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# Project Management Competencies of Building Construction Firms: A Structural Equation Model Approach

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**Abstract** This paper identified and assessed the importance of project management (PM) competencies of indigenous building construction firms (BCFs) in the Upper West region of Ghana. It also analyzed the relationships between the PM competency groups. Empirical evidence on 12 key PM competency groups were decoupled into 42 sub-groups. These were identified and ranked in order of importance to project success of the 44 BCFs. A structural equation model was used to assess the causal relationship between the 12 PM competencies. The findings indicate that of the 12 PM competencies, project cost management, project risk management, and project quality management emerged as the most important to the success of a project. Again, there was a strong positive relationships between and among all the 12 PM competencies. The study argues that the findings could serve as a guide for the local BCFs in their future professional training and development programs.

**Keywords** Project Management, Competency, Construction Firms, Project Success, Wa

## 1. Introduction

> ***"Some businesses find themselves in a situation where often far too many people who are involved in or running projects, are under-trained, lacking in basic knowledge, skills and competencies" (John Edmonds, 2010).***

The building construction is one of the prominent sub-sector of the construction industry, and a key driver of socio-economic development of nations (Hillebrandt, 2000). Ofori (2012), indicates that, generally construction of all forms contributes between 5 and 10 percent of gross domestic product (GDP) in all countries, employs up to 10 percent of the working population, and is responsible for about half of the gross fixed capital formation. On this point Badiane (2001) also estimates that investments in housing alone account for 2 to 8 percent of GNP; between 10 and 30 percent of gross capital formation; between 20 and 50 percent of accumulated wealth; and between 10 and 40 per cent of household expenditure. In the words of Hillebrandt (2000), the industry is "an economic regulator" or "the balance wheel of the economy" as much as it has linkages with many other sectors of the economy.

In the developing countries including Ghana, the building construction industry has been dominated by the private sector for several decades. Contemporary construction management literature indicates that since independence, construction industry in Ghana has been private sector dominated, which consists of both local and foreign construction firms (Laryea and Mensah, 2010). Some studies see for example Laryea and Mensah (2010), Rwelamila (2007), Muriithi and Crawford (2003) have shown among the many problems bedeviling the construction industry in developing countries of which inadequate project management competency has been identified as the most serious.

Ghanaian construction firms like other business entities are now in an environment of constant change (Attakora-Amaniampong et al., 2014; Ofori, 2012) with increasing complexity (Laryea and Mensah, 2010), which must be competitive, productive, customer-focused (Attakora-Amaniampong et al., 2014; Rasila *et al*, 2006), and profitable (Siddiqui and Rahman, 2007). Acquiring essential competencies such as PM competence for organisations like the BCFs to improve has been a documented evidence for enhancing professional development and training in the human resource management parlor (Ahadzie et al., 2009). PM is among the tools for business organizations' survival. Some earlier

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assertions considered PM as one of the oldest and most respected accomplishments of mankind (Morris, 1981). Among these are the architects of ancient sites: the Egyptian Pyramids, the Great Wall of China, the great cathedrals and mosques, and other wonderful edifices of the world. PM has become one of the new ways of accomplishing and managing business activities (Project Management Institute, 2008) of which construction firms in Ghana should not be left out. With construction operations as asserted by Ford and Bhargav (2006), PM is a unique method of generativity that can mitigate risk through the adjustment of individual construction processes. Again, in the project-oriented firms like those in the building construction industry, projects and programs management are becoming more important and new areas of application (Gareis, et al, 2009). The increasing importance of PM could be inferred from the theme of the 2014 annual seminar of the Valuation and Estate Surveying (VES) division of Ghana Institution Surveyors (GhIS): "*Project Management: A development opportunity for the estate surveyor*" GhIS-VES (2014).

PM competence is a well-established research item that categorised in detail the knowledge, skills and competencies into five major areas namely the Project Management Body of Knowledge (PMBOK); Application Area knowledge, standards, and regulations; Understanding the project environment; General management knowledge and skills, and Interpersonal skills. It is stressed that, an effective project management requires that the project manager and staff understand and use these competencies (Project Management Institute, 2013). Nevertheless, whereas many real estate and building construction management research have focused on PM issues among international and large construction firms (such as Bryde, 2003; White and Fortune, 2002) to date, there has been scanty published work on the indigenous building construction firms (Laryea and Mensah, 2010).

Another area of local building construction management that has suffered limited research is in the arena of PM competency. The inadequate knowledge about the importance of PM competencies to local building construction industry and the intricate relationships between the individual PM competencies might militate against the effective use of construction PM. While the construction industry represents one of the largest industries in Ghana, it has remained under-researched regarding the importance of PM competencies and the relationships between the PM competencies among the indigenous BCFs.

The article has two fold objectives; first, identifies and assesses the importance of the PM competencies among the indigenous BCFs and second, it analyzes the relationships between the PM competencies. The paper is intended to serve as a guide for the local BCFs to develop their future professional training and development programs. The rest of this paper is structured so that the next section reviews literature on the relevant literature on BCF, PM and PM competencies after which, the methodological approach for this study is presented. The last section of this paper presents the results and discussion with a conclusion.

## 2. Conceptualizing Building Construction Firms' Project Management Competencies

The question of PM competencies in BCFs is critical in this respect because many studies including Loo (2003) and Edmonds (2010) have indicated that, a project success is hinged on the PM knowledge, skills and competencies of the project manager and the project team. In an attempt to conceptualizing building construction firms' project management competencies, this section dwells on the conceptual explanation of what project, PM, PM competency and BCFs are, as well as the importance of PM competency to BCFs.

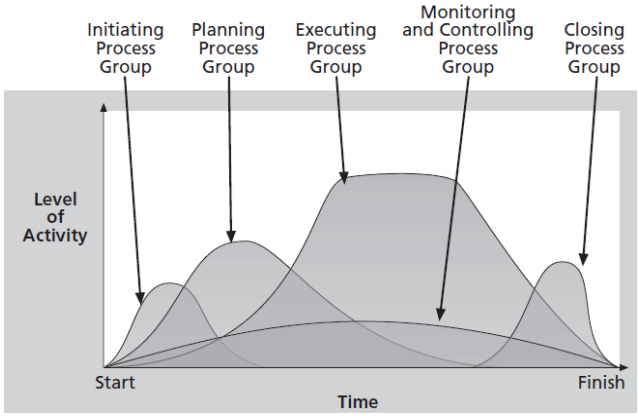
## 3. Project

A project is defined as any temporary endeavour undertaken to achieve a unique product, service, results or objectives (Project Management Institute, 2013; 2008). A project can also be defined as a set of well-defined inter-related activities designed to achieve a specific objective within a specified time frame and budget (APM, 2013; Gardiner and Stewart, 2000). In addition, Stenvenson (2008) defines a project as a unique, one-time operations designed to accomplish a specific set of objectives in a limited time frame. From the above definitions, it can be deduced that projects are characterized by the following features: they constitute a set of activities with well-defined objectives (PMI, 2008; 2013; Whitehead, 2005). In addition, they have a specified time frame, cost constraint, quality limits and involves risk at every step of their processes. Every project is unique (Gary, 2009; Carr, 2009; Stenvenson, 2008). In other words, it may never be repeated in the same way by the same group of people at the same place. They are intended to generate benefit with a progressive elaboration which consume resources in the form of money, people, and equipment (Carr, 2009) as earlier indicated by Whitehead (2005).

Additionally, it is pertinent to stress that projects go through life cycles. Every project goes through the initiating, planning, executing, monitoring and controlling, and closing stages (PMI 2008; Stevenson, 2008). Unique but overlapping set of processes are performed at each stage, and project processes are performed by the project team, categorized as the initiating, planning, executing, monitoring and controlling, and closing groups (PMI, 2013; 2008; Stevenson, 2008) as depicted by Figure 1.

Projects according to Dinsmore, and Cooke-Davies (2006) can be classified into three groups depending upon their triggers: first, Compliance (Requirement) and Emergency (Must Do) Projects; A project that must be done to satisfy a certain requirement, for example to enable an entity to embark on any project in a region, district or an area as

business. There is the need to carry out an Environmental Impact Assessment as a project which is a requirement. They pay penalty is required if not implemented. Second, Strategic Projects are those that directly support organization's long-run mission. Frequently, they are directed toward increasing revenue or market share.




**Source: PMI, 2008**

**Figure 1.** Project Life Cycle

Examples of strategic project include the introduction of a new product and to build a new plant in response to chronic product shortage and resultant high prices. Third, Operational Projects are carried out to support the operations in an organization. These projects are designed to improve efficiency of delivery systems, reduce product costs, and improve performance. TQM projects are operational projects (Dinsmore and Cooke-Davies, 2006). In relation to above classification is the role of projects. Rose (2007) pronounces that projects have many roles to play. They solve a problem; satisfy the needs of society; improve the living standards of people; and improve the capacity of a community to manage on their own. They can serve as philanthropic gesture; politically, they are sometimes used to score political points. Projects are utilized to alleviate difficulties and make a dream come true (Rose, 2007).

## 4. Project Management (PM)

PM is defined as "the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirement" (PMI, 2013; 2008). PMI further stresses that, PM is accomplished through the appropriate application and integration of the project management process groups. Successful project management can be defined as having achieved the project objectives within specified time and cost frame at a given desirable performance/technology level while utilizing the assigned resources effectively and efficiently of which the result should be accepted by the customer or client (PMI, 2008). Previously, Stevenson (2008) opined the key success factors of project management to include top-down commitment; having a capable project manager; having time to plan; careful tracking and control and good communications. Also, in accordance with the Association of Project Management (APM, 2013) a successful project is one that meets or exceeds the expectations of the stakeholders.

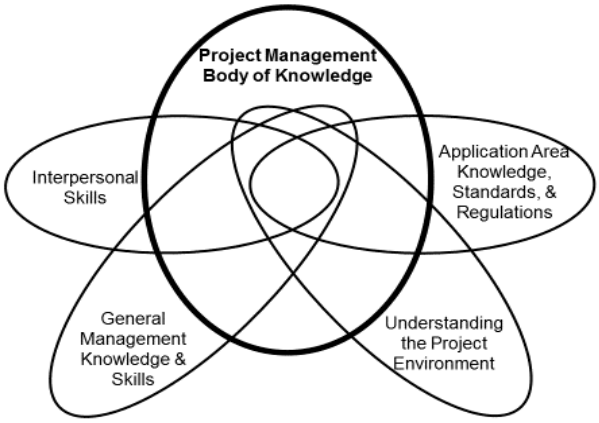
A contemporary PM literature needs to touch on the relationship between project management and its sister concepts such as, programme management and portfolio management. Whereas a programme is a set of projects managed in a coordinated way to obtain benefits and control not available from managing them individually, a Portfolio refers to a collections of projects or programmes or other work that is grouped together to facilitate effective management of that work to meet strategic business objectives (PMI, 2008). It is emphasized that the project or program of a portfolio may not necessarily be interdependent or directly related (PMI, 2008). PMI, 2008) further define portfolio management as the centralized management of one or more portfolios and includes identifying, prioritizing, authorizing, managing and controlling projects, program and other related work to achieve strategic business objectives. Portfolio management focuses on ensuring that projects and programs are reviewed to prioritize resource allocation and that the management of portfolio is consistent with and aligned to organizational strategies (PMI, 2008).

Emphatically, the role of a project manager is distinct from that of a functional manager (Stevenson, 2008). Whiles a functional manager provides management oversight for an operational department and the resources that support the functional area, the project manager is involved with planning, staffing monitoring and controlling, as well as directing the resources associated with a project (PMI, 2008). The project manager is responsible to the project stakeholders for delivering a project objective within scope, time, cost and quality. However, depending on the organizational structure, a project manager may report to a functional manager (PMI, 2008). According to Stevenson (2008) project management are responsible for the work, quality, human resources, time, communications and costs associated with a given project of which project managers and PM teams required key PM skills in their execution.

## 5. Project Management (PM) Competencies

PMI (2002; 2008; 2013) identifies and categorizes the competencies needed by the managers and staff of PM, into three broad competent areas such as: Project Management Knowledge Competency which comprises what the project management team knows about PM; Project Management Performance Competency which entails what the project team can accomplish while applying the project management knowledge; and Personal Competency, which entails how the project management team behave while performing the project or activities. PMI (2008) uncovered that an effective project management requires the project manager and team to understand and use knowledge and skills from at least the

following five areas of expertise: The Project Management Body of Knowledge (PMBOK) which entails the application area knowledge, standards, and regulations; Understanding the project environment; General management knowledge and skills and Interpersonal skills (PMI, 2013; 2008). See figure 2.




**Source: Modified from PMI, 2008**

**Figure 2.** Overlapping Competencies for Successful Project Management

The PMBOK is a trade mark of the Project Management Institute (PMI) and this institute is an inclusive term that describes the sum of knowledge within the profession of project management (PMI. 2002). As with other professions such as Law, Medicine and Accounting, the body of knowledge rests with its practitioners and academics who apply and advance it.

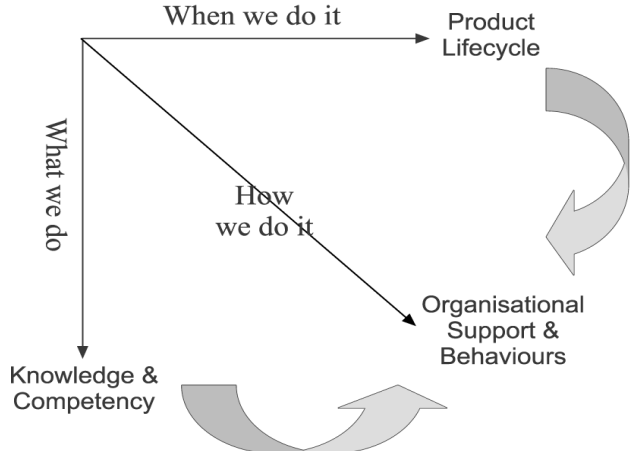
The standard is unique to the project management field (PMI. 2008; 2002). The PMBOK Guide is the standard for managing most projects most of the time across many types of industries. This standard describes project management processes, tools and techniques for managing scope, schedule, quality and cost as well as any project environment aspects that influence the project outcome. This method that allows the standards to work for most projects most of the time is called "project tailoring." According to PMI (2013; 2008, 2002) as previously stated, there are nine project management body of knowledge areas as depicted in the table below. These nine body of knowledge areas are though interrelated but with different skills, tools, and techniques to project activities in order to meet project requirements.

**Table 1.** Knowledge Areas of Project Management

| | | |
|---|---|---|
| 1, Project Integration management | 4, Project Scope Management | 7, Project Communications Management |
| 2, Project Cost Management | 5, Project Quality Management | 8, Project Human Resources Management |
| 3, Project Time Management | 6, Project Risk Management | 9, Project Procurement Management |

**Source: Project management Institute, 2008**

In relation to the nine PM knowledge areas, Eve, (2007), recommended product lifecycle, knowledge and competencies and organizational support and behaviour as the three areas of focus for developing successful project management systems and which has been summarized in figure 3.




**Source: Eve, 2007**

**Figure 3.** The areas of focus for successful project management systems

Eva (2007) lamented that the tendency of the world's benchmark companies towards acceptance for project management as a ''way of working'' rather than a simple approach or tool set is not a mistake. As a key enabler of successful project, PM aids companies implementing business improvement methodologies such as Just-in-Time, Six Sigma or lean operations to improve their efficiency and competitiveness. Further noted that the need for a robust project management core competency as a necessary condition for a company to maximize the positive impacts of these methodologies (Eve, 2007).

## 6. Building Construction Firms in Ghana

The definition of construction industry as adopted from Anaman et al (2007), is defined as a group of firms with closely related operations devoted for the construction of real estates, building, private and public infrastructure. It also constitutes all business entities engaged directly in the creation, renovation, repairs or extension of fixed assets in the form of buildings, land improvements and other engineering constructions such as roads, bridges, railways, ports, dams, among others. In Ghana, there are two broad categories of construction firms namely: the Building Construction Firms (BCFs) and the Civil Engineering Firms (CEFs). Whereas the CEFs cater for projects such as construction of bridges, roads, railways and dams, the BCFs embark upon projects such as the construction of public, private, income and non-income generating real estate in Ghana. Laryea and Mensah (2010) classify the construction firms into foreign firms and local or indigenous construction firms. These authors further described the local or indigenous construction firms to include those established and owned by locals and citizens of a country whereas

foreign firms are owned by foreign nationals (Laryea and Mensah, 2010).

Construction firm's registration with an appropriate ministry in Ghana is its prerequisite to do government projects (Eyiah and Cook, 2003). The Ministry of Works and Housing according to Laryea and Mensah, (2010) classifies BCFs into financial class D1, D2, D3 or D4 whereas CEFs are classified as K1, K2, K3 or K4. Where the class D1 firms are the large scaled BCFs, the D2 are the medium BCFs, the D3 or D4 firms constitute the small scale BCFs (Eyiah and Cook, 2003). It is claimed that, about 10% of the total number of construction firms registered with the Ministry of Water Resources, Works and Housing (MWRW&H) are the large and medium Ghanaian construction firms whiles the remaining 90% constitutes the small construction firms (Edmond et al., 2007). A recent figures from MWRW&H (2011) indicate that the country's total number of class D1K1 stand at 350 constituting about 3.7% whilst that of D2K2 is 548 (5.74%) and that of smaller firms (D3K3 and D4K4) is 8653 constituting a chunk of 90.6% of the registered construction firms. However, their total construction output is about 20% as compared to large and medium (MWRW&H, 2011). This is partly due to the fact that, several private local construction firms which are normally small scaled ones as indicated by Laryea and Mensah (2010) have proliferated in recent times. However, they lamented that, many of these firms lack the capacity to undertake large projects, hence foreign construction firm take most major contracts or projects in the country.

# 7. Importance of PM competencies to Ghanaian BCFs

Ghanaian building construction firms like any building construction firms in other developing countries are in the domain of the construction industry which is project-based. Again, Greasley et al., (2005) characterised this industry as; uncertainty, complexity, project-based nature, poor communication, inadequate co-ordination and inadequate integration. Within such an industry the skills of PM is utilised to manage unique, capital-intensive and non-operational activities (Bryde, 2003) such as the BCFs in Ghana.

Project management competencies are used to develop flexible but quality strategies such as construction strategies for competitive bidding and operations that are meant as indicated by Ford and Bhargav (2006) to avoid the consequences of poor schedule performance such as delay penalties. These authors emphasise that, the current amplified pressure to complete building construction projects faster, cheaper, and better as well as competition from other firms have increased the need for PM competencies for project strategies to effectively manage project risk (Ford and Bhargav, 2006). There are many instances where construction project manager's flexibility skills had influenced both performance and value of projects stated by Ford and Sobek (2005) as supported by Johnson et al., (2006).

Construction project managers' PM life cycle knowledge enhances their competencies in managing effectively project stakeholders (Zhao and Tseng, 2003; Rezgui, et al., 2003). Earlier on Spencer and Winch (2002) recommended the skills to create an avenue for identification, clarification, analysis, formulation, and confirmation of stakeholders takes with an ultimate goal of achieving clients' satisfaction.

Earlier work by Zimmerer and Yasin (1998) cited in Loo (2003) reported that team building, communicating, demonstrating trust, and focussing on results among others were the highest ranked skills for project success and characteristics for effective project. Again, they identified project scheduling, budgeting, and execution planning, among others as key project success tools (Loo, 2003). Loo (2003) concluded that a firm which has project managers and staff with strong technical and people skills, at the organizational level, can yield project success however, a firm which has weak technical and people skills, even with strong organizational facilitators would produce poor project performance. Clearly, Loo stressed that both technical and people skills on one hand and organizational factors on the other have a critical role in mediating project outcomes, success or failure (Loo, 2003).

# 8. Structural Equation Model: Insights from Scholarly World

Available scientific literature (Hui and Zheng, 2010), indicate that structural equation model (SEM) was developed by Joereskog and Goldberger (1975) and Joereskog (1981) to handle variable errors. Structural equation model is not a single statistical technique but rather a set of associated techniques (Kline, 2011). It is sometimes known as analysis of covariance structures, covariance structure analysis, causal modeling, path analysis (with latent variables) and covariance structure modeling, which are fundamentally switchable (Asparouhov and Muthén, 2010; 2009). It is use to tests hypotheses about relationships between variables and is very flexible but comprehensive that subsumes many other techniques such as multiple regression, confirmatory factor analysis, path analysis and ANOVA (Barrett, 2007).

SEM can be viewed as confirmatory, a test of alternative or the most common model generation (Kline, 2011, Barrett, 2007). The observed and latent are the two broad classes of variables in SEM. The observed variables can be categorical, ordinal, or continuous whereas all latent variables in SEM are continuous (Kline, 2011). Latent variables or hypothetical constructs or factors, are explanatory variables presumed to reflect a continuum that is not directly observable (Kline, 2011; Asparouhov and Muthén, 2010) such as the PM competency and the 12 PM competency groups in this study. The observed variables which are used indirectly to measure a construct is referred to as an indicator or attribute (Kline, 2011; Li et al., 2008) such as the 42 PM

competency sub-groups (Q1, Q2…Q42) in this study. Residual or error terms is another class of variables in SEM representing variance that are unexplained which may normally be due to random measurement error, or score unreliability (Kline, 2011; Blunch, 2008).

**Table 2.** An Extract of Questionnaire

| The Key PM Competency Groups | Questions | The Sub-groups of PM Competency |
|---|---|---|
| Project Integration Management Skills (PIM) | Q1 | Develop Project Charter |
| | Q2 | Develop Project Management Plan |
| | Q3 | Direct and Manage Project Execution |
| | Q4 | Monitor and Control Project |
| Project Scope Management Skills (PSM) | Q5 | Define Scope |
| | Q6 | Create WBS(Work breakdown Structure) |
| | Q7 | Scope verification |
| | Q8 | Scope Control |
| Project Cost Management Skills (PCS) | Q9 | Cost Estimation |
| | Q10 | Budget Determination |
| | Q11 | Cost Control |
| Project Procurement Management Skills (PPM) | Q12 | Planning Procurement |
| | Q13 | Administering Procurement |
| | Q14 | Closing Procurement |
| Project Risk Management Skills (PRM) | Q15 | Risk Identification |
| | Q16 | Risk Analysis |
| | Q17 | Risk Response Planning |
| Project Communication Management Skills (PCO) | Q18 | Stakeholders Identification |
| | Q19 | Information Distribution |
| | Q20 | Stakeholders Expectations Management |
| Project Quality Management Skills (PQM) | Q21 | Planning Quality Management |
| | Q22 | Performing Quality Assurance |
| | Q23 | Performing Quality Control |
| Project HRM Skills (PHM) | Q24 | Human Resource Plan Development |
| | Q25 | Project Team Acquisition |
| | Q26 | Human Resource Management (HRM) |
| | Q27 | Human Resource Development |
| Project Time Management Skills (PTM) | Q28 | Activity Resource Estimation |
| | Q29 | Activity Duration Estimation |
| | Q30 | Schedule Development |
| | Q31 | Schedule Control |
| Application Area Knowledge, Std, Reg. Skills (ASR) | Q32 | Integrated Project Management Standards |
| | Q33 | Integrated Project Management Regulations |
| | Q34 | Application Area Knowledge |
| Understanding Project Environment Skills(UPE) | Q35 | Project Office Organization |
| | Q36 | Sector |
| | Q37 | Project Manager |
| | Q38 | External Environment |
| Interpersonal Skills (IPS) | Q39 | Negotiation |
| | Q40 | Leadership |
| | Q41 | Decision Making |
| | Q42 | Political and Cultural Awareness |

SEM allows the evaluation of entire models, which brings a higher-level perspective to the analysis as asserted by Bollen (2007; Thompson, 1992). It also gives better estimates of effect size than traditional techniques for observed variables including MR and ANOVA (Kline, 2011; Blunch, 2008; Brown, 2006). The SEM approach comes in two folds: the structural model, which evaluates causal relationship among endogenous variables which was adopted in this study; and the measurement model that assesses the relationships between exogenous and endogenous variables (Hui and Zheng, 2010).

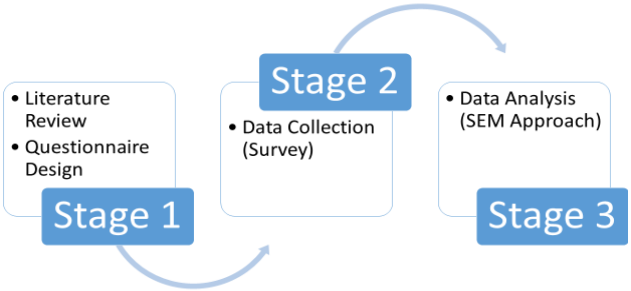
SEM techniques have adapted to accommodate smaller sample sizes (e.g., Nevitt & Hancock, 2004) for simple model calculations as indicated by Shahand Goldstein (2006) which normally come with low statistical power (Barrett, 2007). SEM is a large sample technique to prevent inaccurate standard errors and technical problems in analysis (Shah and Goldstein, 2006; Jackson, 2003). It can also gauge the causal relationships between variables from both front and back directions (Hui and Zheng, 2010; Ahadzie, et al., 2010; Li et al., 2008; Choo and Mokhtarian, 2007; Kline, 2005; 2011).

This has been extensively utilised in many fields such as wildlife (Grace, 2008; Grace and Bollen, 2008); customer and service quality (Florit and Lladosa (2007). Precisely, the applicability of SEM is also seen within the construction industry (Ahadzie, et al., 2010) and Li et al., (2008) in Hui and Zheng (2010).

## 9. Methodology

The study adopted a three stage methodological approach. The first stage involved a review of the literature. This stage was used to identify key PM competency categories which were the unobservable variables. The review also helped to identify three to four sub-groups consisting of the observable variables of each PM competency category. A questionnaire was then formulated as a valid measuring instrument based on the review. The questionnaire consisted of two main parts. The first part was meant for bio-data of the contacted top management and their companies. The last part contained 42 questions on the importance of the twelve PM competency groups (See Table 2 for extract of questionnaire). These questions were a descriptive statements by which a 5-point Likert-scale (1= Very Unimportant, 5= Very Important) was used.

At the second stage, the questionnaire was used to collect empirical data of the importance of the PM competencies based on the perceptions of 44 top management of 44 indigenous BCFs in the Upper West region of Ghana. This region was selected because it is the youngest among the ten regions in Ghana and a region typifying an emerging economy with a considerable number of indigenous BCFs. From the current data of Architectural and Engineering Services Limited (AESL), there are 140 active BCFs in the region, out of which 89 are local BCFs. So, 73 BCFs were targeted for this study based on a sample size determination equation by Michael Slovin (1960): $n = N/1 + N (\alpha)^2$, where n = the sample size, N = the sample frame and α = margin of error of 5%. The third stage involved data analysis based on the structural model in SEM. This was used to gauge the causal relationships between the key PM competency groups (unobservable variables). Figure 4 recapitulates the methodological approach of this study.




**Source: Researcher's Construct, 2016**

**Figure 4.** Methodological Approach

## 10. Results and Discussion

The internal reliability statistics of the study's questionnaire revealed a Cronbach's alpha of .988. Out of the 73 contacted indigenous BCFs with questionnaires, 44 responded representing 60.3% response rate. Out of the 44, 36 (81.8%) were small-to medium-sized BCFs with remaining 8 (18.2%) as large scale BCFs. The 44 top management contacted shared positions of Owners, Chief Executive Officers, Managing Directors, General Managers and Project Manager who have more than 10 years working experience with building construction projects. Among these managers, 18 had basic education, 20 with secondary education and 4 were university graduates. Only two of these 44 top managers were women. Out of the 44, 38 of them were less than 45 years and 6 were more than 45 years old. From the above itemized participants' profile, it shows that, the contacted top managers were appropriate to answer the research questions of this study in terms of their exposal to PM and educational calibre as well as the active nature of their firms.

This research identified 12 key groups of PM competencies for the indigenous BCFs. They included Project Integration Management Skills (PIM), Project Scope Management Skills (PSM), Project Cost Management Skills (PCS), Project Communication Management Skills (PCO), Project Quality Management Skills (PQM), Project HRM Skills (PHM), Project Procurement Management Skills (PPM), Project Risk Management Skills (PRM), Project Time Management Skills (PTM), Application Area Knowledge with Standard and Regulations Skills (ASR), Understanding Project Environment Skills (UPE) and Interpersonal Skills (IPS). These 12 key PM competency groups are unobservable variables which were considered very imperative for the project success of the contacted BCFs. These findings have buttressed the recent assertion of

Laryea and Mensah (2010) that, activities of BCFs in the developing world including those in Ghana are becoming more complex and are sited in an environment of constant change. Again, Rashla et al (2006) claim that, the importance of PM is paramount if BCFs are to meet or surpass the needs of clients. No wonder the 12 identified FM competency groups were all ranked essential to project success of the 44 participant BCFs.

**Table 4.** The key groups and the importance of the 42 sub-groups of PM competencies

| The 12 Key PM Competency Groups | Ques | The 42 Sub-groups of PM Competency | n | Mean | Std | Rank |
|---|---|---|---|---|---|---|
| PIM | Q1 | Develop Project Charter | 44 | 3.82 | 0.16 | 40th |
| | Q2 | Develop Project Management Plan | 44 | 4.14 | 0.18 | 26th |
| | Q3 | Direct and Manage Project Execution | 44 | 4.41 | 0.16 | 9th |
| | Q4 | Monitor and Control Project | 44 | 4.36 | 0.17 | 15th |
| PSM | Q5 | Define Scope | 44 | 4.09 | 0.16 | 29th |
| | Q6 | Create WBS(Work breakdown Structure) | 44 | 4.14 | 0.19 | 26th |
| | Q7 | Scope verification | 44 | 3.95 | 0.12 | 33rd |
| | Q8 | Scope Control | 44 | 4.23 | 0.16 | 17th |
| PCS | Q9 | Cost Estimation | 44 | 4.68 | 0.10 | 5th |
| | Q10 | Budget Determination | 44 | 4.82 | 0.11 | 2nd |
| | Q11 | Cost Control | 44 | 4.77 | 0.09 | 4th |
| PPM | Q12 | Planning Procurement | 44 | 4.18 | 0.16 | 22nd |
| | Q13 | Administering Procurement | 44 | 4.23 | 0.16 | 17th |
| | Q14 | Closing Procurement | 44 | 4.32 | 0.14 | 16th |
| PRM | Q15 | Risk Identification | 44 | 4.41 | 0.13 | 9th |
| | Q16 | Risk Analysis | 44 | 4.55 | 0.13 | 7th |
| | Q17 | Risk Response Planning | 44 | 4.64 | 0.12 | 6th |
| PCO | Q18 | Stakeholders Identification | 44 | 3.64 | 0.12 | 42nd |
| | Q19 | Information Distribution | 44 | 3.95 | 0.17 | 33rd |
| | Q20 | Stakeholders Expectations Management | 44 | 3.86 | 0.17 | 37th |
| PQM | Q21 | Planning Quality Management | 44 | 4.23 | 0.15 | 17th |
| | Q22 | Performing Quality Assurance | 44 | 4.50 | 0.11 | 8th |
| | Q23 | Performing Quality Control | 44 | 4.41 | 0.13 | 9th |
| PHM | Q24 | Human Resource Plan Development | 44 | 3.86 | 0.19 | 37th |
| | Q25 | Project Team Acquisition | 44 | 3.95 | 0.15 | 33rd |
| | Q26 | Human Resource Management (HRM) | 44 | 4.05 | 0.14 | 30th |
| | Q27 | Human Resource Development | 44 | 4.41 | 0.14 | 9th |
| PTM | Q28 | Activity Resource Estimation | 44 | 3.95 | 0.14 | 33rd |
| | Q29 | Activity Duration Estimation | 44 | 4.18 | 0.17 | 22nd |
| | Q30 | Schedule Development | 44 | 4.41 | 0.11 | 9th |
| | Q31 | Schedule Control | 44 | 4.23 | 0.13 | 17th |
| ASR | Q32 | Integrated Project Management Standards | 44 | 3.77 | 0.13 | 41st |
| | Q33 | Integrated Project Management Regulations | 44 | 4.05 | 0.15 | 30th |
| | Q34 | Application Area Knowledge | 44 | 4.09 | 0.17 | 28th |
| UPE | Q35 | Project Office Organization | 44 | 4.23 | 0.21 | 17th |
| | Q36 | Sector | 44 | 4.18 | 0.16 | 22nd |
| | Q37 | Project Manager | 44 | 4.82 | 0.08 | 2nd |
| | Q38 | External Environment | 44 | 4.00 | 0.16 | 32nd |
| IIPS | Q39 | Negotiation | 44 | 3.86 | 0.19 | 37th |
| | Q40 | Leadership | 44 | 4.91 | 0.06 | 1st |
| | Q41 | Decision Making | 44 | 4.18 | 0.18 | 22nd |
| | Q42 | Political and Cultural Awareness | 44 | 4.41 | 0.11 | 9th |

**Table 5.** Key PM Competency Groups Correlation Matrix with levels of Importance

| | PIM | PSM | PCS | PPM | PRM | PCO | PQM | PHM | PTM | ASR | UPE | IPS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PIM | 1 | | | | | | | | | | | |
| PSM | 0.962 | 1 | | | | | | | | | | |
| PCS | 0.856 | 0.864 | 1 | | | | | | | | | |
| PPM | 0.922 | 0.969 | 0.788 | 1 | | | | | | | | |
| PRM | 0.920 | 0.889 | 0.870 | 0.855 | 1 | | | | | | | |
| PCO | 0.932 | 0.894 | 0.738 | 0.841 | 0.863 | 1 | | | | | | |
| PQM | 0.895 | 0.902 | 0.670 | 0.937 | 0.844 | 0.849 | 1 | | | | | |
| PHM | 0.956 | 0.954 | 0.774 | 0.926 | 0.872 | 0.947 | 0.912 | 1 | | | | |
| PTM | 0.928 | 0.976 | 0.773 | 0.964 | 0.846 | 0.897 | 0.926 | 0.959 | 1 | | | |
| ASR | 0.938 | 0.955 | 0.826 | 0.902 | 0.858 | 0.945 | 0.866 | 0.949 | 0.948 | 1 | | |
| UPE | 0.940 | 0.912 | 0.865 | 0.881 | 0.892 | 0.888 | 0.833 | 0.886 | 0.864 | 0.916 | 1 | |
| IPS | 0.929 | 0.907 | 0.694 | 0.915 | 0.867 | 0.886 | 0.956 | 0.927 | 0.924 | 0.888 | 0.895 | 1 |
| Rank | 8th | 9th | 1st | 6th | 2nd | 12th | 3rd | 10th | 7th | 11th | 5th | 4th |
| MEAN | 4.182 | 4.118 | 4.758 | 4.242 | 4.530 | 3.818 | 4.379 | 4.068 | 4.193 | 3.970 | 4.307 | 4.341 |
| STDEV | 0.724 | 0.699 | 0.414 | 0.691 | 0.551 | 0.680 | 0.537 | 0.673 | 0.587 | 0.674 | 0.517 | 0.509 |

Again, the study identified 42 PM competency sub-groups. Table 4 depicts the 12 key PM competency groups and the importance (expressed in terms of mean scores with the standard deviations and ranks) of the PM competency sub-groups. Among all-important-rated 42 sub-groups of the PM competencies, Leadership was ranked first with a mean of 4.91 and both Budget Determination and Project Manager turned out second with a mean of 4.82 followed by Cost Control (4.77). These were the top four important sub-group PM competencies. The least three important rated PM sub-group competencies were Project Charter Development turned 40th with a mean of 3.82 followed by Project Management Standards at 41st with a mean of 3.77 and Stakeholders Identification at the bottom (42nd) with a mean of 3.64. See Table 4 for details. These 42 sub-groups competencies are observable variables, and rated over 5. By virtue of their respective higher mean scores from 4.91 the first to 3.46 for the least ranked PM competencies, imply a huge relevance of these 42 PM competencies to project success of the 44 contacted BCFs. The findings of this paper support the views of Ahadzie et al (2009) on the importance of the PMs' professional training and development. This is in line with the views of Attakora-Amaniampong et al (2014) and Bryde (20003) who describe the dispensation of BCFs as project-based and must be managed as such. Again, the results of this study confirm Gareis (2008) view of seeing PM as a new area of application. Many earlier findings including Loo's (2003) came out with project manager, team building, and communication among the highest ranked skills for project success however, these current findings do not rank team building and communication among the highest rated skills. In addition, the importance ranks of the sub-groups under project risk management skills (PRM) including risk response planning (6th), risk analysis (7th) and risk identification (9th) are in line with many earlier PM findings such as those from Ford and Bhargav (2008) and Sobek (2005), who see PM as an effective way of mitigating risk.

To analyze the relationships between the importance of the 12 identified key PM competency groups, the study through the SEM technique uncovered very strong positive relationships between them. Table 4 depicts the correlations between the 12 PM competence groups with their levels of importance expressed in terms of mean with their respective standard deviations.

From Table 4, PSM and PTM had the strongest positive relationship with r = 0.976, followed by r =0.969 between PSM and PPM and r = 0.955 between PSM and ASR as the third. The correlations between; PCS and PTM was 0.773; PCS and PCO was 0.738 and, PCS and PQM was 0.670 as the last three correlated pairs. These correlation results are of great importance to all stakeholders within the local building construction industry especially those within the study area. For instance, PSM and PTM with r = 0.976 implies that, any professional training and development initiative, or project that can cause 100% PTM increment can yield about 97.6% PTM increase. Even considering the two PM competencies with the least correlation, PCS and PQM with r = 0.670, an initiative that brings 100% increase in PQM can improve PCS by 67%. This revelation from this study has huge implications for all stakeholders in the indigenous building construction industry specifically and generally for professionals in the built environment.

The findings of this paper further revealed that, among the 12 identified key PM competency groups, PCS, PRM, PQM, IPS, UPE and PPM were ranked the 1st, 2nd, 3rd, 4th, 5th and 6th respectively whiles PTM, PIM, PSM, PHM, ASR and PCO were ranked 7th, 8th, 9th, 10th, 11th,and 12th in terms of importance. See Table 5.

Additionally from Table 5, over a total of 5, PCS which scored 4.758 was ranked first, followed by PRM with a score of 4.530 and PQM with 4.379 as third in terms of their

importance to project success of the BCFs in the study area. PCO was ranked the last with an importance score of 3.818. These importance scores attached to these 12 PM competency groups by the contacted BCFs are relatively high buttressing the importance of PM skills indicated by Ahadzie et al., 2010; Rasila et al., 2006; and Loo, 2003. These findings again affirm Eva's (2007) proclamation that, the world's benchmark companies have accepted project management as a way of working.

# 11. Conclusions

This study identified 12 important PM competency groups for the indigenous BCFs in the Upper West region of Ghana, of which were decoupled further into 42 PM competency sub-groups. Among the key PM competency groups, project cost management skills (PCS), project risk management skills (PRM) and project quality management skills (PQM) turned out the top most important groups for project success.

Through a structural model in SEM, the causal relationships between the key PM competency groups were gauged. The SEM analysis produced a range of strong and positive relationships between the key competency groups. This study is limited, the SEM technique used in this study failed to assess the relationships between project success and the key PM competency groups which would be considered in further studies in the future. Yet, this model could serve as a framework to develop and train the PM professionals among the Ghanaian indigenous BCFs where FM competencies are lacking. This model could improve on PM competencies among Ghanaian BCFs which could in turn boost the delivery time, cut down cost and warrant the meeting of clientele requirements within this sector. This could also help in averting the housing shortage problem in Ghana. Academically, this study could be a platform for further studies to cover the entire country, Ghana and other developing countries.

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