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KUMASI, GHANA**

**CHALLENGES FACING GHANAIAAN SMES CONSTRUCTION FIRM IN
ACQUISITION OF PLANT AND EQUIPMENT**

BY

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A Thesis Submitted to the Department of Construction Technology and Management,
College of Art and Built Environment, In Partial Fulfillment of the Requirement for the
Award Of

MASTER OF SCIENCE

NOVEMBER, 2018

DECLARATION

I therefore declare that this template is my own particular work related to the achievement of MSc. Construction Management, and that, to my best judgment, does not contain any material previously distributed by anyone, nor material that has been acknowledged for the honor of another level of the University, except where in the content. However, it is likely that the readers of this work will recognize some mistakes or exclusions. In this regard, I reasonably acknowledge that I am so attentive in this way.

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ABSTRACT

In spite of the many contributions of SMEs to the national economy of Ghana, SMEs in the construction industry are still confronted with challenges in acquiring plant and equipment (P&E's), for achieving maximum results in returns for any construction work. Selecting the right option is one of the most relevant issues. In order to do so the following objectives were employed; to examine the frequent use of acquisition method, to identify the factors that effect on acquisition method and propose strategies for efficient acquisition method for SMEs in Ghana. This study explored the challenges facing Ghanaian SMEs construction firms in acquisition of plant and equipment. The study was carried out along the tenets of a preliminary literature review and followed by a survey using a structured questionnaire. Eighty (80) questionnaire was distributed base on purposive sampling technique, and 64 completed questionnaires representing 80% were considered valid for the analysis. The data collected were analyzed using Relative Importance Index (RII). The study revealed that, majority of SMEs always opt for hiring equipment rather than buying/owing/leasing or the combination of buying and hiring. It is interesting to note that a number of factors have effects on choosing acquisition methods in Ghana. Considering the challenges in order of extremely challenging, respondents indicated that, the purchasing price for equipment either buying, hiring or combining the two is highly beyond their financial base. Other factors like, continuous breakdown, (planning: budgets, upgrading, interchanging), pre-acquisition analysis: future work, market, transportation and assembly capability, supplies etc., were also considered critical. Further, a number of strategies have been proposed to curb the identified challenges for efficient acquisition mode for SMEs in Ghana.

Keywords: Plant and equipment, acquisition, SMEs, challenges, Ghana

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ACKNOWLEDGEMENTS

My first appreciation goes to the Almighty God for the opportunity, knowledge and wisdom for His countless love as well as the direction throughout the program. I owe my supervisor, Dr. Ernest Kissi, many thanks for his valuable commitment and leadership. I also owe much credit to my uncle, Mr William Quartelai Quartey, for his immense contribution from the beginning to the end of the program. With the help of the staff of the Institute for Construction Technology, KNUST, Kumasi, I also acknowledge appreciation. I am very grateful for my wife, Mrs Naomi Tetteh, my children, David Richmond Nii Martey and Karen Naa Merley Tetteh, who have supported me in many diverse ways. I also thank my Father, Mr Edward Martey Tetteh.

Finally, I thank my colleagues for their constructive criticism and for all those who contributed in making this a success.

DEDICATION

I dedicate this work first to the Almighty God for the gift of life and how far he has brought me. In addition, I dedicate this work to my uncle for his constant prayers, support and encouragement throughout the program and indeed, it would have been difficult without him. In addition, I dedicate this work to my wife and children for their understanding, support, and for keeping up the faults in my absence throughout this time, Mrs. Naomi Tetteh, David, and Karen Tetteh.

Also many thanks to my dad, Mr Edward M. Tetteh and my Late mother Grace Oyoo Quartey who I lost during the course of the programme and to all my mates, friends, well-wishers and loved ones.

God bless you all.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Globally, the building industry constitutes an important element in every economy. The construction sector contributes 10.5% of the Gross Domestic Products (GDP) of the Ghanaian economy and about 6% of the economically active populations in Ghana are employed in the construction sector (Ghana Statistical Services, 2013). The construction sector is key to the creation of wealth as a nation acting as an accelerator for, and has multiplier effect to the economy as well as enabling other industries like professional service, manufacturing, financial service and others to function effectively (Sajoudi et al. 2011). Regardless of the numerous benefits the construction industry offers to the economy, there still exist many challenges. Currently construction projects are mechanized in every aspect (Waris et al. 2014). Due to the increase in mechanization of construction work, the importance of plant and equipment (P&Es) is very critical in achieving efficiency and productivity. However, the acquisition of plant and equipment for construction firms in Ghana very capital intensive. In Ghana, plant and equipment acquisition by large construction firms (D1K1 and D2K2) is not much difficult as compared to small and medium construction firms (D3K3 and D4K4). According to Kenny (2007), in Ghana, there exit fewer large construction businesses as related to small scale construction businesses. A research conducted by Bastiat Ghana indicated that 92% of registered companies in the country are micro, small and medium scale enterprises (SMEs) (Senzu, 2014). SME employs nearly 60% of the Ghanaian labour force. SMEs are described as

efficient and productive job creators, the seeds of big businesses and the fuel of national economic engines (Abor and Quartey, 2010).

In Ghana, registered contractors are categorized as D1K1, D2K2, D3K3 and D4K4 based on a number of factors like plant and equipment holding, financial position, technical competence and previous performance. SMEs are those with limited financial base and lack of plant and equipment.

Previous studies demonstrates that the procurement of plant and equipment constitute around 36% of the aggregated project cost (Yeo and Ning, 2006). Along these lines, it is considered as a major financial burden amid the development stage beside other expenditures (Prasertrungruang and Hadikusumo, 2007). Laryea (2010) reported in his study that most challenges and opportunities which contractors face in Ghana is that most contractors do not have direct ownership and have to hire, and SMEs are the hardest hit of this challenge due to their limited capital markets (Abebe, 2013). According to Laryea (2010) the government of Ghana established an equipment supply scheme in 2005/2006 to support local contractors this initiative was managed by the National Investment Bank (NIB). This is a clear indication that plant and equipment acquisition by local contractors particularly SMEs in Ghana is a problem. Therefore, how SMEs acquire equipment, whether acquisition policies exist and the challenging factors on the acquisition mode must be of interest practitioners and scholars. Thus, the study seeks to explore the challenges facing Ghanaian SME construction firms in acquisition of plant and equipment.

1.2 Problem Statement

Despite the many contributions of SMEs to Ghana's national economy, SMEs in the construction industry are still faced with challenges in acquiring equipment and equipment

(P & E's) in order to get the best results for any development work as one of the big issues in construction companies is that the company need construction equipment but doesn't know whether to buy it rent it or lease it; in the other word company doesn't know how to acquire it (Lotker, 2007; Clapper et al., 2007; Coker, 2007).

Fundraising, pre-financing, leasing or leasing are the four most basic ways to acquire development assets and equipment. The selection of the best alternative, as described by Sajoudi et al. (2011) is one of the most important topics. Laryea (2010) announced these difficulties facing contract workers in Ghana that, most contractors do not have and need to have coordinated staff. In the unusual situations where a contract worker claims a few assets and equipment, the breakdown is a key issue that may be due to the maturity or lack of planned maintenance (Danso, 2014). According to Abebe (2013), SMEs are the most affected by this challenge because of their limited capital markets. According to Laryea (2010), the government of Ghana in 2005/2006 attempted to assist local contractors through an equipment delivery program managed by the National Investment Bank (NIB). This is a clear indication that plant and equipment acquisition by local contractors particularly SMEs in Ghana is a problem. In the same vein, a study conducted in Thailand, Malaysia and Nigeria, the exhibited reports and consultation of concerned bodies shows that plant and equipment acquisition, proper utilization, equipment replacement and disposal are the main challenge of contractors (Abebe, 2013). The ideal acquisition technique originates from precise assessments of incomes and monetary value and furthermore some items not included in the budgetary components that impact the acquisition mode. Thus, the study seeks to explore the challenges facing Ghanaian SME construction firms in acquisition of plant and equipment.

1.3 Research Questions

The following are the key research questions that were employed to facilitate the study are:

1. What is the most frequent acquisition mode employed by SMEs in the Ghana?
2. What are the challenging factors that effect on choosing acquisition mode by SMEs in Ghana:
3. What strategy can be adopted to mitigate the identified challenges for efficient acquisition mode for SMEs in Ghana?

1.4 Aim and Objectives

1.4.1 Aim

The aim of the study was to explore the challenges facing Ghanaian SME construction firms in acquisition of plant and equipment.

1.4.2 Objectives

To satisfy the above stated research aim the following objectives were set:

1. To examine the frequent use of acquisition of plant and equipment mode by SMEs in Ghana;
2. To identify the factors that effect on acquisition method by SMEs in Ghana; and
3. To propose strategies for efficient acquisition method for SMEs in Ghana.

1.5 RESEARCH SCOPE

Contextually, the study focused on SMEs and their acquisition method in the construction industry of Ghana and tailored to investigate the challenges facing Ghanaian SME construction firms in acquisition of plant and equipment. Geographically, the study targeted SMEs with the classification D3K3 and D4K4 in the Accra Metropolis and

Kumasi Metropolis. These Metropolises were decided upon because they serve as hubs for construction in the country. Again, these contractors are the main focus of this study because they constitute the majority of construction companies in the country according to Ahiagu-Dagbui et al. (2011). Again, past studies have demonstrated that one the challenges confronting contractors in Ghana is that most contractors do not have direct ownership and have to hire (Laryea, 2010).

1.6 RESEARCH METHODOLOGY

The study employed a quantitative research method. A structured questionnaire survey was designed to collect primary data from D3K3 and D4K4 contractors in Accra Metropolis and Kumasi Metropolis. The sampling technique used for the study is purposive sampling technique. The researcher adopted this technique so as to directly approach contractors who would readily provide the primary data required. A time frame not exceeding two weeks was allowed for the collection of the primary data whiles secondary data from both publish and unpublished sources were collected over the entire period of the study. Descriptive statistics was employed in analysing the quantitative data collected from the questionnaire survey.

1.7 JUSTIFICATION OF THE STUDY

Research on plant and equipment (P&Es) utilization on construction sites focused more on maintenance of equipment, life cycle costing and others. Also, research on construction plant and equipment has focused on general construction industry with much concentration in the European and Asian countries like US, UK, Hong Kong, etc., and little in Africa. Extant review of literature reveals that many of these studies have often focused on the relatively large companies who often undertake the very large projects in the major cities

of the economy (Ahadzie, 1995; Owusu-Tawiah, 1998; Fugar and Agyarkwa-Baah, 2010). Small scale contractors who constitute over 9-% of the job market have often being left out of the sampling frame. This research focuses specifically on small scale contractors (SMEs) in Ghana. The outcome of this research will impart to knowledge as well as aid construction professionals, researchers the best acquisition mode of plant and equipment for construction works by small scale contractors (SMEs). More than these, the study would contribute to available literature in the field of construction plant and equipment acquisition.

1.8 THESIS STRUCTURE

The thesis was arranged into five (5) chapters. The first chapter focused on the background, statement of the problem, research methods, and relevance of the research, the aim of the research, the research questions, and objectives of the research and the scope of the research. The second chapter comprised the appropriate literature review, which brings clarity to plant and equipment usage in the construction industry, challenging factors on acquisition mode, strategies for plant and equipment acquisition etc. The third chapter identified and brought together the methodology of the research. The fourth chapter reported on the data analysis and discussion of the results. Lastly, the fifth chapter presented details on the findings of the study, the conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The chapter two expounds on germane literature on the theme of the study, that is, “Challenges facing Ghanaian SMEs construction firm in acquisition of plant and equipment’. The study limited its scope to the D3K3 and D4K4 classes of firms in the Accra and Kumasi metropolises. Thus, the chapter starts by giving an overview of the construction industry in general, throwing light on the Ghanaian construction view including SMEs and their proximate contributions to the economy. Further, the chapter discusses plant and equipment (P&Es) acquisition in the construction industry including factors affecting the acquisition mode of plant and equipment. The chapter finally ended on strategies for effective and efficient acquisition method.

2.2 GLOBAL OVERVIEW OF THE CONSTRUCTION INDUSTRY

Investment in long-lived assets, such as equipment, property, and plant, are important elements on the balance sheets of most companies. According to Naskoudakis and Petroutsatou (2016), major companies are recently reporting equipment, property, and plant, as a percent of total assets ranging between 40% to approximately 90%. As Day and Benjamin (1991) indicates, plant and equipment (P&Es) constitute an important factor in the construction industry, especially in the highway and heavy segments of the industry, where it may be the largest long-term capital investment for many firms. As Abebe (2013) opines, the concept of P&Es in construction has been a point of controversy for a long time. However, in its border sense, various researchers in the field have come to conclude that

P&Es refer to all kinds of machinery in the industry that are utilized by firms to assist human labour on sites during construction. Edwards and Holt (2009) defined construction plant as automotive machines that are designed to do work such as compaction rollers, excavators, and specialized equipment – like telehandlers or trenchers. Construction plant includes automotive machines that are able to access the plying by the general public, such as delivery trucks for concrete and mobile cranes. They also defined construction equipment as all other types of mechanized construction work apparatus such as handheld tools, static cranes, concrete pokers, and specialist equipment like floor polishers. For short, the researchers postulate that, ‘plant’ as a term may be used to represent ‘equipment’ too, for instance, a plant manager on site is responsible for all of the above-mentioned equipments. The use of P&Es in construction has substantial importance in the successful realization of civil projects; thus, they represent a major capital investment for the industry as Naskoudakis and Petroutsatou (2016) postulates. In selecting P&Es for construction projects, that is, even before their usage, two most important classes of factors to consider according to Shapira et al. (2007) include:

- a) Tangible, quantitative and formal considerations (i.e. these factors include technical specifications of the equipment, physical dimensions of the site and constructed facility, and cost calculations) which are at times termed as “hard” factors considerations; and
- b) Intangible, qualitative and informal considerations (i.e. these factors include safety considerations, company policies regarding purchase/rental, market fluctuations, and environmental constraints) which are referred to as “other” factors on most occasions.

On the practical side, most construction P&Es come with manuals and handbooks that list all the factors and general- albeit usually unstructured recommendations which provide guidance, including ways to handle various factors in a systematic manner (Shapira et al., 2007). P&Es unquestionably provide efficiency and speed in construction projects, but at the same time they create a hazardous work environment for all workers who are directly or indirectly involved in heavy equipment operations, thus manuals and handbooks together with the latter consideration in the above are considered indispensable. The owning and operation of construction equipment constitutes significant portion of yearly spending for project contractors engaging in equipment-intensive projects like earth moving, highway, and industrial installations. According to Stewart (2006), the total construction equipment replacement value in North America of the top 250 construction and mining related companies reached nearly US\$100 billion in 2006. Studies have demonstrated that; a number of contractors will most likely be unable to compete for specific contracts without a significant money save or potentially monetary help in gaining a fleet of P&Es. The cost of equipment for construction is as high as 36% of the general cost of construction project (Yeo and Ning, 2006). Thus, as Mathew (2004) posits most contractors normally resort to large number of inventories, over-planning, and inflated budgets just to avert project failure. In the operational period of P&Es, absence of preparing which may therefore cause the breakdown of equipment and mischance and training for operators are as often as possible seen as exorbitant and, sometimes, even pointless (Cabahug and Edwards, 2002). In the maintenance stage, over the years as an equipment ages and enters the wear-out stage with expanding disappointment rate, estimating end up troublesome. Likewise, substantial and impalpable expenses of downtime coming about

because of fizzled equipment are oftentimes found among, and additionally subordinate gatherings. In the transfer stage, deciding the suitable equipment benefit life and the planning for substitution of apparatus can be dangerous since these choices are administered by various variables like devaluation, equipment proficiency, and oldness (Vorster, 2005). In the operational phase of P&Es, lack of training which may lead to the breakdown of the equipment and accident education for operators are frequently perceived as expensive and, in some cases, even unneeded (Cabahug and Edwards, 2002). In the maintenance phase, as equipment ages and enters the wear-out stage with increasing rate of failure, forecasting become difficult. Additionally, tangible and intangible expenses of downtime coming about because of fizzled equipment are as often as possible found among contractors, and in addition subordinate parties. At the disposal stage, deciding the suitable equipment benefit life and the planning for substitution of equipment is tricky since such choices are administered by various variables like deterioration, equipment proficiency, and out of date quality. Also, failed equipment results in tangible and intangible costs of downtime are frequently found among contractors, as well as stakeholders. In the disposal phase, deciding the right service life of the equipment and the timing for substitution of machinery can be tough since these decisions are governed by a number of factors like depreciation, equipment efficiency, and obsolescence (Vorster, 2005). Among the above-mentioned drawbacks, downtime resulting from a break-down of equipment which affect project schedule and causes additional costs has been one the most important areas researched on in P&Es management.

Generally, construction P&Es constitute one of the most important assets in the construction industry. That is, P&Es play a pivotal role in most of the operations in

construction and thus constitute a major portion of construction projects. As Tavakoli et al. (1989) indicates, approximately 50% of the construction companies own the P&Es they use, suggesting how significant P&Es have been placed in the world of construction. The subsequent bulletins constitute some of the advantages of utilizing construction P&Es.

- Maintain the planned rate of production where there is a shortage of skilled or unskilled labour.
- Reduce the overall construction costs especially for large contracts.
- Eliminate the heavy manual work by human thus reducing fatigue and eliminate various other hazards and health issues.
- Increase the rate of output through work progress with the best effective and efficient methods.
- Maintain the high-quality standards often required by present-day design and specifications (technical standards) among others.

According to Shapira et al. (2007), it is not always possible or desirable for the project contractor to own each and every type of construction P&Es required for the project. Considering the various aspects of the utility of particular P&E, the contractor has to economically justify whether to purchase the equipment or hire it. Naskoudakis and Petroutsatou (2016) simply put it as, the amount invested in the purchase of P&Es should be recovered during the useful period of such equipment.

2.2.1 The Ghanaian Construction View

Fugar and Agyakwah-Baah (2010) posits that, the Ghanaian construction industry is work escalated with hand tools and equipment that are essential for construction exercises, thus,

the use of these major equipment intensively becomes less on many projects. Fugar and Agyakwah-Baah (2010) posited that, even in projects that demands P&Es, contractors are left with the option to hire, what's more, in the uncommon situations where some P&Es are claimed by contractors, breakdown is a central point maybe attributable to maturity or absence of. According to Laryea (2010), Ghanaian contractors have no equipment complement on a full scale; and as a result of most equipment lasting for 20-25 years, this normally results in occasionally breaking down of construction equipment which as a result undermines the progress of work. It sometimes get to a point that getting the spare parts for these equipment becomes a problem since most of these equipment are hard to get. Additional to these, Laryea (2010) reports that supports have been received from Ghana as to try and support local contractors through an equipment supply scheme in 2005/2006 and this was handled by National Investment Bank (NIB). This is an indication that even P&Es acquisition by the local contractor especially those under SMEs in Ghana is a problem. Likewise, a study conducted in some of the developing countries, that is, Nigeria, Thailand, and Malaysia, shows that plant and equipment acquisition, proper utilization, equipment replacement and disposal constitute the main challenges facing the local contractor (Abebe, 2013).

In the Ghanaian construction industry, when carrying out arduous and industrial construction works, there is a high use of stabilizing machinery for carrying out, compacting, excavations, finishing paving with asphalt among others. However, most construction sites in the country are not well organized to allow for efficient use of P&Es employed by large construction firms. Badu and Owusu-Manu (2010) posits that a safe and organized construction site is one that implements a good traffic management plan for

project successes. It therefore important to identify that, as project contractor site arrangement and its organization connects with how effective and efficient P&Es can be utilized to boost production and project successes. Thus, the identification of P&Es utilization problems, the selection techniques and the methods of acquisition of P&Es and the documentation of existing maintenance policy employed by construction companies on sites will greatly shape the success of project delivery in Ghana. However, since construction P&Es constitute a major capital investment in both building operations as much as civil engineering, it is thus important to maximize the utilization of P&Es on construction sites so as to obtain an adequate return on capital invested. A good project manager is thus obliged to take appropriate decision in the acquisition, utilization, replacement and disposal of P&Es for the project and company successes.

2.2.2 SMEs and Contributions

Firms can be made small and different from others in several reasons. This study shall outline the reasons why small firms are created and also identify the small firms as it becomes problematic in the identification of those firms. There is no exact and all around acknowledged single meaning of SMEs (Aikaeli, 2007). Distinctive nations utilize different measures in characterizing the SMEs as per their level of advancement. The normally utilized measures are the aggregate number of representatives, deals turnover, size of the premises and additionally the productivity of the firm. This implies every association has their own meaning of SMEs to suit their work or as per their work, which cause inconsistency from one business part to the next.

The significance of SMEs to social and financial advancement in Ghana and even Africa is relatively undisputed. All through the mainland, SME advancement is a need in the

approach motivation of most African nations as it is broadly perceived. There is most likely that SMEs comprise the seed-bed for the impending age of African business people. As indicated by United Countries Mechanical Advancement Association (UNIDO), SMEs represent over 90% of every enrolled business in Africa and subsequently, they have been one of the real worries to numerous approach producers trying to quicken the rate of development in an economy, for example, Ghana. These undertakings have been recognized as the motor through which the development goal of creating centre wage nations like Ghana can be accomplished. It is likewise assessed that SMEs create around half of national yield and give around 60% work to Ghanaians (Abor and Biekpe, 2006).

In the construction industry, SMEs are a real driving force – devoting time to improve their technical expertise and pioneering ground-breaking technologies that push the boundaries of innovation in the industry. They lead the way in providing apprenticeship opportunities within the industry. According to the European Commission, 99% of businesses in the EU are SMEs and as such, they are “a key driver for economic growth, innovation, employment and social integration”. The Department for Business Innovation and Skills determined that 99.9% of UK construction contracting businesses are SMEs, the same applies to the Federation of Small Business (FSB), who determined that SMEs make up about 99% businesses in the UK. However, within the public sector SMEs in construction find it difficult to break into the market for larger projects with all these contributions. Approximately 40% of construction SMEs were failing to win nine out of ten public sector contracts and more than half reported their success rate failing over the last five years as reported by the Federation of Master Builders (2013). This was accounted to difficulty of pre-qualifying the cost, tendering including the financial strength to compete with their

larger counterparts (i.e. large sized firms). As per Rogers (2003) and Tschirky (2003), to remain aggressive and survive, most firms oversee innovations having four key targets at the top of the priority list. These four goals are (1) encouraging the creation and improvement of new items and administrations; (2) permitting and enhancing the execution of particular elements of items and administration; (3) serving fabricating elements and delivering items and administrations and (4) guaranteeing that firms' managerial procedures are made more proficient and streamlined. However, most construction SMEs are constrained in their ability to adopt the technology pertinent to handling major construction projects and this tends to affect their overall ability to be efficient in that sense (Madria, 2001).

2.3 PLANT AND EQUIPMENT (P&Es) ACQUISITION IN THE CONSTRUCTION INDUSTRY

The role of overwhelming equipment is exceptionally fundamental for expanding the development profitability particularly for infrastructure works. Be that as it may, their obtaining is particularly capital concentrated for firms. It is likewise considered as a noteworthy money related weight amid the development stage next to different uses. Previous study demonstrates that the obtaining of substantial equipment establishes 36 percent of the aggregate venture cost and has high hazard and vulnerabilities for the owners (Yeo and Ning, 2006). Another exploration demonstrates that construction equipment worth is 30 percent of the aggregate organization resources (Vorester, 2005). Therefore, construction companies formulate stringent policies for hiring construction equipment as it directly affects the profitability of the firm. The construction equipment acquisition policy comprises of financing modes; operational and maintenance strategies; equipment

standardization and the process need that are mandatory compliance for the contracting firm (Tavakoli et al., 1989). There is no unique method for the financing of heavy equipment. The acquisition practices include many financing options and alternatives. The basic methods which are used to pre - finance the purchase of construction equipment are basically three. These methods are buying or 100% ownership, lease agreement and rental (Gransberg et al., 2006). Each of these methods has their own advantages and limitations. Due to the deductions of related depreciation, repairs, taxes and interest, and insurance, many large contractors are willing to own equipment. However, large deposits can strain their resources. In addition, buying of equipment also requires operation, maintenance and storage and transportation costs. And last but not least, the owner must deal with disposing of the equipment after achieving its useful life service period (Iarossi, 2006). As opposed to the former section, smaller organizations frequently can't bear to claim each bit of equipment they require and furthermore they can't stand to be without them either. In such manner, an adaptable chance to leasing equipment is that client pay for it just when utilizes it. If a project falls through or slows down, the construction firm can return the equipment to the rental company. Leasing offers the same benefits as equipment rental. Firstly, total flexibility is provided by rental contract. Secondly, equipment for renting usually includes maintenance provisions. And, thirdly, user can return the item if users do not like how a rental operates after actually using it. In this way the user is not locked into a long-term commitment with the supplier. Inventories are regularly upgraded by rental companies. Capital is conserve when contractors lease their equipment (Gransberg et al., 2006). Equipment leasing practice is similar to loaning. The lender buys and owns the equipment and then leases it at a fixed monthly fee for a pre-defined duration. The equipment lender

has the option to purchase the equipment, return it or lease new equipment at the end of the lease period. It is customarily practice that a lot of firms leasing offer flexible payments modes that benefit small scale contracting firms to manage properly their payments schedule when they are busy and allow no payments during slow periods. According to Waris and Khamidi (2013), large construction firms are more willing to own or purchase P&Es as compared to medium and smaller size firms. That is, among the medium and smaller size firms there is more trend for renting and leasing of equipment. As Waris and Khamidi (2013) posits, the current machine import duties and sales taxes in the developing countries especially are comparatively high. Consequently, it may act as a barrier for owning P&Es especially for the SMEs. They added that, aside these barriers, construction firms also require stringent selection criteria for acquiring construction equipment.

2.4 FACTORS AFFECTING THE ACQUISITION MODE OF PLANT AND EQUIPMENT

More recently, the decline in construction activity in developing countries has led to the need to strengthen the foundations of industry to meet challenges confronting the industry now and in the future (CIDB, 2007). Manufacturers of construction P & Es begins the basic strategy to get a new piece of this equipment was the direct acquisition method (Lotker, 2006).

This method of purchasing has recently included various financing options and scenarios offered by leasing agencies (Gransberg et al., 2006, Shiu-Wan, 2007). The problem among most construction firms is the fact that companies need construction P & E, but is indecisive on the acquisition method to use, that is, whether to lease, rent or buy it. In other words, companies do not know how to acquire P & E (Lotker, 2006; Ghazi, 2002). Therefore, as

a project manager, it is important for you to identify the different factors and enable decision-making through evaluation (Lotker, 2006, Gransberg et al., 2006). A method of determining the cost of repair that should multiply some factors multiplied by a multiple of the original price at which the machine was acquired (Nichols et al. 1976). These elements or factors take into account the type of equipment, the life span, the service life, the temperature, the working conditions, the maintenance, the quality and the kind of use, the operating style of the operator, the level of quality embedded in the equipment, the speed of work and the luck. In the Nichols model, the cost of repair heightened with the continuous application of the machine. The selection of equipment is very vital in the undertaking of construction activities Nunnally et al. (1977). This is much more critical in large construction activities where the equipment park plays a significant role in the execution of the works. With this type of project, the fleet of equipment can make up the largest part of the offer price. The operating costs of the unit are influenced by factors such as the state of the equipment, experience of the operator, the nature of the ground, and the composition of the construction team Mayer and Stark et al. (1981). Companies do not know how to acquire P&Es (Lotker, 2006; Ghazi, 2002). Thus, it is important that as a construction project manager you identify the various factors and this makes decision making possible by evaluating (Lotker, 2006; Gransberg et al., 2006). A method of determining the cost of repair that should multiply some factors multiplied by a multiple of the original price at which the machine was acquired (Nichols et al. 1976). These elements or factors take into account the type of equipment, the life span, the service life, the temperature, the working conditions, the maintenance, the quality and the kind of use, the operating style of the operator, the level of quality embedded in the equipment, the

speed of work and the luck. In the Nichols model, the cost of repair heightened with the continuous application of the machine. The selection of equipment is very vital in the undertaking of construction activities Nunnally et al. (1977). This is much more critical in large construction activities where the equipment park plays a significant role in the execution of the works. With this type of project, the fleet of equipment can make up the largest part of the offer price. The operating costs of the unit are influenced by factors such as the state of the equipment, experience of the operator, the nature of the ground, and the composition of the construction team Mayer and Stark et al. (1981).

Therefore, they vary throughout the activities involved in the design and the use of static values does not match the actual conditions on the jobsite. Tavakoliet al. (1985) proposed that the productivity level of plant is a prominent factor that allows contractors to make critical decisions about project planning, selection of fleet and costs involved in the execution of the project. Most contractors rely on data used in the execution of previous projects and past projects to maintain the productive level of equipment selected.

The application of cost visibilities for eventful equipment cost defects and to include them in the cost model for the equipment for the replacement of it. The choice of plant and equipment is a vital factor in attempting a project on budget and on schedule (Alwood et al. 1989).

Without appropriate equipment, the level of the outcome will decrease, setbacks encountered will increase, possible accidents will occur and unneeded costs will be accrued. A system application for the choice of equipment was set up by (Chan et al. 1989). They developed a program using a technical criterion for selecting the best excavators and loaders during earthmoving operations. The selection of an equipment is a vital

requirement in construction projects (Tavakoliet al., 1989). Rationalized equipment selection leads to increase in returns for owners of construction firms. At the same time, the calculation of wrong number and size of fleets required for the project can lead to the loss of the contract or to overheads. Marzouk et al. (2004) found that an essential factor for a successful contract project is the selection of the fleet of equipment. A proficient system for the selection of equipment for earthmoving activities Amirkhanian et al. (1992). As part of the development of the system, a system based on expert rule was used to select earthmoving machines. The algorithm was developed to translate data based on performance of the operator, ground conditions and the volume of earth required to be moved.

The equipment selection process as an surely multi-faceted problem with numerous, multi-layered considerations, frequently with complicated compromises, implied that an suitable answer technique should be observed in the family of multi-attribute selection evaluation methods (Norris et. al. 1995). Schaufelberger et al. (1999); O'Brien et al. (1996); Nunnally et al. (2000); Peurifoy et al. (2006) Harris et al. (2001); postulated that deciding on the best equipment has always been a critical aspect in the successful completion of any construction project; This is all the extra genuine for present day complex, noticeably industrialized projects. Haidaret al. (1999) divided the tools choice technique into cognition-based and optimized genetic algorithms.

The first part consists of tactics that pick out the preferred equipment from the listing on the groundwork of expertise, while the later phase fine-tunes the decision on the foundation of standard. These standards consist of rate of production, running costs, working costs, equipment facets and manufacturer, number, model and life. Two customary factors to

consider when deciding on the equipment fleet: (a) cost-effectiveness; which includes considering the measurement of the equipment next to the proper type; and (b) versatility; This includes the determination of gadgets that can operate multiple duties on the site Schauffelberger et al. (1999). They further located that with increasing mechanization, this turns into increasingly worsens thing for organizations to make the high-quality preference from the pool of many picks and make the exceptional decision. There are a range of factors that appropriate supervisor must reflect on consideration on when obtaining the equipment Lotker et al. (2000). These elements are both monetary and non-financial. A true website online supervisor must perceive these elements and make their judgment possible. An assessment standard for the determination of industrial trucks was developed Chan et al. (2001). Her research recognized performance, economic, technical and strategic aspects as evaluation criteria. Construction agencies are regularly confronted with problems associated with a high fee of tools failure or breakdowns and accidents ensuing from the misuse of nonprofessional operators. Poor training of outfitters is regularly cited as the main reason of accidents related to equipments.

A choice guide system that uses qualitative and quantitative elements for the selection of open pit mines was developed by Bascetin et al. (2003). He has divided the resolution standards into operational requirements and cost. The conclusions had been in addition supported by means of the outcomes of a subject find out about among profitable challenge managers skilled in constructing large, complex projects Shapira et al. (2005). They further investigated that a listing of fabric (hard) and soft elements was identified. Tangible elements include specifications about technicalities, site prerequisites and cost considerations. The intangibles are qualitative and include enterprise insurance policies

and safety considerations related to the buy of equipment, market stipulations and restrictions due to the environment. It is an important factor that this research raises the question of smooth consideration in the choice of building equipment in construction projects. At some point of the execution phase, the fee of construction equipment money owed for approximately 30% of total assets Vorester et al. (2005). The first element to reflect on consideration on when adapting the correct tools to the right kind of activity Gransberg et al. (2006). Another thing would be the accessibility of the proper equipment with enough service, protection and repair reserve.

Gransberget al. (2006) have proposed two elements that may additionally be taken into account when selecting the excellent equipment: (i) the kind and condition of the job site; which consists of the distance to be covered; and (ii) preferred productivity; this is a critical issue that influences the choice of equipment. Gransberget al. (2006) determined that tools decision is commonly executed with the aid of matching gear in a fleet of tasks. Such reconciliation takes into account system productivity, gadget capacity and cost. Heavy construction tasks required intensive and high utilization of machinery for excavation works, stabilization, compaction, asphaltting and refining, railroads and many different specialized activities Gransberget al. (2006).

The complexity of new constructing tasks makes it harder to evaluate equipment options and make the right picks from many alternatives Peurifoy et al. (2006). The main undertaking of the method of selecting an equipment is to attain higher productivity, larger operational flexibility and sound economic considerations Tatari et al. (2006). Previous lookup indicates that the right desire of gear has constantly been regarded as a strategic decision throughout the building segment of a project. The splendid use of fantastic

equipment contributes to the economy, speed, quality, safety, and timely completion of the project Tatum et al. (2006). In the past lookup that the procurement of heavy tools accounts for 36% of the complete venture price and involves excessive investment and uncertainty for the owners Yeo et al. (2006). Prices and time exceeding the planned budget or task timeline are frequently due to bad preservation practice Schexnayder et al. (2009). Schexnayder et al. (2009) found that tools preservation was no longer properly taken into account, contributing approximately 40% of the complete value of the building project. The categorization of equipment, age and strength as nicely as the type of fuel used can have a strong influence on emission rates Avetisyan et al. (2012). Chamzini et al. (2012) recognized the nine-point system of standards and divided them into two wide categories; H. Benefit criteria based on technical overall performance and price criteria. Chinchore et al. (2014) observed that choice is a process that finds the most fantastic gear for a unique task. And a choice is made about the type of equipment to be purchased. Table 2.1 summarizes the results of the previous research assessment into factors that have an effect on the acquisition of equipment and equipment in the construction industry.

Table 2.1 Factors Affecting the Acquisition Mode of Plant and Equipment

Financial Factors	Fixed Costs	Purchase price
		Freight charges
		Initial unloading and assembly
		Depreciation
		Interest
		Insurance
		Sales taxes
		Storage
	Operating Costs	Repair
		Maintenance
		Supplies
		Fuel
		Labour
		Transportation
		Break down
		Set up
		Overhauls
		Inspection
	Modification	
	Indirect Costs	Supervision
Overhead		
Other Costs	Obsolescence	
	Inflation	
	Improper selection or replacement	
Non-financial Factors	Advertisement	Prestige of company
		Image to public
	Adaptability	Compatible with company goals
		Planning: budgets, upgrading, interchanging
		Storage: work cycles, market fluctuations
		Mobility: remote sites, scheduling, coordination

		Flexibility: versatility of acquisition mode
	Availability	Opportunity to get work because of owning specialized equipment
		Lag time during procurement
		Freedom of use of equipment
		Demand of market for this equipment, backlog of work
	Risk	Possibility of losing contracts due to lack of working capital
		Obsolescence: risk of improved model being developed
		Competitiveness: of acquisition mode, strategy (situation of other construction contractors)
		Other investment: compare risks and rates of return
		Timing: timing of loan, lease payments
		Disposal: risk of low salvage value, poor used market
	Organization	Employee morale: new equipment, owned etc.
		Transportation and assembly capability
		Pre-acquisition analysis: future work, market
		Replacement parts, inventory, storage
		Post-acquisition analysis: generate work, replacement etc.
		Compatibility of staff for proper operation, repair and maintenance of equipment

Source: Sajoudi et al. (2011)

2.5 STRATEGIES FOR EFFECTIVE AND EFFICIENT ACQUISITION

MEHTOD

An acquisition strategy serves as a roadmap for the acquisition part of the investment life cycle. The decision to rent, buy or lease P & E is a challenge for most construction companies, regardless of the size of the company, and there are several factors that must be considered in order to make the best choice for the company's success. It has to be pointed out that each method of acquisition has several advantages and disadvantages and that the decision is ultimately based on the specific needs and the situation of the contractor. Acquisition strategies may change over time as the project progresses and the contractor is able to more accurately forecast the need for equipment.

In the current market, such as Sajoudi (2010), plant manufacturers, used equipment brokers and rental companies claim that a user with the appropriate credentials and expertise is able to purchase almost any heavy construction equipment that is temporary or permanent. To get the best profit out of a site manager, choosing the best alternative to getting a machine is one of the most important issues to consider. According to Sajoudi (2010), there are a number of strategies that must be taken into account when deciding on the acquisition and financing of heavy machinery.

The ultimate acquisition method is based totally on correct estimates of income and costs as nicely as some non-financial elements that affect the resolution of the acquisition mode. Basically, the most important project of the Acquisition Methodology techniques is to attain higher productivity, increased operational flexibility, and practicable economic thinking.

Previous lookup shows that the right preference of acquisition approach has usually been regarded as a strategic selection for the duration of the building section of a project (Tatari and Skibniewski, 2006).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter expounds on the processes executed to achieve the aim and objectives of the project. The next level in the study after identifying the research question and review of literature is selecting the methodology that is most appropriate in addressing the issues in the research (Blumberg et al., 2005). Collis and Hussey, (2013) has emphasized that design process from hypothetical testing to data collection and data analysis is the overall approach to research methodology, therefore methodology employs the tactics of discovery how to go about finding out what we believe is true (Christou *et al.*, 2008). This chapter focuses on the framework of the study, research design instrument, data collection and data analysis.

3.2 RESEARCH APPROACH

The research approach used in this research is the deductive approach consistent with the selected positivist view. Gill and Johnson (2002), cited by Pathirage et al. (2008) argue that the deductive research approach has become synonymous with positivism and the inductive approach with social constructivism. The deductive approach moves from theory to data and uses scientific principles. It includes the collection of quantitative data; explains causal relationships between variables and uses a highly structured approach (Saunders et al., 2009).

3.3 RESEARCH STRATEGY

Considering the philosophical position of this study thus positivist on one hand, and the nature of the problem identified in literature as well as the pilot interview on the other hand, survey strategy emerges as more appropriate. Creswell (2005) defined a survey research as an orderly gathering of information for the purpose of understanding and/or predicting some aspect of the behaviour of the population of interest. Surveys are classified under longitudinal and cross-sectional studies. The study was suitable for this study for the following reasons: (i) it allows researchers to use questionnaires or interviews to obtain data on situations, practices or views at a given time; ii) it also allows a researcher to study more variables simultaneously; iii) The survey allows the use of quantitative analysis techniques to draw conclusions. Furthermore, survey is the strategy that responds suitably to all the research questions which are of the type of what, who, what, where, how much and how many (Saunders, et al., 2012).

The use of Likert scales which are famous strategies of gathering records for surveys was employed. Further, the researcher gathered data from respondents via posting some of the questionnaires, emails, and face to face method of records which is the case of a survey research strategy.

3.4 RESEARCH DESIGN

Saunders et al. (2012) define research design as the general plan of providing mounting answers to the research questions as well as the organization and analysis of the data. Thus, it explains the overall plan of the research. Burns and Grove (2003) added that, it is the general process of undertaking the research. Through a well formulated research design, researchers are able to gain maximum control over several thwarting factors that

undermines the validity of the study. According to Creswell and Clark (2017), selecting appropriate research design is based on the nature of research problem or issue being addressed, the experience of the researcher, and the respondents for the study. Two types of research designs are advanced: Descriptive Research Design and Correlational Research Design. Descriptive research design is designed to give a clear picture of a situation as it naturally happens (Burns and Grove, 2003).

Thus, situations are commonly described the usage of descriptive research design. Profile of persons, situations or occasions are the basic object of size in descriptive research. It is also employed for the justification of present - day practices, make judgement and to increase theories. This additionally deals with clarification of the existence of a relationship that exist between two or extra elements of a state of affairs or phenomenon as properly as forecast future happenings. This is mostly considered by research questions or hypothesis which specifies the direction and nature of the relationship between the variable being examined. Correlational research design comes in where there is the need to possibly investigate the relationships among variables without trying to influence those variables. However, the degree of relationship between the variables is of much concern. Correlational study deals with measuring two variables and then determining the degree of relationship that exist between them (Christensen et al. 2011). In general, correlative research design is integrated into quantitative research methods, and enables us to achieve research goals of description and prediction (Christensen et al., 2011). Further, correlational research design normally involves multiple variables that helps to improve the researcher's ability to make predictions. The study employed a descriptive research design to justify the current practices, make judgment and to develop theories. This also

tackles and clarifies the existence of a relationship that exists between two or more aspects of a situation or phenomenon as well as forecast future happenings.

3.5 RESEARCH METHOD

The lookup approach adopted for this study was once merely quantitative method, to tackle the research questions. This system affords a quantitative description of trends, attitudes, or opinion of a populace with the aid of reading a sample of that populace (Creswell, 2009). This learn about adopted a quantitative lookup layout to have a look at the objectives. The following are justifications why quantitative research used to be adopted for this research, gathers correct facts plus find out about members of the family between data as properly as members of the family in agreement with theory, this was performed using many data gathering performances as nicely as analytical methods. Prior to the launch of the first study, a comprehensive collection of collected works was tackled. Literary criticism detailed in matters that make rounds in discipline; particularly a broad synopsis of the Ghanaian construction industry as well as the frequent use of acquisition mode by SMEs, numerous meanings in the discipline and modern works on the challenging factors that effect on choosing acquisition mode by SMEs in Ghana. Strategies to mitigate the identified challenges for efficient acquisition mode for SMEs in Ghana. These sections clearly highlight the factors thwarting road contractors in the Ghanaian construction industry.

3.6 DATA SOURCES

The researcher employed primary sources of data. The main purpose of the study is to gather info that can be analyzed, to enable interpretation, and aided the investigator to grow unique data such as account of an eye witness, and personal observations.

3.7 POPULATION AND SAMPLING SIZE

The population of the study is the registered D3K3 and D4K4 in the Accra and Kumasi Metropolis. These classes of contractors were chosen on the basis that they constitute the majority of construction companies in the country. In addition, many construction firms seek to find greener pastures in these two cities because of the increasing demand for housing, roads and other structures. In Ghana, D3K3 class of contractors are capable of undertaking projects up to US\$200,000 or GH¢ 300,000.00. D4K4 class of contractors undertake projects up to US\$75,000 or GH¢112,500.00 (Danso, 2010). Statistics from Association of Building and Civil contractors (ABC) indicates that the number of registered D3K3 companies as at 2014 was 412. Construction professionals such as project managers, site managers and engineers were the targeted respondents for the study.

3.7.1 Sample Size Determination

It is argued that, it is efficaciously difficult to examine each and every member of a population. This means that, it is impracticable to attain every member of a populace when gathering data. To acquire a sample, the Kish formulation was once used to decide the sample size. Kish Formula indicates that:

$$n = \frac{n'}{\left(1 + \frac{n'}{N}\right)}$$

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

Where

v = the standard error of sampling distribution = 0.05

s^2 = the maximum standard deviation of the population

Total error = 0.10 at a confidence interval of 95%

$$s^2 = p(1 - p) \text{ where } p = 0.50$$

$$= 0.50(1 - 0.50)$$

$$= 0.25$$

p = the proportion of the population elements that belong to the defined region.

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

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

$$N = 412$$

Therefore

$$n = \frac{100}{\left(1 + \frac{100}{412}\right)} = \frac{100}{(1 + 0.243)} = 80.45 \approx 80$$

This formula for sample size contained the least number of questionnaires to manage. The sample size was eighty (80) D3K3 and D4K4 construction companies. For every firm that was visited, one person was administered with questionnaire. Construction professionals such as project managers, site managers and engineers were the targeted respondents for the study.

3.7.2 Sampling techniques

A sample is a fraction or subset of a greater group called the population. The best sample is a mini version of the population of which it is a part (Lenth, 2001). Sampling is therefore the process of choosing the research units from a target population. Multi-stage or two stage sampling techniques was adopted for this research. This is a technique where sampling is conducted to arrive at the sample size in stages (Elder, 2009). In that, the

researcher purposively sampled the D3K3 contractors in the greater Accra region. A purposive sample refers to selection of units based on personal sentiments rather than randomization. This judgmental sampling in some way is representative of the population of interest without sampling at random (Elder, 2009).

At a second stage, Simple random sampling was adopted using the result of the first stage as a sample frame for selection. Elder(2009) describes simple random sampling as selecting units from the population through randomization , for example, through a raffle, so that every member has an equal chance of being picked, and there is an equal chance of all various permutations of selections.

In view of the fact that majority of the fact that majority of D3K3 contractors are in the Greater Accra Region, a decision by the researcher to draw his sample randomly from the Greater Accra Region will reflect the true state of affairs in the SMEs operations.

3.8 Questionnaire Design and Development

The questionnaire was designed to be friendly to the respondents in order to facilitate the involvement of a lot and in final result maximize the response rate. The questionnaire was once designed the use of simple language devoid of ‘technical’ words, besides where used it was once defined to the respondents. Aside the plain language, the questionnaire used to be deliberately designed to include close-ended questions. The diagram and structure of the questionnaire had been cautiously regarded as they have an impact on the response rate. Instructions were given at the commencing of each principal phase for filling the questionnaire. The questionnaire used to be in two main sections, Parts A and B. The Part A targeted principally on the demographics of the respondents and as such requested the

background information of the respondents. Studies have demonstrated the importance of demographic variables or historical past information, especially 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 frequent use of acquisition mode by SMEs, the challenging factors that effect on choosing acquisition mode by SMEs in Ghana and strategies to mitigate the identified challenges for efficient acquisition mode for SMEs in Ghana.

3.9 Data analysis

The answered questionnaires have been embedded to ensure completeness, consistency and readability. After reviewing the data, they were arranged in a format that allowed for easy analysis. The retrieved questionnaire was grouped and processed into larger units and entered into the Social Science Statistical Packages (SPSS, version 21). The SPSS software was used to organize the survey results and to tabulate the relationships between the variables. In order to elucidate the discussion in this discipline, the data obtained were presented graphically and in tabular form. Information containing the background of respondents is displayed in pie charts and bar charts. Then, the results are statistically analyzed using the Relative Importance Index (RII) to determine severity. The RII value indicates the relative importance or importance of a factor compared to other variables of the same category. The RII is calculated using the formula:

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{A \times N}$$

Where, W = weighting given to each statement by the respondents and ranges from 1 to

5, where '1' is very low and '5' is very high

A = the highest Likert scale (i.e. 5 in this study)

N = the total number of respondents

The Mean Score Ranking (MSR) was also used to compare the sample mean with the known population

3.10 Ethical Consideration

The study will consider some broad ethical areas including voluntary participation, informed consent, confidentiality and anonymity. The participants from whom the data will be gathered for this study will not be coerced or put under any form of pressure to participate in the study. Informed consent stating who the researcher is, what the study is all about and the desired outcomes and potential risk for being part of the study will be taken from participants either in written or verbally. To ensure anonymity, the identity of participants will not be required neither will any clue be given in the presentation of the results to reveal the identity of any participant. This was to ensure the confidentiality of each participant.

3.10.1 Reliability and Validity

Validity refers to the degree to which a test or instrument measures or performs the task for which it is intended. In qualitative studies, eg. For example, in semi-structured interviews, there are no established standards for evaluating the validity or authenticity of inferences, but there is an urgent need for careful consideration of evidence and methods on which conclusions are based in this research. Criteria for the evaluation of individual information can be based on three (Becker, 1958):

- How credible is the informant?
- Were the statements made in response to the researchers or were they spontaneous?
- How does the presence or absence of the researcher or the informant of the researcher influence the actions and statements of the other groups?

All these criteria will be carefully considered and observed for the interview process to help validate the data collected. The information that are gathered will be transcribed and returned to the respondents for concurrent confirmation on the accuracy and precision of the content gathered.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF THE RESULTS

4.1 INTRODUCTION

This section analyzes the results of the study, shows the results and discusses key research objectives. The first section describes the sample properties and descriptive statistics. The following sections present results and discussion of key research findings. It discusses the respondents' views on the frequent use of the acquisition mode in Ghana, the challenging factors that affect the choice of purchasing methods by SMEs in Ghana, and the strategies to address identified challenges for an efficient acquisition mode for SMEs in Ghana. The analysis saw the adoption of simple descriptive statistics such as percentages and relative index of meaning. The results were presented in tables and interpreted accordingly.

4.1.1 Sample Characteristics

Using purposive sampling and distributing one (1) questionnaire per each firm, out of the 80 questionnaires distributed, 64 questionnaires representing 80% were completed and retrieved. Subsequently, considering the deletion of outliers and missing values due to incomplete data, it was found that all 64 completed questionnaires were considered valid for the analysis. The analysis of the results is based on this number of retrieved questionnaires and thus formed the basis for the results of this study. The high response rate of 80% was due to the researcher's consistent visits to the sampled firms to remind them about the need to answer the questionnaires.

4.2 DESCRIPTIVE STATISTICS (DEMOGRAPHIC DATA)

4.2.1 Organizational Role

Nearly, 25% were Quantity surveyors (N = 16), 36% were contractors (N = 23), 8% were project managers (N = 5), 11% were civil engineers (N = 7), and 20% were site managers (N = 13). The respondent position is vital to ensure some degree of reliability of the data. The high representation of quantity surveyors, contractors, site managers etc. was inevitable as these professionals are very key and usually engage in the construction activities like the planning of any construction equipment needed for construction work. This makes them credible and reliable source of information which is needed for this study.

Table 4.1: Organizational Role

Item	Frequency	Percentage (%)
Quantity Surveyor	16	25%
Contractor	23	36%
Project Manager	5	8%
Civil Engineer	7	11%
Site Manager	13	20%
Total	64	100

Source: Field Survey, 2018

4.2.2 Years of Experience in the Organization

Respondents work experience is presented in table 4.2. Roughly, 19% of the respondents showed that they been in their organization for less than 5 years; different group of approximately 31% have varied experience of 6 to 10 years in the organization. 34% of the respondents' have also been in the organization for between 11 to 15 years and 16% have worked for over 16 years. Majority of the respondents have construction experience which is vital in this case to give some degree of reliability to the data given. The length of experience in the organization of operation is vital to contribute to crucial information on the challenges facing Ghanaian SME construction firms in acquisition of plant and equipment for construction work.

Table 4.2: Years of Experience in the Organization

Item	Frequency	Percentage (%)
Less than 5 years	12	19%
6 to 10 years	20	31%
11 to 15 years	22	34%
Above 16 years	10	16%
Total	64	100

Source: Field Survey, 2018

4.2.3 Working Experience of Respondents in the Construction Industry

This question was intended to determine the level of experience of respondents throughout the construction industry, as the duration of the construction industry has affected the quality of the answers. The table shows that the majority of respondents have worked in

the construction industry for more than 6 years, which is 81% ($N = 31 + 34 + 16$). Nearly 19% said they worked less than 5 years in the construction industry. Therefore, one can assume that they have gained a lot of experience in the Ghanaian construction industry and are able to provide in-depth information on the topics discussed. The balance of the various levels of experience therefore allows a generalized and realistic view of this research.

Table 4.3: Working Experience of Respondents in the Construction Industry

Item	Frequency	Percentage (%)
Less than 5 years	12	19%
6 to 10 years	20	31%
11 to 15 years	22	34%
Above 16 years	10	16%
Total	64	100

Source: Field Survey, 2018

4.3 ANALYSIS AND DISCUSSION OF MAIN OBJECTIVES

4.3.1 Acquisition Mode Type

Table 4.4 shows that the majority of respondents, representing 48% ($N = 31$), say they rent construction equipment for their work. The reason was that they have limited capital for fully acquired equipment.

This is mirrored in Laryea's (2010) study of the challenges and opportunities facing contractors in Ghana, the place most of the contractors do not have direct possession and need to be hired. In the rare situations when some tools and tools is owned through a contractor, failure might also be a foremost element due to ancient age or lack of scheduled

protection (Danso, 2014). About 22% of respondents said that they own equipment for any construction activity. However, 30% of respondents consider rental equipment that they do not have for construction.

Table 4.4: Acquisition Mode Type

Acquisition Mode	Frequency	Percentage (%)
Buying/Owing/Leasing	14	22%
Hiring	31	48%
Combination of Buying/Hiring	19	30%
Total	64	100

Source: Field Survey, 2018

4.3.2 Equipment Type

From the survey, as showed in table 4.5, majority (69%) of the respondents representing (N = 44) acquire earthmoving and excavating equipment. 9% indicated that they mostly acquire material handling and transport equipment, about 14% of the respondents pointed out that they acquire concrete technology equipment and, with 9% acquiring small tools and equipment. This clearly shows that, with the increasing industrialization of construction work, the importance of plant and equipment (P&Es) is growing.

Table 4.5: Equipment Type

Equipment Type	Frequency	Percentage (%)
Earthmoving and Excavating Equipment (e.g. graders, excavators backhoes, etc.)	44	69%
Material Handling and Transport Equipment (e.g. conveyors, cranes, hoist, forklift, etc.)	5	9%
Concrete Technology Equipment (e.g. concrete mixer, concrete vibrators, concrete etc.)	9	14%
Small Tools and Equipment (e.g. saws, compacting equipment, breaking and drilling eq.)	6	9%
Total	64	100

Source: Field Survey, 2018

4.3.3 Challenging factors that effect on choosing acquisition mode by SMEs in Ghana

In determining the challenging factors that affect SMEs' choice of purchasing methods in Ghana, a list of factors (thirty-two factors) from the literature was identified and respondents were asked to rate them for their impact on each of the five factors Scale point Likert. The assumed scale was as follows: 5 = *extremely challenging*; 4 = *very challenging*; 3 = *moderately challenging*; 2 = *slightly challenging*; 1 = *not challenging at all*.

In analyzing the results of the challenging factors influencing the choice of purchase mode by SMEs in Ghana, the relative importance index was used. It is interesting to note from Table 4.6 below that twenty-three (23) factors from the thirty-two (32) appear to be

influential because they had a mean score and RII greater than 3.50 and 0.700, respectively. However, taking into account the challenges in the order of the extremely challenging factors, respondents indicated that the cost of purchasing, renting or combining equipment far exceeds their financial base. The purchase price was first valued at an average and an RII of 4.38 and 0.912, respectively. This was followed by a continuous collapse (planning: budgets, modernization, replacement), pre-acquisition analysis: future work, market, transportation and assembly capability, supplies, maintenance, equipment freedom, freight costs, modification, storage: work cycles, Market fluctuations and flexibility: versatility of the acquisition mode. They all had a mean score and RII greater than 4.00 and 0.700, respectively.

Many large entrepreneurs are willing to own equipment because they can deduct the associated depreciation, insurance, repairs, taxes and interest, which lowers their tax bills. Large down payments, however, can burden their resources. As Yeo and Ning (2006) report, SMEs are companies with limited financial base and equipment and equipment shortages, and previous studies also show that asset purchases account for around 36% of total project costs. Therefore, among other issues, it is considered a major financial burden during the construction phase (Pra serratruang and Hadikusumo, 2007).

Construction agencies are regularly confronted with troubles related with a high charge of equipment failure or breakdowns and accidents ensuing from the misuse of nonprofessional operators John et al. (2009). It is captured in Gransberg et al. (2006) research that in a state of affairs the place the gear is no longer used for the proper exercise additionally causes breakdown, for Ghanaian contractors with lack of maintenance tradition additionally worsens the equipment proper manufacturing cycle (Laryea, 2010). Gransberget al. (2006)

recommended two elements that can also be taken into account in the determination of the fabulous equipment: (i) the kind and situation of the website online and the storage of the equipment; which consists of the distance to be covered; and (ii) favored productivity; This is a fundamental component that influences the choice of equipment. Tavakoliet al. (1989) delivered that the procurement policy for development gear have to consist of financing modalities; Operating and maintenance strategies; the standardization of the tools and the process must be binding on the contractor. More importantly, factors such as, competitiveness: the mode of acquisition, strategy, employee morale: new equipment, property, supervision, facility, fuel, initial discharging and assembly, insurance, depreciation and sales tax in this order receive a middle score and one RII value greater than 3.50 or 0.700. From the survey, respondents consider these factors to be additional costs for the purchase of equipment and this sometimes prevents them from purchasing equipment for their work. This is consistent with Iarossi, (2006) Studies. Disposal: The risk of a low replacement value, a bad second-hand market appeared last with an average and a RII value of 2.75 and 0.575 respectively.

Table 4.6: factors that affect acquisition mode by SMEs in Ghana

No.	Challenges	Mean	RII	Ranking
1	Purchase price	4.38	0.912	1 st
2	Break down of plant & equipment	4.31	0.882	2 nd
3	Planning: budgets, upgrading, interchanging	4.29	0.901	3 rd
4	Pre-acquisition analysis: future work, market	4.25	0.872	4 th
5	Transportation and assembly capability	4.21	0.885	5 th
6	Supplies options	4.33	0.854	6 th
7	Maintenance options	4.24	0.865	7 th
8	Freedom of use of equipment	4.35	0.891	8 th
9	Freight charges	4.33	0.893	9 th
10	Modification options	4.19	0.875	10 th
11	Storage: work cycles, market fluctuations	4.11	0.877	11 th
12	Flexibility: versatility of acquisition mode	4.01	0.746	12 th
13	Demand of market for equipment, backlog of work	3.98	0.799	13 th
14	Competitiveness: of acquisition mode, strategy (situation of other construction contractors)	3.93	0.739	14 th
15	Other investment: compare risks and rates of return	3.89	0.734	15 th
16	Employee morale: new equipment, owned etc.	3.84	0.729	16 th
17	Supervision	3.80	0.730	17 th
18	Set up	3.75	0.725	18 th
19	Fuel	3.70	0.720	19 th
20	Initial unloading and assembly	3.65	0.716	20 th

21	Insurance	3.61	0.710	21 st
22	Depreciation	3.56	0.705	22 nd
23	Sales taxes	3.51	0.704	23 rd
24	Compatible with company goals	3.49	0.695	24 th
25	Mobility: remote sites, scheduling, coordination	3.44	0.690	25 th
26	Lag time during procurement	3.40	0.685	26 th
27	Opportunity to get work because of owing specialized equipment	3.35	0.680	27 th
28	Possibility of losing contracts due to lack of working capital	3.30	0.675	28 th
29	Obsolescence: risk of improved model being developed	2.90	0.590	29 th
30	Timing: timing of loan, lease payments	2.85	0.589	30 th
31	Compatibility of staff for proper operation, repair and maintenance of equipment	2.80	0.580	31 st
32	Disposal: risk of low salvage value, poor used market	2.75	0.575	32 nd

Source: Field Survey, 2018

4.3.4 Strategies for efficient acquisition mode for SMEs in Ghana

From Table 4.7, which uses the index of relative importance to determine the strategies to mitigate the challenges for an efficient acquisition mode for SMEs, effective planning was made prior to selecting an acquisition mode first with an average and a RII value of 4.54 and 0.811 rated respectively. Equipment selection is a critical factor in the execution of

many construction projects Nunnally et al. (1977). Therefore, careful planning of equipment selection is very necessary. Without proper equipment, productivity will decrease, delays will increase, possible injuries will occur and unnecessary costs will be incurred. Marzouk et al. (2004) therefore found that contractors should consider the selection of the equipment fleet as an essential factor for a successful construction project. The planning of the equipment acquisition must be carried out by a professional person who is well versed in the execution of the work. It appeared second with a mean and RII of 4.50 and 0.806, respectively. Good equipment planning leads to better project implementation, as John et al. (2009).

The choicest acquisition approach is based on correct estimates of income and costs, as properly as some non-financial elements that have an effect on the preference of acquisition mode, which can be positively influenced by using an expert. Basically, the most important assignment of the Acquisition Methodology techniques is to obtain higher productivity, greater operational flexibility, and viable economic thinking. Previous research indicates that the proper desire of acquisition method has continually been considered as a strategic decision in the course of the building segment of a assignment (Tatari and Skibniewski, 2006). The training of SMEs for different acquisition methods was rated third with an average and an RII value of 4.36 and 0.801, respectively. This has been followed by policy reforms in terms of financial support and training programs for SMEs, capacity building needs to be extended to SMEs, appropriate methods and tools need to be put in place by financial institutions to assist SMEs in the allocation of loans and equipment manufacturers, and leasing companies should Making procurement equipment flexible for

contractors, and developing an optimal acquisition strategy, such as an accurate estimate of revenue and costs, before purchasing a device.

They all had a mean and RII greater than 3.50 and 0.600 respectively, indicating their relevance to stakeholders and construction companies.

Table 4.7: Strategies for efficient acquisition mode for SMEs in Ghana

No.	Strategies	Mean	RII	Ranking
1	Effective planning before selection of any acquisition mode	4.54	0.811	1 st
2	Planning of equipment acquisition needs to be done by a professional person with good exposure of execution of work	4.50	0.806	2 nd
3	Provision of training and education to SMEs on various acquisition methods	4.36	0.801	3 rd
4	Policy reforms with regards to financial support and training Programme for SMEs	4.31	0.754	4 th
5	Capacity building efforts need to be extended to the SMEs	4.30	0.726	5 th
6	Proper methodologies and tools must be introduced by financial institution to assist SMEs when they come in for loans	4.24	0.705	6 th
7	Equipment manufacturers and rental companies should make the acquisition equipment flexible for contractors	3.63	0.694	7 th
8	Optimum acquisition strategy like accurate estimate of revenues and cost should be devise before going in for an equipment	3.59	0.681	8 th

Source: Field Survey, 2018

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

The summary of key research findings tailored to the proposed research aim and objectives are presented in this chapter. The conclusion, relevance and contributions of this study are also highlighted in this chapter. In addition, limitations of research and proposals for future research

5.2 SUMMARY OF FINDINGS

This research was instigated with the primary aim of exploring the challenges facing Ghanaian SME construction firms in acquisition of plant and equipment. In achieving this aim, three objectives were set out. The achievement of each of the three objectives was set out in the following subsections.

5.2.1 Examination of the frequent use of acquisition mode by SMEs in Ghana

The study shows that the majority of SMEs prefer to hire equipment more often than owning them. This could be due to the added costs and responsibilities with owning a fleet of equipment. The second highest was a combination of both buying and hiring. This means that when they have a project to be executed, they hire some equipment in addition to what they own.

5.2.2 Factors that affect the acquisition mode by SMEs in Ghana

From the survey conducted, it was gathered that the top ten challenges that affect the acquisition mode of equipment by SMEs in Ghana are; Purchase price, Breakdown of plant & equipment, Planning: budgets, upgrading, interchanging, Pre-acquisition analysis: future work, market, Transportation and assembly capability, Supplies options, Maintenance options, Freedom of use of equipment, Freight charges and Modification options

5.2.3 Strategies for efficient acquisition mode for SMEs in Ghana

From the survey conducted, it emerged that the following are some of the efficient acquisition mode of equipment for SMEs in Ghana; Effective planning before selection of any acquisition mode, Planning of equipment acquisition needs to be done by a professional person with good exposure of execution of work, Provision of training and education to SMEs on various acquisition methods, Policy reforms with regards to financial support and training Programme for SMEs, Capacity building efforts need to be extended to the SMEs, Proper methodologies and tools must be introduced by financial institution to assist SMEs when they come in for loans, Equipment manufacturers and rental companies should make the acquisition equipment flexible for contractors, Optimum acquisition strategy like accurate estimate of revenues and cost should be devise before going in for an equipment.

5.3 CONCLUSION

This study explored the challenges facing Ghanaian SMEs construction firms in acquisition of plant and equipment. In attempt to achieve this aim, three objectives were set which includes, examining the frequent use of acquisition mode by SMEs in Ghana, identifying the challenging factors that effect on choosing acquisition mode by SMEs in Ghana and

strategies to mitigate the identified challenges for efficient acquisition mode for SMEs in Ghana. The study revealed that, majority of SMEs always opts for hiring equipment rather than buying/owing/leasing or the combination of buying and hiring. The respondents indicated that, the purchasing price for equipment either buying, hiring or combining the two is highly beyond their financial base. Other factors like, continuous breakdown, (planning: budgets, upgrading, interchanging), pre-acquisition analysis: future work, market, transportation and assembly capability, supplies etc., were also considered critical. Further, a number of strategies were proposed by respondents to be important.

5.4 RECOMMENDATION

Considering the findings of this research, the following recommendations are therefore prescribed to support acquisition mode for SMEs in Ghana.

- ✚ The company needs to facilitate training to all stakeholders on various acquisition methods. This would provide knowledge to every individual on the efficient acquisition method for any construction project.
- ✚ Equipment manufacturers and rental companies should make the acquisition equipment flexible for contractors. They must provide a means for a user with proper credentials and competence to acquire just about any heavy construction machine available on a temporary or permanent basis.
- ✚ Optimal acquisition strategy like precise estimate of income and cost should be devised before going in for an equipment.
- ✚ Policy reforms with regards to financial support and training Programmes for SMEs must be devised by the government to support the growth of SMEs

- ✚ Planning of equipment acquisition needs to be done by a professional person with good exposure of execution of work.
- ✚ Proper methodologies and tools must be introduced by financial institution to assist SMEs when they come in for loans.
- ✚ Effective planning before selection of any acquisition mode. Selection of equipment is a vital factor in the undertaking of many construction projects. Therefore, proper planning of equipment selection is very necessary.
- ✚ Capacity building efforts need to be extended to the SMEs

5.5. AREAS FOR FURTHER STUDY

1. The researcher recommends a further study to identify the effect of the failure of SMEs in the Construction industry and its implication on economic development.
2. The researcher also recommends a further study to identify the strategies that can be employed to reduce excessive cost of leasing or hiring equipment by contractors.
3. The researcher recommends a further study to validate the strategies to mitigate challenges for efficient acquisition of plants and equipment for Small and Medium Enterprises in Ghana.

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APPENDIX

QUESTIONNAIRE SURVEY

Challenges Facing Ghanaian SMEs Construction Firm in Acquisition of Plant and Equipment

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI**

COLLEGE OF ART AND BUILT ENVIRONMENT

Department of Building Technology

(MSc. Construction Management)

Dear Sir/Madam

Many thanks for your participation. This questionnaire survey aims to explore the challenges facing Ghanaian SME construction firms in acquisition of plant and equipment. Please fill in the questionnaire using the instructions, which will only take you about 10 to 15 minutes. Please be noted that all the information you provided is anonymous and will only be used for academic purpose. Thank you once again for your valuable time. If you have any queries, please feel free to contact:

Jacob Tetteh

Department of Building Technology

KNUST.

Tel: +233244654978

Email: jactetteh@gmail.com

Section A: Background Information

Q1. Please indicate the name of your organization. (Optional)

.....

Q2. Please indicate your role in your organization.

☐ Quantity Surveyor

☐ Contractor

☐ Project Manager

☐ Civil Engineer

☐ Site Manager

Others (please specify)

Q3. Please indicate how long have you been working in your organization.

☐ Less than 5 years

☐ 6 to 10 years

☐ 11 to 15 years

☐ Above 16 years

Q4. Please indicate how long have you been working in construction industry.

☐ Less than 5 years

☐ 6 to 10 years

☐ 11 to 15 years

☐ Above 16 years

Section B: Considering main objectives

Q5. What acquisition mode do you often use for construction works?

☐ Buying/Owing/Leasing

☐ Hiring

☐ Combination of Buying/Hiring

Others (please specify)

Q6. What equipment type do you often acquire?

☐ Earthmoving and Excavating Equipment (e.g. graders, excavators backhoes, etc.)

☐ Material Handling and Transport Equipment (e.g. conveyors, cranes, hoist, forklift, etc.)

☐ Concrete Technology Equipment (e.g. concrete mixer, concrete vibrators, concrete etc.)

☐ Small Tools and Equipment (e.g. saws, compacting equipment, breaking and drilling eq.)

Q7. Challenging factors that effect on choosing acquisition mode by SMEs in Ghana

In your experience, indicate the level of influence of each challenging factors facing Ghanaian SMEs construction firms in acquiring plant and equipment by ticking the appropriate boxes.

5= extremely challenging; 4=very challenging; 3=moderately challenging; 2=slightly challenging; 1= not at all challenging

NO.	CHALLENGING FACTORS	levels of influence				
		1	2	3	4	5
Financial Factors						
1	Purchase price					
2	Freight charges					
3	Initial unloading and assembly					
4	Depreciation					
5	Insurance					
6	Sales taxes					
7	Storage					
8	Maintenance					
9	Supplies					
10	Fuel					
11	Transportation					
12	Break down					
13	Set up					
14	Inspection					
15	Modification					
16	Supervision					
Non-financial Factors						
17	Compatible with company goals					
18	Planning: budgets, upgrading, interchanging					
19	Storage: work cycles, market fluctuations					
20	Mobility: remote sites, scheduling, coordination					
21	Flexibility: versatility of acquisition mode					

22	Opportunity to get work because of owning specialized equipment					
23	Lag time during procurement					
24	Freedom of use of equipment					
25	Demand of market for equipment, backlog of work					
26	Possibility of losing contracts due to lack of working capital					
27	Obsolescence: risk of improved model being developed					
28	Competitiveness: of acquisition mode, strategy (situation of other construction contractors)					
29	Other investment: compare risks and rates of return					
30	Timing: timing of loan, lease payments					
31	Disposal: risk of low salvage value, poor used market					
32	Employee morale: new equipment, owned etc.					
33	Transportation and assembly capability					
34	Pre-acquisition analysis: future work, market					
35	Replacement parts, inventory, storage					
36	Compatibility of staff for proper operation, repair and maintenance of equipment					
	Others (please specify)					
37						
38						
39						

Q8. Strategies to mitigate the identified challenges for efficient acquisition mode for SMEs in Ghana

Please kindly rate the following strategies that can be employed to mitigate the identified challenges for efficient acquisition mode for SMEs in Ghana on the scale 1-5.

5= extremely significant; 4=very significant; 3=moderately significant; 2=slightly significant; 1= not at all significant

NO.	STRATEGIES	levels of influence				
		1	2	3	4	5
1	Planning of equipment acquisition needs to be done by a professional person with good exposure of execution of work					
2	Effective planning before selection of any acquisition mode					
3	Educate SMEs on the various acquisition mode					
4	Proper methodologies and tools must be introduced by financial institution to assist SMEs when they come in for loans					
5	Policy reforms with regards to financial support and training Programmes for SMEs					
6	Capacity building efforts need to be extended to the SMEs					

7	Equipment manufacturers and rental companies should provide a means for a user with proper credentials and competence to acquire any heavy construction machine available on a temporary or permanent basis					
8	Optimum acquisition strategy like accurate estimate of revenues and cost should be devise before going in for an equipment					
	Others (please specify)					
9						
10						
11						

THANK YOU!