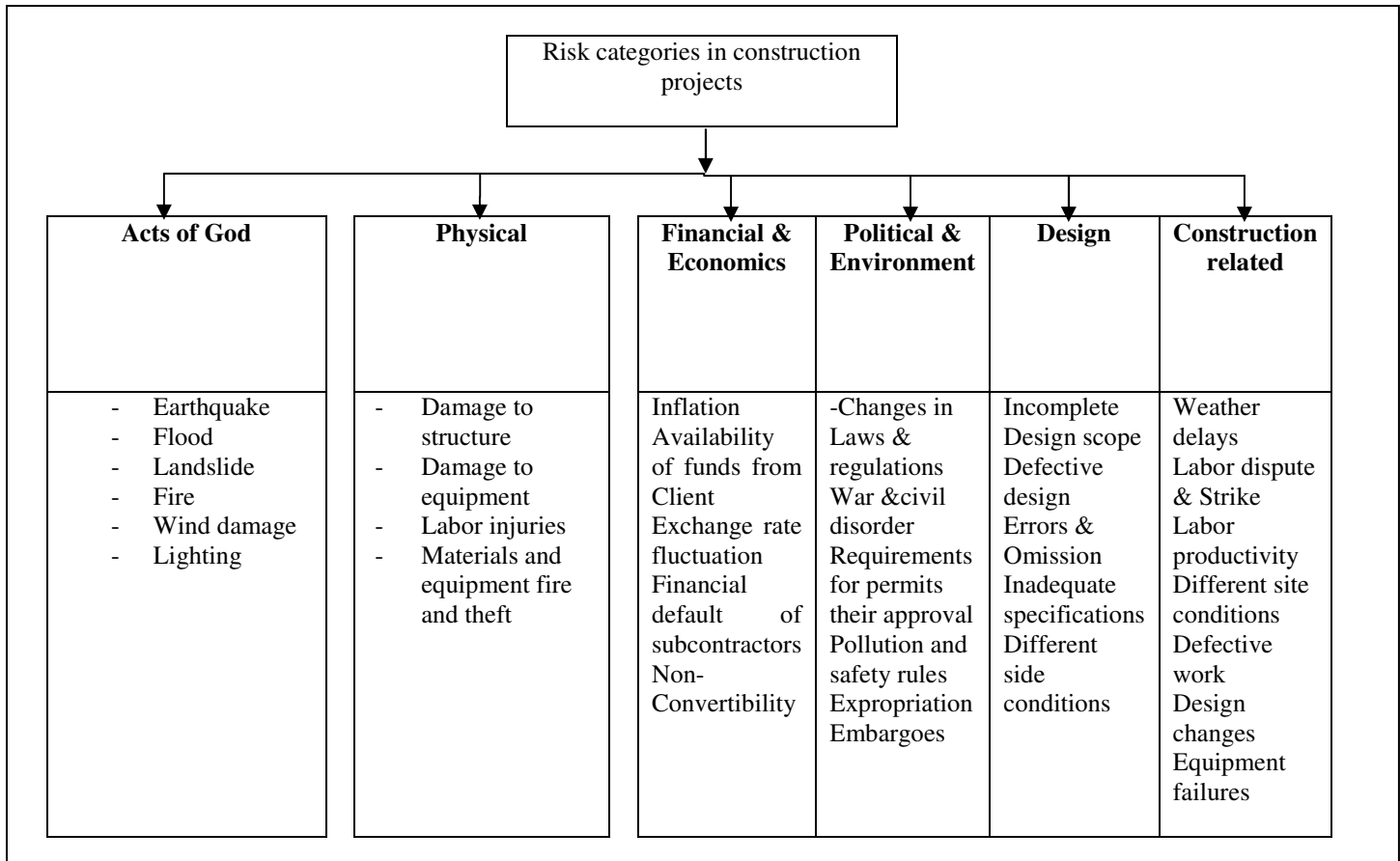


Figure 4: Types of risks in the Construction industry (Al-Bahar, 1990)

There are steps involved in developing risk managing plans, these includes; First; identifying potential risks, second step is for the project team to analyze the identified risks and estimating the probability of risk occurrence and also estimate the potential impact on project goals in the event of risk occurrence. The project team then develops a risk mitigation plan that reduces the likelihood of risk occurrence and its impact on project success. (PMBOK Guide, 2008).

3.2. Project Risks Management and Its Relation to Success of Construction Project

Mohamad Farazi, (2010) in his study of the public construction industry in Malaysian school computer laboratories examined the project success factors throughout project lifespan for 357 projects and used five success factors to investigate the project conceptualization. Farazi found out that only two of the factors out of the five were reasonably defined. These are project goal and project scope. However, he argued that the factor of stakeholder participation was inadequately defined but the other remaining that include resource assessment and risk management were not even put into consideration by the decision making committees. Farazi went on to analyze project planning by these projects and argued that even this issue had deficiencies. He says out of six success factors studied during this phase, only project design and project costing were well planned while the other four including distribution of authority and responsibility, contractor selection, project scheduling and project documentation were insufficiently planned. This inadequacy in project definition and project planning was extended to project implementation phase and the same was reflected where two out of six success factors positively affected the project while the other four which he termed as supervising team efficiency, contractor competence, integrity and external influence affected the project negatively. Farazi concludes by stating that despite the deficiencies identified in the project management, the result of the deliverables was regarded as a success by the target group and the users of the project.

Bing Li, A Akintoye & P J Edwards, (2005), in their study of critical success factors, examined the relative importance of 18 potential critical success factors (CSF) for public private partnerships (PPP)/ Private Finance initiatives (PFI) projects in UK construction industry. They found out that out the 18, there are three most important factors that include a strong and good private consortium, appropriate risk allocation and available financial market. Bing Li et, al. also conducted factor analysis of the 18 critical success factors and argued that appropriate factor groupings revealed the following factors i.e. effective procurement, project implementation, government guarantee, favorable economic conditions and available financial market which they say influences policy development towards PPP and the manner in which partners go about the development of PFI projects. They concluded that these PPPs/PFIs project have experienced casualties but still regarded as a success and yet the reason for the success could not be ascertained.

Kumar Neeraj Jha, (2004), in his study of factors for the success of construction projects in India identified and evaluate 55 success and failure attributes affecting the performance of a construction project. Kumar analyzed the criticality of these factors in influencing the four performance criteria namely; schedule, cost, quality and no-dispute through a two stage questionnaire survey. He conducted factor analysis and revealed a set of 11 success factors and 9 failure factors. Some of the critical success factors he considered include; commitment of project participants, owner's competence, coordination among project participants, favorable working condition, project manager's competence, top management support, conflict among project participants and interaction between project participants. Kumar argued that the contribution of these critical success factors to project success differ among projects. The study found out that coordination which was considered as one of the critical success factors is not an isolated and an independent activity but is actually a typical management function and conclude that there are three broad skill groups when it comes to communication. These are team building skill, contract implementation skill and project communication skill required of an effective project coordinator.

Krishnan V, Ulrich, Karl (2001) in their study argue that the issue of success of construction project like all the other projects it must have a beginning and an end point and should also include risk management practices that allows managers to identify and measure the risks associated with resource constraints and then develop appropriate responses to ensure the achievement of project goals. Therefore, in order to be considered a success, a project must deliver within the constraints of cost, quality and on time; and it must deliver the benefits presented in an organization. These means that a project that did not meet its objectives as expected is considered a failure (PMBOK Guide, 2008).

Tzvi Raz, Aaron Shenhar and Dov Dvir, (2002), studied risk management practices in over hundred projects within different industries in Israel. They examined the extent of usage of some risk management practices such as risk identification, probabilistic risks analysis, planning for uncertainty and trade off analysis, the difference in application across different types of projects and their impacts on various project successes. They found out that risk management practices were not being widely used and thus only limited number of projects in their study have used some kind of risk management practices and many others did not utilize all the available tools.

Elkington and Smallman, (2002), in their case study on the utilities sector management project risk and project success pin pointed that there is a strong link between the amount of risk management measures undertaken and the levels of project success. The duo opines that among the most successful project projects are the ones that use risk management practices and went on to conclude that the more an organization uses risk management practices in dealing with risk factors in project the more the success. In fact, Tinnirello, (2000), argues that ones the risks factors are identified in projects; it increases the chances of overall project success. This outcome can only be affected if risk is not identified and mitigated in time thus becoming a problem at some point in time during the project lifecycle. Therefore, as suggested by scholars like Kerzner, 2001; Maylor, 2003; Burke2003; Rozenes et al, 2006; Project managers should establish control systems that is compatible with project success factors but the issue of concern is how to measure this success factors.

Michael Stanleigh, the CEO of Business Improvement Architect argues that there is a large benefit which accrues from identifying and managing risks in projects because the outcome of a project failure can be disastrous for investors as it results in wastage of Dollars that steals investors profit and consequently impacting negatively on the entire firm. He argues that continuous assessment of risks in projects from its onset throughout the project lifecycle will increase the chances of project success. Michael recommends that project managers need to continue measuring and improving their risk management efforts. He concludes his argument by giving his own understanding of risk management and suggests ten golden rules of managing project risks to ensure success. Michael says risk management is the process of identifying, analyzing and responding to risk factors throughout the life of project in order to provide a rational basis for decision making with regards to all risks. This risk management process should help in developing quality assessment tools to determine and prioritize risks to ensure project success. He suggested the following ten rules of quality risk assessment;

- i. Identifying the risks earlier on in projects
- ii. Communicate about risks
- iii. Consider opportunities as well as threats.
- iv. Prioritize the risks
- v. Assess the risk
- vi. Develop response to risks
- vii. Develop the preventive measure task for each risk
- viii. Develop contingency plan for each risk.
- ix. Register project risks.
- x. Track risks and associated tasks.

3.3. Conceptual Framework

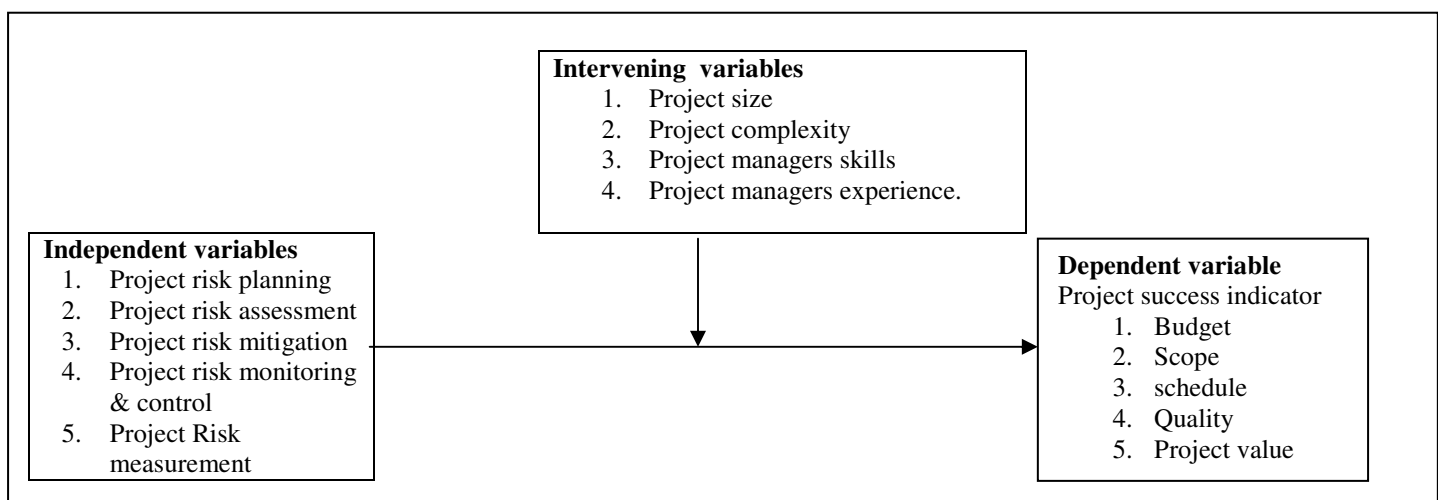


Figure 5

Source: Author, (2015)

4. Conclusions and Recommendation

This research study reviewed empirically the relation between project risks and project success theories. Specifically, the review considered theories with regard to risk management process and its applicability in measuring project success in construction industry. As identified by Al-Bahar in 1990, all the risks factors like risks due to an Act of God, physical risks, financial and economic risks, political and environmental risks, risk due to design and construction related risks associated with construction industry will have an effect on the quality of project outcome. This indicates that risk factor is a condition that is connected to project success in one way or another regardless of the size and complexity of project. Unlike the critical success factors, the traditional success factors of cost, scope, time and quality are found to be universally inherent in all construction projects and should always be considered as a base for all other forms of critical success factors. Furthermore, the main weakness of project success is not from the traditional views but rather the society as confirmed by Edward and Bowen, (2005).

Edward and Bowen, argue that the Society within which the project managers operate has piled a lot of pressure on these managers to ensure project success and is not willing to listen to any issue concerning project failures. Besides, the critical success factors are necessities aimed at supporting projects managers in tracking various risk factors associated with projects and make an informed decision. The success criteria proposed by Andersen et al in 1995 and Bellasi & Tukul in 1996 was a good indicator in identification of some notable success factors. However, not all projects will be affected by these factors due to the size, complexity and purpose of the project. Therefore, project managers need to develop a more appropriate success factor selection procedure so as to avoid the problem of over planning or under planning at the start of the project.

When the construction project is being planned, the appropriate critical success factors may need to be identified and defined using factor analysis as suggested by Kumar Neeraj, 2004, when he studied factors for the success of construction projects in India. However, the identification of critical success factors using factor analysis may not guarantee construction project success. This therefore calls for new techniques of identifying risk factors and also measuring critical success factors in the success of construction projects. Further, this literature review on risks and critical success factors in construction project success is not exhaustive and therefore confirmation of this work may be done.

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