

Key Competencies Required Of Project Managers In Green Construction

By

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## DECLARATION

I hereby declare that this submission is my own work toward the award of this MSc project management and that, to the best of my knowledge, it contains no material previously published by another person or material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been duly made in the text.

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## **ABSTRACT**

The need for green construction has been stimulated by global concerns about climate change and sustainability. It is necessary to ensure that green construction projects are successfully implemented with the growing demand for green building projects. Therefore, since a competent project manager is pivotal factor for the successful delivery of any given project, it is essential to identify the knowledge and critical skills that a project manager needs to effectively implement especially in a green building project. In view of this, this study aimed to examine the key competences required of project managers in the green building sector in the context of the Ghana construction industry. To achieve this goal, the following specific objectives were established, which include: evaluating the level of awareness of project managers in green building, identifying the roles of green building project managers and identifying the key competences required by project managers in green construction. The study adopted a quantitative research approach and with the help of an extensive literature review, a structured questionnaire was developed that were distributed to collect data. The collected data were analyzed using simple descriptive statistics and the Relative Importance Index (RII) method. Findings of the study revealed that there is a great awareness of green building in Ghana, however, clients have pay little attention because, green construction project tends to be capital intensive than the traditional construction project. In addition, five (5) key competencies were identified and required of managers in green construction projects. The order of importance of the key competence requirement includes: environmental competence, social competence, leadership competence, economic competence and interpersonal skills.

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## **DEDICATION**

This dissertation is dedicated to all our family members, friends and loved ones.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background

The notion of sustainability has gained recognition and significance since the last 10 to 15 years (Silvius et al., 2012) and both scientists and professionals have discussed the problem of attaining construction, environment change and social welfare. This awareness occurs when many environmental issues such as pollution of soil and water were created by construction (Pasquire 1999). In addition, commercial and housing structures are accountable for 20-40% of the world's energy consumption, which is increasing rapidly each year.

In addition to consuming big amounts of energy, these structures are also responsible for significant carbon dioxide emission, which can be harmful to the atmosphere as well as perform an enormous part in global climate change (Yudelton, 2007). For this reason, construction may lead in a strain on the environment. Green concept and interventions were adopted to mitigate the harms brought on the environment by constructing sectors into their design. Therefore, the idea of green construction (GB) was launched. GB has many advantages for its proprietor, occupants as well as the environment, as mentioned in most literature (Bond, 2011).

Some research undertaken, however, clarifies that there is a well-known difference between forecast and real green construction performance (Huat and Akasah, 2011; Ng and Akasah, 2013), as there are many project managers and teams who prefer traditional methods used for centuries to sustainable / green design leadership methods (Sharif *et al.*, 2014).

The green construction is still in its infancy in Ghana. Sustainable projects are mostly at the groundbreaking point. Project managers need more commitment to advance towards sustainable construction and are aimed towards achieving the green construction industry (Elvis, 2008). To

begin with the trajectory of sustainable construction, two main factors are required: first, to generate a competent and feasible local construction industry, and second, the industry must meet the requirement for sustainable construction in all operations (Geodknecht, 2012). This will only be feasible if all stakeholders are working together to encourage the implementation of sustainability in construction.

Green construction which is also known as high-performance construction or sustainable construction have been practiced over the centuries. However, in modern era, sustainable construction started in the 1970's with rising oil prices and the need to enhanced energy efficiency (Korkmaz et al., 2010). The high-performance structures are intended and built to integrate economic factors and resources efficiency.

Green construction is a reasonable reaction to a multitude of problems that influence us all: such as increasing energy rates, depletion of water resources, and climate change (Hwang et al., 2013). However, it also has advantages in encouraging the implementation of sustainable construction ideas in the sector (Hwang et al., 2013), as the operating cost of sustainable constructions are more useful than the operating cost of standard structures, enhanced efficiency of green construction can increase the productivity of the users whereas a decrease in emissions and the use of natural resources for sustainable construction can boost the economy of the country. Li et al., 2013).

This study seeks to answer the questions on what are the competencies of green construction project manager and to present some ideas for future studies on competency of green construction project management.

## **1.2 Problem Statement**

The rate of urbanization and industrialization of Ghana is skyrocketing and the standard of living and per capita increase in the consumption of energy since an increase in the economy put greater demands on the infrastructure needed to support these activities. Hence, there is an increase in construction activities which is accompanied by greater amount of pollutions to the environment. Sustainable or green constructions are emerging and with increase in studies concerned with green construction and the criteria for the evaluation of green constructions, there is the issue of procurement as well as codes, standards, regulations and laws that need to be put in place to regulate the operations of green construction projects. Nonetheless little efforts have been made on project management cornered with green construction and remains at the traditional stage of construction project. This is to say that the ideas and concept of traditional construction project management are projected on the that of green construction despite their differences. This study therefore seeks to investigate into the key competences required of a project manager in order to be effectively meet the demands sustainable/green construction within the Ghanaian construction industry.

Gultelian (2013) in his research concerning sustainable construction submitted that, more difficulties are met when pursuing green building projects compared to traditional buildings right from project initiation to execution. Additional goals (saving power, water, soil, equipment, and environmental awareness) must be met in terms of green building compared to traditional building (Hwang, 2017).

## **1.3 Research Question**

1. What is the level of awareness of project managers in Ghana on their knowledge's of green construction?
2. what are the roles of project managers in green construction?

3. what are the key competencies required of project managers in green construction?

#### **1.4 Aim**

The aim of the study is to examine the key competencies required of project managers in green construction.

#### **1.5 Objective**

in order to achieve the above stated aim, the following objectives have been set

1. To assess the level of awareness of project managers in green construction;
2. To identify the roles of project managers in green construction, and
3. To identify the key competencies required of project managers in green construction.

#### **1.6 Scope of the Study**

This research focused on registered construction contractors working within the Accra metropolis. Accra's choice is based on the fact that many construction activities characterized by cutting-edge technologies are located in Accra (Amoah, et al., 2011). Therefore, it is prudent to involve the project managers involved in that project, since their experience and exposure can contribute significantly to this study. However, it is worth noting that although most companies are based in Accra, they work in various parts of the country. This study aimed to examine the key competences required of project managers in green construction. This study focuses on construction companies in Ghana, focusing primarily on construction professionals who have taken over project management functions or worked closely with project managers.

### **1.7 Significance of the Study**

This research seeks to ascertain the difficulties encountered by project managers concerned with green construction processes and based on that data, measures on how the project manager's function can overcome the outlined difficulties that project managers face in the sector of green construction. This study will also contribute to the education sector of sharing data and understanding with others. In addition, this study will help project managers manage the project in a sustainable building process and lessons can be learned, achieving results that will help project managers ensure the project is successful in the future.

### **1.8 Research Methodology**

This research strategically investigated into the success factors for attaining the required competence for green construction project management within the Ghanaian construction industry by considering existing literature on green construction project management. This provided a thoughtful insight and knowledge in the domain of the study. Honest views from professionals of project management were taken to the later. During the exploratory phase of the study, structured questionnaire was carried out to review existing challenges of successful implementation of green construction management. The data was gathered from project managers, architects, structural engineers, services engineers and quantity surveyors and other partners involved in collaborative construction work.

A quantitative approach was used and the study shall include a comprehensive review of literature, collecting and analyzing of data. The technique of simple random sampling and snowball were considered. The data was analyzed with the help of SPSS 21 and Microsoft Excel 2010. In addition to this descriptive statistical tool composed of tables; average and standard deviation; The relative importance index (RII), the factor analysis and the means values was used to assess despondence submissions.



## **1.9 Organization of the Study.**

The study is organized into five chapters. Chapter one deals with the introduction, which includes the background to the study, problem statement, aims and objectives, hypothesis, scope, methodology, justification and the structure of the study; and chapter two considers the review of literature relating to the study. Chapter three shall examine the details of the research methodology while chapter four focused on the analysis and discussion of the data collected for the study; and finally, chapter five included the summary of findings, recommendations for the study and conclusion.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Having a competent project manager is vital to the success of the project. Crawford, 2000 highlighted the critical roles of project managers for the success of the project, and in particular Frank (2002) reported that project managers have a direct influence on the 34% 47% of the project's success. To manage a project in a professional way, a project manager must have the necessary skills and knowledge. However, given the evolving environment of the construction industry with challenges such as skills shortages, the rapid advancement of information and communication technologies and the growing definition of the priorities of topics such as sustainability, environmental protection and climate change, the role of the project manager must adapt.

According to Pérez-Lombard et al (2008), combined commercial and residential constructions account for 20% to 40% of world energy consumption, while in Singapore constructions represent 16% of the nation's total energy consumption. With the growing global concern for the environment, many industries are moving towards sustainable construction and the implementation of green measures. In line with this trend, construction companies in various regions of the world have integrated green elements into their construction plans (Hwang and Tan, 2012) and Singapore has also made sustainable construction a key national priority (Singapore Green Construction Council, 2009)

Because green construction phenomenon continues to develop and gradually attain attention, it is essential to better comprehend the basic characteristics that project managers need to have in managing green building projects. Notwithstanding countless research on project manager's expertise, few have specifically examined which skills the project manager will need to effectively undertake a project requiring sustainable construction. Hence, in order to improve

sustainability attempts without compromising the competitiveness of project managers, this research seeks to evaluate the level of consciousness of project managers in the building of green buildings; identify the roles of project managers in green construction; and identify key competences needed by project managers in the construction of green construction.

## **2.2. Project and Project management**

A project is simply defined as a temporary company and it basically entails the needed resources and group of expertise working together to attain a common objective with a specific duration of time. Usually, after the project is finished, the team will dissolve and move on to another project (if they work together) or return to their normal jobs (depending on the terms of engagement). Typically, each particular is usually unique and is most unlikely that projects will be repeated in precisely the exact form, position and size. a good project is characterized with a well-defined objective on cost, time and resources needed to eventually meet target effectively (Jones, 2007).

A project can be likened to an investment for any business. projects are allocated with resources and funds with the expectation that, the project will benefit or ultimately improve the purpose for which it was initiated. It would therefore make sense to engage a specialist with good financial, managerial and more particular abilities to carry out the project than the purely technical abilities of the engineer or the average technician (Heerkens, 2005).

the origin of project management can be traced back to the U.S in the mid-1950s during the time of aerospace and defense industries whereas actual project management profession started in the late 1960s and evolved in the early 1970s. The Association of Project Managers and the International Association of Project Management were created during this era. Because the discipline was still very young and not well articulated, the impact of project management on large construction, defense and aerospace projects was rather weak during the first 10-20 years.

Following this original stage, individuals started to recognize the wider picture of project management and began to look more critically at project manager training and growth (Morris, 1997).

The primary goal of project management is to coordinate in an economical and timely way a mixture of resources with distinct specialties and duties so that the project concerned can be finished on time and time constraints. project management in construction may be defined in a much more unique way as coordinating resources on a construction site in a convenient and timely manner to achieve timely and budget-free completion of the project (Kangari,1993)."

The construction industry in the United states is characterized at one of the highest industry challenged with failures. It has been demonstrated that mismanagement is one of the primary factors for such mistakes. "Project management therefore plays a significant role in building firms, as the primary source of job is connected to particular activities in building projects. despite the fact that every construction project is unique, administration process applied in most of the construction project remains more or less similar (Isik et al., 2010). "A project manager is an individual officially delegated to deal with a Project with the particular duty of accomplishing targets within the confined resources available. In a perfect world, the project manager ought to have skill in a particular area, just as capacities in planning and management (Jha and Iyer, 2006). Experience in green technology can be connected to the specialized abilities and foundation of most program managers in the construction industry. Therefore, the project manager is responsible for ensuring the delivery of the physical infrastructure specified by the owner within the specified cost, quality, safety and time, requirements. The project manager is the customer-contractor contact point and therefore, accountable for connection between the customer and the construction company. This connection is very essential to complete the present project, but also to receive potential works from the same client (Sculthorpe, 1994).

## 2.3 Green Constructions

There is no single, "generally acknowledged definition for GB (Robichaud and Anantatmula, 2010). In any case, it has been uncovered by numerous ongoing themes that reflect GB as a related way of thinking within a project compared to construction management practices aimed at: (1) minimizing or eliminating of environmental, natural resources and non-renewable energy sources in order to encourage the sustainability of the built environment (2) to improve the wellbeing, prosperity and profitability of the tenants and all things considered; (3) develop monetary advancement and budgetary returns for engineers and whole networks; and (4) apply life-cycle ways to deal with network arranging and improvement." As portrayed by Kubba (2010), GB is a construction planned, constructed and figured out how to be asset productive. In the interim, Zhang (2013) characterized GB as a structure that uses a procedure that is greenly capable and asset effective during the whole life cycle of a construction, from area to plan, construction, activity, support, rebuilding and destruction. Besides, "Glavinich (2008) exhibited that GB phrasing as per the American Culture of Test Materials (ASTM) is a construction that gives explicit execution necessities of the construction by limiting aggravations and improving the working of neighborhood, territorial and worldwide biological systems both during and after construction and administration life."

Despite the fact that there are more definitions, GB alludes to an asset productive construction with negligible obstruction with nature and is regularly cited reciprocally with supportable construction (Hwang and Tan, 2012) and green construction or practical construction (Zhang, 2013). Thirdly, the term GB utilized in this shows supportable or green constructions and/or feasible constructions. The primary propelling element behind GB's construction is to limit the negative effects of construction on the common habitat and give a more advantageous spot to tenants that is productive during the existence cycle than ordinary structures (Doyle et al., 2009). So as to persuade designers, clients and different pieces of the construction to assemble GB,

the benefits of GB must be uncovered. GB offers to diminish vitality and water utilization, just as support, lawful and protection costs, cleaning costs, squander gathering and supply costs (Shiers, 2000). Also, GB offers a market advantage by expanding the cost and estimation of offers higher rents, lower non-attendance and better profitability of the workforce (USGBC, 2003), more beneficial to utilize, improve the sentiment of prosperity (Edwards, 2003) and improve the company pictures (Edwards, 2003; McKee, 2003).

In spite of the benefits of GB, there are numerous obstructions experienced in past investigations, for example, the high beginning expense, absence of client enthusiasm, including proprietors and engineers, absence of preparing/instruction in economic plan and construction, the recuperation of long haul reserve funds isn't reflected in the structure of administration commissions, the absence of specialized comprehension by Subcontractors, low degree of advancement among construction experts (Richardson and Lynes, 2007), a high propensity to keep up current practices and oppose change in the construction segment, obliviousness of green items, restricted or supply of items green, tall expense of green items and absence of trust in the nature of problematic or doubtful green items and items (Korkmaz et al., 2010)

These obstructions emerge in light of the fact that GB is very new with numerous mind boggling forms. Moreover, there are numerous construction industry participants who don't have clear plans to oversee GB projects adequately and effectively. To boost the accomplishment of project success in a coherent manner, the construction industry must, create, develop, and keep up senior project manager (Hwang and Ng, 2013) so the project can be finished inside the time and cost points of confinement built up as per it with arranging, programming and control just as Project duty (Singes et al., 2010). Along these lines, one of the arrangements is to designate a project manager equipped in the management of green or sustainable maintainable constructions (Hwang and Ng, 2013).

## **2.4 Competency Concept and Theory**

The concept of competency was first introduced by Frederick W. Taylor in the early twentieth century, followed by the studies of McClelland (1973), Boyatzis (1982) and Spencer and Spencer (1993). Subsequently, it becomes an intention among researchers, especially in the United States. Several researchers from various disciplines have also conducted competency studies, the discipline of human resource management is the most active discipline in competency studies. According to Parry (1996), competency is defined as a collection of knowledge, skills and attributes that influence individual performance. Competency also refers to the motive, to the personal characteristic, to the skill and ability shown through coherent behavior (Fleisher, 2003).

Meanwhile, Blancero et al (1996) defined competency as knowledge, skills, abilities and other features that demonstrate desired behavior in the future. In addition, it was also defined, based on individual knowledge, skills and abilities. Mansfield (1996) stated that competency is a set of skills and characteristics necessary for workers to do their jobs effectively. According to McLagan (1996), competency consists of knowledge and skills that underpin effective performance. On the other hand, Mirabile (1997) suggests that key competences are related to skill, ability or characteristic with a relationship or influence in high performance jobs. Rothwell et al (1999) have also defined competency as a field of knowledge or skills necessary to produce identified results. Production in this context refers to the product or service that satisfies the need for human resources construction towards the company.

In the study by Rifkin et al (1999), the easiest way to understand competency is to refer to everything a person requires to do a job perfectly. Holmes and Joyce (1993) also define competency as an action, a behavior or results shown by individuals who are connected to the ability to transfer skills and knowledge to new situations within their career. Within this definition, Meyer and Semark (1996) added "trait" and "value orientation" in describing the

meaning of competence. Furthermore, Hammersley and Tynon (1998) defined the definition of competence of the "Manager of Hospitality, Catering and Institutional Education" as the ability to carry out work activities.

As the sector changes, project managers face new problems and roles as part of their responsibility (Edum-Fotwe and McCaffer, 2000). Many project managers and project teams have difficulty adapting new practices, so they refused to accept changes in sustainable or green project management practices from conventional practices that have been used for decades (Sharif et al., 2014). Therefore, it is necessary to understand the fundamental attributes that the project manager must possess to manage green construction projects. A competent project manager (Robichaud and Anantatmula, 2010) is required to carry out a successful project based on the customer's cost expectations. Although there is a standard for project management, the role of project managers in achieving sustainable construction is poorly indicated with their lack of competence in considering the sustainability aspects of their projects (Silvius and Schipper, 2014). Similarly, in Ghana, the project manager and the project team are among the key factors contributing to the successful implementation of the green construction project (Sharif et al., 2014).

According to Klein (1996), the key competences are the behavior of people who consistently demonstrate superiority over ordinary artists. In addition, Bond (2011) stated that basic skills are any personal knowledge, skills, abilities or qualities expressed through behaviors that can translate into excellence in a service. Furthermore, competency is often associated with the iceberg theory introduced by Spencer and Spencer (1993). In this theory, competency is described as an iceberg at sea level, which is divided into two parts, namely the visible part and the hidden part. The visible part of the iceberg represents knowledge and skill. Meanwhile, the hidden part represents interpersonal, motive / characteristic / concept and value.



Although different definitions have been found, the "competence" in this document refers only to skills and knowledge, which is the visible part of the iceberg, since it is easy to form with respect to the hidden part (Sail, 2010). Knowledge is awareness, information or understanding of facts, rules, principles, guidelines, concepts, theories or processes necessary to perform a Project successfully (Marrelli, 2001). Knowledge can be concrete, specific and easily measurable, or it can be more complex, abstract and difficult to evaluate (Lucia and Lepsinger, 1999). A skill is the ability to perform mental or physical Projects with a specific result (Marrelli, 1998). Similar to knowledge, skills can range from highly concrete and easily identifiable Projects, such as archiving documents in alphabetical order, to those that are less tangible and more abstract, such as managing a quality improvement project (Lucia and Lepsinger, 1999) Figure 1 illustrates the iceberg theory.

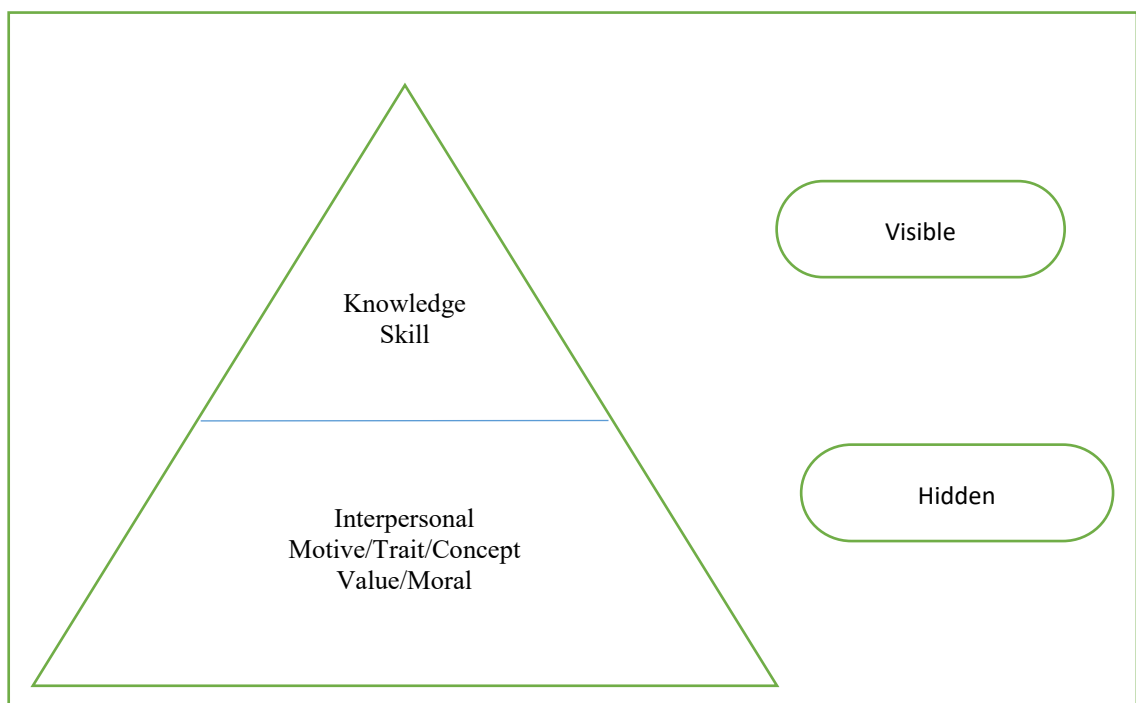


Figure 1: Iceberg Theory by spencer and Spencer (1993)

## **2.5. Project Management Competencies for Green Construction**

The project manager is an individual with the responsibility to ensure the flow of a project from planning, construction and obtaining approval for each construction project (Meredith & Mantel, 1989). Among the construction parties, the project manager is important and vital to the success of the project (Hwang and Ng, 2013) and has a direct influence on 34-47% of the project's success (Toney, 2001). According to Sharif et al. (2014), there will be no project without project manager. Many researchers have mentioned the importance of a project manager competent for the success of a project (Turner and Zolin, 2012) with several researchers such as Avots (1969), emphasizing the critical abilities of the project manager through their studies. In parallel with the results of Ahadzie (2007), there is a growing awareness among industries of the relationship between achieving project success and construction project management skills. Now, successful construction companies are focusing on ensuring that the project manager has the key skills needed to fulfill their Projects in achieving customer satisfaction. Project managers are believed to play a crucial role in completing a project.

Once again project manager aptitudes or capabilities can be contrasted and general administration abilities. Two significant contrasts between Project the manager and general administration abilities are that each project attempted by a company is interesting and has a characterized beginning and end date. An undertaking is in this way of a transitory sort, rather than the administration of a company that is overseen as a consistent concern.

Project the manager can be separated into various parts, including arranging, association, execution and control. Arranging is fundamental with the goal that it is conceivable to distinguish what should be possible so as to compose it to recognize how it will be finished. These plans must be continually actualized and checked to guarantee that the project stays in

accordance with the arranged determinations, quality, time and assets (Jones, 2007). To deal with every one of these segments, various aptitudes or capacities of the undertaking Project and Project group are required.

Construction Projects are one of the most troublesome zones in which to apply project the manager's strategies, because of the run of the mill idea of construction projects, which ordinarily include emergencies, vulnerability and tension, which consolidate to exhibit the last evidences to the Leader of the undertaking in charge of the undertaking. project. Along these lines, project in the construction division must consolidate their specialized information with powerful collaboration abilities and relational abilities in regions known as key skills. Recognizing, assessing and accurately keeping up the particular skills of the project and of the segment where the Project works is essential for the accomplishment of an undertaking (Dainty et al., 2005).

Project manager's aptitudes in the construction division incorporate general and the manager abilities, just as the specialized abilities of conventional designing territories (Edum-Fotwe and McCaffer, 2000). The specialized abilities required by a construction project director are explicit to the construction business, while other increasingly broad administration aptitudes can be effectively moved between different Project the manager's disciplines (Edum-Fotwe and McCaffer, 2000).

A portion of a broader aptitude or capacity incorporate pioneers, correspondence, arrangement and critical thinking (Edum-Fotwe and McCaffer, 2000). The information regions are generously bigger than the fundamental aptitudes or capabilities. These subject matters incorporate time the manager, cost the project, obtaining the project, quality administration, correspondence, hazard recognizable proof and the managers, field distinguishing proof and the managers and the managers of HR (Edum-Fotwe and McCaffer, 2000). Different aptitudes recorded by various creators incorporate social skill, enthusiastic insight and the significance

of vision, values and convictions (Thomas and Mengel, 2008), the capacity to accomplish project destinations, the capacity to decide (She and Skitmore, 2004) and capacity to oversee changes and perceive openings (Odusami, 2002).

Past research has grouped undertaking the manager aptitudes into key abilities or subject matters. These incorporate correspondence, hierarchical, cooperation, authority, adapting and specialized abilities. In every one of these regions there are various explicit aptitudes that would help a project to arrive at the characterized targets of a given undertaking with its specific time and asset impediments (Dainty et al., 2005). Despite the fact that undertaking Projects don't need to be pros in every one of these fields, they must do things utilizing a huge gathering of individuals, while they have minimal direct command over what they are doing (El-Sabaa, 2001). Along these lines, project directors must build up a group fit for cooperating in powerful and developing situations to arrive at the objective of the undertaking (Thomas and Mengel, 2008).

A portion of the fundamental abilities and skills that an undertaking supervisor needs to finish a Project adequately and effectively, as demonstrated in the past sections, are recorded and examined underneath:

### **2.5.1 Activity schedule and resource and duration estimation**

Deadlines, accessibility of resources and productivity, and economic data are crucial in any business. This is just as essential in the design setting. Therefore, it is also essential to communicate all this data to the project management team. By splitting a building project into a sequence of operations and calculating time, resources and reliance on each other for each of these operations, a project manager will be able to answer all questions about deadlines and accessibility and productivity of funds. To calculate the project's economic data. In huge construction projects, there can be a large number of various assignments, with several distinct

assets working at the same time. Consequently, it is critical that a company can always screen these assets to guarantee that every asset is utilized to its maximum capacity (Kangari, 1993). It is additionally critical to comprehend which activities can be performed in parallel with different activities and which assets are allotted to every one of these activities to guarantee that assets are not required in two places simultaneously and furthermore that the activities are finished as quickly as time permits (Madan, 1993).

For the designer or Project supervisor, it is imperative to comprehend which activities are important to finish the various activities or periods of the project. A case of this in the construction division would be the construction of the establishments of a construction, which requires investigation, unearthing, addition of stacks and solid foundry for the establishments (Jones, 2007).

A significant perspective to comprehend the structure of assets and the arranging of activities is the capacity to acknowledge and concede that a particular area of the Project or project in general won't be finished in time. In the event that a project comprehends the purposes behind the normal deferral in finishing the Project, different choices might be considered or other invested individuals educated regarding the conceivable postponement ahead of time. In the event that a Project can't foresee this postponement and acknowledges unreasonable due dates, the undertaking could wind up costing the company more cash than if the conceivable deferral were distinguished toward the start of the valuable existence of the project (Heerkens, 2005). It is additionally the Project supervisor's obligation to guarantee that practical due dates and dates are set for the different activities, as it would in any case be the project Project's general duty if the undertaking was not finished in time. It doesn't help if the undertaking Project gives somebody a chance to acknowledge a ridiculous end date, realizing that the individual won't have the option to fulfill the time constraint (Jones, 2007).

To guarantee that Project Projects buy their projects, it is essential to include the principle on-screen characters and project teammates in arranging and programming activities and assets. This additionally encourages project supervisors to precisely evaluate the term of different activities, since the Project might not have the inside and out learning expected of every basic resource (Youthful, 2006). Jones (2007) likewise stresses this point, which clarifies that one reason for the program's poor assessments is that individuals who truly need to take the necessary steps are not engaged with the definition and arranging. Arranging approaches have additionally been named the most significant key skills in an investigation led on the key capabilities identified with Project the manager in the South African setting by Birkhead et al. (2000).

### **2.5.2 Calculating team size and allocation of resources**

When dealing with enormous multidisciplinary construction projects, there are typically a progression of covering work modules, frequently performed by various companies that attention on various particular fields. At the point when a temporary worker needs to begin the following stage or module of the project, the date on which the past contractual worker must finish a Project is critical. So also, past activities in a similar project can be impacted by a past action, which can anticipate the beginning of consequent activities. For these activities, achievement dates are made. All together for project managers to have the option to figure and accurately allot their assets in the project, they should have an inside and out learning of the inner dates of the undertaking objective and furthermore of the deadlines set by the customer (Jones, 2007).

When figuring the quantity of assets to be apportioned to a particular action and utilizing it to build up a program, the project manager must comprehend the elements of working with enormous groups. One of the angles to consider is the real accessibility of the important assets.

Today it is a reality in the construction segment that the project manager must consider the all-out time and the effect of diversions, for example, preparing, group security gatherings, non-attendance, tea and mid-day breaks and the time when each break group takes. to come back to finish generation, personal time since individuals are visiting as opposed to working and time squandered in the midst of a get-away (Jones, 2007). Every one of these elements must be thought about when arranging the piece of a group to finish a given movement on a specific end date.

When working meagerly with huge groups, it is likewise essential to recollect that albeit most colleagues might be in charge of comparable activities, a few people might be in charge of a solitary Undertaking and that there is not a viable alternative for this individual (Jones, 2007). A case of this in the construction segment could be the manager of specific hardware, for example, a portable pressure driven crane. At the point when the manager is on leave or wiped out for seven days, any movement that requires the utilization of that particular asset must be deferred or elective plans must be made to finish the Project without the specific asset.

Another significant factor in the distribution of assets is the thought of the project manager of the company overall. Altogether, for a company to design and make procedures viable, it must be refreshed with the accessibility and execution of every one of its assets. These assets of the company in general incorporate every one of the abilities of the construction company, including those of its project managers, money related assets, specialized assets, administration and friends experience (Isik et al., 2010). It is significant that a project manager does not superfluously retain assets in a specific undertaking as an extravagance, which could harm different projects in which the company could partake (Jones, 2007).

### **2.5.3 Problem solving and route cause analysis**

Alongside hazard the manager, the day by day goals of issues requires an undertaking manager to have extremely clear basic leadership aptitudes. Issues emerge at all degrees of a construction project, including generation, the manager and wellbeing and security issues. To guarantee that the different issues do not defer the undertaking, the project manager must break down each issue, set up the hazard related with that specific issue and make an obvious choice in transit forward (Dainty et al., 2005).

To do this adequately, the undertaking supervisor must be able to build up a comprehension of the issue by separating it into its different components and afterward building up a comprehension of how every component will impact different Activities in manners that probably won't be clearly related (Dainty et al., 2005). The demeanor of the project director ought to be to addressed, for example, "is impossible". Looked with such an issue, a project manager must have the option to comprehend why such an assertion was made, consider every one of the options in contrast to the issue referenced and think "out of the crate" for arrangements that do not have time, cash or practice extra. Impediments and after that embrace this answer for current conditions to all the more likely take care of the issue (Jones, 2007). At last, Birkhead et al. (2000) ordered critical thinking as the fourth most significant principle capability in their South African research.

### **2.5.4 Continuous learning and adaptation of different environments**

Given the likelihood that a solitary undertaking will be rehashed is exceptionally low, a project manager ought to have the option not to take everything comprehensively as gain from new conditions, at that point apply what he has figured out how to the project. The undertaking manager should likewise be able to gain from past projects and the mix-ups made in past projects to join the aggregate information that will be utilized in the present project and abstain



from rehashing past blunders. This will likewise expand the information and abilities of the undertaking manager on a continuous premise (Dainty et al., 2005).

It is likewise significant that the company has project managers who can learn and build up an expansive information base in the construction segment in which they work. To run any extend proficiently, access to best rehearses, activities learned, instances of recorded projects and other data is imperative for a company. In spite of the fact that it is not constantly feasible for each project director and worker to have all the required understanding, the company can unite a group of specialist dependent on their aggregate involvement in past undertakings (Isik et al., 2010).

#### **2.5.5 Financial and Cost Management**

Cost manager alludes to all activities that on the whole, are in charge of guaranteeing that the general expenses of the project are limited, yet that all client necessities are still met (Isik et al., 2010). One of the most significant objectives for a company is to acquire money. Accordingly, it is additionally critical that one of the objectives, legitimately or in a roundabout way, of the project is to acquire or set aside cash. In this manner, it is imperative to understand that, regardless of whether a project can end in time and with the right determinations, in the event that it loses money or costs more money than it in the long run spares the company once finished, the undertaking will be viewed as bankrupt (Heerkens, 2005). In spite of this test to finish projects at the most minimal conceivable cost, project managers should likewise have the chance to see chances to build benefits or investment funds that an undertaking was at first intended to create by spending extra cash, in this manner surpassing the first spending plan. of the project, yet at last acquiring a higher benefit than at first expected (Heerkens, 2005).

The utilization and comprehension of spending plans or estimates are significant for a project director to arrange for how the money will be earned and consumed during the time on earth

of the project. This is significant, on the grounds that the rate at which cash is spent and the rate at which the money is earned are not constantly connected. Now and again, it might be important to have cash-flow to purchase and introduce a vehicle and get pay just a couple of months in the wake of completing work. It is essential to see how this cost/benefit bend will influence the income of the project and the company. To play out these Projects precisely, a project director must see how cash issues are connected to various activities in the undertaking program, as this will frame the premise of how cash is earned and spent (Harrison, 1993).

### **2.5.6 Claim and contractual experience**

Because of the enormous number of gatherings engaged with the construction area and in a specific project, together with the vulnerabilities identifying with the ecological parts of every individual project, the plausibility of deferrals between the gatherings and solicitations towards the gatherings is a reality. In any case, numerous grumblings and questions between gatherings can maintain a strategic distance, if a project supervisor has understanding and can obviously build up the authoritative terms and states of the agreement, if potential issues between the gatherings are imparted ahead of time and gainfully and if the manager has a decent information of what causes grievances from the two gatherings. It is in light of a legitimate concern for every one of the gatherings to maintain such asserts, since in each mishap circumstance there will consistently be washouts (Isik et al., 2010).

In the past, project managers had to be more technical and sector specific. Today, they should be more business-oriented. Project managers need to understand how their project affects the end result of their companies, when to apply different commercial tools and techniques, and what benefits the project and the company can achieve (Heerkens, 2005).

### **2.5.7 Leaders and managing different stakeholders.**

With a wide range of personalities in a construction project, the project manager needs a clear and resolute approach. However, the project manager must be flexible and able to adapt to the changing environment and the different levels of people that are treated daily. An important part of managing all the different stakeholders and demonstrating strong leadership skills is honesty and integrity (Dainty et al., 2005). The project manager must have the influence and assertiveness in the project environment so that the team can work together and guide teamwork and cooperation to achieve the final success of the project (Dainty et al., 2005).

In any project, different stakeholders, including the main contracting company, project group, public or private clients, subcontractors, trade unions, suppliers and financial institutions are involved at some time or for the duration of the contract. The relationships with all these interested parties both for the duration of the project and for the future are extremely important for a project manager and the construction company. The relationship between the client and the project manager must guarantee that the client obtains what he has specified and that the contractor is paid the amount due. In the long term, it is also important that the construction company ensures the future work of the same client. Since most of the work is done by labor represented by trade unions, labor relations are also fundamental, because if there is an interruption in the relationship between the construction company and the workforce, this could cause delays and the contractor would not appeal the customer. It is also important to realize that the same union represents the workforce involved in all the other projects of the company, so that if a strike occurs in a project, it is likely that the strike will extend to other projects, causing further delays and breakup. For the same reasons, the relationship with the main project suppliers is important, because a company tends to use the same important suppliers in other simultaneous and future projects (Isik et al., 2010). Much of the responsibility for maintaining these relationships lies with the project manager.

It is the responsibility of the project manager to identify and manage all the external stakeholders mentioned above, but also to identify and manage internal stakeholders. Many departments, including production, health and safety, quality, accounting department and human resources department are involved in the project, directly or indirectly. A project manager must know exactly what is expected of each stakeholder or department and what they expect from the project team. All these interested parties must be managed for the duration of the project to ensure that each department fulfills its role in the project, takes responsibility and takes its obligations into account (Young, 2007).

### **2.5.8 People and human resource management**

The project manager requires a clear and resolute strategy with a broad spectrum of personalities in a building project. The project manager, however, must be flexible and capable of adapting to the evolving setting and the various levels of individuals being handled daily. Honesty and integrity are significant component of handling all the various stakeholders and showing powerful management abilities (Dainty et al., 2005). In the project environment, the project manager must have the influence and assertiveness to allow the team to work together and guide teamwork and cooperation to achieve the project's final success (Dainty et al., 2005).

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In a construction project, the project manager needs a clear and determined approach with a wide spectrum of personalities. However, the project manager must be flexible and able to adapt to the changing environment and the different levels of people being treated on a daily basis. Honesty and integrity are an important part of handling all the different stakeholders and demonstrating powerful management skills (Dainty et al., 2005). The project manager must have the impact and assertiveness in the project setting to enable the team to work together and guide teamwork and collaboration in order to attain the final achievement of the project (Dainty et al., 2005).

### **2.5.9 Understanding different cultures in the workplace**

One of the most significant variables to consider when working on a global project is to know the various cultures engaged in the project. This can likewise happen when chipping away at enormous undertakings in the nation itself, when global providers or particular subcontractors travel to the nation to take a shot at a similar project (Madhavan, 1993). There are likewise a few likenesses between working in remote nations and managing their various networks, and the connection between project groups and neighborhood networks, from one viewpoint, and working in a nation like South Africa, where there are 11 dialects officials and various tongues in each of these and an associative scope of societies, on the other (Focal Knowledge Office of the US of America, 2012). Project directors must be prepared to communicate with the various networks in which they work to take care of potential issues between neighborhood networks and the destinations of the undertaking (Madhavan, 1993). It is similarly significant that project supervisors can assess the customer during the first long stretches of the project in quite a while of any social or explicit position contrasts that may exist between the construction company and the customer, to guarantee that the undertaking destinations can be accomplished as far as the client's particular needs (Madhavan, 1993). At the point when undertaking supervisors work in a global situation, or in a territory of their nation where the company does not have a neighborhood office, it is additionally essential to remember that the company will likely utilize some nearby individuals to be a piece of the project staff. Overseeing various individuals and persuading various individuals to adjust to a workplace is basic if project managers need to convey an undertaking effectively (Madhavan, 1993).

### **2.5.10 Personal and project time management**

Since many undertaking staff members take a gander at the project manager, it is significant that the perspectives identified with self-inspiration, energy, self-restraint, desire and time the

manager are a piece of the skills of the project supervisor, since These will influence the manner in which the entire group assumes liability for their individual Activities (Dainty et al., 2005). The project supervisor must be able to recognize and evaluate current project circumstances to distinguish where to center and how to partition the time accessible to guarantee that the most significant issues get more often than not and consideration required (Jones, 2007)

It is significant that an undertaking manager does not befuddle the improvement of a program with the general administration of the project time. In the undertaking in general, program advancement is just a single part of time arranging. Before the program can be built up, the project manager must comprehend the general timeframe of the undertaking. This ought to incorporate time for program improvement, time to completely comprehend the program and to affirm that the program is extremely plausible, recognize, obtain and allot all the essential assets as arranged in the program and after that do the genuine work as per the program. It is likewise critical to remember that albeit all activities are not arranged, they are as yet vital and must be finished during the general project program (Harrison, 1993).

#### **2.5.11 Health, quality management and safety**

When working with individuals in an extremely mind boggling construction condition, mishaps can happen that can cause gear harm, individual damage and/or passing. Practically all mishaps affect circuitous expenses for the undertaking. Each of the previously mentioned sorts of mishaps can include claims for protection remuneration, specific assessments by outside gatherings and the conceivable intrusion of the undertaking to explore the reason for the mishap and execute the essential insurances to keep away from future redundancies (Isik et al., 2010). The project director must be completely educated regarding the applicable well-being and security necessities and dangers related with the particular undertakings engaged with a project to limit the probability of such occurrences.

In the present complex condition of the construction project, quality administration assumes a critical job, since even little imperfections can lead the client to dismiss the structures or components of the structures, which can imply that they should be wrecked and revamped. Remedies and recreation of components will absolutely affect costs and can likewise negatively affect the program in general (Isik et al., 2010). The project director must give the case of the execution of the quality framework to guarantee that the customer's needs are met, that the work is done accurately the first run through and that no cash is spent on remedial activities (Banarjee, 1993).

#### **2.5.12 Industry-specific specifications**

When chipping away at universal contracts or contraction of various projects in the nation can be a starting point of the company, it is imperative to know which principles and determinations are significant and are utilized to characterize as far as possible. Prior to requesting or assembling any construction project, it is the project manager's obligation to ensure that he or she and the group know about the particular specialized determinations of the neighborhood nation or explicit client. The undertaking supervisor should likewise have adequate specialized learning to talk about the circumstance with the customer or to persuade him, if important, that the predetermined specialized particulars are not the best or are not fitting for the neighborhood or explicit states of the project (Madhavan, 1993).

#### **2.5.13 Progress Measurement and Scope Management**

A significant social trademark is the capacity to step up to the plate. A project director must have the option to ceaselessly assess the different activities that are occurring to distinguish potential issues and take proactive measures to avert the real event of arranged issues. The extent of a project does not really stay unaltered during the life of the undertaking, so it might



be important for a project manager to be adaptable to discover or make new answers for the potential issues of the project (Dainty et al., 2005). This is affirmed by Heerkens (2005), who notices that the underlying meaning of a project regarding program, spending plan, quality, degree and rate of profitability could change during the project, dependant upon the business, financial, political change. What is more, other outer components.

It is likewise significant that a project manager can break down the present pattern of advancement and foresee future issues in light of the fact that the expense of re-trying the activities or activities when they were performed erroneously is a lot more noteworthy than doing the activities accurately the first run through. The need to revise a task may emerge because of construction hardware mistakes or changes in the underlying structure. Cooperating as a group and utilizing the consolidated involvement of the individuals, blunders or postponements can be kept away from or alleviated as fast as could reasonably be expected (Madan, 1993). The undertaking director ought to likewise have the option to utilize pattern examination to help foresee how cash will be earned and spent later on for the project (Harrison, 1993).

#### **2.5.14 Designation Skills and Communication**

Since the project condition is ordinarily quickened, includes various controls and various activities are completed at the same time, the capacity to move learning successfully among interior and outside groups is vital (Dainty et al., 2005). An undertaking manager must explain the duty of each colleague at the start of the project to guarantee that colleagues comprehend that obligation regarding the different activities is their duty. The project director must give the direction, backing, inspiration and asserts for all colleagues to satisfy their obligations. It is essential to offer aid to colleagues and to demonstrate their trust, enabling them to play out the various undertakings themselves. In any case, it is at last the duty of the project supervisor to

guarantee that the various components are finished, so it is imperative to consistently screen all colleagues and the different activities for which they are mindful (Jones, 2007).

#### **2.5.15 Risk Identification and Management**

In the present complex, dynamic and developing construction industry, hazard manager is a vital piece of a project. For every single functional reason, the hazard in a construction project is inescapable, since a project works with individuals, in another condition for all colleagues. The project is presented to natural factors, for example, downpour, extraordinary temperatures and floods. The hazard essentially influences profitability and asset execution, the nature of the last item and the financial limit. It is the duty of the undertaking director and the group to move the hazard (stipulating protection approaches), limit the hazard by executing safe work systems and satisfactory arranging and imparting the hazard to the client, or just tolerating the hazard and attempting to keep away from it (Isik et al., 2010).

Since hazard is practically unavoidable in construction projects, it is a piece of the undertaking director's duty to permit certain possibilities if certain dangers emerge during the project. There are two principal kinds of dangers, in particular the orderly chance and the particular danger of the project. Deliberate hazard can be recognized toward the start of a project and this is simpler to consider as far as an unexpected financial sum. The second kind of hazard, the particular danger of the project, is the hazard that the project supervisor should better comprehend and have the option to distinguish as the undertaking advances. These are dangers that were not obvious toward the start of the project, however were recognized later because of components related with conveyance delays, construction capacities, certain site conditions and other outside elements. A project manager must comprehend the different project risk and the potential impacts on the project so as to enable a specific preventive measures which financially sound. Risk identification measures enable project managers to anticipate and precisely foresee

potential danger. For instance, without a reasonable and point by point meaning of the extension, the plausibility of unanticipated occurrence of risk increments, the probability of dangers or risk emerging as delays or extra costs (Crawford, 2001).

The abilities identified in table 2.1 below speak to those that a perfect undertaking manager ought to have in the wake of having picked up involvement in every one of these aptitudes during quite a long while of work on various construction projects. In this manner, each company should settle on vital choices about what is explicitly required in their part and in the company's principal activities (Dainty et al., 2005).

To fully understand the various skills of the green construction project manager, this study identified the following competencies in reducing risk and it management.

**Table 2.1: Project Managers in Green Construction Competence Requirement**

Author	Title	Competencies	
		Knowledge	skills
Hwang and Ng (2013)	Project Management Knowledge and Skills for Green Construction  Green project management practices for sustainable construction	<ul style="list-style-type: none"> <li>• Cost management</li> <li>• Communication management</li> <li>• Schedule management and planning</li> <li>• Health and safety management</li> <li>• Risk management</li> <li>• Conflict and dispute managements</li> <li>• Stakeholder management</li> <li>• Material resource management</li> <li>• Claim management</li> <li>• Human resource management</li> </ul>	<ul style="list-style-type: none"> <li>• Decision making</li> <li>• Delegation</li> <li>• Analytical</li> <li>• Team working</li> <li>• Problem solving</li> <li>• Leadership</li> <li>• Negotiation</li> <li>• Human behaviour</li> <li>• Chairing meeting</li> <li>• Presentation</li> </ul>
Lam et al. (2009)	Factors that influence the implementation of green specifications in constructions.	<ul style="list-style-type: none"> <li>• Green specifications.</li> </ul>	
Riley, Pexton, and Drilling (2003)	Procurement of sustainable construction services in the United States: the role of the contractor in green constructions	<ul style="list-style-type: none"> <li>• Estimation</li> <li>• Green construction materials</li> <li>• Waste minimisation and recycling</li> <li>• Indoor air quality management.</li> </ul>	
Robichaud and Anantatmula (2010)	Green Project management practice for sustainable construction	<ul style="list-style-type: none"> <li>• Sustainable construction practices</li> <li>• LEED requirement</li> <li>• Sustainability goals</li> <li>• Familiarity with product type and marked</li> <li>• Pricing and developing cost-saving strategies</li> <li>• Procuring specialized software for sustainable project</li> <li>• Budgeting and scheduling.</li> </ul>	<ul style="list-style-type: none"> <li>• Planning and strategy meeting</li> <li>• Communication and document sharing</li> <li>• Communication</li> <li>• Teamwork</li> </ul>

## **2.6. Construction of Project management Competence**

Professional construction and performance management are component of human resource management function in most industries. This relates to a strategic and planned strategy to improving individuals and team performance by improving their abilities in that particular industry (Raiden *et al.*, 2008).

Due to the concern of the entire project manager society for project managers ' competence, a set of project management knowledge norms was created (Crawford, 2005). Many of these norms were developed based on the collective experience of qualified project managers, not research (Crawford, 2005). This could be why Thomas and Mengel (2008) discovered no conclusive proof that qualified or licensed project managers were more successful than those who had simply acquired industry knowledge.

A significant part of the improvement of project managers relies upon their encounters in their working life (Edum-Fotwe and McCaffer, 2000). This reliance on experience and the aftereffects of Lei and Skitmore (2004) and Captain and Chime (2008) as per which senior project managers have a bigger number of aptitudes than the youthful project supervisors, can clarify the consequences of Thomas and Mengel (2008) on who is the better: a prepared and affirmed project director or a randomly progressively experienced undertaking manager.

One of the dangers of setting up explicit measures and aptitudes is that individuals are instructed how to act just in specific cases. The genuine test in undertaking the manager is the capacity to think and take care of issues that the project director had never experienced. Learners will in general respond just in the manner they have been prepared to do as such, and they dread change, since they can haul them out of their customary range of familiarity (Thomas and Mengel, 2008). Subsequently, project directors must be presented and prepared to oversee change and adjust to various conditions, which formal preparing alone cannot generally give (Thomas and Mengel, 2008). Understudies ought to be prepared to comprehend

the earth and the setting in which they work before beginning to apply the general guidelines and norms that their formal training could have given them (Thomas and Mengel, 2008).

Banarjee (1993) raises an admirable statement when he contends that there is a reasonable distinction between essentially "bringing issues to light" about specific capacities and really "creating abilities". Numerous foundations or companies offer preparing that uncovered project managers just to circumstances that may emerge, yet neglect to build up the abilities important to address that particular circumstance or comparable circumstances. There is a wide part of abilities improvement that preparation outside authority work cannot grow; in this way, it is basic to create aptitudes through hands on preparing and mentoring directing (Banarjee, 1993).

### **2.6.1 Project Manager Competence Construction in green construction**

The improvement of project the manager for architects is from various perspectives like the advancement of undertaking the managers all in all. A few abilities can be scholarly at school or in formal preparing, yet others must be taken in on the site as a matter of fact (Odusami, 2002).

Since most designing project managers get principally specialized, numerical and logical training during their graduation years, they are all around furnished to manage the specialized parts of project the managers, however are not set up to attempt general undertaking the managers. (Edum-Fotwe and McCaffer, 2000). A large number of the abilities and the mix of specialized and general aptitudes required are explicit to the construction segment (Edum-Fotwe and McCaffer, 2000). In light of the advancing condition and globalization, building project directors need to comprehend the requirement for a vocation in "long lasting learning" and constant improvement in the designing and the management sectors (Farr and Brazil, 2009). With respect to extend directors when all is said in done, there are clear contrasts between the abilities of more seasoned project managers and those of their more youthful partners (Lei and

Skitmore, 2004). Most project directors in the Lei and Skitmore studio (2004) progressed toward becoming project manager simply in the wake of finishing at any rate six years in numerous lesser positions. Edum-Fotwe and McCaffer (2000) revealed that this past experience could be more like ten years in increasingly junior positions.

Captain and Chime (2006) found that authority is obtained through the experience of being more than once put in initiative obligations and that the best performing project managers were those with the most experience. One of the issues with this learning through this experimentation technique is that it requires some investment and the most focused minute where the business is as of now not permitting much space for blunder. This requires the advancement of learning and the improvement of project the manager aptitudes in designers.

The present circumstance in the segment doesn't fit this choice. As Raiden et al. (2008) notice that most improvement activities are extremely casual or responsive. This implies architects can even now encounter experimentation, or that some advancement happens just once somebody explicitly demands it. The circumstance is exacerbated by directors who invigorate the advancement of their representatives just to the degree that it benefits a present project and the way that a significant part of the improvement is left to the administration of the working line, rather than being contracted by the company in general (Raiden et al., 2008). This is the explanation and the way that mentoring assumes such a significant job in the advancement of youthful designers that Dainty et al. (2005) additionally distinguished the need to build up the aptitudes to create different designers, to guarantee that when junior specialists get taller, mentoring, preparing and improvement of others become natural to them.

A last issue with current frameworks is that there is constrained proof of worker investment in arranging their advancement needs (Raiden et al., 2008).

### **2.6.2. Professional and Career Construction**

Living in the 21st century, one of the substances of the work environment is that globalization and advanced advancement assume a significant job in how representatives and associations interface. In the earlier century, it was typical for a worker to go through 30 years in a similar association and, in this way, build up a profession, progressing on a corporate scale at a moderate pace however pretty much ensured in a secured space. Despite what might be expected, it was anticipated that representatives currently entering the working environment will effortlessly possess up to 10 occupations in their vocations (Savickas, 2012). This will power individuals to assume an increasingly significant job in their expert and expert advancement than previously, without depending entirely on the business, yet to end up long lasting learners (Savickas, 2012).

Investigating the social and workplace in South Africa today, Creager (2011) can set up a parallel with an examination record, which breaks down how significant the job of various subjects is as qualities, societies, pay gatherings, being ladies against being men, age and handicap play in what various individuals see as needs and what is required for expert improvement (Creager, 2011). Joined with the manner by which globalization and digitization have impacted the manner in which youthful specialists see their professions as not really in a company during their vocations as in the past, these elements make it incredibly hard for bosses and Workers locate the ideal parity to adjust to every person. This contention is in accordance with that of Shillingstad (2012), which he found in his meeting with an organizer at an American college. UU. That the entire issue of expert improvement is viewed as an individual issue for a representative and that the individual must determination choices that the association can't make for him (Shillingstad, 2012).



## **2.7. Project manager competence construction practice**

It has just been referenced that some project the manager's abilities can be gained through conventional preparing and others are gotten for a fact on the site. One of the most significant strides in the improvement of managers and project pioneers is that youthful designers ought to be urged to confront new difficulties that will drive them out of their customary ranges of familiarity (Farr and Brazil, 2009). "A specialist will never improve his relational, informative, administrative abilities, and so on., in the event that they will just hold fast to parts of the project with which they feel good" (Farr and Brazil, 2009).

A few sources in the writing propose that one of the most significant wellsprings of advancement is to have a mentor (Farr and Brazil, 2009). In this way, mentoring and different approaches to pick up involvement and be created are talked about.

### **2.7.1 Training and Learning**

"Learning" can be deciphered in various ways, dependent upon the person. O'Conner and Cordova (2010) allude to a meaning of learning as "a procedure to comprehend educational encounters". Settle on choices and choices as a method for getting criticism to affirm or announce implications and decisions "(Mackeracher, 2004). Different definitions likewise recommend that learning is impacted by both the psyche and the physical encounters of the body. This prompts the understanding that grown-ups settle on choices and have various discernments about the estimation of a particular learning point, and this will influence in the case of adapting truly happens or not. In synopsis, if a grown-up chooses not to need to discover some new information, the individual can be sent to every accessible course and still not get anything (O'Conner and Cordova, 2010). Grown-up learning and diverse learning and advancement techniques will be examined in the accompanying focuses:

### **2.7.1.1 Learning at the Workplace**

The discovering that happens in the work environment can be isolated into learning by obtaining knowledge when playing out a Project physically or through the preparation given by the business. It ought to be noticed that, much of the time, the business just gives preparing that the company thinks about significant to its projects. Hence, since the business controls the time and assets committed to this, the representative has little authority over this learning (Ball, 2011).

### **2.7.1.2 Learning by Experience**

The learning knowledge can likewise be portrayed as casual learning. This alludes to discovering that isn't organized, or that has not been authoritatively arranged, and that individuals dominantly do without anyone else. This can occur through the ordinary experience of physical work or the manner in which individuals live their typical lives (Jubas, 2011).

Another issue with experience-based learning is issue based learning. The thought in issue based learning is that once looked with an issue, an individual can separate the issue and, by taking a gander at the pieces of the issue, the individual can utilize the past information of comparative or related issues to tackle this issue. It functions admirably in a work or gathering condition where the gathering's aggregate learning can contribute essentially to taking care of the issue (Schmidt et al., 2011). This new information is safeguarded in the individual's understanding for later use in his working or private life.

The individual has the duty to stay aware of mechanical advances and construction in the business to guarantee that he has enough involvement to propel his profession. Staying aware of these progressions and advances in innovation and social change enables an individual to constantly improve their aptitudes base and furthermore improve profitability and proficiency

in the work environment, something that will help the individual being developed and advancement proficient at new openings (Gong et al., 2011).

### **2.7.1.3 Mentoring and Coaching**

"A mentor is commonly characterized as a person with involvement in an association who has accomplished a specific degree or accomplishment and who can offer help for expert advancement to people less experienced in that association" (Gong et al., 2011, p. 807). Positive reports have been shown in past investigations among mentoring and its consequences for compensation, work fulfillment, advancement and occupation fulfillment of the worker or disciple. Surrendered that to 70% of working environment learning appears as casual learning, the significance and significant job that a guide can play in a worker's vocation is clear (Gong et al., 2011).

Coaching can likewise be utilized as a business technique to propel the expert improvement of representatives at a quicker rate than essentially enabling them to pick up involvement in ordinary working conditions. By improving occupation fulfillment, an company can at long last improve the profitability of its representatives, delivering better returns for the company (Gong et al., 2011). Companies ought to likewise consider coaching as a straightforward transient good example. They should concentrate on the long haul and eventually they ought to have the option to utilize this methodology in progression arranging, in which a guide can take on.

## **2.8. Perceptions of Management Construction**

Senior managers often identify companyal construction needs without involving potential participants at the moment (Hotho and Dowling, 2010). There are clear differences in what implies effective leadership between management perspectives and non-managerial employees. Because leadership is one of the key project management competencies and because engineers

do not receive leadership or management training, it can be assumed that similar differences in project management perceptions may exist.

Crawford (2005) also showed that project managers and senior managers have different views on what a good project manager's most important skills are. One of the reasons might be that in recent decades, the fundamental approach to project management has changed significantly from very technical to more interpersonal and behavioral aspects of project management, also known as transversal skills (Heerkens, 2005).

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

this chapter essentially discusses the methods and strategies adopted in achieving the aim and objectives of this study. Hence, this chapter seeks to deliberate on the research strategy, research design and the targeted population in addition to the methods and techniques used for data collection. A detailed methodology and tools used are described. This research adopts an intensive literature review and a survey with the use of a structured questionnaires to collect data. The chapter then provides an overview of the sampling technique and the unit of analysis.

#### **3.2 Research Strategy**

According to Saunders *et al.* (2007) Research approach is described as the researcher's plan for answering study concerns during the information collection phase. The research strategy can also be defined as the way in which the research objectives can be achieved (Naoum, 1998). Yin (1994), also states that the research tools adopted for a study mostly depend on the research purpose that is, exploratory, explanatory or descriptive. There are two kinds of approaches for studies, namely quantitative and qualitative study (Naoum, 1998). The decision to accommodate any particular approach, however, relies on the study intent, the sort and accessibility of research data (Baiden, 2006).

This study adopted a quantitative strategy. The approach adopted measurements in collecting the data. The approach was also built upon previous works which have developed principles that helped to decide the data requirements of this particular research. All the items that was measured in the research have their basis in theory from literature and that informed what have to be measured so as to achieve what was being measured. The quantitative research approach was used in this study because of these well-known advantages such as, formal, descriptive,

exploratory, and correlated. The gathered samples are often big and representative, and this further illustrates that within reasonable error boundaries, quantitative research findings can be generalized to a bigger population.

### **3.3 Research Design**

Kothari (2004) defined the term "research project" as providing conditions for the collection and analysis of data in a way that seeks to combine relevance for research purposes with economics in the procedure. The literature available literature suggests that there is the need for an agreement with the structure of the study for data collection and to allow easy analysis. Thus the structure influences the nature of the data to be collected and provides the link between the empirical data and its logical sequence of conclusion (Mensah, 2013). The aim of the research project is to provide the plan to answer the research problem (Wood and Haber, 1998). This research adopted a questionnaire survey to gather data on the view construction professionals of the key competence requirement for project manager in green construction. This technique enables the researcher to ask all respondents the same query with predetermined answers, thus allowing the compilation of objective information throughout the research to be in tandem with the positivist tradition of survey as the primary strategy to information compilation. Again, very short and concise questions were administered as questions that are long and wordy may appear confusing to respondents. With the help of questionnaires survey, consistency of observations as well as replication of is improved due to the inherent standardized measurement and sampling techniques (Oppenheim, 1999).

### **3.4 Population**

Statistically, Population is explained to be units that have the chance to be involved in the survey sample. The units could be people, employee or members of a particular set (Groves et

al., 2009). For the purpose of the research, the considered population is a number of identified contraction and a few selected consulting firms who have ongoing projects in the city of Accra, Ghana. The choice of contractors was based on the fact that, they are working on ongoing projects which may have required the necessary human resource especially graduates to meet the project demands and this ensured the validity of the research. The population constituted a total of 155 construction firms and 7 consulting firms within the Accra metropolis as obtained from the office of the Accra Metropolitan Assembly. The selection of geographical area is due to the researcher's location and convenience, and information in terms of collection of data

### **3.5 Questionnaire**

A questionnaire is a printed self-report form designed to elicit information that can be obtained through written responses of the subjects. The information obtained through a questionnaire is similar to that obtained by an interview, but the questions tend to have less depth (Burns and Groove, 2001). The questionnaire was developed to ensure that they offer the possibility of anonymity because the names of the subjects was not requested in the completed questionnaires. There were fewer opportunities for bias because they have been presented consistently. Most of the questions in the questionnaire was closed, which facilitated the comparison of the answers to each item. They require less time and energy to answer.

#### **3.5.1 Questionnaire Design**

The questionnaire survey was carried out to seek the view construction professionals of the key competence requirement for project manager in green construction. The questionnaire was accompanied with a covering letter which was delivered to the contractors. The latter specified the objectives of the research and enlighten the participants that the outcomes of the

questionnaire would be used to develop and analyze view construction professionals of the key competence requirement for project manager in green construction.

A close-ended questionnaire was used for its benefits as it is easy to ask and quick to answer, they require no writing from the respondents. Questionnaire was used as main data collection techniques because questionnaires can help in obtaining information about what people do, what they have, what they think, know, feel or want (Taylor-Powell, 1998). A sample of the structured questionnaire was placed in the Appendix.

### **3.5.2 Questionnaires**

The questionnaire was developed by the researcher which was reviewed by the supervisor. Consequently, the respondents which consisted of contractor and consultants were given a structured questionnaire while ensuring that the questionnaire eliminated all feasible ambiguities. In order to enhance accuracy and validity, the questionnaires were evaluated and well-structured. Self-administered the questionnaires one by one. A sequence of follow-up processes and policies, such as issuing surveys or reminding notices to non-respondents, were regarded to enhance the response rate. However, this was not considered possible by Dunn and Huss (2004), as they noted that raising the response rate could have a negative impact on the accuracy of the data acquired. The research also showed that more pressure on the subjects to be addressed from a researcher led in most educated responses.

To solve this, Bednar et al. (2006) suggested a sequence of initiatives to enhance the response rate centered on proven values of reciprocity, cultural evidence, validity and power. The researcher examined the primary data collected to ensure maximum accuracy, readability, integrity, consistency and reduce ambiguity.



### **3.6 Sampling**

Sampling helps to provide useful ways of making sure that data collection and processing aspects of research are done whilst ensuring that the sample is a true reflection of the population (Fellows and Liu, 1997). The advantage of selecting a sample is that it is less costly and time saving than collecting information from a large group of respondents. The selected sample should therefore, have similar characteristics to the population under study to allow generalizability of the results to represent the population (Polit *et al.*, 2001). There are two types of sampling, namely probability and non-probability sampling (Hamed, 2016). In this study, non-probability sampling was used.

#### **3.6.1 Non-Probability Sampling**

Non-probability sampling can be just a sampling procedure in that samples have been accumulated at a course of action that does not offer you most individuals within the public the exact very same probability to be picked. At just about any sort of exploration, it's always hard to acquire genuine random sampling. Not like probability sampling, the non-probability sample isn't the product or service of the random choice procedure. Subjects within a non-probability sample are often selected dependent upon their own availability or dependent around the deliberate individual standards of their investigator. Even the non-probability sampling procedure is going to be properly used as the research workers is going to undoubtedly be limited through time, dollars and labour induce and also, thanks to those constraints, it is all but not possible to bring a random sample of the whole populace.

### **3.6.2 Criteria for Selecting Respondents**

The purposive sampling technique was used to select the subcontractors. Purposive sampling technique, a procedure that involves the selection of persons who represents the desired population was used for the purpose of this study. The purposive sampling technique is a non-probability sampling method which involves the conscious selection of certain subjects to be included in the study (Polit and Hungler, 1999). Non-probability sampling designs are suitable in situations where the number of elements in the population is either unknown or cannot be individually identified (Kumar, 1999). Purposive sampling was used because there is knowledge about the population.

### **3.6.3 Sample Size**

A sample comprises of a topic of the units that constitute population (Polit and Hungler, 1999) and is usually used for economic and precise purposes in large-scale studies (Weisberg and Bowen, 1997). Research surveys, however, merely use a tiny proportion of the population, called the sample. This is because it is more practical and less costly to use a sample than to collect information from the entire population. Polit and Hungler (1999) indicated that the biggest danger of using a chosen sample is that the conduct, characteristics or views of the population may not be properly reflected.

A streamlined formula for calculating the sample size is provided by Kish's (1965). The sample size was calculated using this formula. A confidence level of 95 percent is presumed. The sampling technique for this attempt is deliberate sampling based on its intent, the design and the study topic's practical consequences. The investigator, in a nutshell, chooses what requires to be done and intends to discover individuals who can and ready to provide data on the basis of their expertise or experience (Bernard, 2002; Lewis and Sheppard, 2006; Tongoco, 2007).

For a total of 162, the group targets 155 building firms and 7 consulting firms. Kish equations are used to determine the sample size of the 162 inhabitants, assuming that the following equation has a 95% trust range: Kish (1965) gives a method to assist determine the sample size.

$$n = \frac{n^1}{1 + \frac{n^1}{N}}$$

Where,

$n$  = Sample size

$$n^1 = \frac{s^2}{v^2}$$

$S^2$  = maximum standard deviation of the population

$V^@$  = Standard error of the sample distributed (0.05)

$N$  = Total population size = 162

$p$  = the proportion of the population element the belongs to the defined region

i.e.  $p = 0.5$  at 95% confidence interval

$$s^2 = p(1 - p)$$

$$= 0.5 (1-0.5)$$

$$= 0.25$$

Since,  $n^1 = \frac{s^2}{v^2}$

$$= \frac{0.25}{0.05^2} = 100$$

Hence if  $N = 162$

$$n = \frac{100}{1 + \frac{100}{162}}$$

$$n = 61.83 \approx 62$$

Add 10% for non-responsiveness;

$$\frac{10}{100} \times 62 = 6.2$$

$$\approx 6$$

$$\text{Sample size} = 62 + 6 = 68$$

This sample size formula provided the minimum number of questionnaires to administer.

The snowball sampling technique was used to find research subjects (Atkinson and Flint, 2001).

This strategy is seen as a response to overcome the problems associated with hidden or hard-to-reach populations. The process based on the assumption that there is a "connection" between the initial sample and others in the same target population, allows for a series of references made within a circle of knowledge (Berg, 1988; Atkinson and Flint, 2001).

This will lead to the position of the offices of the first line of workers in the company from which the positions of subsequent workers were obtained. An additional list of employees was obtained from the employees initially contacted.

Selected respondents were composed of people at managerial, technical, staff responsible for financial decisions and site supervisors.

### 3.7 Limitation of Research

Due to time limitation and resources available, this research was focused on just construction projects and did not consider other sectors of the construction industry like heavy engineering construction and industrial projects. This study was limited to only contractors who have ongoing projects in Accra. This study is also limited to the construction industry in Ghana.

### **3.9 Data Collection**

The method adopted in this survey was that of deductive approach as it is, through this method through which it is possible to reach the set of specific objectives. Scientific research in the field of education wants data to support a topic. Therefore, the data serve as the basis for any investigation (Singh, 2006). Data collection was exclusively done using a closed ended questionnaire. A structured questionnaire was administered to a sample size of 68 respondents and collected in person after the questionnaires have been filled within a specified time frame.

### **3.10 Data Analysis**

The completed questionnaire was edited to ensure completeness, consistency and readability. Once the data has been checked, it was arranged in a format that enabled easy analysis. Data collected from the respondents (contractors) was analyzed using Statistical Package for Social Sciences (SPSS 16.0) and Microsoft Excel. The variables were then entered in the SPSS. The output of the SPSS was further confirmed by frequency tables and analyzed descriptively using statistical tools like charts (pie and bar) and frequency distribution. The Relative Importance Index (RII) helped in determining the major concerns of contractors with regards to the employability skills of built environment undergraduate in Ghana.

## **CHAPTER FOUR**

### **DATA ANALYSIS AND DISCUSSIONS**

#### **4.1 INTRODUCTION**

This section essentially discusses the analysis of the data obtained from the respondents. The analysis is centered on seventy-five respondents that consisted of construction companies registered and in operation within the Accra metropolis. 80 questionnaires were distributed however, 75 was received which accounted for a respondent rate of approximately 93%. The retrieved number of respondents also accounts for about 6% of a sample of 162 populations. the snowball sample method was used to attain the sample size which consisted of D1k1 and D2k2 classification of contractors as according to the Ministry of Water Resources and Housing in Ghana. This section describes the key competence needed by project managers in the green the Ghanaian construction industry. the study also discusses among others, project manager's awareness and roles in the management of green construction projects in the Ghanaian context.

The analysis consisted of simple descriptive statistics and the relative importance index of analysis. Results were submitted in tables and appropriately interpreted. The analysis that centers around the research aim the discussions are interpreted in four sections; demographic factors, the extent of project managers ' competence in building green buildings, functions of project managers in building green buildings, and key skills needed by project managers in green construction in the Ghanaian construction industry.

#### **4.2 Presentation and Descriptive Analysis of Data (Demographic)**

This portion of the questionnaire included questions seeking background data and some related issues to ascertain the knowledge of the respondents. The significance of this chapter is to reinforce trust in the information gathered to provide comprehensive respondent features. Data

included: academic, qualification, occupation, how long the participants worked in their enterprises and how long the enterprise lasted.

#### 4.2.1 Qualification

This part of the questionnaire sought to ascertain the present academic qualification of the respondents involved in the study. From table 4.1, a total of 20 respondents representing 26.7% had HND, 36 respondents representing 48% had obtained BSC, 8 of the respondents representing 10.7% had obtained MSC and 3 representing 4.0% had obtained PHD in their field of study. Consequently, majority of the construction professionals are Bsc holders which places the respondents in a better position to provide useful contribution to the study.

**Table 4.1 Academic Qualification**

	Frequency	Percent	Valid Percent	Cumulative Percent
HND	28	37.4	26.7	37.3
BSC	36	48.0	48.0	85.3
MSC	8	10.7	10.7	96.0
PHD	3	4.0	4.0	100.0
Total	75	100.0	100.0	

#### 4.2.2 Position held

With regards to the position held by the respondents from the various construction firms involved in the study, as seen from Table 4.2, 24 respondents representing 32.0% were project manager, 22 of the respondents representing 29.3% were practicing engineers, 15 of the respondents representing 20% were architects. Also, of the 14 of the respondents representing 18.7% were supervisors. Hence as can be seen from the above table, quantity surveyors were the most available respondents followed by engineers who are more vested in the subject matter under study.

**Table 4.2 Occupation**

	Frequency	Percent	Valid Percent	Cumulative Percent
Project Manager	24	32.0	32.0	32.0
Engineer	22	29.3	29.3	61.3
Architect	15	20.0	20.0	81.3
Quantity Surveyor	14	18.7	18.7	100.0
Total	75	100.0	100.0	

**4.3 How long have you worked at this company?**

As indicated in the following table 4.3, a total of 3 of the respondents corresponding to 4.0% worked for their various companies for less than a year, 15 respondents corresponding to 20% also worked for 1-5 years, 47 respondents corresponding to 62.7% worked for 6-10 years and 10 of the respondents who also corresponded to 13.3% worked for more than 10 years. Therefore, from the previous data it is clear that the interviewees have worked in different workplaces enough to make a significant and useful contribution to the study.

**Table 4.3 How long have you worked at this company**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than (1) year	3	4.0	4.0	4.0
1 –5 years	15	20.0	20.0	86.7
6- 10 years	47	62.7	62.7	66.7
Above 10 years	10	13.3	13.3	100.0
Total	75	100.0	100.0	



Assuming the role of a project manager gives one the experience to understand the demands and expectations of all stakeholders. Hence this question was necessary to ascertain the validity of the respondents' contributions to this study. From Table 4.4 below. 32 respondents submitted that, they have assumed the role of a project manager before whereas 43 of the respondent have not. However, thought the majority may not have assumed a lead role as a project manager it is a fact that they will have being working closely with project managers hence, they understand the role of a project manager.

**Table 4.4 Have you assumed the role of a project manager before**

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	32	42.7	42.7	42.7
No	43	57.3	57.3	100
Total	75	100.0	100.0	

# **OBJECTICE ONE: LEVEL OF AWARENESS OF PROJECT MANAGERS IN GREEN CONSTRUCTION IN THE GHANAIAN CONSTRUCTION INDUSTRY.**

## **4.3.1: level of understanding on the concept of green construction**

it is not disputable that the concept of green construction is new and is not commonly known to even some construction practitioners around the globe and Ghana is not an exception. this section sought to ascertain the level of awareness of professionals within the industry on how much they know about green construction. interestingly, from table 4.5 below hundred percent of the respondents have one way on the other head of green construction. the details illustrated bellow.

**Table 4.5 level of understanding on the concept of green construction**

	Frequen cy	Percent	Valid Percent	Cumulative Percent
Understand deeply	28	37.4	37.3	37.3
Only read about it	36	48.0	48.0	85.3
Fair Knowledge about it	3	4	4	89.3
Just aware of it	8	10.7	10.7	89.3
No Knowledge about it	0.0	0.0	0.0	100.0
Total	75	100.0	100.0	

#### 4.3.2 What is your view on the concept of green construction in Ghana

The importance of green construction and its benefit to the end-user, the environment, and function is the main motivational factor for considering green construction as an alternative to the traditional construction. From Table 4.3.2, respondents submitted that, the concept of green construction is important and therefore this alerts the readiness of the professionals within the Ghanaian Construction industry to adopts this new construction approach.

**Table 4.6 Level of understanding on the concept of green construction**

	Frequen cy	Percent	Valid Percent	Cumulative Percent
Very important	75	100	100	100
Important	0.0	0.0	0.0	100
Fairly important	0.0	0.0	0.0	100
Not important	0.0	0.0	0.0	100
Do not know	0.0	0.0	0.0	100.0
Total	75	100.0	100.0	

#### 4.3.4 Have you ever been involved in green construction project before?

Ascertaining the level of awareness of respondents on the concept of green construction is not enough hence, it was necessary to determine whether the respondents have undertaking a green/sustainability construction project before. Owing to this, Table 4.6 indicated that all

respondents have been involved in green construction project. It is however important to add that this information does not necessarily indicate that all construction professionals within the Ghanaian construction industry have undertaken green construction project before since the research was limited to only the Construction companies within the Accra Metropolis.

#### **4.3.4 Respondents' challenges and success in undertaking green construction.**

This section of the questionnaire was opened to attain respondents view that is typical within the Ghanaian construction industry. Submissions from respondents indicated that, green construction project as compared to conventional project tends to be more cost incurring. This is due to materials and technology need for green construction.

Again respondents were of the view that there is the issue of unfamiliarity with green technologies. There again, there is the issue of insufficient knowledge and technical expertise. This is because the technologies that comes with green construction are more complicated and deference from conventional construction.

Finally, there is also the issue of difficulty in the planning process and can be protracted due to the process of approvals needing in the use of new green technologies and materials. This is in conformity with a study conducted by Tagaza and Wilson, (2004).

#### **OBJECTICE TWO: ROLES OF PROJECT MANAGERS IN GREEN CONSTRUCTION IN THE GHANAIAN CONSTRUCTION INDUSTRY**

The following are factors relating to the roles of project managers in green construction. Kindly tick your level of agreement to the bellow listed roles of project managers in green construction based project using a likert scale of 1 to 5 1- Strongly Disagree, 2- Disagree, 3- Neither Disagree nor Agree, 4- Agree, 5- Strongly Agree.

The mean as well as mean scores of the following 14 project manager in green construction roles as in the view of all seventy-five (75) respondents were calculated have been presented in the table below.

Results from Table 4.7 below indicates that the lead role of a project manager in green construction is Setting sustainable priorities and goals early in feasibility study. This was ranked 1<sup>st</sup> and is evidenced with a mean and RII value of 4.973 and 0.995 respectively. As affirmed by Hakkinen and Belloni, (2001), setting clear goals is important for sustainable construction because in addition to market conditions and physical needs that are normally considered in a traditional construction the project manager should be able to set environmental and sustainable priorities to in order to meet cost targets since green projects can be very capital intensive.

The issue of communication and collaboration is key in executions and attainment of success in any given project. Hence from table 4.7 below it can be observed that Stimulation collaboration and communication among team members ranked 2<sup>nd</sup> with a mean of value 4.933 whiles Establishing basic communication procedures by providing useful, objective and reliable information for end users ranked 3<sup>rd</sup> with a mean value of 4.907. the closely related ranks on the issue of communication therefor indicated this important role of the project manager. Robichaud et al (2011) recognize communication and coordination across a multidisciplinary team as the most important challenge in the role of project managers in green construction projects. In a multi-disciplinary team, the role of a project manager is even more crucial since there have the responsibly of conduction planning and strategy meetings in order to ensure that project goals are understood by all team members.

Also, being acquainted with measureable targets and their evaluation tools ranked 4<sup>th</sup> and role of a project manager in green construction is very important. This is because green construction and sustainability projects comes with new and strict regulations and legislation example on

energy saving and carbon dioxide emissions. This regulation in order jurisdictions like the United Kingdom has strict regulations, codes and legislations. This therefore calls for a project manager that is well acquainted with these codes and standards to avoid any form of violations that may subject the project to damaging law suits.

**Table 4.7: Roles of Project Managers in Green Construction**

NO.		FREQUENCY OF RANKING					TOTAL	$\Sigma W$	MEAN	RII	RANKING
		1	2	3	4	5					
1	Setting sustainable priorities and goals early in feasibility study.				2	73	75	373	4.973	0.995	1 <sup>st</sup>
2	Providing information regarding sustainable construction and value added				15	60	75	360	4.800	0.960	8 <sup>th</sup>
3	Establishing basic communication procedures by providing useful, objective and reliable information for end users.				7	68	75	368	4.907	0.981	3 <sup>rd</sup>
4	Being acquainted with measureable targets and their evaluation tools.				9	66	75	366	4.880	0.976	4 <sup>th</sup>
5	Conduction charette to establish basic communication among key stakeholders.				17	58	75	358	4.773	0.955	9 <sup>th</sup>
6	Stimulation collaboration and communication among team members.				5	70	75	370	4.933	0.987	2 <sup>nd</sup>
7	Conduction planning and strategy meetings.				10	65	75	365	4.867	0.973	5 <sup>th</sup>
8	Being a role model among the project team.				11	64	75	364	4.853	0.971	6 <sup>th</sup>
9	Adjustable role between innovation and regulation.			4	20	50	74	342	4.622	0.924	13 <sup>th</sup>
10	Providing in-time and efficient information regarding different regulations.			5	17	53	75	348	4.640	0.928	12 <sup>th</sup>
11	Providing opportunities for regulatory bodies to participate in the charrette.			5	25	45	75	340	4.533	0.907	14 <sup>th</sup>
12	Providing a conceptual cost estimate for review by the owner in the charrette process.			4	18	53	75	349	4.653	0.931	11 <sup>th</sup>
13	Developing strategies for formulating an initial budget and schedule in the presence of an integrated group.				13	62	75	362	4.827	0.965	7
14	Organizing evaluation process for performance-based tendering and procurement.			4	14	57	75	353	4.707	0.941	10

Source: field survey, (2019)

### **OBJECTIVE THREE: KEY COMPETENCIES REQUIRED OF PROJECT MANAGERS IN GREEN CONSTRUCTION.**

For this section of the questionnaire, respondents were asked to indicate their level of agreement to the bellow listed key competencies of project managers in green construction based project using a likert scale of 1 to 5 1- Strongly Disagree, 2- Disagree, 3- Neither Disagree nor Agree, 4- Agree, 5- Strongly Agree.

This section of the questionnaire was categorized into five major competence requirement which includes; Social, Economic, Environmental, Leadership and Interpersonal skills. The mean as well as mean scores of the major competence requirement have being raked and presented in the table below.

From Table 4.4 below, Environmental competence ranked 1<sup>st</sup> with and average RII of 1.294. The environmental competence domain in green project management focuses on achieving projects in a sustainable way through responsible green contruction. As the interview respondents stated, the management of resources, including energy, water, and waste, and procurement management skills are an inherent aspect of construction project management.

The same applies for soil management.

Sustainable energy management refers to the procedures undertaken to minimize energy consumption and pollution through effective use of energy (GPM, 2013). Efficient energy management requires project managers in green construction to minimize the levels of embodied energy in materials, prioritize the use of renewable energy sources, and establish principles that seek energy efficiency as a priority.

Sustainable water management refers to the procedures that pertain to the impact on water quality, water consumption and water displacement. This ability includes managing the optimal use of water resources to minimize the impact on local bodies of water and ecosystems (GPM, 2013). In order to preserve ecosystems and bodies of water, project managers in green

construction should take into account the amount of water necessary for the project realization and its impact on the local water table (GPM, 2014).

Sustainable waste management refers to the procedures with regard to waste disposal, the handling of waste during the project construction lifecycle, and the type and amount of waste created by the project's output. This ability includes the optimization of all available resources and responsible waste disposal (GPM, 2013). To sustainably manage waste, project managers in green construction are expected to explore options for material reuse and recycling.

Secondly, from Table 4.4 below, Social competence ranked 2<sup>nd</sup> with an average RII of 1.133. The social competence in green project management focuses on achieving projects in an ethical way while maintaining mutually beneficial relationships with employees and stakeholders. The ability to establish vision and direction to influence and align others towards a common purpose, and to empower and inspire people to achieve project [objectives] is the very essence of managerial leadership on a regular basis, CPMs require leadership skills to lead the project team.

Project health and safety management is a company's procedures for health and safety management relating to the project, its team and environment (Maltzman and Shirley, 2010). The most important health and safety issue regarding construction workers is the quality of the working conditions. One might deduce that project managers in green construction need a background in legal knowledge to assure compliance with such standards.

It is also important that project manager in green construction obtain the skill in managing stakeholders (Bradley and Anantatmula, 2014). Similarly, the Green Project Management (2014) strongly advises project managers to identify environmental-related stakeholders, either internal or external, in order to ensure the consideration of sustainability aspects in projects.



Again, from Table 4.8 below, leadership competence ranked 3<sup>rd</sup> with an average RII of 1.133. The ability to establish vision and direction to influence and align others towards a common purpose, and to empower and inspire people to achieve project objectives is the very essence of managerial leadership (GPM, 2013). On a regular basis, construction project managers require leadership skills to lead the project team. Effective leadership is nowadays all the more important for construction project managers to deal with the new technologies and construction standards (Tabassi et al., 2016).

According to the Green Project Management (2013) company, green project managers differentiate themselves from other managers by the principles to which they adhere and by their ability to convey that into others. Tabassi *et al.* (2016) agree and argue that, through transformational leadership skill, project managers in green construction have the potential to inspire and empower employees to commit to sustainability during the realization of projects.

Last but not the least, from Table 4.4 below, leadership competence ranked 4<sup>th</sup> with an average RII of 0.766. The economic competence requirement in green project management focuses on achieving projects in the most efficient, productive and profitable way. This covers quality management, project risk management, project time management, and project cost management (Tabassi et al. 2016).

Finally, from Table 4.8 below, Interpersonal skills ranked 5<sup>th</sup> with an average RII of 0.576. This comprised of the project manager in green construction being resourceful, solution oriented, possess analytical skills, exhibiting adaptability, and being proactive and demonstrating positive attitude.

**Table 4.8: Key Competencies Required of Project Managers in Green Construction**

		FREQUENCY OF RANKING					TOTAL	ΣW	MEAN	RII	RANKING		
NO.		1	2	3	4	5						AVERAGE RII	OVERALL RANKING
SOCIAL												1.133	2 <sup>nd</sup>
1	Leadership			5	5	65	75	360	4.800	0.960	2nd		
2	Ethics & professionalism				30	45	75	345	4.600	0.920	6th		
3	Health & safety managements				12	63	75	363	4.840	0.968	1st		
4	Claim management				25	50	75	350	4.667	0.933	5th		
5	contract management				20	55	75	355	4.733	0.947	3rd		
6	Corporate social responsibility				22	53	75	353	4.707	0.941	4th		
ECONOMIC												0.766	4 <sup>th</sup>
1	Reviewing & reporting process			5	25	45	75	340	4.533	0.907	4th		
2	Project management software			2	5	66	75	356	4.877	0.975	2nd		
3	Investment appraisals				5	70	75	370	4.933	0.987	1st		
4	Literacy & Numeracy skills			2	10	63	75	361	4.813	0.963	3rd		
ENVIRONMENTAL												1.294	1 <sup>st</sup>
1	Procurement & logistics			5	25	45	75	340	4.533	0.907	6th		
2	Energy management			5	15	55	75	350	4.667	0.933	3rd		
3	Waste management			4	23	48	75	344	4.587	0.917	5th		
4	Water management			21	12	42	75	321	4.280	0.856	7th		
5	Environmental legislative requirements				30	45	75	345	4.600	0.920	4th		
6	Environmental Impact Assessment				11	64	75	364	4.853	0.971	1st		
7	Sustainability reporting processes				12	63	75	363	4.840	0.968	2nd		
LEADERSHIP												0.965	3 <sup>rd</sup>
1	Creative effective environment				15	60	75	360	4.800	0.960	4th		

2	Decision-making				10	65	75	365	4.867	0.973	2nd
3	Negotiation skills				9	66	75	366	4.880	0.976	1st
4	Coaching & independent actions				13	62	75	362	4.827	0.965	3rd
5	Teamwork				17	58	75	358	4.773	0.955	5th
<b>INTERPERSONAL SKILLS</b>											
1	Resourcefulness			5	1	69	75	364	4.853	0.971	1st
2	Solution-oriented				17	58	75	358	4.773	0.955	2nd
3	Analytical skills			3	12	60	75	357	4.760	0.952	3rd
4	Adaptability				27	48	75	348	4.640	0.928	5th
5	Proactive and positive attitude			3	15	57	75	354	4.720	0.944	4th
										0.5755	5 <sup>th</sup>

Source: field survey, (2019)

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION**

#### **5.1 Introduction**

This thesis has essentially dealt with the key competences required for project managers in green construction. The structure of the study is divided into five (5) independent but related chapters. The objective of this research is to examine the key competences required by green building project managers, which ultimately contribute to improving sustainability in the Ghana construction sector. The study also sought to assess the level of awareness of project managers in green construction, identify the roles of project managers in green construction and identify the key competencies required by project managers in green construction. This chapter summarizes the results of the study and provides recommendations based on the researcher's findings of the study.

#### **5.2 Summary of Findings**

The results of the study revealed that the green construction project compared to the conventional project tends to be more capital intensive. This is due to the need for materials and technologies for green building.

Respondents felt that the problem of lack of familiarity with green technologies existed. Once again, there is the problem of insufficient technical knowledge and experience. This is because the technologies that derive from green building are more complicated and respect conventional constructions.

Once again, it has been discovered that there is a difficulty in the planning process and that it can be prolonged due to the approval process required in the use of new technologies and green materials.

The formulation and communication of clear project objectives, including those related to sustainability, is an integral part of the functional competences of the green building project management competence, which requires careful planning and analysis skills.

The results of this study have finally revealed 5 key competency requirements for managers in green building projects. The order of importance of the key competence requirement includes: environmental competence, social competence, leadership competence, economic competence and interpersonal skills.



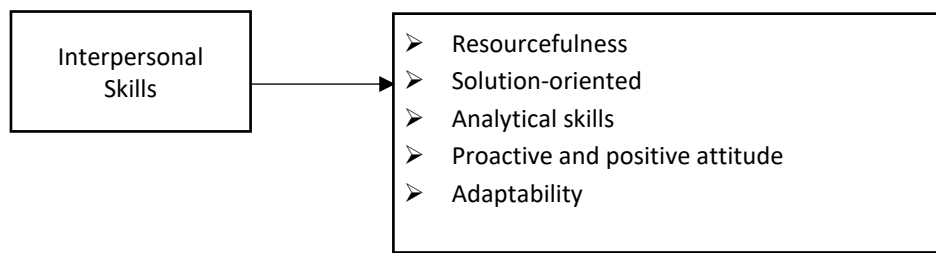


Fig 5.1: key competencies required of project managers in green construction

### 5.3 Conclusion.

As sustainability becomes more common in construction project management, it is expected that through a proactive management approach, project management in green construction will further understand how best to apply and adapt their practices and competencies. Currently, ongoing innovation, resulting from institutional and technological change, adds complexity to project management. Hence, selection of a project manager should prioritize a manager who is effective in environmental issues, leadership and company, and target management at the start of green construction in Ghana.

## **5.4 Review of Objectives**

In pursuit of the research objective, three objectives have been set. The achievement of each of the three research objectives is established in the following subsections.

### **5.4.1 Review of Objective one**

The first objective was to assess the level of awareness of project managers in the green building sector in the Ghana construction sector. This objective was first achieved by asking respondents the awareness and perception of the concept of green construction and therefore indicating by far the challenges encountered in the implementation of any green construction project. As a result, respondents' presentations indicated that the green construction project compared to the conventional project tends to generate more costs. This is due to the need for materials and technologies for green building. Furthermore, there is the question of lack of familiarity with green technologies, as well as the lack of technical knowledge and experience. Finally, the green building planning process can be prolonged due to the approval process of the authorities that need the use of new technologies and green materials.

### **5.4.2 Review of Second Objective**

The second objective was to identify the roles of project managers in green construction. Respondents were asked to indicate their level of agreement with fourteen (14) listed roles of project managers in green constructions that fit the literature using a likert scale. The result was analyzed using the Relative Importance Index analysis and, depending on the values and average means of each variable, the mean values that signified the most important role for the variable were ranked accordingly.

### **5.4.3 Review of Third Objective**

The third objective was to identify the key competences required by project managers in green construction. Once again, respondents were asked to indicate their level of agreement with the key competences required by project managers in ecological construction that fit the literature using a Likert scale. As a result, key competences have been classified into five main competency requirements which include; Social, economic, environmental, leadership and interpersonal skills. The result was analyzed using the Relative Importance Index analysis and, depending on the average values and indexes of each variable, the variable representing the most important category of key competences to the less important variable were ranked.

### **5.5 Recommendation**

From the findings of the study, it is therefore essential to enact and enforce support regulations and also to make the initial and operational costs of sustainable construction projects cheaper than traditional construction projects. The following measures are recommended:

1. There must be improvements in the education and training of personnel and companies responsible for ensuring environmental sustainability and processes in the construction sector that are documented, adaptable and periodically evaluated;
2. The district, municipal and metropolitan planning authorities must vary the rates and the procedures for the construction of the building permits in accordance with the sustainability of the project. Therefore, the more sustainable a project is, the lower the processing cost and the faster the authorization procedures.
3. Provision of incentives for collaborative work and the existence of a companies' policy framework that supports both individuals and teams in green building projects.



4. It is necessary to make changes to the regulation of the government, in particular as regards the correct classification of contractors, consultants and projects; This will help to assign green building projects to qualified bidders in green building.
5. It is also recommended that, technological platforms such as software for proper sharing of information and communication technologies should be made readily available to guarantee the continuous exchange of information that facilitates the execution of green building projects.
6. The creation of strategic alliances and partnerships with all interested parties to raise public awareness on green building and its benefits for society. This will also ensure that customers insist on undertaking sustainable projects.

Furthermore, efforts should be made by the government to discount tax and provide incentives for companies that deal with green technology and green construction. This will attract companies in the production of these materials and, over time, will guarantee the availability and the lowest cost of green materials and green technology.

### **5.6 Recommendation for future study**

For future research, it would be interesting to combine project management skills in green construction with specific types of projects or stages in the construction life cycle. In this way, the management of green construction projects could specifically identify the skills they wish to improve or develop.



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## APPENDICES

### KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY MSC PROJECT MANAGEMENT

#### QUESTIONNAIRE

#### KEY COMPETENCIES REQUIRED OF PROJECT MANAGERS IN GREEN CONSTRUCTION

This questionnaire forms part of a MSc research being undertaken at the Kwame Nkrumah University of Science and technology.

The purpose of the questionnaire is to enable the achievement of the following research objectives:

4. To assess the level of awareness of project managers in green construction.
5. To identify the roles of project managers in green construction
6. To identify the key competencies required of project managers in green construction.

Your assistance in answering the questions set out below would be much appreciated. Please do not leave any identification marks on the forms in order that the replies remain anonymous. The information provided will be used solely for academic purposes and will be treated confidentially.

Thank you.

For any enquiries please contact;

.

Tel. No: +233.....

Email: .....

Please provide the correct information by ticking [✓] in the appropriate box and fill in the blank

Spaces where necessary.

## SECTION A: BACKGROUND INFORMATION OF RESPONDENT

1. Academic Qualification:
  - a. SSCE [ ]
  - b. HND [ ]
  - c. BSC [ ]
  - d. MSC [ ]
  - e. PHD [ ]
2. Current position in your company:
  - a. Manager [ ]
  - b. Engineer [ ]
  - c. Architect [ ]
  - d. Quantity Surveyor [ ]
3. How long have you worked in this firm?
  - a. Less than (1) year [ ]
  - b. 1 –5 years [ ]
  - c. 6- 10 years [ ]
  - d. Above 10 years [ ]
4. Have you assumed the role of a project manager before?
  - a. Yes
  - b. No

**OBJECTICE ONE: LEVEL OF AWARENESS OF PROJECT MANAGERS IN  
GREEN CONSTRUCTION IN THE GHANAIAAN CONSTRUCTION INDUSTRY.**

1. What is your level of understanding on the concept of green construction?
  - a. Understand deeply through reading and taught courses [ ]
  - b. Only read about it [ ]
  - c. Fair knowledge about the concept [ ]
  - d. Just aware of it [ ]
  - e. No knowledge about it [ ]
2. What is your view on concept of green construction in the Ghanaian construction industry?
  - a. Very important
  - b. Important
  - c. Fairly Important
  - d. Not important
  - e. Do not know
3. Have you ever been involved in a green construction project before?
  - a. Yes
  - b. No
4. If yes, please state your experience in terms of challenges and its success.  
.....  
.....



## OBJECTICE TWO: ROLES OF PROJECT MANAGERS IN GREEN CONSTRUCTION IN THE GHANAIAI CONSTRUCTION INDUSTRY

The following are the Role of project managers in green construction. With your experience, kindly rank on a Likert scale of 1-5, the importance of the following project managers' roles in green construction.

1	2	3	4	5
Not important	Less important	Neutral	Important	Very Important

Role of project managers in green construction		1	2	3	4	5
1	Setting sustainable priorities and goals early in feasibility study					
2	Providing information regarding sustainable construction and value added					
3	Establishing basic communication procedures by providing useful, objective and reliable information for end users.					
4	Being acquainted with measureable targets and their evaluation tools					
5	Conduction charette to establish basic communication among key stakeholders					
6	Stimulation collaboration and communication among team members					
7	Conduction planning and strategy meetings					
8	Being a role model among the project team					
9	Adjustable role between innovation and regulation					
10	Providing in-time and efficient information regarding different regulations					
11	Providing opportunities for regulatory bodies to participate in the charette					
12	Providing a conceptual cost estimate for review by the owner in the charrette process					
13	Developing strategies for formulating an initial budget and schedule in the presence of an integrated group					
14	Organizing evaluation process for performance-based tendering and procurement					

### OBJECTIVE THREE: KEY COMPETENCIES REQUIRED OF PROJECT MANAGERS IN GREEN CONSTRUCTION.

The following are key competencies required of project managers in green construction. Kindly rank on a Likert scale of 1-5, the following strategies in effective stakeholder management.

1	2	3	4	5
Not important	Less important	Neutral	Important	Very Important

KEY COMPETENCIES REQUIRED OF PROJECT MANAGERS IN GREEN CONSTRUCTION						1	2	3	4	5
	<b>SOCIAL</b>									
1	Leadership									
2	Ethics & professionalism									
3	Health & safety managements									
4	Claim management									
5	contract management									
6	<b>Corporate social responsibility</b>									
	<b>ECONOMIC</b>									
1	Reviewing & reporting process									
2	Project management software									
3	Investment appraisals									
4	Literacy & Numeracy skills									
	<b>ENVIRONMENTAL</b>									
1	Procurement & logistics									
2	Energy management									
3	Waste management									
4	Water management									
5	Environmental legislative requirements									
6	Environmental Impact Assessment									
7	Sustainability reporting processes									
	<b>LEADERSHIP</b>									
5	Creative effective environment									
6	Decision-mating									
7	Negotiation skills									
	Coaching & independent actions									
	Teamwork									

	<b>INTERPERSONAL SKILLS</b>				
1	Resourcefulness				
2	Solution-oriented				
3	Analytical skills				
4	Adaptability				
5	Proactive and positive attitude				