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Exploring the Professional Competencies of Quantity Surveyor in Retrofitting and Adaptation of Existing Building

By

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DECLARATION

This is to certify that this work or any part thereof has not been previously submitted in any form to the university or to any body for the purpose of assessment, publication. I confirm that except for any express acknowledgements, reference cited in the work. The original work is the result of my own efforts.

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ABSTRACT

The Construction Industry (CI) worldwide involves many professionals, notably among them is the Quantity Surveyor (QS), whose role is key to project success of which retrofitting and adaptation of existing building is no exception. QSs are cost-literates concerned with financial probity in the conceptualization, planning and execution of projects in the pre–construction, construction and post-construction stages. Their role contributes to overall construction project performance by acquiring, developing and deploying appropriate competencies and the need to maintain high level of ethics in recent times. Thus, the aim of the study was identifying the professional competencies of QS in retrofitting and adaptation of existing building projects in Ghana. In achieving the aim the following objectives were set; identifying the level of involvement of QS in retrofitting and adaptation of existing building projects in Ghana; identifying the challenges QS, face in retrofitting and adaptation of existing buildings; and identifying QS competencies in retrofitting and adaptation of existing buildings. Following a thorough literature review, a quantitative research design was adopted. Adopting a snowball sampling technique, a representative sample of forty (40) QS within Kumasi provided data for the study, through a self-administered structured questionnaire. Data gathered was analyzed using descriptive statistical tools including frequencies and mean score ranking with the help SPSS version 21. The findings of the study revealed that QS involvement in retrofitting and adaption of existing building projects were very high. Notwithstanding the fact that QS faces various challenges ranging from poor quality drawings, to low remunerations for services in retrofitting buildings, continuous professional development of their competences in the areas of construction technology and environmental services; project financial control and reporting; conduct ethics, rules and professional practice; is essential to the success in retrofitting and adaptation of existing buildings.

TABLE OF CONTENTS

LIST OF TABLES

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DEDICATION

This dissertation is dedicated to God almighty and the Slipway family.

ABBREVIATIONS

BOQ	:	Bill of Quantities
BCIS	:	Building Cost Information Service
CI	:	Construction Industry
GDP	:	Gross Domestic Product
PMI	:	Project Management Institute
QS	:	Quantity Surveyor
QSs	:	Quantity Surveyors
RII	:	Relative Importance Index
RICS	:	Royal Institute of Chartered Surveyors

CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF THE STUDY.

Construction in any country is a complex sector of the economy, which involves a broad range of stakeholders and has wide ranging linkages with other areas of activity such as manufacturing and the use of materials, energy, finance, labor and equipment. Professionals involve in this industry include planners, designers, building technicians, architects, civil engineers, QS among others. Growing year-on-year as a contributor to the economy, Ghana's construction sector is increasingly dynamic and led by private sector participants. Ghana's GDP surged to 4.1% in the first quarter of 2015, compared to 3.8% in the same period in 2014 (Ghana Statistical Service, 2015). As Sajoudi *et al.* (2011) posits, the CI is key to national wealth creation acting as a catalyst for, and has multiplier effect to the economy and it as well enables other industries like professional service, manufacturing, financial service and others to function effectively. The roles played by the various professional bodies in the industry stands key and cannot be overemphasized. One of these key professionals in the industry to both the private and public clients is the QS.

The Guide for QS Appointments states that any client who is considering building any structure of any size, changing an existing structure or investing in construction projects no matter how simple or complex, needs the expert advice of a professional QS for establishing budgets, cash flows, cost planning, cost management and obtaining value for money. In many cases construction teams are being formed and reformed for each new project (RICS, 2013a). Technology, financing and the economy influences the methods adopted for each construction project. This necessitate expert advice of a QS before the start of any project planning.

QS is a CI professional with expert knowledge in construction costs and contracts. Their services which obscure most clients especially the private client include cost planning and commercial management, value determination, risk management and calculation, procurement advice and assistance during the tendering procedures, tender analysis and agreement of the contract sum, preparation of pricing documents (e.g. Bills of Quantities) in tender, drafting contract conditions and contractual correspondence, commercial management and contract administration among others. Timothy and Olaniyi (2010) described QS as a professional trained, qualified and experienced in dealing with problems relating to construction cost, management and communication in the CI. Formal measures of competencies and skills require definition and classification, type and extent. However, the general literature on quantity surveying skills and competencies illustrates a multiplicity of perspectives (Dada, 2014). Lee (2008) posits that the success of any project depends on a competent design team. The addition of a QS to the design team of a project is crucial for the client. The client's interest will be his priority by providing professional advice on contractual and monetary matters.

In recent times as Kissi *et al*. (2016) posits, retrofitting and adaptation of existing buildings in the CI has gained mounting recognition as an acceptable substitute for new buildings. According to Jansson (2013), global environmental issues like climate change and declining resources pose threat to the world and thus as remit of the CI to solving this menace the industry sort to adopt more of sustainable building like for instance retrofitting a better insulation to decrease energy demand. This type of construction leans towards the environmental impacts building as sustainability takes on a holistic approach on building developments that considers economic and social aspects of building designs (Wedding and Crawford-Brown, 2007). As Elforgani and

Rahmat (2010) posits, such projects (i.e. retrofitting construction) demand a superior project team with which professional roles like that of the QS cannot be left out. This study consequently sought to explore the professional competencies of QS in ensuring the successes of delivering such projects precisely in Ghana.

1.2 PROBLEM STATEMENT

There is a general understanding that clients, developers and contractors are much concerned about project cost; proper budgeting of cost-effective construction works; adequate procurement process in project development. Project cost estimation is the most important preliminary process in any construction project (Elfaki, 2014) especially in retrofitting and adaptation of existing buildings. Establishing proper budget for retrofit projects; managing, reviewing and controlling construction cost by accurate measurement of the required works; and value for the money invested is the utmost desire of every client.

The services and competencies of the QS is known to only a few percentages of the general public when it comes to retrofitting and adaptation to existing buildings. Even though the CI is seen as a unique and complex industry (RICS, 2013a; Jones and Saad, 2003) where in many cases construction teams are being formed and reformed for each new project (RICS, 2013a) indicating how each and every project differ from the other, it requires the competencies and responsibilities of a QS at the pre–construction, construction and post-construction phase to help in setting initial budget with client; contract administration; construction technology and environmental services, quantification and costing of construction works, financial control and reporting among others.

Ayodele (2012) categorized the roles of QS into pre-contract, post contract and general roles; the expert advice in these three areas are very crucial to the success of every project. For example, in terms of value determination, the QS can help a client know the actual value of the project before committing his finances to it. Similarly, in the aspect of procurement and tendering procedures, the professional and expert advice of a QS can assist the client in landing the contract.

The fees charged by professional QSs are proportionate with the work done for the client according to A Guide for Quantity Surveying Appointments (2006). Thus, there are five options which include the following: time charges; percentage fee based on a tariff recommended by the Surveyor; an agreed percentage of the contract value; a lump-sum fee; and any other fee arranged between the QS and the client. Project managers and clients are often intimidated with these fees associated with hiring a QS. This causes them to overlook the competencies and effect of a QS, without acknowledging the substantial amount that can be saved from the expert advice on financial and contractual matters.

1.3 RESEARCH QUESTIONS

The following are set of research questions which the study seeks to address:

1. What is the level of involvement of QS in retrofitting and adaptation of existing buildings in Ghana?
2. What are the challenges QSs, face in retrofitting and adaptation of existing buildings in Ghana?
3. What are the QS competencies in retrofitting and adaptation of existing buildings projects in Ghana?

1.4 RESEARCH AIM AND OBJECTIVES

1.4.1 Aim

This research was aimed at identifying the professional competencies of QS in retrofitting and adaptation of existing building projects in Ghana.

1.4.2 Objectives

To achieve the aim of this research, these objectives were set to guide the study:

1. To identify the level of involvement of QS in retrofitting and adaptation of existing building projects in Ghana;
2. To identify the challenges QS, face in retrofitting and adaptation of existing buildings.
3. To identify QS competencies in retrofitting and adaptation of existing buildings.

1.5 RESEARCH METHODOLOGY

A comprehensive review of literature relevant to this study was conducted obtaining information from journals, articles, books, research papers, internet, and sample students' thesis. A quantitative research approach was adopted for the purpose of this study. The main emphasis was on the competencies of QS and the services they provide in retrofitting and adaptation of existing building projects in Ghana. Professional QSs who have been involved in retrofitting and adaptation of projects were interviewed face to face to get more insight in the functions QS perform in the aforementioned projects. Like indicated earlier QS professionals through snowball sampling technique were involved in the process allowing them to complete questionnaires. The quantitative data was summarized, organized and analyzed to come out with tangible recommendations and final conclusions.

1.6 RESEARCH SCOPE

The study was confined to the Kumasi metropolis by sourcing information from professional QSs in the various government and private firms. Kumasi represent the second largest city in Ghana and so houses major construction firms that employ the services of QSs in the country. The researcher chose Kumasi because of his familiarity with the area as such making data collection easier from respondents. Again, the cost involved in collecting data was minimized because of the proximity of the area to the researcher.

1.7 STRUCTURE OF THE RESEARCH

This research was organized into five interconnected chapters. The first chapter talked about the main introduction which include the background, problem statement, aim and objectives, research questions, scope of the study, research methodology. The second chapter, covered literature on previous work done around the subject area. It also includes information and various commentaries related to this study by other authors which served as a foundation for this study. Chapter three provides a systematic approach as to how this research was conducted. It also covered how the questionnaire was established and how data was collected from respondents. Chapter four talks about discussions of the findings of the study through data presentation and analysis. Finally, the fifth chapter presented and discussed the conclusions of this study and its contribution to the knowledge gap and also enhancing research in this study area.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter throws more light on the literature review for this study. Appropriate literature on exploring the professional competencies of QS in retrofitting and adaptation of existing buildings are examined and the general overview of the CI with much emphasis in Ghana, the stakeholders and its contribution to the economy of the country at large are explored.

2.2 GLOBAL OVERVIEW OF THE CI

The CI is an economic investment and its relationship with economic development is well posited. Many studies have highlighted the significant contribution of the industry to national economic development (Myers, 2013). It is widely recognized that the CI has a positive role to accelerate the wheel of economic growth in any country. The industry plays an important role in the national economy and economic development of any country. The importance of the CI is due to the role it has in the economy, but that role varies greatly from one nation to another. In developing countries, the CI is a vital sector providing mainly new infrastructure in the form of roads, railways, airports, new hospitals, schools, housing among others (Dakhil, 2013).

The CI can be categorized into three basic classes as subsequently outlined:

a) Construction involving heavy and civil engineering - this type of construction involves the execution of large construction projects such as bridge, road among others.
b) General construction – this involves building of real estate; it includes residential or commercial real estate assets among others.

c) Construction projects involving specialty trades – this also involves building up of specialized items such as electric related works, works on woods and others. It is generally being observed in and all-round the globe.

The CI stands to be one of the biggest industries in the whole world. The contribution of this industry towards global GDP revolves around one-tenth of the total amount. The world's CI is also a potential employment generator and provides work to almost seven percent of the total employed person in the whole world. The resources that are utilized in the industry is also staggeringly high and itself consumes fifty percent of the total world resources. The world's CI is the base of the world economy which is achieved through projects (Economy Watch, 2010).

The construction professionals are defined as the architect, engineer and QS. The expertise of each construction professionals must be carefully exercised as they are answerable to any mischief occurred during and after the construction project. The negligence for giving professional advices and carrying out the duty may contribute to the client's economic loss and also to public safety (Aziz and Omran, 2009). Within the CI, a common mode of organizing projects is by decoupling activities from the main organization and delegating responsibilities. Carrying out their core activities in projects has nurtured a decentralized decision-making culture, which is characterized by operational interdependence and organizational independence (Gluch, 2009).

In general, an architect is a person who is involved in the planning, designing and oversight of a building's construction. In the broadcast sense, an architect is a person who translates the user's needs into the builder's requirements. An architect must thoroughly understand the building and operational codes under which his or her design must conform. That degree of knowledge is necessary so that he or she is not apt to

omit any necessary requirements, or produce improper, conflicting, ambiguous, or confusing requirements. Architects are charged only with being generally familiar with the work and reporting the general progress and quality of the work, as completed to the owner (Aziz and Omran, 2009). According to Simson and Atkins (2006) the standard of care is that the architect should be responsible for discovering and reporting non-conforming work that is available to be seen.

On the other hand, construction engineer's functions involve planning and execution of the designs from transportation, site development, and hydraulic environmental, structural and geotechnical engineers. Construction engineers have a lot of responsibilities in their job. Certain tasks have to be completed every day in order to get the job done correctly. Analyzing reports is a main part of their job description. They must analyze maps, drawings, blueprints, aerial photography and other topographical information. Construction engineers also have to use computer software to design hydraulic systems and structures while following construction codes. They have to calculate load and grade requirements, liquid flow rates and material stress points to ensure that the structure can withstand stress. Keeping a safe workplace is crucial to having a successful construction company. It is the construction engineer's job to make sure that everything is conducted correctly. In addition to safety, the construction engineer has to make sure that the site stays clean and sanitary. They have to make sure that there are no impediments in the way of where the structure will be built and if there are any they must move them before construction begins (Aziz and Omran, 2009).

Finally, QS are professionally trained, qualified and experienced in dealing with problems relating to construction cost, management and communication in the CI according to Timothy and Olaniyi (2010). Their services which obscure most clients especially the private client include cost planning and commercial management, value determination, risk management and calculation, procurement advice and assistance during the tendering procedures, tender analysis and agreement of the contract sum, preparation of pricing documents (e.g. Bills of Quantities) in tender, drafting contract conditions and contractual correspondence, commercial management and contract administration among others. A QS can also be known as construction economists, cost engineers or construction managers. QSs control construction costs by accurate measurement of the work required, the application of expert knowledge of costs and prices of work, labor, materials and an understanding of the implications of design decisions at an early stage to ensure that good value is obtained for the money to be expended (Aziz and Omran, 2009). This study thus focused on identifying the professional competencies of QS in retrofitting and adaptation of existing building projects in Ghana.

2.2.1 The Ghanaian Construction Industry

Ghana is renowned as an emerging market in sub-Saharan Africa, thanks in large part to contributions from the CI. The industry is dominated by physical infrastructure and asset-based-lending as a means for growth and development (Ahmed, 2014). Growing year-on-year as a contributor to the economy, Ghana's construction sector is increasingly dynamic and led by private sector participants. Ghana's GDP surged to 4.1% in the first quarter of 2015, compared to 3.8% in the same period in 2014. Construction activity contributed $3.8bn to GDP in 2014 at current prices, according to

the Ghana Statistical Service. This was equal to 12.7% of GDP and up 26.9% from $2.9bn in 2013 (Construct Ghana, 2018).

According to Asamoah and Decardi-Nelson (2014), the CI in Ghana contributes about 5% to 10% of Gross Domestic Product (GDP) to the country and employs nearly 10% of the working population. The sector has grown strongly over the past decade, up from $280.3m in 2006, and has become of increasing importance to the broader economy, more than doubling as a contributor to GDP from 5.7% in 2006. Government investment is a major driver of growth, with a substantial pipeline of projects in transport infrastructure in particular expected to be rolled out in the coming years, often using public-private partnership models (Construct Ghana, 2018).

The Ghanaian construction industry is complex in nature, representing a range of stakeholders (Dadzie *et al*., 2012). The sporadic development of the CI in local areas has been identified as a means of alleviating poverty in the country. The Chartered Institute of Building (CIOB) in Ghana estimates that there are over 1,600 building contractors working in Ghana since October 2012.

Although the building CI supports the country's economy and thus provides a means for social development, the industry is characterized by unprofessional practices (Asamoah and Decardi-Nelson, 2014). The unsustainable building construction processes coupled with the constant degradation of the environment continue to take their toll on Ghana's development (Djokoto *et al*., 2014). Further, the industry is noted to be suffering from lack of planning, including inappropriate water and energy use, building material consumption, failure to meet consumer/tenant needs, and disjointed stakeholder's cooperation in the industry (Twumasi-Ampofo *et al*., 2013).

2.3 THE QS

The origins of QS can be traced back to the ancient Egyptian civilization who used dedicated personnel to carry out estimates and costing for their magnificent structures and buildings. It developed into an occupation during the 17th century restoration of London after the Great Fire. In 1836, the profession entered its new age when the new Houses of Parliament of Great Britain, designed by Sir Charles Barry, became the first major public contract to be fully measured and tendered using detailed bills of quantities for financial accountability (Ward, 2016).

QSs are construction economists who fulfill varied and comprehensive duties to support cost-effective construction and property development projects. The core competencies of QS include determining project budgets, measuring project quantities, preparing contract documentation (such as Bills of Quantities and Cost Control Documents), administering contracts, and preparing final accounts (O'Brien *et al*., 2014).

Traditionally quantity surveying is concerned with contracts and costs on construction projects and QS control construction costs by accurate measurement of the work required. These methods, however, cover a range of activities which may include value management, tendering, valuation, change control, claims management and cost estimation. The QS facilitates the design process by systematic application of cost criteria so as to maintain a sensible and economic relationship between cost, quality, utility and appearance which thus helps in achieving the client's requirements within the agreed budget. The New Zealand Institute of Quantity Surveyors (NZIQS) (2014) defines QSs as the construction cost professionals who measure and estimate the cost of resources for construction projects, and whose role, among others, is to keep projects

on budget. This definition can only be seen as the primary role of the QS. Since the 21st Century, QS has evolved to take on wider responsibilities in all stages of the building life cycle from project conception, through design and consenting to procurement, construction and commissioning of the finished building, and to the retrofitting or upgrade of the building in the use phase. The role of the QS has therefore widened beyond measuring and estimating of the quantities and costs of the building project to include emerging roles such as project management, contract administration, dispute resolution, and insurance valuation (Mbachu, 2015). For instance, O'Brien et al. (2014) observed that QS role includes overseeing the financial and contractual administration of construction projects.

According to Ward (2016), the solid foundation of the QS role is based upon an extensive knowledge of construction techniques and competencies to measure works and assess rates that determine costs. Whilst this is correct, it would be incorrect to perceive the role of the modern QS as one of a mere measurer of materials and trade works, as quantity surveying has expanded to create different job titles that attract additional responsibilities in the process. It is thus important to appreciate that the role of the QS has changed over the years and to a large extent this role needs to be defined depending on which type of organization the QS works for, either a private practice or a contracting company, as the overall skill base is similar, but the detailed operations are quite different. The size of the company can also play an important part in defining the role of the QS. It was found that the working practices within smaller building companies, and also quantification skills generally, are quite different to those in larger organizations, which is more recently supported by (Ashworth *et al.*, 2013).

2.3.1 Professional Competency of the QS

Many researchers have proposed several definitions for competency inclining to different aspects. For instance, Cardy and Selvarajanb (2006) defined competency as individual characteristics related to job performance that make positive difference. They concluded that these characteristics include noticeable behaviour like motives, skills, personality traits, values, and abilities. Another definition of competency from professional aspect can be found in study of Shafiei, and Said (2008). According to Said *et al*. (2010), professional competencies refer to one's ability to employ the significant skill in conference with effective behaviour in order to achieve a curtain task and the achievement can be measured by others. According to the Project management Institute), organizations categorize competencies for the purpose of meeting their set targets or objectives. Jeou-Shyan *et al.* (2011) notice that professional competencies can be divided into generic and technical competency. Generic competencies are people-related competency that can be employed to fulfil tasks and also include individual characteristics, such as motivation, attitude and personal characteristics; technical competencies are specific work-related professional knowledge.

From the QS perspective, there exist several sets of competencies according the various standards. RICS (2009b) has established a guide identifying, classifying and explaining QS competencies for the assessment of professional competence. Consequently, the 24 professional competencies of the QS have categorized under the following: core competencies, mandatory competencies and optional competencies. Table 2.1 elaborate the various competencies as clearly classified under the 3 preceding competencies.

Table 2.1: Profession Competencies of the Quantity Surveyor

No.	Core competencies	Mandatory competencies	Optional competencies
1	*Commercial management of construction or Design economics and cost planning*	*Conduct ethics, rules and professional practice*	*Capital allowances*
2	*Procurement and tendering*	*Health and safety*	*Corporate recovery and insolvency*
3	*Construction technology and environmental services*	*Communication and negotiation*	*Contract administration*
4	*Contract practice*	*Client care*	*Commercial management of project or Design economics and cost planning*
5	*Project financial control and reporting*	*Accounting principles and procedures*	*Due diligence*
6	*Quantification and costing of construction works*	*Business planning*	*Insurance*
7		*Team working*	*Conflict avoidance, management and dispute resolution procedures or Sustainability*
8		*Data management*	*Project evaluation*
9		*Sustainability*	*Risk management*
10		*Conflict avoidance, management and dispute resolution procedures*	*Programming and planning*

Source: RICS (2009b); RICS (2012)

Jeou-Shyan *et al.* (2011) indicate that it is insufficient to employ only one-dimensional competency. The underlying reason of this sufficiency is found in the context of organisational management that the determinants of employee's performance are not only their abilities but also behaviours determined by motivation (Mullin 2010).

2.3.2 Role of QSs in Construction Project Performance

Project performance evaluation is essential to determine if a project is a success or failure (Cheng *et al.,* 2007). Yates and Eskander (2002) defined a successful project as a project that has been completed on schedule, within budget, within scope and satisfied the required quality. Time, cost and quality are, however, the three predominant, but historic performance evaluation dimensions. Thus, Atkinson *et al.* (1997) calls for a break from the 50-year old tradition of measuring project performance (success and failure) in terms of the cost, time, and quality. Hence, there have been further suggestions by various authors for assessing construction project performance. Cheung *et al*. (2004) proposed other performance indicators to include client satisfaction, client changes, business performance, health and safety. In a close relation to the traditional measures, Storms (2008) identified earned value management (EVM) as a three-dimensional measurement of project performance. The three dimensions are earned value, planned value, and actual cost.

In terms of QSs' contribution to construction project delivery, Poon *et al.* (2001) revealed that the QS is important in the design process of construction. In the study, while not undermining the roles of the Architect, the respondent QSs explicitly expressed the opinion that 'QSs are the team leaders nowadays', adding that it is now a common practice to employ the QS as the first consultant in building projects. Furthermore, the QS is said to be responsible for preparing cost advice and the cost plan; cost being the most critical pre-determinant factor of the feasibility of a project. Eke (2006) observed that the fundamental role of the QS in engineering infrastructure is similar to that undertaken in building; expertise in cost control, embracing reporting and monitoring functions and financial management procedures, are of paramount importance.

Male (1999) emphasizes that the distinctive competencies of the QS are associated with measurement and calculation which provides the basis for the proper cost management of forecasting, analysing, planning, controlling and accounting, and these competencies are expended within the frame of construction project delivery. Oke *et al.* (2010) observed that QSs in Nigeria, precisely those of older generation were more of experts and experienced in costing, cost monitoring and control as it relates to building projects which they were respected for by their sisters' professionals. Nkado and Meyer (2001) submit that QSs add value primarily to the financial and contractual management of construction projects at the pre-construction, construction and post-construction stages and thereby contribute to overall construction project performance by acquiring, developing and deploying appropriate competencies. Poon *et al* (2001) investigates the relationship between QSs' professional ethics and construction project performance. The research concluded that 'maintaining the high level of surveyors' professional ethics can contribute to the high level of construction project performance'. Anago (2006) identified quantity surveying as a basically cost-literate profession, concerned with financial probity in the conceptualization, planning, and execution of development projects.

2.3.3 Areas for Improvement in the QS Services

Insights gleaned from literature on how to improve QS services and augment their value delivery in project development process, the subsequent authors postulate the following as outlined below:

- **Diversifying portfolio of services –** Durdyev and Mbachu (2012) observed that to succeed, businesses need to have broad and diversified portfolio of service offerings so as not to be caught up by vagaries in the business landscape, which

often diminish opportunities in certain areas of business, while raising prospects in other areas. Though it is good to specialist in areas of key strengths, but including a number of other service lines could help the Institute members stay in business when their current specialist areas face recession.

- **Engaging in lifelong learning –** Dada and Jagboro (2015) argued that QSs need to continuously engage in lifelong learning to keep abreast with rapid advances in technology and knowledge that have profound impact on their current and evolving service offerings. Frei *et al*. (2013) concurs with this by suggesting that QSs should constantly scan the external business landscape to discern future directions that have critical impact on their businesses, and formulate strategies to reposition themselves to embrace the changes as opportunities rather than sit back and face the changes as threats.

- **Engage in foreign partnership to explore foreign markets –** Stating a small size of the New Zealand market as an example, the Building and Construction Sector Productivity Taskforce (BCSPT) (2009) posits that such market could grow by exploring regional markets through partnership with players in those regions that have trading agreement; and by doing so, the local businesses gain competitive strengths to competitive in the global markets.

- **Engaging in joint ventures –** Hoxley *et al*. (2007) identified joint ventures as an avenue for small firms to pull their resources together to handle bigger projects which would be difficult for them to handle on individual basis. In doing this, they complement each other's strengths in the key competencies and financial resources needed to successfully execute the big projects.

According to Mbachu (2015), like any other professionals, quantity surveying services have their strengths and weaknesses. The researcher thus identified two streams of improvement needed in the current and evolving roles of the QS. The first involves consolidating and leveraging key strengths to exploring priority opportunities in the business landscape. The second involves managing critical weakness through minimizing exposure to key threats and/or working towards converting these into strengths.

2.4 CONSTRUCTION MEASUREMENTS

In the context of the CI, the term measurement is used to describe the process of obtaining accurate descriptions and quantities of items of work for the purpose of costing. This can be from drawings or from completed works on site depending on specific requirements. In the most traditional sense measurement is used to produce a bill of quantities (BOQ), which is essentially a detailed list of all items required to construct a building along with their quantities (Ward, 2016). BOQ has been one of the key control documents, in both the building and civil engineering sectors, for over a century. Indeed, the BOQ was the 'raison d'etre' for the development of quantity surveying as a separate profession. The use of a BOQ increases the efficiency in obtaining competitive tenders, as well as being the key document when calculating monthly payments and valuing variations (Seeley, 1997). Towey (2012) states that, a BOQ is a document formatted and worded in accordance with a set of coverage rules provided from a measurement guide, which comprises a measured quantity alongside a detailed description of the works, this, in turn, permits the contractors estimator to understand the requirement and apply a rate to a given quantity that includes labor, plant and materials in order to determine a price. BOQ are prepared by QSs. They are

prepared by a “taking off” process in which the quantity and the cost of a building or other structure is estimated from measurements in the architect's drawings. These are used to create a cost estimate such as in regard to the square area in meters of walls and roofs, the numbers of doors and windows, and systems as heating, plumbing and electrical services. Similar types of work are then brought together under one item, a process known as "abstracting". Since the architectural drawings are dimensioned in millimeter (mm), so that it is necessary to convert the plan dimensions to meters (m) to two decimal places when transposing dimensions to quantity surveying paper (Rabie and Riad, 2011). The decline in the use of the BOQ has meant that the measurement process has gone from being the preserve of the private practice QS and become a necessity for the contractor’s QS, or in many cases further down the supply chain to the sub-contractor’s QS. This switch in responsibility is in no small part due to the subject of liability. A fundamental point about measurement – it is entirely necessary to accurately measure items of construction work in order to accurately price them. Lee *et al.* (2011) stress that substantial errors can lead to increased costs for the responsible party.

The preserve QS has traditionally been responsible for the production of cost estimates and cost plans to assist clients with their decision making. This cost planning process is supported by the Building Cost Information Service (BCIS) who are an independent organization who collate construction cost data from completed projects for QSs to use when estimating the cost of projects based on limited information. Early cost advice requires a different set of measurement techniques and although there is more interpretation in compiling such an estimate, the basic principles of accuracy and consistency still apply. As stated, this process is ordinarily the reserve of the private QS. What is clear is that the measurement of building works is undertaken at various

stages in the broader construction process, and that the measurement process is also influenced by the particular procurement route that is in operation for any given project. It is therefore, necessary to outline the two most popular procurement routes and their relationship to the measurement process (Ward, 2016).

2.5 RETROFITTING AND ADAPTATION CONSTRUCTION

Retrofitting for sustainability is typically viewed as expensive and disruptive process. Also building owners are often suspicious about design challenges and cost. In view of that, building users also show resistance to change and the disruptive process (Miller and Buys, 2011). Conventional upgrading or retrofitting techniques which usually includes the addition of existing walls, foundations and strengthening of frames often leads to costly consequences such as heavy demolishing, lengthy construction time and occupant relocation. Such costly, environmentally hostile and intrusive approach associated with these conventional processes usually deters building owners from retrofitting their buildings (Cheung *et al.*, 2004).

There is a large body of research on building retrofits available in the public domain. However, existing buildings continue to be upgraded at a very low rate. For instance, existing commercial building stock is currently being retrofitted at a rate of approximately 2.2% per year (Olygyay and Seluto, 2010). A reasonable level of retrofitting would be in the order of 10% of building stock (Deloitte, 2009). Studies suggest that the reasons for this are risks of failure, overestimation of energy savings, increased payback period, and interruptions to operations.

Adaptation is a method of extending the useful life of buildings by a combination of improvement and conversion (Kohler and Hassler, 2002). This adaptation combined with the energy savings, carbon emissions reduction, and the social and economic advantages of recycling a valued heritage building, makes adaptation turns into the reuse of a building which is an essential component of sustainable development (Department of the Environment and Heritage, 2004). Adaptive reuse of already existing buildings, i.e. changing the original purpose of a heritage building to suit new conditions or needs and so reusing it, has a major importance in the sustainable development of communities, avoiding the processes of demolition and reconstruction. This alone sells the benefits of adaptive reuse (Department of Environment and Heritage, 2004).

The purposes and possibilities of today that old buildings represent, work as an impetus and inspiration for their conservation and maintenance. Therefore, their new uses are one of the reasons why heritage buildings are refurbished, i.e. being restored to its former good condition. According to Power (2008) some of the benefits offered by retrofitting and adaptation of existing buildings are among the following:

- Renovation preserves the basic structure of the property and retains existing infrastructure in an existing built environment;
- The renewal of a building has an immediate beneficial effect on neighboring properties because it gives a clear signal that the neighborhood is worth investing in;
- Upgrading is far quicker than demolition and replacement building because, in most cases, it involves adaptation of the existing structure and layout of a building rather than starting from scratch;

- It is less disruptive because even where major work is undertaken, unless a dangerous structure is involved, people can usually stay inside and the area services continue to operate;
- It involves a shorter and more continuous building process since most of the work can happen under cover in weatherproof conditions. Compared to new build, this involves many months of exposure to all weathers while building the foundations and main structure;
- It has a positive impact on the wider neighborhood sending a signal that renewal and reinvestment will ensure the long term value and stability of an area. This, in turn, generates other investments and a broader upgrading;
- Older existing buildings require constant upgrading. Renovation has a positive effect on street conditions, social mixing, service quality, local transport and schools, since it adds value and attractiveness.

Reuse can create valuable community resources from unproductive property, substantially reduce land acquisition and construction costs, revitalize existing neighborhoods and help control sprawl (Bullen, 2007). In particular, extending the life of an existing building through reuse can lower material, transport and energy consumption and pollution and thus make a significant contribution to carbon emissions reduction and sustainability (Bullen, 2007). Adapting and refurbishing heritage buildings to suit new applications is an effective strategy; besides extending the life cycle of a building, it reduces its carbon emissions and improve cost efficiency, but also conserve significant heritage values (Yung and Chan, 2012).

Several organizations are attempting to provide pathways and a staged approach to retrofitting and adaptation building projects. Table 2.2 shows two key approaches. In particular, it is useful to consider these criteria, their definitions, as well as suggested order. On a similar scale, in the University of Wollongong (Ma *et al.*, 2012) has put together their strategy towards building retrofitting, suggesting five stages. The intent in both of these staged methods is similar, however detail is lacking as to how these investigative processes take place.

Table 2.2: Key Phases to Retrofitting and Adaptation Building Projects

	Origin Energy (2011)	Ma et al. (2012)
Stage 1	*Understand the business case objectives and qualify its suitability*	*Defining the scope of work, setting targets and a pre-retrofit survey*
Stage 2	*Perform on-site assessment of selected buildings or sites*	*Project auditing, selecting performance indicators, and building performance assessment and diagnostics*
Stage 3	*Provide detailed project reports—quantifying every aspect of the project with cost estimates*	*Identifying options: saving estimates, economic and risk analysis*
Stage 4	*Implement guaranteed Energy Saving Measures (within +/– 20% of target)*	*Implementation and commissioning*
Stage 5	*Deliver a complete Measurement and Verification Report: verifying savings*	*Validation and verification*

Source: (Ma *et al*., 2012)

To augment the aforementioned purposes of retrofitting and adaption building projects as put forward by Power (2008), this sought to identify the level of involvement of QS in the preceding phases as clearly indicated in table 2.2, as they act as advisors in terms of project costing to clients.

2.6 QS CHALLENGES IN RETROFITTING AND ADAPTATION OF EXISTING BUILDINGS

Retrofitting existing buildings for sustainability comes with more challenges to construction professionals, than designing a new sustainable building from scratch (Miller and Buys, 2011). Adapting and retrofitting building for sustainability is typically viewed as cumbersome with the intent of maximizing retention of original structure and fabric and extending a building's useful life (Ankrah and Ahadzie, 2014). The complexity nature of retrofitting existing building requires QS to ensure; proper planning and development of estimated cost to establish project budget at the pre-construction stage; cost-effective construction works through proper site measurements; quality workmanship and materials meet specifications; management of time to match progress of works done; effective monitoring of project cost and controlling financial dispute that may occur at the construction stages.

The above responsibilities of the QS becomes difficult to achieve when; the nature of drawing produce is poor without enough detailing of components and dimensions; low remuneration or professional fees; poor specification; difficulty in measuring works on site; lack of creativity and limited time requirement. Poor quality drawings towards designing energy efficient and sustainable drawings making it difficult to read and interpreted by QSs. This is a challenge as initial budgeted cost of quantified items in the drawing maybe wrong. Wrongly budgeted project cost may mean cost overrun or cost underrun with its associated delay and conflict implications. Low remuneration by building owners on service charges of professional QS slows down the pace of establishing initial project budget. Poor specification as an outcome of inadequate description of quality material to be used on retrofitted project may lead to defective works. Difficulty in measuring works on site due to complex design shapes and non-

availability of modern measuring instrument makes costing and quantification of works done on site difficult to be determined. The change in construction technologies and innovation in retrofitting technologies in our present day have added a number of challenges. This is especially so when engineering professionals have to select or develop a technical and socio-economic acceptable solution (Cheung *et al.*, 2000). In the process of achieving retrofitting projects, the QS has to be creative enough to meet the needs and requirement it carries along as wells complying with the building codes.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This section addresses issues relevant to the methods employed in order to achieve the objectives of the research and the overall aim of the topic. The full picture underpinning the choice of the sampling methods, data collection instruments and tools are addressed.

3.2 STUDY AREA

As already indicated, to augment the purposes of retrofitting and adaptation of existing building projects, it is important not to overlook the involvement of QS who happens to be advisors to clients on project cost and estimates. That is, without the professional competencies of the QS, clients at times turn to overlook the benefits of retrofitting and adaptation of existing building, looking at the cost involved. The study thus confined it scope to the Kumasi metropolis by sourcing information from professional QS involved in retrofitting and adaptation of project. Kumasi represent the second largest city in Ghana and so houses major construction firms that employ the services of QS in the country. The researcher chose Kumasi because of his familiarity with the area as such making data collection easier from respondents. Again, the cost involved in collecting data was minimized because of the proximity of the area to the researcher.

3.3 RESEACH STRATEGY

The enquiry of research objective is simply the research strategy as Naoum (2012) define. There are three (3) main types of research strategy according to Naoum (2002) asserted. They are qualitative, quantitative and triangulation. However, the one to employ in any exact research practically relies on the intent of the study, type, as well as the availability of information for the study (Naoum, 2012). In effect, the study utilized the quantitative research approach. According to Frechtling and Sharp (1997) questionnaire tested and represented on database is the common data collection technique used in quantitative research technique. This study employed quantitative research approach to examine the objectives and identified the level of involvement of QS in retrofitting and adaptation of existing building projects in Ghana; the challenges QSs face in retrofitting and adaptation of existing buildings; and the QS competencies in retrofitting and adaptation of existing buildings using mean score ranking. Consequently, the views of professional QSs from the survey were tested empirically to augment findings. The quantitative method was adopted to gather factual data so that the researcher can study the relationships between facts in accordance with theory. The procedure for the study took the form of literature review and survey using the structured questionnaire approach.

3.4 RESEARCH DESIGN

Research design is explained as the plan or outline that serves as a guideline in the gathering and explanation of data (Al-Moghany, 2006). It refers to the series of steps that connect research questions and collected data. Research design is the plan guiding the investigator to gather, analyze and explain observations (Nachmias and Nachmias, 1992). It involves a clear process of evidence permitting researcher to make inferences about causal relations of variables under study (Nachmias and Nachmias, 1992).

Research design is defined by Al-Moghany (2006) as an outline that explains what data are important, what questions to investigate, which data to be gathered and how data will be analyzed. Research design provides answers to questions under study (Polit and Hungler, 1999; Al-Moghany, 2006). It also mitigates challenges encountered when undertaking research (Naoum, 1998). It is impossible for researchers to assume people reason in a certain way without confirming from them (Polit and Hungler, 1999; Al-Moghany, 2006). According to Polit and Hungler (1999), research design explains the method to be utilized as well as how the investigator hopes to device controls to improve the interpretation of outcomes.

There are varying research designs that are used to meet the challenges anticipated in the review schedule (Weisberg and Bowen, 1977). As opined by Naoum (1998), the most used technique in data collection to gather opinions, facts and views of people is using structured questionnaire. A questionnaire survey design was employed in this survey.

3.5 RESEARCH APPROACH

3.5.1 Deductive Research Approach

According to Baxter and Jack (2008), deductive approach is at times referred to as quantitative method or design. A key characteristic of deductive approach is that concepts need to be operationalized in a way that enables facts to be measured quantitatively. Additional, with deductive approach, the principle of reductionism is followed (Saunders *et al.,* 2012). According to Saunders *et al.* (2009), deductive research approach owes more to the positivism approach especially when it is attached to different research philosophies

3.5.2 Inductive Research Approach

The inductive research approach involves the case where the researcher gathers information for the purpose of developing a theory (Saunders *et al.,* 2012). As a result, this approach involves theory development by empirically observing reality as well as inferring broad interpretations from precise occurrences (Neuman, 2002). Inductive research approach is targeted to engender meanings with respect to data set gathered to identify relationships and patterns to build a theory. Again, this approach is primarily tied to the context in which the study's background is placed (Saunders, *et al.,* 2012).

3.6 RESEARCH METHOD

Quantitative research is a research strategy that emphasizes measurement and quantification in the collection and analysis of data (Bryman, 2004). It constitutes a deductive approach to the relationship between theory and research, in which the accent is placed on the testing of theories. It has incorporated the practices and norms of natural science model and of positivism in particular. It also embodies a view of social reality as an external, objective reality. This study adopts a quantitative research approach because it's entirely deductive.

3.7 POPULATION

Population in research methodology is understood to be objects, subjects, phenomena, cases, events or activities specified for the purpose of sampling (Brynard and Hanekom, 2005). Also, Population refers to a group or units of interest located in a geographic area of interest during the time of interest (Taylor-Powell, 1998). For the purpose of this study, the population was chosen to encompass quantity surveyors, and specifically only those in Kumasi, who are in good standing as to the year 2017. Consequently, this research was focused on the building construction industry in the Kumasi metropolis. The choice was because they are well established and may demonstrate satisfactory records in terms of delivering retrofitting and adaptation building projects. Thus, their opinion was imperative to this study as they reflect the issues on the ground. The list had 43 registered quantity surveying firms in Ghana with their respective locations. From GhIS (2017), the membership of the quantity surveying division consists of 39 fellows; 313 professionals; and 37 technicians. This this sum up to 389. Out of this number, about 92% represent those operating within Accra and Kumasi. It was not

possible to obtain the exact number of professionals operating in Kumasi, and hence a snowball sampling helped to secure a representative sample.

3.8 SAMPLE SIZE

Selecting a representative part of a population (sample) to determine characteristics or parameters of the whole population is termed as Sampling (Taylor-Powell, 1998). However, Taylor-Powell (1998) argued that sampling may not be necessary if the population is small. The number of quantity surveyors in Kumasi are not determinized, as is the case with the QS firms. Therefore, considering time and resources available for the study, the study targeted forty (40) Professional QSs involved in retrofitting and adaptation of projects, through a snowballing sampling technique.

3.9 SAMPLING TECHNIQUES

Various sampling techniques abound. The choice of a sampling technique depends on the constructs and the mode of conducting the research. . Purposive Sampling is a sampling technique whereby the researcher decides who to be engaged in the research.

Snowball sampling is a technique where the researcher builds a network of respondents through an initial group. Additionally, this is used to develop samples from groups which are difficult to contact (Henn et al., 2009). It is valuable in research since it is directed at individuals that are difficult to identify in a research process. Fellows and Liu (2015) adds that the researcher may identify a very small number of sources (respondents) and, after collecting data from each one, requests that source to identify further sources thereby progressively building a sufficient sample. The snowball sampling was used to select QSs that currently operating in the Kumasi metropolis. The snowball sampling was used for identifying

respondents with rich information that are relevant to the study. In using this approach, the researcher contacted the professional QSs involved in retrofitting and adaptation of building projects within the study area, who are easy to reach for questionnaire administration. When the process was concluded with this QS he or she directed researcher to other consultants within the study area. This process continued till a representative sample size of seventy (40) respondents was obtained.

3.10 SOURCES OF DATA AND DATA COLLECTION

Evaluation is the process of systematically collecting data that represents the opinion and experience of its participants or other stakeholders (Thomas, 2010). Hence, data collection and the sources from which data would be collected are imperative to understanding the theoretical background of the research (Thomas, 2010). The purpose of this aspect of the research methodology was to present the data collection instruments, methods and procedures. The data collection process involved two stages literature review (secondary) and field survey (Primary).

The first stage consisted of literature search for information on research uptake in the topic area. Robust review considered the key aspects of the study objectives. The information gathered through these formed the basis for a survey questionnaire designed and used to obtain the primary data for this study

Primary data are information that the researcher collects because no one has compiled and published for public accessibility (Thomas, 2010). Easterby-Smith et al (2003) argued that every research should include empirical research data (i.e. primary data). To this end, the primary data sources were collected from QS professionals in the building CI. The primary technique for collecting the data was a self-administered

structured questionnaire; since it serves as the major source of information (Taylor-Powell, 1998) and can be used to measure issues that are crucial to management and development of human resources, such as behaviors, attitudes, beliefs and expectations. Thus, the design and administration of relevant questionnaires was appropriate for measuring individual's perspectives on competencies of QSs in the delivery of retrofitting and adaptation building projects.

3.11 QUESTIONNAIRE DESIGN AND DEVELOPMENT

Being the main data collection tool, the questionnaire was designed to be respondent-friendly in order to facilitate the involvement of a lot and in consequence maximize the response rate. The questionnaire was designed using plain language devoid of 'technical' words. Aside the plain language, the questionnaire was deliberately designed to include both close- and open-ended questions. According to Babbie (1990), this provide flexibility in questionnaire design and it will thus avoid monotony which in turn makes the questionnaire interesting for the respondents. The layout and format of the questionnaire were carefully considered as they impact on the response rate. Instructions were given at the beginning of every major part for filling the questionnaire.

The questionnaire was in two main sections, Parts A and B. The sample questionnaire as attached as Appendix A. The Part A focused primarily on the demographics of the respondents and as such requested the background information of the respondents. Studies have demonstrated the significance of demographic variables or background information, particularly in quantitative studies. The Part B was anchored on the research objectives and as such was based on the literature review in regards to the

level of involvement of QS in retrofitting and adaptation of existing building projects; challenges QS face in retrofitting and adaptation of existing buildings; and the QS competencies in retrofitting and adaptation of existing buildings. Having decided on the variables based on the review, the Likert scale Ratings was employed to help elicit appropriate ratings. Here, the conventional five-point rating scale was used as literature suggest more complex rating scale yields no significant advantages (Oppenheim, 2000 cited in Ahadzie, 2007).

The questionnaire was first piloted using some experienced Professional QSs within the KNUST community. Piloting was required to establish the reliability, validity and practicability of the questionnaire. Some suggestions observed through the pilot study was considered in the final questionnaire. The questionnaire was administered and retrieved by the researcher through direct visit to prospective respondents.

3.12 DATA ANALYSIS

The collection of data in quantitative research usually require some form of measurement. This is done using indicators such as response categories on a research instrument (Henn *et al.*,2009). Kothari (2004) outlines four key steps involved in data analysis. It starts with editing, codding, classification and tabulation.

The completed questionnaires were edited to ensure completeness, consistency and readability. Once the data had been checked, they were arranged in a format that enabled easy analysis. The retrieved questionnaire were aggregated into larger units and were processed and entered into the Statistical Packages for Social Sciences (SPSS version 21). The statistical tools used in the analysis comprise of descriptive statistics and Relative Important Index (RII). The RII was used to determine

the significance of the identified strategies as it compares one strategy to the other variables within the same category. According to Henn *et al.* (2009), the researcher often requires a snapshot of the data being analyzed. The SPSS software was then employed to organize the survey findings and to cross-tabulate the relationships between the variables. To elucidate the discussion in this discipline, the data obtained was presented mainly in tabular form.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

The chapter four of the thesis presents information on the analysis that was done on the data collected. The number of responses that was retrieved from the study were forty in number. The questions were sectioned in parts and the results are presented in accordance to the pattern and most importantly the objectives of the study. The interpretation and discussion of the results are also presented below as well.

4.2 BACK GROUND INFORMATION OF RESPONDENTS

The instrument for the survey included question on the background of the respondents. This was necessary to ensure that the people giving the responses are fit and are suitable to do so for the purpose of the research. The details requested included the gender, the years of experience, their roles as QSs and the status of the institution they belong to. The table (4.1) below presents the results of the demographic data that was retrieved. The information on the gender of the respondents revealed that there were more male respondents to female. The males were 27 in number thus 67.5 percent and the females were 13 in number thus 32.5 percent of the total responses. In relation to the status to which they belonged, most if the quantity surveyors were in the private sector. This data also shows that the Public sector quantity surveyors were 18 and the Private sector quantity surveyors were also 22. The years of working experience of the quantity surveyors were also asked. The questions were structured for them to indicate the 1 to 5 years, 6 to 10 years, 11 to 15 years. Most of the respondents ticked the having experience between 6 to 10 years. 12 respondents had 1 to 5 years, 20 had 6 to 10 years and 8 had 11 to 15 years.

Role in QS service in their institutions includes Measurement and Taking off, Preparation of Bill of quantities, Preparation of Valuation certificate, Preparation of Risk Management Plan and Preparation of Cost Plan and Visibility studies amongst others. The respondents indicate the roles which they mostly engaged in at the work places. The results displayed that those engaged in Measurement and Taking off were 3, Preparation of Bill of quantities were 3, Preparation of Valuation certificate were 18, Preparation of Risk Management Plan were 3 and Preparation of Cost Plan and Visibility studies were 8 and 5 Respondents ticked other roles.

Table 4.1: Background information

Variables	Details	Frequency	Percentage	Cumulative %
Gender	Male	27	67.5	67.5
	Female	13	32.5	100.0
Status of institution	Public	18	45.0	45.0
	Private	22	55.0	100.0
Working experience	1 to 5 years	12	30.0	30.0
	6 to 10 years	20	50.0	80.0
	11 to 15 years	8	20.0	100.0
Role in QS service	Measurement and Taking off	3	7.5	7.5
	Preparation of Bill of quantities	3	7.5	15.0
	Preparation of Valuation certificate	18	45.0	60.0
	Preparation of Risk Management Plan	3	7.5	67.5
	Preparation of Cost Plan and Visibility studies	8	20.0	87.5
	Others	5	12.5	100.0

4.3 QUESTIONS TIED TO THE STUDY'S OBJECTIVES

As part of the survey questionnaire, this part of the questions was asked of the respondents. They were asked some questions which are presented in the table below.

4.3.1 Level of involvement of QS in retrofitting and adaptation of existing building projects

Table 4.2 below shows results of the frequencies which indicate that, the QS frequency of involvement in retrofitting and adaptation of building projects was high. Such that 3 ticked Not Frequent, 7 Less Frequent, 9 Moderately Frequent, 11 Frequent, and 10 Very Frequent. The Number of projects involved in were scaled from 1 to 5, 6 to 10, 11 to 15 and 16 and above and the responses were 3, 10, 17 and 10 respectively. The question on percentage of projects of that sort usually involved QS services was asked also and scaled from 11 to 20%, 21 to 30%, 31 to 50%, Above 50%, and the number of respondents who chose the mentioned scales are as follows, 6, 14, 7, and 13 respectively. The questions further asked them to indicate the various roles they play in relation to phases. There were five phases in all and the results show that, they mostly engaged in project auditing, defining scope of work, saving estimates, implementation and validation in accordance to phases 1, 2, 3, 4 and 5 respectively. Eventually they were made to indicate the 'Do you see other professional competencies within the QS profession'. This is because out of the forty respondents, 14 are mostly involved in defining scope of work representing 35%, 13 are mostly involved in Setting targets representing 32.5, and 13 are also mostly involved in pre-retrofit survey representing 32.5 during the first phase. In the second phase, 20 are mostly involved in project auditing representing 50.0%, 9 are mostly involved in selecting performance indicators representing 22.5% and 11 also involve themselves building performance assessment

and diagnostics representing 27.5%. The third phase also has most respondent being part of saving estimates that is 19 respondents representing 47.5%. Implementation was the highest activity done by the participants in the fourth phase with 22 respondents representing 55.0%. The fifth phase had validation as the highest activity done by the participants with 24 respondents representing 60.0%.

Concerning the level of involvement of QSs in retrofitting and adaptation of existing building, the merely involvement of the QS in retrofitting and adaptation of existing building shows that, the services of the professional QS are highly engaged by building clients, thus there is the need to continuously develop as a professional. Continuous professional development in this case can lead to increased public confidence in individual professionals and their profession as they are given a deeper understanding of what it means to be a professional, along with a greater appreciation of the implications, involvement and impacts of their work.

Table 4.2: Involvement level of QS in retrofitting and adaptation of existing building project.

No.	Question	Details	Frequency	Percentage
6	QS frequency of involvement in retrofitting and adaptation building projects.	Not Frequent	3	20.0
		Less Frequent	7	20.0
		Moderately Frequent	9	22.5
		Frequent	11	25.0
		Very Frequent	10	12.5
		Total	**40**	**100**
7	Number of projects involved in	1 to 5	3	7.5
		6 to 10	10	25.0
		11 to 15	17	42.5
		16 and above	10	25.0
		Total	**40**	**100.0**
8	Percentage of projects of that sort usually involved QS services	11 to 20%	6	15.0
		21 to 30	14	35.0
		31 to 50%	7	17.5
		Above 50%	13	32.5
		Total	**40**	**100.0**
9	**Your role as professional Quantity Surveyor in these phases.**			
	Phase 1	Defining scope of work	14	35.0
		Setting targets	13	32.5
		Pre-retrofit survey	13	32.5
		Total	**40**	**100**
10	Phase 2	Project auditing	20	50.0
		Selecting performance indicators	9	22.5
		Building performance assessment and diagnostics	11	27.5
		Total	**40**	**100**
11	Phase 3	Identifying options	8	20.0
		Saving estimates	19	47.5
		Economic and risk analysis	13	32.5
		Total	**40**	**100.0**
12	Phase 4	Implementation	22	55.0
		Commissioning	18	45.0
		Total	**40**	**100.0**
13	Phase 5	Validation	24	60.0
		Verification	16	40.0
		Total	**40**	**100.0**

4.3.2 Challenges QSs face in retrofitting and adaptation of existing buildings

This second objective was to identify the challenges being faced by QSs in the delivery of retrofitting and adaptation of existing building projects. The Likert scale of five was used to develop the close ended questions which were the respondents. Results from Table 4.3 below shows that, Poor quality drawings obtained a Relative Importance Index (RII) of 0.820; Difficulty in measuring work done had a RII of 0.815; Poor specifications. RII of 0.810; a RII on Low remuneration / consultancy fees was 0.800; Limited time requirements of retrofitting projects with a RII of 0.795; a RII Lack of creative process in handling the complexity of retrofitting projects was 0.775; In summary, all the challenges variables exceeded the average mean score hence indicating the relevance or significance of the challenges. These challenges are to be highly noted and controlled to facilitate the execution of retrofitting and adaptation of existing buildings. The respondents considered poor quality drawing to be the main challenge QSs face in retrofitting and adaptation of buildings. Lack of creative process in handling the complexity of retrofitting projects was considered the least challenge even though very significant.

Table 4.3: Ranking of challenges QSs face in retrofitting and adaptation of existing building.

Challenges	(ΣW)	Mean Scores	RII	RII Ranking
Poor Quality of Drawings	164	4.100	0.820	**1**
Difficulty in Measuring works on site	163	4.075	0.815	**2**
Poor specifications	162	4.050	0.810	**3**
Low remuneration / consultancy fees	160	4.000	0.800	**4**
Limited time requirements of retrofitting projects	159	3.975	0.795	**5**
Lack of creative process in handling the complexity of retrofitting projects.	155	3.875	0.775	**6**

4.3.3 QS competencies in retrofitting and adaptation of existing buildings.

The respondents were also tasked to indicate QS competencies in retrofitting and adaptation of existing buildings. The questions were ranked for them to tick on a scale such that 5 represents =Very high; 4=High; 3=Substantially low; 2=Low; and 1=Very low. The RII analysis was done and the result are presented below. From Table 4.4, results show that construction technology and environmental services had a mean of 4.3 and RII value of 0.86; project financial control and reporting, a mean of 4.275 and RII value of 0.855; conduct ethics, rules and professional practice had a mean of 4.275 and RII value of 0.855; contract administration obtained a mean of 4.225 and RII 0.845; quantification and costing of construction works had a mean of 4.2 and RII value of 0.84; business planning had a mean of 4.125 and RII value of 0.825; accounting principles and procedures obtained a mean of 4.1 and RII value 0.82; health and safety, a mean of 4.00 and RII value of 0.800; communication and negotiation obtained a mean of 3.875 and RII value of 0.775; conflict avoidance, management and dispute resolution procedures obtained a mean of 3.875 and RII value of 0.775; and capital allowances also had a mean of 3.85 and RII value of 0.77. The above motioned were

the top ten variables or competencies that the respondents highly opined to. Generally, from the analysis most of the factors are very significant since they exceeded the average mean score of 3.5 except advanced operational efficiency which had 3.425. This can also be considered relevant since it is close to the mean score.

Table 4.4: Ranking of QS competencies in retrofitting and adaptation of existing buildings.

QS Competencies	(ΣW)	Mean Scores	RII	RII Ranking
Construction technology and environmental services	172	4.3	0.86	**1**
Project financial control and reporting	171	4.275	0.855	**2**
Conduct ethics, rules and professional practice	171	4.275	0.855	**3**
Contract administration	169	4.225	0.845	**4**
Quantification and costing of construction works	168	4.2	0.84	**5**
Business planning	165	4.125	0.825	**6**
Accounting principles and procedures	164	4.1	0.82	**7**
Health and safety	160	4	0.8	**8**
Corporate recovery and insolvency	157	3.925	0.785	**9**
Programming and planning	156	3.9	0.78	**10**
Communication and negotiation	155	3.875	0.775	**11**
Conflict avoidance, management and dispute resolution procedures	155	3.875	0.775	**12**
Capital allowances	154	3.85	0.77	**13**
Dissemination of information	150	3.75	0.75	**14**
Regulatory compliance	146	3.65	0.73	**15**
Client care	141	3.525	0.705	**16**
Advanced operational efficiency	137	3.425	0.685	**17**

Construction technology and environmental services among other competencies was given much more emphasis by respondents and this attest to the fact there cannot be any cost-effective construction works without the technology in construction in this our modern era of construction and its associated environmental services.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter presents the summary and major findings of the study, the conclusions drawn from the study and the recommendations made. The findings that were made from this study were summarized under each respective objective.

5.2 SUMMARY OF FINDINGS

5.2.1 Objective One: To identify the level of involvement of QS in retrofitting and adaptation of existing building projects in Ghana;

The findings that evolved from this study revealed that QSs involvement in retrofitting is frequent according to the respondents. Majority of them had also worked on between 11-15 retrofitting projects and usually a number of such projects require the services of a QS. It is therefore said that the level of QS involvement in retrofitting projects were high. This implies that, the services of QSs is much more needed when it comes to retrofitting and adaptation of existing building.

5.2.2 Objective Two: To identify the challenges QSs face in retrofitting and adaptation of existing buildings.

QSs face a number of challenges following the changes in construction technologies and innovation in retrofitting technologies in our present day. Some of the challenges that emerged from the study are poor quality of drawings, difficulty in measuring works on site, poorly drafted specifications, Low remunerations and professional fees, Limited time requirements of retrofitting projects and Lack of creative process in handling the complexity of retrofitting projects. Despite the numerous challenges QSs

face in retrofitting and adaptation of existing buildings, it is equally important for them to maintain a high level of professionalism whiles relating and coordinating with other appropriate professionals to overcome the various challenges.

5.2.3 Objective Three: To identify QS competencies in retrofitting and adaptation of existing buildings.

Retrofitting existing buildings is more interesting as it requires efficient skills and knowledge to be able to successfully retrofit. From the survey it was deduced that, to be able to successfully retrofit existing building as a quantity surveyor, you would need to have the following set of skills; Construction technology and environmental services; Project financial control and reporting; Conduct ethics, rules and professional practice; Contract administration; Quantification and costing of construction works; Business planning; Accounting principles and procedures; Health and safety; Corporate recovery and insolvency; Programming and planning; Communication and negotiation, Conflict avoidance, management and dispute resolution procedures; Capital allowances, Dissemination of information; Regulatory compliance; Client care and Advanced operational efficiency.

Even though the competencies listed are no different from the ordinary required by QS in delivering their services, much emphasis is made on construction technology and environmental services when it comes to retrofitting and adaptation of existing buildings. This implies that, as QSs develop professionally there is the need to fully improve on their construction technology by knowing all construction processes involved in cost-effective construction works and its related environmental services.

5.3 CONCLUSION

Retrofitting can create valuable community resources from unproductive property, to substantially reduce land acquisition and construction costs, revitalize existing neighborhoods and help control sprawl. However, it is very challenging to retrofit existing buildings. This is because the advancement in construction technologies and innovation pose challenges that stereotype the QSs efforts in retrofitting buildings in our present day. It is therefore necessary for QSs in the built environment to re-look at their skills and knowledge in construction technology and the built environment with the aim of improving them so as to be fully equipped in retrofitting and adaptation of existing buildings.

5.4 RECOMMENDATIONS

1. The Ghana Institution of Surveyors should conduct Continuing Professional Developments (CPD) to train QS in retrofitting and adaptation of existing buildings so as to improve their competency skills.
2. QSs must be proactive in embracing the challenges that comes with retrofitting of existing building projects and seek new strategies in alleviating these challenges.

5.5 RECOMMENDATION FOR FURTHER STUDIES

1. A research can be conducted to identify the number of successfully retrofitted buildings projects in Ghana with the aim of identifying the various pre and post construction stages or processes and evaluating its associated project cost.

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APPENDIX

SURVEY QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

(TOPIC: EXPLORING THE PROFESSIONAL COMPETENCIES OF QUANTITY SURVEYOR IN RETROFITTING AND ADAPTATION OF EXISTING BUILDINGS)

Dear Sir/Madam,

Thank you in advance for your enormous contribution to this study. The aim of this survey is to identify the professional competencies of Quantity Surveyors in retrofitting and adaptation of existing building projects in Ghana. Please fill in the questionnaire using the instructions, which will not take you more than 15 minutes. Please note that the information provided is anonymous and will only be used for academic purpose. Thank you once more for your appreciated time. Please be free to contact the number(s) provided below should in case you have any queries.

(NAME: Benjamin Danyame Eshun)

Department of Construction Technology and Management

KNUST.

Tel: 0546928092

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SECTION A: BACKGROUND INFORMATION

Please respond to the following by either ticking the appropriate box or writing in the blank space provided.

Q1. Professional Position ……..

Q2. Sex

a) Male [ ]
b) Female [ ]

Q3. Status of your institution

a) Public [ ]
b) Private [ ]

Q4. Please indicate the number of years you have being practicing your QS profession

a) 1 to 5 years [ ]
b) 6 to 10 years [ ]
c) 11 to 15 years [ ]
d) Over 15 years [ ]

Q5. Please indicate your particular role in QS services in your organization

a) Measurement and Taking off [ ]
b) Preparation of Bill of quantities [ ]
c) Preparation of Valuation certificate [ ]
d) Preparation of Risk Management Plan [ ]
e) Preparation of Cost Plan and Visibility studies [ ]
f) Other(s) ……..

SECTION B: QUESTIONS TIED TO THE STUDY'S OBJECTIVES

Level of Involvement of QS in Retrofitting and Adaptation of Existing Building Projects

Q6. How frequent are QSs involved in retrofitting and adaptation building projects?

a) Very Frequent [ ]
b) Frequent [ ]
c) Moderately Frequent [ ]
d) Less Frequent [ ]
e) Not Frequent [ ]

Q7. How many of such projects have you been involved in the last five years?

a) 1 to 5 [ ]
b) 6 to 10 [ ]
c) 11 to 15 [ ]
d) 16 and above [ ]

Q8. On average what percentage of projects of that sort usually involved QS services?

a) 0 to 10% [ ]
b) 11 to 20% [ ]
c) 21 to 30 [ ]
d) 31 to 40% [ ]
e) Above 50% [ ]

Q9. Below are the five key phases of retrofitting and adaptation building projects identified from literature; please indicate by stating categorically your role as professional Quantity Surveyor in these phases.

a) Phase 1: Defining scope of work, setting targets and a pre-retrofit survey

……

b) Phase 2: Project auditing, selecting performance indicators, and building performance assessment and diagnostics

……

c) Phase 3: Identifying options: saving estimates, economic and risk analysis

……

d) Phase 4: Implementation and commissioning

……

e) Phase 5: Validation and verification

……

Challenges Quantity Surveyors face in Retrofitting and Adaptation of Existing Building.

Q10. Please kindly rate on the scale the level of agreement to the following challenges Quantity Surveyors face in retrofitting and adaptation of existing buildings. Please tick in the appropriate box. ***1= Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly agree***

No.	**CHALLENGES**	**Levels of Agreement**				
		1	2	3	4	5
1	Poor Quality of Drawings					
2	Difficulty in Measuring works on site					
3	Poor specifications					
4	Low remuneration / consultancy fees					
5	Limited time requirements of retrofitting projects					
6	Lack of creative process in handling the complexity of retrofitting projects.					

Quantity Surveyors Competencies in Retrofitting and Adaptation of Existing Buildings.

Q10. Please kindly rate on the scale the level of agreement to the following Quantity Surveyors Competencies in retrofitting and adaptation of existing buildings. Please tick in the appropriate box. ***5=Very high; 4=High; 3=Substantially low; 2=Low; and 1=Very low.***

No.	QS COMPETENCIES	Levels of Agreement				
		1	2	3	4	5
1	Commercial management of construction or Design economics and cost planning					
2	Procurement and tendering					
3	Construction technology and environmental services					
4	Contract practice					
5	Project financial control and reporting					
6	Quantification and costing of construction works					
7	Conduct ethics, rules and professional practice					
8	Health and safety					
9	Communication and negotiation					
10	Client care					
11	Accounting principles and procedures					
12	Business planning					
13	Conflict avoidance, management and dispute resolution procedures					
14	Capital allowances					
15	Corporate recovery and insolvency					
16	Contract administration					
17	Programming and planning					
	Others (Please indicate)					
18						
19						
20						

THANK YOU!