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**COLLEGE OF ARCHITECTURE AND PLANNING**

**FACULTY OF ARCHITECTURE AND BUILDING TECHNOLOGY**

**DEPARTMENT OF BUILDING TECHNOLOGY**

**IDENTIFYING SIGNIFICANT COMPENSATION EVENTS AND THE  
ASSESSMENT OF THESE EVENTS UNDER PUBLIC PROCUREMENT  
AUTHORITY'S CONDITIONS OF CONTRACT FOR MEDIUM CONTRACTS IN  
GHANA**

**BY**

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**BSc. (Hons)**

**A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR A  
DEGREE OF MASTER OF SCIENCE IN CONSTRUCTION  
MANAGEMENT**

**JUNE, 2014**

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**A Thesis submitted to the Department of Building Technology, Kwame Nkrumah  
University of Science and Technology in partial fulfilment of the requirements for the**

**Degree of**

**MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT**

**Faculty of Architecture and Building Technology,**

**College of Architecture and Planning**

**By**

**DANIEL DONYINAH**

**JUNE, 2014**

## DECLARATION

I hereby declare that, this project report is the result of my own work toward the attainment of Master of Science in Construction Management, except for the literature whose sources have been explicitly stated and that, this thesis has neither in whole nor in part been prescribed by another degree elsewhere.

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(HEAD OF DEPARTMENT)

Signature

Date

## **DEDICATION**

I dedicate this research work to the Lord God Almighty through whose grace has guided me this far.

Secondly, to all the people who supported me throughout the work; my parents and my friends.

# KNUST



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I say thank you and may God bless you all.



## **ABSTRACT**

The main aim of this study is identify significant Compensation events and assessment of these events under Public Procurement Authority's (PPA) Conditions of Contract in relation to time, cost and profit. Quantitative research approach was adopted and purposive sampling was used to determine the respondents.

Twenty five (25) identified compensation events were significantly tested and were ranked in order of importance using the Relative Importance Index under cost, time and profit respectively.

Under cost category, variations, late response to claims and cost overruns were identified as the most significant by consultants, clients and contractors respectively. For time category, inexperience, poor communication and clients with no technical background were identified to be the most significant. Finally, late response to claim, insufficient time for claims to be notified and changes and modification in design were seen to be the most significant factors which affected the contractor's profit.

Using factor analysis, it was determined that the variables had common underlying factors. The significant factors determined after reduction were four under Profit, namely: Delays from Consultants, Extra Cost, Increase or Decrease in Project Duration and Programme of Works. Under time, the factors were Works Interruptions, Inconsistent Instructions and Late Implementation. Cost also had three main factors namely: Cost Benefit to Stakeholders, Additional works and technical errors.

It was revealed that compensation events tend to increase project cost and also drag the project. In view of this, the origination of compensation events must be thoroughly assessed and best solutions to these events must be implemented for a successful project.

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# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Background**

The construction industry in Ghana, like many others worldwide, has had its share of independent reviews. Huge and unsustainable foreign debt, excessive budget deficit, huge contractual payment arrears, poor construction performance, corruption and pressure from international financial institution, forced the government to commit to a reform of public procurement, which culminated in the creation of the Public Procurement Authority (PPA), in 2003 (Act 663) (A. Anvuur et al, 2006). A review by Anvuur et al, 2006 suggested that many private entities executed works to the government cut corners, underperformed and sometimes abandoned the project (Westring, 1997). These often cause adversarial relationship between the client and contractor (Kissiedu, 2009).

The PPA's conditions of contract were reformed to:

- Promote national development
- Enhance harmony with other local and international Laws
- Foster competition, efficiency, transparency, and accountability
- Facilitate ease of procurement administration
- Ensure value for money (Ministry of Finance, 2001).

A unique feature of the PPA that attempts to actualize the above mentioned is the introduction of progressive compensation events mechanism for dealing with change in contracts. Compensation events are claims for which risk in terms of money or time are transferred away from the contractor onto the employer. In other words, compensation events are extra cost caused to the contractor by the client or the client's representative or any other unforeseen physical discrepancies (PPA, 2003).



Section 3, clause 44 of the conditions of contract clearly states all the events that can lead to compensation events.

The actual defined cost of work already done, the forecast defined cost of work still to be done and the resulting fee form the basis for assessment of compensation events. In the construction industry, the key players such as the client, contractor and the consultant can contribute immensely to the successful completion of projects. Thus any measure taken which is contradictory to conditions of contract may incur further cost to the client or the contractor.

Under the PPA's conditions of contract, the contractor may claim a fee to recompense him for the loss or expense that he has suffered or an attempt to avoid the requirement to pay liquidated and ascertained damages (Seeley, 1997), thus clearly showing that provisions have been made in the conditions to cater for any extra cost to the contractor caused by the client or the client's consultants.

There are several actions by the client and his consultant that can lead to compensation of the contractor. These activities will lead to the contractor's prolonged presence on site, additional overhead costs, and loss of profit for the extended period, site and general overheads, an extended attendance on the nominated subcontractors, extra costs on preliminaries, variations, and acceleration costs (Oyegoke, 2006).

In some cases, a number of contractors may successfully claim compensation fee whilst others may not succeed. This is because some of the contractors may only be interested in the Bill of Quantities section which resorts to the negligence of the conditions of contract hence not knowing how to go about compensation claim when the need arises. On the other hand, some consultants may have little or no idea about the conditions of contracts and may continue to engage in actions that may be causing lots of extra cost to the contractor

(Williamson, 2007). This is not a healthy situation for the construction industry so in view of this; there should be a detailed understanding of the PPA especially compensation events and also to ascertain multiple assessment of compensation events claims.

Contractors may fail to make substantive compensation claims due to the following:

- Claims management is still performed in ad hoc manner.
- Contractor's management information systems are ill-designed to support claims.
- Products of basic good management practice, such as diaries, timesheets and programmes, often are inadequate in content even if available.
- Some aspects of the claims are impossible to quantify with a precision even when the best information is available (Vidogah and Ndekugri, 1998).

The above indicates reasons why it is difficult for the contractor to make substantive compensation claims.

Compensation events claim is a cumbersome process. The mechanism for computing compensation events is time consuming and expensive such that it is common to come across situations where the cost of assessment of low value items exceeds the value of the actual compensation events (Eggleson, 2006) and the assessment of compensation events is too complicated therefore tends to put people off (Barnes, 2001). Various suggestions have been made regarding how to handle compensation events but there is lack of empirical data to support how efficient such methods have been. Faced with multiple compensation events situations, parties in the construction industry often sought alternatives or modifications of the rules for assessing multiple compensation events such as batching, time grouping, establishing schedule of rates and excluding items below a certain value from the full procedural rigours of the system (Eggleson, 2006). In situation where compensation events occur, the completion date is often affected (Nelson, 2011).

Compensation claims is a sector under the conditions of contract which includes all the stakeholders and thus there should be a critical view to manage it appropriately in the construction industry.

## **1.2 Problem Statement**

Compensation events are the most significantly discussed and disputed part of conditions of contract since its introduction in the construction industry (Eggleson, 2006). Thus there should be more clarity on this section of the conditions of contract, especially how contractors assess multiple compensation events [section 3 of the clause 44 of the of the Public Procurement Authority's (PPA's) conditions of contract].

There have been situations in the past where clients altered project design without giving much consideration to the cost implications. These actions from the client does not auger well for the contractor in terms of monetary gains. Thus compensation events were introduced to make any actions from the client or his representative who caused extra cost to the contractor susceptible to compensable claims from the contractor.

Clients are allowed by the conditions of contract to charge the contractor liquidated ascertained damages for project delivery delays. Likewise, to be fair to the contractor, compensation events mechanism are provisions made in the conditions of contracts to enable the contractor to make substantive claims for any action from the client's party that causes extra cost and delay to the contractor's disadvantage. These claims are not just monetary in nature but, could also be legitimate extension of time without the contractor paying liquidated ascertained damages to the client.

Claims must be based on the supportive contract clauses and founded on the facts that are observed, recorded, notifying the project manager (PM), and also should be presented in a logical manner (Oyegoke, 2006). Potential loss and expense must be clearly identified,

qualified, and valued (Seeley (1997). Other parties to the contract must also be convinced that what the contractor is claiming has been valued and that the adjoining issues are credible to the presented claim. Thus, it is the responsibility of the contractor to formulate his claim in detail and to furnish the evidence on which he is claiming to be compensated.

Questions often asked when managing compensation events include:

- What are the significant compensation events under the PPA?
- How are compensation events assessed under the PPA?

This study seeks to identify events that can decrease the contractors' profit margin, extend the project duration and increase in the project cost.

### **1.3 Aims of the Research**

The aim of this study is to identify significant compensation events under the Public Procurement Authority's (PPA) conditions of contract for small and medium contracts (Lump sum contracts) in relation to cost, time and profit.

### **1.4 Objectives of the Research**

The objective of this project is as follows:

- To identify significant compensation events under construction projects.
- Determining the significance of these compensation events as perceived by contractors, consultants and clients.

### **1.5 Scope of the Research**

Geographically, this research will be conducted on the different types of consultancies and construction firms in Accra and Kumasi both private and government firms.

The research seeks to find out how these agencies manage compensation events under the conditions of contract for medium contracts (lump sum contracts) in their field of work.

### **1.6 Justification of the Research**

Everybody starts a project and wants it finished. Compensation events are one of the contributing factors that drags project and increase cost and as such it should be managed to the understanding of the client and contractors where best practices are known and where clearly compensation events are stated, but not clearly understood in the PPA's conditions of contract.

Due to future relationships, it has been realized that other alternative systems are adopted by both contractors and clients to take care of compensation events and as such a critical analysis of this procedure and contractual terms in relation with the PPA option needs to be analyzed and merged with the good practices and failure in the course of action

### **1.7 Research Methodology**

In this research, the quantitative method would be employed. Non-probability sampling which is purposive and snowball sampling will be used to select a sampled building consultancy and contracting firms.

Factor analysis would be used in finding those variables that have common underlying factors in Ghana in relation to compensation events to the opinion of construction professionals.

Events that lead to compensation claims will be listed for respondents to rank them in order of importance and the results obtained would assist construction professionals to manage activities that lead to payment of compensation to the contractor. The experienced professionals from different consultancy and contraction firms will be interviewed to identify how they ranked significant compensation event that was identified.

For the objectives of the research to be realized, the following variables will be looked at:

- i. **Specialty:** This refers to the class of the contractor, the type of consultancy firm whether quantity surveying, Architectural, Structural Engineering, Plumbing and Electrical Installation Engineering Services.
- ii. **Mode of Operation:** This will deal with the type of infrastructure the contractor specializes in, mode of supervision of the consultants and the type of information system adopted by the contractor and the consultant.

A combination of primary and secondary data will be used. The primary data will be acquired from field survey instruments such as interview guides, structured questionnaires and field observation. The secondary data which comprises the literature review will however be acquired from published documents, the internet, magazines, newspapers, reports and scientific journals and will look at the following:

- Project construction stage
- Inspection of works
- Site instruction (Consultants):
  - Architect's instruction



- Structural Engineer's instruction
- Services Engineer's instruction
- Interpretation of drawings by the contractor
- Compensation claim procedures.

The primary data on the other hand will consist of the following:

- Practical measures to curtail compensation events in their mode of operation (Client/Consultant).
- Contractor's measures taken to present solid claim of compensation.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Chapter one focuses on the introduction to this research. It gives an introduction to the background and justification for the research in identifying significant of compensation events on construction projects. This chapter reviews the causes of compensation events on construction projects as indicated by other researchers. It assesses multiple compensation events based on Public Procurement Authority's (PPA's) view on compensation events in order to allow the project to continue with minimum delays and disruption. Compensation events mechanisms are also discussed to highlight how compensation can be properly managed or prevented.

One important factor that will influence the achievement of project standards and discourage disputes over claims is the type of procurement method adopted. Love et al. (1998), defines procurement as a system that assigns responsibilities and power to the people and defines the connections of the different elements in the construction of a project. The procurement systems are divided into four major sections according to Yates (1991) and Seeley (1997) are as follows:

- 1) Lump sum/conventional either sequential or accelerated.
- 2) Design and build/package deal either direct, competitive or develop and construct.
- 3) Design and manage either by contractor or consultant.
- 4) Fee-based construction/management method either management contracting or construction management.

The major focus for this research is the Public Procurement Authority's conditions of contract for medium contracts which is a lump sum system of procurement used for undertaking works in the public sector of Ghana.



Although there has been an outgrowth of new procurement methods with the aim of improving value for money, (Akintoye et al., 1998; Cox, 2001; Zhang and Kumaraswamy, 2001), Kululanga et al. (2001) indicate that contractual issues keeps on rising to even though conducts of projects have clearly been stated in the conditions of contract. These difficulties can be assigned to the fact that each party enters the signed contract with the aim of protecting the construction business environment and his own personal interests.

According to Pernu (1994), accesses to procurement are defined by estimating the scope of responsibilities in a building project between the contractor and the client. Thus with the emergence of (PPA, 2003) fairness in procurement is defined clearly, especially with how risks should be divided.

This study seeks to identify significant compensation events and the assessment of these events as stated in the section 3 clause 44 of the PPA's conditions of contract. This is due to the fact that, compensation claims are complicated and a difficult issue that needs professional judgment to scrutinize what contributed to the compensation events, and how there can be a successful claim to that effect.

Seeley (1997) defines a claim as a request by the contractor to be compensated for some loss or expense he has suffered or an attempt to avoid the requirement to pay the liquidated and ascertained damages. Bubshait and Cunningham (1998), stated that, during a construction project, delays may be caused by the owner, the contractor, by act of nature and the third party.

The actions of the employer and his representative that cause additional costs to the contractor in executing the project constitute a genuine claim. A claim will result from the contractor's prolonged presence on site, additional overhead costs, and loss of profit for the

extended period, site and general overheads, an extended attendance on the nominated subcontractors, extra costs on preliminaries, variations, and acceleration costs (PPA, 2003).

## **2.2 Public Procurement Authority**

### **2.2.1 Introduction**

The Public Procurement Act 663 (2003), is an act approved by parliament as an authority to handle all public contracts in Ghana. As such it includes a mechanism of fairness to satisfy stakeholders in the contract (Kotoka, 2012). Compensation event is basically under the section 3 clause 44, of the PPA which seeks to transfer risk in terms of money and time from the contractor to the employer.

### **2.2.2 Public Procurement Overview**

Public procurement dates between 2400 and 2800 B.C. (Thai, 2001). The importance of public procurement cannot be overstressed in the construction industry especially looking at the huge capital involved in Ghana (Kotoka, 2012). The World Bank (2003), estimated that the annual value of public procurement for goods, works, and consultancy services is about 600 million US dollars representing about 10% of the country's GDP. Therefore, public procurement system is an integral function of governments in both developed and developing countries as the high financial outflows which has a great impact on their economies that needs careful management (Thai, 2001).

Public procurement has and plays an important role in ensuring an open free competitive bidding for the award and execution of contracts. (Thai, 2001; Tucker, 1998).

### **2.2.3 Definition of Public Procurement**

Procurement may be defined as a major means of obtaining works and goods through the required legal process satisfying all parties involved (Thai, 2001).

Public Procurement, according to the Public Procurement Act, 2003 (Act 663), is ‘the procurement of goods, works and services through a fair means and a fair process for all stakeholders (PPA Module, 2007). Thus the act clearly states its stands with fairness in the execution of works between all parties involved and justifies the introduction of compensation events clause in its conditions of contracts included in the section 3 of the PPA in the construction industry.

#### ***2.2.4 Nature of Public Procurement Systems before the Reforms***

World Bank Procurement Guidelines were also used for World Bank projects (World Bank, 1995/1997). Traditional procurement methods were used for public works with plans for compulsory registration and classification of suppliers and contractors administered by the Ministry of Water Resources, Works and Housing. Contractors classified by the Ministry of Water Resources, Works and Housing were too general and out of date and their registration criterion - contractors lists and monetary thresholds - were not regularly rationalized as indicated by the World Bank (1996), and Eyiah and Cook, (2003).

These uncoordinated and unregulated systems of procurement were the consequences of poor procurement situations leading to the much acclaimed reform of public procurement practices to instill trust and confidence in the public and the donor community (Kotoka, 2012).

#### ***2.2.5. The Public Procurement Reforms in Ghana***

The Public Financial Management Reform Program (PUFMARP) was set in motion in 1996 by the Government of Ghana with the aim of improving the overall public financial management in Ghana (Kotoka, 2012). The Public Procurement Act, 2003, (Act 663) has established Public Procurement Authority (PPA) as a corporate body charged with the oversight obligation for the effective implementation of the Act.

### ***2.2.6 The Legal and Regulatory Framework of Public Procurement***

#### ***The Public Procurement Act, 2003 (Act 663)***

The Public Procurement Act, 2003 (Act 663) establishes the legal, institutional and regulatory frame work to secure fiscal transparent and public accountability in Ghana's procurement system (Kotoka, 2012). The Act establishes five basic precepts upon which the public procurement is based (World Bank, 2003). These pillars are: the legal and institutional framework; standardized procurement procedures and tender documents; independent control system; proficient procurement staff; and anti-corruption measures (Kotoka, 2012).

The Public Procurement Act 663 established the Public Procurement Board (PPB) now PPA, Entity Tender Committees (ETCs) and Tender Review Boards (TRBs) (Kotoka, 2012). It specifies in clear terms the laws for procurement methods and thresholds, procedures, appeals and complaints resolution procedures and disposal of stores. It authorizes the issuance of enforceable regulations, Guidelines, Standard Tender Documents (STDs) and Manual under the Act. 1

#### **2.3 Contractual Basis for Claim under PPA**

PPA has a dedicated clause within its contractual agreements for events of compensation claims. This is found in clause 44 of the PPA. Nonetheless, this clause is not read alone but must be read in conjunction with clause 24 and 25 because, if the claim put forth by the contractor is not accepted, there can be disputes which the clauses 24 and 25 seeks to cover.

#### **2.4 The Construction Industry**

Construction is a high stake effort, which has a long duration process of different complex activities that finally yields building projects and infrastructure (Levy, 2007). Taking a building project from planning through design, construction, and occupancy involves a various kinds of construction stakeholders such as the end product beneficiaries, clients,

construction professionals and all adjoining institutions. The control of these stakeholders on the project differs as the project progresses and this is as result of having a continuous demand to complete the project at a budget cost and stipulated time (Kissiedu, 2009).

Chin (2003) indicated that, the construction industry is an industry which is well known for a high level of disputes. In view of this, compensation events mechanism are included in the conditions of contract to aid the contractor make claims for extra cost caused to him by the client or the clients' representative or any natural occurrence as stated in the conditions of contract of the PPA. Failure by the client or the client's party to recompense the contractor based on substantial claims can affect all those engaged in a project. According to Steen (2002), this industry is well known for claims and disputes issues on construction projects. Cost overruns and schedule delays can be the subject of expensive and protracted claims and litigation, and pose serious risks for all parties to a construction project. The construction industry in Ghana covers a complex and comprehensive field of activities involving the client's party and the contractor. Thus, it is often not surprising to experience compensation claims from the contractor (Kissiedu, 2009).

The conditions of contract are a binding medium for the contract to protect the interest of both parties since the adversarial relationship is higher now than that of the 1960's (McGuinn, 2002). In those days, the relationship existing between the construction parties were very cordial. Clients accepted the fact that undertaking construction projects contained built in risks and, therefore, accepted a certain amount of errors. Claims were not prevalent and, exceptionally, design and construction firms worked together to maximize project performance (McGuinn 2002). The focus of the construction industry was on teamwork which leads to less claim issues at the end of the project.



According to Shoyilekov (2003), the construction industry today is unique. In that, strong relationships and trust between construction stakeholders have been substituted with doubtfulness and conflict, thus each party guards his interest of gains at the end of the project. He also noted that, the construction industry has continually disintegrated into narrow specialty areas that have resulted in an increasing number of potential participants. Thus any of the parties' action contrary to the conditions of contract may cause further cost to the project specifically to the contractor. This is further stated in section 3 of the PPA's conditions of contract clause 12 that the contractor is responsible for works from the beginning date till defects correction certificates. The high stakes in this environment has warranted each party to legitimately make claims for any breach as stated in the conditions of contract. Thus the importance of compensation events included in the conditions (Sakal, 2004),

Stipanowich (1998), noted that, each party protects its interest when offering services in the course of the building project. Therefore any action, genuine or ignorant which may cause extra cost to the contractor may lead to vehement reaction from the contractor's outfit in view of the extra cost to him. Actions leading to claims are estimated to arise in ten (10) to thirty (30) percent of all construction projects. Thus, a main cause of project delays in one in four construction projects (Kissiedu, 2009).

## **2.5 An Overview of Compensation Claims**

Construction projects have continually become much more dynamic in nature over the past four decades (Sakal, 2004). Often the environment in which construction projects are accomplished today involves completing complex, uncertain projects within tight budget and time constraints (Kissiedu, 2009). The industry as a whole has become much more dynamic as illustrated by its continual fragmentation (McGuinn, 2002), which contributes specifically to demonstrated complexity—more parts, more interfaces. In this dynamic environment,

clients often attempt to reduce costs and reduce design/construction time while still demanding high quality finished products (Kissiedu, 2009). Clients may alter the design to achieve what they want and this may have an effect on the schedule of works of the entire project. This can cause extra cost to the contractor in delay of works, and extra days to pay for both machinery and labour. When this occurs, there will be definitely an attempt to pass on financial responsibility from the contractor to the client. This may urge the contractor to raise claims for extra cost he has incurred, but it is not always the case that the claims can be easily accepted by the client or the project manager. This attempt by project participants to protect themselves by shedding risk ultimately backfires and leads to adversarial relationships and costly litigious battles (Kissiedu, 2009). Furthermore, it is not surprising that project performance is negatively affected and that payment of extra money to the aggrieved party as compensation claims may not have an easy transaction between the parties involved in construction projects. More often than not, these claims and actions may be justified by each party. The project manager may review the whole compensation mechanism to check whether there is a deliberate action from the contractor to gain more profit or what preventive steps were taken by the contractor to prevent this cost. Other instances too may be an extensive review of the whole compensation claims by the project manager (PM) again to check whether the authentication of the claim is genuine and the amount quoted is okay to be paid. Definitely there has to be checks by PM whether there was early warning notification by the contractor as stated in clause 32.1 under section 3 of the PPA's conditions of contract.

However, compensation claims are not easily transacted as explained. The project may suffer extra cost, abandoning of projects, rift between client and contractor and finally undermining of the PM's competence. Events that have led to compensation claims issues have increased dramatically. This has raised a lot of concerns on the complexity and cost as projects become

complex with ever increasing competing interest involved in project delivery (Canterbury Jr., 2007).

In an ideal environment, construction projects should be based on team endeavor; where the unique skills of workmen are used to maximize project performance (Kissiedu, 2009). Unfortunately, this is the other way round today; parties enter most projects guarded and suspicious of each other's motives before design and construction even begins. This is due to the fact that, there is contravening interest and the focus on one goal and successful project delivery may not be the interest of another party. The client may want the edifice to suit his modern day ideas while the contractor or the PM may be only interested in the profit gains at the completion of the project. This does not auger well for the best interest in the construction industry (Steen 1994).

Motsa (2006) indicated that contract administration takes a lot of experienced hands to ensure successful project completion less any grievances. Thus the PM should be experienced to make provisions for any unforeseen occurrences. Furthermore, the interest of each individual should be protected and although the PM represents the client, he should be in a position to ensure that there is fairness in administering of the contract. Definitely the project may receive further changes to the scope, design, and cost by the client or an outside authority but then there should be a timely intervention and right direction by the PM in order to protect the interest of each party. Thus showcasing preventive disputes measures over claims and this is further considered as a vital business practice and a very important management process (Nystrom, 1995).

Compensation events are seen as a very important area which has not yet surfaced to the lime light but then, it is an area that is very sensitive in the construction industry that results in a lot of disputes when it is not managed well. Thus, there should be in-depth knowledge and



findings on contractor's assessment of multiple compensation events. This further shows that the construction industry has entered an era where both professionals in the field and contractors must understand the PPA's conditions of contracts especially issues concerning compensation events mechanism in Ghana.

## **2.6 Compensation Events Defined**

Compensation events mechanism is intended to be operated in accordance with PPA's conditions of contract in Ghana and as such all the parties involved in construction should have an indebt understanding.

In this area of contractual machinery, there are a lot of difficulties linked with assessment of compensation events therefore there should be necessary inputs which will make parties comfortable to operate smoothly when managing these events (Williamson, 2007).

Compensation event claims seek to transfer risks in terms of money or time away from the contractor onto the employer. In other words, compensation events are extra cost caused to the contractor by the client or the client's representative or any other unforeseen physical discrepancies (PPA, 2003).

However, it is realized that compensation event claims are not initiated correctly by contractors; with the inevitable outcome of having a long list of compensation claims disagreed between the contractor and the project manager (Williamson, 2007).

Generally, most of these compensation events will have initially been notified by the contractor and money involved on account of the compensation claims will have been certified or paid against a number of them by the project manager (Williamson, 2007). This clearly should not be the intent of the contract process since the stipulated project budget and duration is what every stakeholder including the contractor hope for.

Due to time constraints, it is very rare for sufficient time to exist for a compensation event to be notified and a quotation submitted and agreed prior to works in progress (Williamson, 2007). In such price changes can only be assessed in accordance with what is stated in the conditions of contract on the basis of the actual cost of the work already done (Williamson, 2007).

Again, it is also found that very few compensation events emanate from the project manager notifying the contractor of the existence of a compensation event and requesting the contractor to submit the associated quotation.

In very rare cases, the project manager may instruct the contractor to submit quotations for the event, and the correct contractual route is followed through to the compensation event being implemented and the changes to the prices being agreed (McGuinn, 2009).

However, the more likely outcome after such a contractor notification is either:

- The project manager rejects that the event that has arisen as compensation event.
- The project manager fails to respond at all to the contractor's notification.

In this situation, the contract is silent as to what is the contractor's remedy should they still believe the event to be a compensation event. The only route would seem to be for the contractor to notify their disagreement with the action of the project manager in rejecting their notification of the compensation event, and declare this to be a dispute pursuant to clause 24.1 under section 3 of the PPA and refer the matter to adjudication. Furthermore, it is experienced that dozens, and sometimes hundreds, of compensation events are rejected in such a manner by the project manager on a typical construction project (Williamson, 2007). Ironically, one would also have to consider the practical consequences for a contractor who instigated dozens of adjudications upon every project they undertook, both from gaining a

confrontational reputation within the industry and selection for future projects (Kissiedu, 2009).

Furthermore, the same direct route to adjudication also exists through the Project Manager not having taken an action they should have taken according clause 44.4 to under the PPA by rejecting the contractor's notification or instructing the submission of a quotation. However, the same situations flowing from a multitude of adjudication references, as already set out above, would also arise here. Instead of this, what is found to be a common approach adopted by many contractors is to still prepare and submit a quotation to be compensated for, despite not having been instructed to do so by the project manager (Williamson, 2007).

Often, it is found that the first hurdles of submitting a quotation is negotiated successfully but then falls down when the project manager fails to either accept it, instructs a revised quotation or make their own assessment (Williamson, 2007).

Again, the contractor is often not whiter than white themselves. Often they do not notify of a compensation event within the requisite time as stated in the early warning clause 32.1 under section 3 of the PPA. Williamson (2007), in his findings detected that notifications are not submitted until many months after the event, sometimes over a year later. Such notifications are then, inevitably, followed up with unrequested quotations. After this, follows the forecast disputes and long drawn out negotiations. However, as the notification or communication clause 6.1 under section 3 in the PPA's conditions contract states that notification is only effective when "written and delivered to the project manager"; this seems to be rather procedural than mandatory.

Upon improved innovations of compensation events mechanism in the conditions of contract, a key observation is realized (Seeley, 2007):

Unless the project manager notifies the contractor of a possible compensation event, the contractor is not entitled either to changes in rates and completion date of the project (Williamson, 2007).

This intent appropriately highlights the fact that where compensation events are notified extremely late in the day by the contractor, thus preventing possible mitigating measures to be implemented by the project manager or accurate budgetary control by the employer will not be possible (Seeley, 2007). This shows that the contractor's team should be vigilant enough to notify as early as possible any actions that can lead or has led compensation events for a proper review by the project manager. Two instances are notified here, firstly, the time old argument of when the contractor first became aware of the event and secondly, it is still not stated that such a notification is a **condition precedent** to the contractor being entitled to a change in the prices or to the completion date (Seeley, 2007).

Comparing the NEC 3 and the PPA, the time frame for response to claims by the Project Manager is not clearly stated under the PPA's compensation event clause. NEC 3 makes relevant additional provisions that "When the Project Manager does not notify the contractor within the agreed contractual period, the contractor is mandated to make follow ups to this effect. Failure on the part of the Project Manager to reply as required to this notification is treated as acceptance by the Project Manager that the event is a compensation event and an instruction to submit quotations." These are some of the innovative ways of addressing compensation events claims in the NEC 3's conditions of contract unlike the PPA's communication clause 6.1 which states that 'Communications between parties that are referred to in the Conditions shall be effective only when in writing'.

Having overcome the problem of not being formally instructed to submit a quotation by the above amendment, a further wholly additional sub clause has been added at clause 62.6 of the NEC3 which has an upper hand to the conditions of PPA as in going further to address the

situation where, after the contractor submits a quotation to the Project Manager, they fail to respond to it within the requisite timescales (Williamson, 2007):

“When the Project Manager does not reply to a claim within the contractual period, the contractor is mandated to notify the project manager to this effect. In an instance where the contractor submitted more than one claim, he notifies which quotation he proposes to accept. If the project manager does not reply to the notification within the stated period, the contractor’s notification is handled as approval of the quotation by the Project Manager unless the submitted quotation is for a proposed instruction or a proposed changed decision”

These are implementations observed by Williamson (2007), about how the NEC 3 has categorically streamline compensation events mechanism. The PPA’s version can be improved so that the contractor cannot be cheated or cheat the client in anyway. This will encourage professionalism in the administration of compensation events claims by both the contractor and the project manager.

## **2.7 Compensation Events as a Factor to Delay of Works**

Delay of works is a common phenomenon which is generally known to be, costly, complex and dicey problem encountered in construction projects. Because of the domineering importance of time for both the owner and the contractor, it is a major contribution to disputes and litigation (Alaghbari et al., 2007). The clause 44 of the PPA’s conditions of contract streamlines the activities that can clearly exonerate claims for the contractor if he is delayed by any actions from the client’s party.

The contractor’s delay may be due to so many factors from the client’s party and the causes of these delays may differ from project to project.



Basically delay is one of the most highlighted events under the compensation events of the PPA and it falls in the category of cost and time. In view of this, it is very essential to emphasize more on the causes of delay and how best it can be managed (Ahmed et al., 2003). Mansfield et al. (1994); Chan and Kumaraswamy, (1998), embarked on a research to evaluate the causes of delay in construction projects. The results showed delay may be due to the following:

- Late financing and payment for completed works
- Poor contract management
- Changes in site conditions
- Shortage of materials
- Improper planning

Comparing this to the precepts under the compensation event clause in the PPA, all the above stated may warrant the contractor to have legitimate claims.

Assaf et al., (1995) also indicated from a survey conducted that the major contribution to project delay is late approval of drawings. This has become common in the construction industry in Ghana. Professionals in the construction industry identified delay in advance payment or interim certificate during construction, poor communication between the contractor consultants, and indecisive nature of clients as a cause of project delays (Alaghbari et al., 2007). These are also factors that are common in Ghana. However, the compensation events clause 44.1h under section 3 of the PPA states that contractors can legitimately make compensation claims when other contractors, public authorities, or the employer(s) cause delay to the project.

Another aspect of delays is prioritizing of interest preceding cordial relationship amongst project partners. Mezher and Tawil (1998), stated that the cause of delays in the construction industry were; owners had more interest in monetary matters whilst contractors on the other

hand too were more interested in only contractual relationships. The consultants supervising the projects too are only interested in solely project management.

Al-Moumani, (2000), also concluded that the main causes of delay which may lead to compensation claims were user changes, weather, site conditions, late deliveries, and economic conditions.

Frimpong and Oluwoye (2003), had a different categorization in project delay perception. Their review indicated that clients, consultants and contractors agreed to the fact that project financing, economic and natural conditions are the major causes of delay and increase in cost.

### ***2.7.1 Types of Delay***

Generally, delays can be divided into three major types, namely (Alaghbari, 2007):

- Compensable
- Non-compensable
- Excusable

Compensable delays are delays that are caused by the client or the consultant whilst non-compensable delays is the failure of the contractor to meet target goals in the course of construction (Alaghbari, 2007).

On the other hand, excusable delays according to Alaghbari (2007) are due to natural occurrences - force majeure. When this happens the contractor may be granted an extension of time.

### **2.7.2 Delay Responsibility**

Under the PPA conditions of contract, the contractor has the legitimate right to be compensated with additional time or liable for payment of cost.

Ahmed et al. (2003), indicated the following under delay category:

- Owner (or agent) responsible – contractor will be granted a time extension and Additional costs (indirect), where warranted;
- Natural causes (e.g. “act of God”) responsible – contractor will receive additional time to complete the project but no costs will be granted and no damages/penalties assessed; and
- Both parties responsible – contractor will receive additional time to complete the project but no costs will be granted and no damages/penalties assessed.

### **2.7.3 Causes of Delay Which May Lead to Compensation Claims**

Alaghbari et al. (2007), categorized delays into internal and external causes. Owners, designers, contractors and consultants were the major cause of internal delays according to (Alaghbari et al., 2007). The external causes of delays according to (Alaghbari et al., 2007) were mainly from the government, materials suppliers, or the weather.

According to Ahmed et al. (2003) and Alaghbari (2007), the possible factors which cause delays on a project and may lead to compensation events claims are:

Consultants:

- Absence of clerk of works
- Inexperience
- Slow decision making process
- Incomplete documents and
- Slowness in giving instructions.



Owner's responsibility:

- Lack of working knowledge
- Slowness in making decisions
- Lack of coordination with contractors
- Contract modifications (replacement and addition of new work to the project and change in specifications); and
- Financial problems (delayed payments, financial difficulties, and economic problems).

External factors:

- Lack of equipment and tools on the market
- Poor weather conditions
- Poor site conditions (location, ground, etc.)
- Poor economic conditions (currency, inflation rate, etc.)
- Changes in laws and regulations
- Transportation delays; and
- External work due to public agencies (roads, utilities and public services).

## **2.8 Claims as Risk in Construction**

Traditionally, client's parties continually were seen to transfer the risks to the contractors, and this has resulted in high contingencies to their bids to cover the costs of risk (Cho, 2003).

Therefore creating a notion that compensation events and claims are bound to happen as the project progresses so provisions have been made in the contingencies to cater for it (Cho, 2003).

### ***2.8.1 Construction Risks and Claims***

The claims are more likely to end up in disputes and litigation in the construction industry Ahmed et al. (2003).

Whilst construction risk may originate from foreseen and unforeseen circumstances (McCallum 2000), claims may originate from breach of contract conditions except in situations of force majeure.

Construction claims may be presented in different forms as clearly stated in the compensation events clause under the section 3 of the PPA. Claims are normally not envisaged to occur or in plain terms 'goodwill wish-not to be encountered in contracts'. Claim is a disagreement or an extension of conflict, which comes into effect to recover the loss incurred by the party involved. When claims are not resolved by mutual agreement, it becomes construction disputes that must be resolved by arbitration, litigation or other alternative dispute resolution methods as set forth in the contract Ahmed et al. (2003)

A review by Acharya et al., (2006), categorized claims into the following:

1. Owner actions leading to claims. These are:

- Excessive change orders
- Supremacy of owner/consultant
- Project scope definition not clear
- Site access delays
- Delay in decision by owner
- Late handover of construction site

- Delay in running bill payment

## 2. Consultant actions leading to claims.

- Errors and omission in design
- Excessive extra work
- Differing site condition
- Excessive quantity variations
- Specification related

This review also captured contractors' action but then in summary, the relevant issue raised was the contractors' inability to perform up to specified standard.

Although the points stated by Acharya et al., (2006), may be basic phenomenon often experienced in the field, some of the problems supported by other theoretical approaches are brief.

O'Brien (1998), also highlighted that the contractor may welcome any additional works if only there is negotiation between him and the client on the rate build up or contract figure.

But this may not be the situation on the actual ground. There is always a tendency of conflicts on drawings and specification. Contract documents have failed to describe, define, or delineate the work to be performed (Fisk 2000).

## 2.9 Management of Compensation Events Claims

When any of the multiple compensation events occur during the construction stage, they can have a replication effect on the entire project and these can be categorized into three major parts that is (Vidogah and Ndekugri 1998):

- Extension of time for the contractor.

- Increase in the overall project cost.
- Increase contractors profit (negative effect to the project).

When the above stated occurs, the project time and cost is affected. The contractor's delay that leads to non-completion of the project at the predetermined completion time will result in payment for liquidated and ascertained damages to the employer. It must not be a penalty but it should aim at compensating the employer for a loss of benefits from his inability to make use of the project at the agreed completion date.

Claims that result from an act of Nature are stated in clause 25.4.1-3 of JCT '80 Standard Form of Building Contract under relevant events. It includes force majeure, exceptional (unpredictable) weather conditions, a loss or a damage occasioned by specified perils, e.g. an earthquake, a flood etc. In such a situation the architect gives a fair and reasonable extension of time to the contractor (Vidogah and Ndekugri 1998).

Vidogah and Ndekugri (1998) further deliberated on the level of involvement of project team members in claims evaluations in the following ranking order: project quantity surveyor, project architect/engineer, project manager, others involved, and client is very important.

The role of quantity surveyors is very important. The quantity surveyor, on the receipt of the claim, determines the relevant clauses that apply to it either directly or indirectly and their contractual interpretations. The quantity surveyor (QS) again looks at the element of costs that are involved and the monetary entitlement that is justified. For example, this can be achieved by ascertaining the period between the latest date when the drawings were required and the date at which they were actually supplied to the contractor.

Thus, the QS are able to take into consideration an unreasonably early or late request by the contractor. He also requires a master program in the form of a bar chart, critical paths, and a method statement that shows how the contractor intends to carry out the work, and a detailed

breakdown of the preliminaries. In this case, the contractor is strongly encouraged to try as much as possible to utilize the early warning practices in order to keep the consultant informed of anything that is happening or has happened that involves the possibility of additional expenses.

Oyegoke (2006), also added that in the JCT 80 conditions of contract (Joint Contracts Tribunal's Standard Form of Building Contract (Joint Contracts Tribunal, 1995), clauses 25 and 26 deals with extension of time and loss and expense respectively. Clauses 17-23 and clauses 34 and 35 in the Finnish conditions of contracts YSE 1998 (General Conditions for Building Contracts), deal with extension of time and monetary compensation to the contractor.

In the FIDIC 4th edition (1987) (International Federation of Consulting Engineers, 1987) conditions of contract clauses 6.3, 6.4, 12.2, 42.2 and 44.1 deal with the extension of time and the reimbursement of any costs which may have been incurred by the contractor in regards to a delay by the employer. Clauses 53.1-53.5 spell out the procedure to be followed when a claim arises.

Likewise the clause 44 of the PPA's conditions of contract which clearly states the contractor has the right to claim for delay in payment, late submission of drawing, adverse ground conditions which were not envisaged in the contract, client or client's representative which may cause the contractor delay of time and extra cost.

Vidogah and Ndekugri (1998) stated that most of the literature studied does not go beyond the management of claims in normal circumstances. They further highlighted problems in claims management as the following:

- Claims management is still performed in ad hoc manner

- Contractor's management information systems are ill-designed to support claims. They lack proper diary keeping, tally cards and way bill system.
- Some aspects of the claims are impossible to quantify with a precision even when the best information is available.

They further suggested some remedies such as: greater emphasis on the quality of claims management practice and information systems during evaluation of tenders; agreeing figures in contention as terms of contracts; implementation of electronic document management systems; and stricter contractual provisions on the quality of programmes, timesheets, and contents of claims.

Since genuine claims are due to the additional cost incurred by the contractor in the course of carrying out the project, management of such a claim is very important for a proper reimbursement.

The normal procedure in submitting claims in the British circumstances Notice (Oyegoke, 2006):

The contractor should recognize the occurrence of events that are likely to result in claims in advance (direct loss and/or expense suffered or incurred, or extension of time). This is achieved by identifying claims that are likely to affect the project and by documenting the characteristics of each event. In clause 25.2 of the JCT 80 conditions of contract, the contractor should give a written notice to the architect or the engineer on the current material supply situation and also causes of the delay. If the architect upon receiving the notice detects that any of the events stated by the contractor is a relevant event and will cause delay the work in progress and also extend the contract duration, he shall notify the contractor in writing to give an extension of time that is agreed to be reasonable.



### ***2.9.1 Preparations of Claims***

Claims must be based on the supportive contract clauses and founded on the facts that are observed, recorded, notified to the architect, and should be presented in an explanatory manner (Oyegoke, 2006). Seeley (1997) asserts that a potential loss and expense must be clearly identified, qualified, and valued. He emphasizes that other parties to the contract must be convinced that the claims are valued and that the integral parts are claimable and correctly valued and it is the responsibility of the contractor to formulate his claim in detail and to furnish the evidence on which the claim is based.

Seeley (1997) stated that most poorly produced or bad claims result from a hasty, last minute analysis of sketchy and incomplete records and incompetent hands to produce a genuine claim.

### ***2.9.2 Submission of Claims***

Claim should be submitted to the right person, at the right time within the allowed time limit (Oyegoke, 2006). Claims should not be submitted late because the late submission will result in difficulties and misunderstanding since neither the client nor his representatives will have the opportunity to cross-check the reasons for an additional claim at or about the time of its occurrence (Seeley, 1997). Clause 26.1 of JCT 80 states that the contractor's application for loss and expense should be made as soon as it is apparent that the regular progress of the work is likely to be affected.

Sawyer and Gillott (1990) profess that all the claims submitted by the contractor should be cogent, logically argued, prepared and presented professionally to receive proper attention from the engineer/architect. As the fact remains that most of the contractors are in business to make money, they will be looking for opportunities of submitting claims, genuine or not genuine, fully justified or otherwise. All the matters that lead to additional payments and

resultant extension of time should be evaluated at the time when the events are recent and the facts are fresh in the mind of the parties concerned and easy to be remembered.

### ***2.9.3 Presentation of a claim***

Claims can be submitted in any form that is suitable to that particular compensation event that has occurred.

Vidogah and Ndekugri (1998) have ranked the reasons for rejection of some or all of contractor's claims as follows: non-entitlement in principle;

- Inadequate information; quantification of claim
- Lack of breakdown of claim by causes
- Non-compliance with contractual procedures inadequate effort at mitigation
- Validity of architect/engineer's instructions

Oyegoke, (2006) stated that it is important to start a presented claim with an introduction which gives a brief outline of the contractor's submission, also to summarize the subject matter, to be precise and concise, and to develop the claim later. The presentation of the claim can be broken down into the following logical sequence: introductory, contractual basis, comprehensive assessment, and auxiliary data.

### ***2.9.4 Introductory Stage.***

This stage includes the details of the site as contained in the preliminaries, and the details of the contract as contained in the articles of the agreement and appendices. It would be helpful to give the general description and any historical data by making all the necessary references to the other documents for understanding the rudiments and the basis for the claim (Oyegoke, 2006).

### ***2.9.5 Contractual Basis***

This stage establishes the contractual basis for the claims. Every claim must be supported by a particular clause or clauses on which the claim is founded. Sawyer and Gillott (1990) emphasize that there is nothing like extra-contractual claim, it is either the claim exist under the conditions of contract or not. The presentation at this stage should be precise and straight to the point by stating all the facts and details. In principle, this is the most important aspect of the presentation and every effort should be geared toward a simple, logical argument for easy understanding of the consultants.

### ***2.9.6 Comprehensive Assessment of the Claim***

This stage shows the summary of the contractor's financial loss and expense (Oyegoke, 2006). The claimed costs involved in carrying out the work should be recorded at the time of carrying out the project.

### ***2.9.7 Auxiliary Data***

This is a section that collates and placed in classification all backup information for the introductory, contractual basis and comprehensive assessment of the claim (Oyegoke, 2006).

He further stated that this is a section that includes all the data from approved site meetings architect or project manager's instruction, instruction from clerk of works, the contract documents, labour allocation sheets, the correspondence with and claims from the subcontractors and suppliers.

Also, it includes site diary, daily weather report, receipt of the drawing schedule, progress photograph, site level details, build-up of the tender, extension of time claims, provided by the contractor's time keeper, approved by the clerk of works and certified by the architect. Others are the material schedule, invoice list, schedule of the anticipated plant output, plant records, scaffolding records, authorized day work schedule, programme and progress charts,

borehole logs, work method statement, variation data sheets, interim applications, certificates and payments, and many others.

## **2.10 Claims for Default Payment**

Late or non-payment of interim payment to contractors has been a major issue on the construction projects. In the worse scenario, they are forced to abandon their projects for lack of funds. This is something that is frowned by the PPA's conditions of contract for small and medium contracts. The clause 43.1 under the section 3 of the PPA's conditions of contract states that the Employer is supposed to pay the Contractor the amounts certified by the Project Manager within the period of 28 days of the date of each certificate.

Payment of valued interim certificate has been one of the major issues in the construction industry since industry often involve very huge capital the project takes time to complete. Some contractors may be able to pre-finance the project based on agreement whilst others like the small and medium contractors, may find it difficult to finance the project. When this happens, it tends to delay the whole project duration.

Clients' failure to honour raised interim certificates for payment may cause project delay and reduced profitability.

In the worst scenario the Contractor may simply leave the site and abandon the project and this tends to drag the whole construction project.

Now the question is:

- Can a Contractor take any legitimate actions when they are not paid or when payment is unduly delayed?
- Is there any provision in the PPA's conditions of contract for medium contracts as remedy to delay of payment?

### ***2.10.1 Payment of Valued Works in the Construction Industry***

In construction, payment is defined as “a monetary consideration for the Contractor’s performance or work done” (Oyegoke, 2006).

Contractually, the amount due the contractor must be paid on time or should it be held, there must be genuine reason for withholding the payment.

The Interim Payment and the Final Payment are the two major mode of payment in the construction industry (Oyegoke, 2006).

### ***2.10.2 Interim Payment***

Interim Payments of valued works are short-term payments contractually agreed to be paid to the contractor as works progresses (Oyegoke, 2006).

The clause 42 articles 1 – 3 of the conditions of contract of the PPA states that the Contractor has to submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously and the Project Manager has to check the Contractor’s monthly statement and certify the amount to be paid to the Contractor. Finally the value of work executed has to be determined by the Project Manager.

The provisions give the Contractor the right to be paid upon the issuance of the interim certificate and compel the Employer to pay the Contractor the certified amount. In other words, the employer must pay the contractor at the right time in the right amount.

The purpose of interim payment is to ensure that the Contractor is regularly paid throughout the progress of the works.

### ***2.10.3 Late and Non-Payment***

Ameer (2005) defined late payment as the failure by the Employer to pay the Contractor within the time stated in the Contract. He also defined that non-payment occurs when the



Contractor is not being paid at all for his work. In practice, the issue of late or non-payment is not as straight forward as it seems.

In the PPA's conditions of contract for medium contract, it is stipulated that the period for honouring the certificate is 28 days from the date of the issuance of the certificate. Thus, any payment made later than this can be considered as late payment

In other opinion by construction professionals, the client is termed to have delayed in paying the contractor when the contractor does not receive payment after 3 to 5 consecutive periods of interim certificate (3-5 months) as stated in the public works and department conditions of contract (Ameer, 2005).

When the contractor starts experiencing this, what are possible actions he can take to get all arrears paid?

#### ***2.10.4 Justified Contractor's Action for Default Payment***

It appears that the Contractor may have several options if the employer has neglected or failed to pay him on time or has not pay him at all. They include the following:

- (a) Suspension of work
- (b) Slowing down the work
- (c) Claiming for interest
- (d) Apply for summary judgment

##### **a) Suspension of Works**

It is universally known that there is no right of suspension of work due to non-payment under the common law (Judi and Rashid 2010). This shows that the contractor is not justified for abandoning site. From the signing of the agreement letter, the contractor is contractually entreated to execute works until the project is completed as stated in the clause 17 under the section 3 of the PPA's conditions of contract.



Murdoch and Hughes (1996), indicated that it is very rare to see the contractor or the sub-contractor abandoning site due to late or non-payment. In this respect, if the Contractor suspends the works the court may find him guilty of repudiating the contract.

Therefore, the contractor can make provisions of records of payment either attached to site meetings minutes for all stakeholders to be aware. Again the contractor can serve notices of legal backing to the employer after which there can be actions of slow works or desert the site upon notifying the project manager.

Furthermore with the rest of the major points listed above, the contractor can do so in writing an early warning notices served to all stakeholders and the employer. Refusal by the employer to honour payment shall lead to litigation or referred for adjudication according to clause 24 of the PPA's conditions of contract.

### **2.11 Assessment of Compensation Events**

The motive for a contractor investing his capital into construction project is to achieve maximum profit gains for his venture. Thus precaution should be taken when there are transactions between the client and the contractor.

Each activity involving the contractor from the site possession date to handing over has a cost implication either to the benefit or the detriment of the contractor (Othman et al.,2006) Taking into consideration the major highlights of compensation events under the PPA, the following could be deduced:

- Cost (Contractor's cost reimbursement)
- Time (legitimate extension of time)
- Profit gains (increase in profit margin)

### **2.11.1 Cost**

The contractor's cost may include labour cost, overhead cost, cost of plant equipment and purchasing of materials (Vidogah and Ndekugri, 1998). Although they have been priced already, the cost involved in the project can favour the contractor's finances within the stipulated time of the contract.

Perhaps if there should be any change of schedule caused by the client's party which may end up extending the project duration, the contractor would have to bear extra cost of labour, plant and equipment (hired or owned).

Extension of time as a result of client's party delay has a lot of implications on the contractor.

Thus the contractor has to embark on the following (McCaffer et al., 2006):

- Re-negotiate plant hiring rates with hirers.
- Equipment that can be moved to support other sites, still remain on this particular project to the detriment of the contractor.
- Labour rates may have to be re-negotiated especially if there has been a general trend of increment in prices of goods and services in the country.
- Works Specialist has to come back to the drawing board and renegotiate contract sum for sub-letted works.
- Time extension may narrow the profit margin if there is inflation in material costs.

The above mentioned indicate how the contractor is affected if there is delay in the project duration. Assessing the compensation events under the conditions of contract the contractor will definitely look at clauses that strongly support compensation of cost claims.

These are found in clause 44.1 articles D, F and G under section 3 of the PPA's conditions of contract):

- Uncovering of works for further review by the consultant
- Unfavourable ground conditions
- Instruction for dealing with additional works.

The supervising consultant has the duty to inspect major works such as casting of slab to make sure that the contractor is doing the right thing. Again the contractor should also be calling for the daily inspection so that the PM will be aware of the current site situation.

But if the consultant upon the contractor serving notification in written form as stated under the communication clause 6 under section 3 of the PPA's conditions of contract refuses to turn up for inspection before the casting is done, the client would be charged extra cost for the uncovering of finished works supposing there were no defaults. The contractor then would have the legitimate right to charge the client for extra cost caused by the client's representative (clause 44 under section 3 of the PPA's conditions of contract of the PPA).

The contractors view on compensation events may be how this can affect him or how these clauses can help the contractor to claim the right compensation. Also to prioritise which activities are very prevalent so as to take maximum precautions when executing works that may call for such compensation events.

The conditions of contract can have a review with time and cost index. There can be further studies to establish appropriate index, percentage, and figures related to each clause that causes extra cost to the contractor in different forms under the compensation events. This will help the contractor to know how he can go about the compensation events and also the time effects attached to these clauses.

This is because what is practically done on site concerning issues of claims may be different from theory. Experience from the researcher's outfit shows that submission of claims for extra cost to the contractor may be submission of gang number used for the works under the day works section, a material schedule and receipt of materials used. This may actually not reflect the true nature of cost charged to the contractor.

### **2.11.2 Time**

Under the PPA's compensation events, activities that can lead to legitimate extension of time are clearly defined under the clause 44.

These have their critical issues interlacing with cost (Oyegoke, 2006). Although some may grant the contractor legitimate extension of time devoid of any charges of liquidated ascertained and damages.

The following are compensation events which may be grouped under time and these may be found section3, clauses 44.1A, B, C, E, and H of the PPA's conditions of contract for medium contracts):

Delay of site possession date by the client

- Modification of the schedule of works to the detriment of the main contractor.
- Delay of issuing specification, drawings and instructions.
- The PM unreasonably does not approve a subcontract to be let.
- Employers do not work within the stated date i.e.:
  - Advance payment delay.
  - The effects on the contract of any of the employer's risks.

➤ Deliberate delay of certificate of completion.

The above are categories under the time delay section of the compensation events. When claims are issued appropriately for the above stated compensation events, the contractor is entitled to legitimate extension of time when he is not able to complete works within the stipulated contract duration.

A survey by Odeyinka and Kaka (2005), on the impact of payment terms on cash flow found that contractors were dissatisfied with the time lag to receiving payment. This indicates that delay in payments is a general trend in the construction industry which often calls for claims

Interestingly, these delays by the client's party have found its way in the normal practice of payment delay of certificates, issuance of drawings and instructions, delay in site possession dates (Othman et al, 2006 ).

The PPA's compensation events clauses may seem to have less influence on the contractor's claims, especially where certain delay practices are seen as normal in consultancy outfits.

First of all, the delay in honouring of payments of interim certificates has become a canker (Judi and Rashid, 2010), especially in Ghana. Therefore, will there be an appropriate way where delay in payments can be managed to get a satisfactory result for the contractor? Besides, can the works of the contractor be fairly valued and paid the right amount at the right time?

The only provisions the PPA's conditions of contract catered for is that the contractor can make claims of interest on payment if certificates of payments has elapsed for more than 28 days (Clause 43.1 under section 3 of the PPA's conditions of contract).

The whole transaction process between the contractor and the consultants seems to be having a monopoly play of the consultants over the contractor. But what backings does the

compensation events mechanism have to appropriately defend the contractor from unfair delay implications. In assessing the compensation claims, there should be extra mechanisms which have to appropriately back the contractor from not being cheated.

### ***2.11.3 Contractor's Profit***

The timing of payments is said to be a key element of a contractor's profitability performance (Strischek, 1995). Profit of the contractor is the key issue of concern when he enters into any contract. His calculated base rate has a reasonable amount of input as his profit at the end of the project. But the contractor's profit may lose effective value if he does not make effective gain within the stipulated time frame of the project (Balatbat, 2010).

One of the major issues that may cause the contractor to lose a substantive profit margin may be from undue delay of works by the client's party.

When the project is delayed unduly, the project is likely to be faced with increased materials cost, extra payment of hired equipment, payments of both site and office staff. This may adversely affect his profit since he may not have budgeted for the additional time or may have included a minimum percentage of profit in order to win the project.

Under clause 44.1.f, adverse ground conditions which were not reasonably assumed before start of the project could affect the profit of the contractor in either way. When such conditions are met, the negotiation between the contractor and the project manager could be in favour of the contractor by being asked to reasonably price again or execution of works could be valued through admeasure. On the hand, the contractor may be found in a situation where he priced less for adverse ground conditions captured in the bill of quantities. In this situation, the contractor's hope lies in the negotiation with the project manager to readjust the rate to have a favourable profit gain otherwise it would be a lost to the contractor.



Again clause 44.2 of the PPA states that “if a compensation event would cause additional cost, the contract price would be negotiated based on possible increment if agreed. In addition, the project manager will determine technically how much the contract price can be increased and the extent to which the completion date can be adjusted. In this situation, reprising of the contract sum should have a reflection on the contractor’s profit margin if the claims are presented appropriately. On the other hand, whether or not the project manager adjusted a fair increase of the project, cost remains a debatable issue.

Although the profit of the contractor cuts across all the compensation events, these two claims can positively or negatively affect the profit margin of the contractor.

## **2.12 Key Points for Assessment**

Tangible benefits of successful compensation claims can be referred to cost and time savings achieved as a direct result of adopting successful claim processes (Ming, 2008). Assessment of compensation claims can be done through comparing the ways that key contractual practices are handled. Four such key processes are identified – early warning notices, compensation event, claim submission process, managing of claims and aftermath of claims (Williamson, 2007).

### ***2.12.1 Contractor’s Early Warning Notices***

Early warning notices are one of the vital processes in the assessment of compensation claims in the construction industry. This usually starts when the contractor notices a potential risk and informs the project manager. The project manager must to issue an early warning notification in accordance with the contractual procedure. When these warnings are assessed at risk reduction meetings, they should be duplicated and documented for future reference (Ming, 2008).

However, the magnitude of early warning is quite debatable. Accuracy of discovery of early warning may be to how accurate the contractor keeps site documents, internal meeting with the site technical supervisors and corresponding reviews site instructions and schedule of works.

### ***2.12.2 Compensation Event***

Compensation Event is one of the processes where contract notices are issued by the project manager in the event of contract changes upon claims from the contractor that these events have happened and he has suffered a loss. It provides an effective procedure for assessing and agreeing the time and cost effects of the events as they occur and in a timely manner (Williamson, 2007).

The project manager has to refer to the contract itself to find the appropriate clauses to refer to before making any decisions. Some compensation events decisions need to be approved by senior management and agreed by other project partners. Compensation events documents represent alterations to the original contract. They need to be formally issued to all partners involved. For every Compensation event, the partners involved have to maintain an audit trail by logging both incoming and outgoing communications (Ming, 2008). This requires managerial and administrative staff time. It also increases the risks of making mistakes or errors.

### ***2.12.3 Claim Submission Process***

This process reflects the valuation of a potential change (cost and time implication on the contractor). This process indicates the extent to which the contractor's outfit has suffered in terms of cost or time.

The gravity of cost or time delay is evaluated by the contractor's outfit and submitted to the Project manager for assessment. In view of this, the contractor has to identify the event and

the rightful clause which has been breached. Technicalities with submission of the claim are very necessary. Thus the timing of claim submission, the number of times notification has to be sent to the project manager, the evidential facts and the right mode of presentation. Again the right platform where the claim has to be presented should also be considered.

#### ***2.12.4 Managing of Claims***

This is a two way correspondence affair. The project manager should indicate that he has received the claim (Ming, 2008). The project manager then has the onus to review the submitted claim to verify authenticity of the claim. The project manager can choose not to react to the claim or there could be an unintentional negligence. When this happens, the contractor then has to remind the project manager in writing as a reminder notice of the submitted claim for the compensation events that has occurred. This can also reflect in the site meeting minutes.

The contractor in his conducts must show goodwill of not intentionally making the claims when it is avoidable.

#### ***2.12.5 Aftermath of Claims***

Construction industry exists with cordiality amongst the different partners. Submission of compensation claims must be tactically presented. Any contractor who is fond of raising claims at the least event on different projects may be blacklisted as a litigant (Williamson, 2007). Therefore the whole process must be seen as an agreement between the parties to recompense the contractor for the loss suffered due to the actions of the client's party or natural occurrence.

#### ***2.12.6 Claims Review***

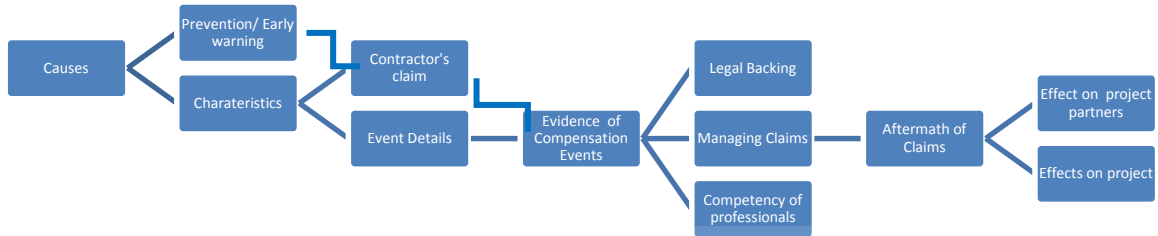
Complaints of claims and additional costs are routinely made during the course of a construction project yet they remain notoriously difficult to prove.

As such, most compensation claims are dealt with retrospectively and the claimant is forced to rely on contemporary records to try and establish a causal effect for identified losses which are all too often inadequate for the purposes of giving evidences for a loss of compensation claims (Nelson, 2011).

The cause and effect burden of proof is the same for a claim so far as the claiming party must first establish that the event or factor causing the disruption is a compensable risk event under the contract. To this effect, the contract needs to be reviewed to understand the basis of the agreement as certain compensation events may have been foreseeable and therefore accounted for within the claimant's productivity allowances (Nelson, 2011). It is unlikely that contractors and subcontractors will succeed where their claims for compensation events are based simply on actions of the client's party or natural occurrences causing extra cost to the client. Sufficient detail is required to isolate the cause of the compensation events complained of and evaluate the effects of that event.

Actions from the client's party that leads to compensation claims affects the contractor's progress of works. Thus mandating the contractor to rightfully claim for losses incurred from the client (Nelson, 2011).

## PRACTICAL ASSESSMENT OF COMPENSATION EVENTS



**Figure 2.1 Contractors Assessment Of Compensation Events**

Assessment of compensation events by contractors as listed above entails a lot of processes and verification. In the assessment, there must be vivid conclusions to how compensation events can be understood and assessed (Cooper, 2004).

From the time the contractor received an award letter, there is a likelihood of encountering compensation events from the very on set. Land disputes and litigation are very common instances in Ghana so there may be a tendency of being handed over a site which has litigation issues (Kissiedu, 2006). When this happens, the correct site possession date may not be set or the contractor may end up with cost of paying idle workers for preliminary stages works as long as cost for furniture is moved on site. Thus the only way to show evidence and also to serve as a reminder is to put into writing to the project manager the due delay and losses incurred financially.

Generally, the side that presents the claim must have substantive proof to support the allegation (Kissiedu, 2006). The dated letters issued as notification from one party to other can be considered as evidence of works delay.

Another important issue too is the provision of schedule of works. When the contractor puts in a claim that he has been delayed unduly, the only proof to show his innocence is the activities with date in the schedule of works. Depending on the type of conditions of contract, the contractor is obliged to hint of early notification, make follow ups on the claims.

Another instance to consider in the assessment of the compensation events is a vindicating sign of good will from the contractor. Thus, was there any evidential proof to indicate that the contractor showed any signs of good will in order to avert the compensation events?

In situations where the contractor is delayed unduly by the attendance of a nominated sub-contractor, the contract can write to the sub-contractor earlier for him to mobilize on site but when the sub-contractor fails to turn up on the arranged date, the contractor can make claims of delays for both extra cost for paying idle workers and undue delay. If the project manager intervenes by advising the contractor to move on with concurrent activities, there could be an indirect risk implication and issued instruction of acceleration of works which were not intended for the particular time (Betts, 1999).

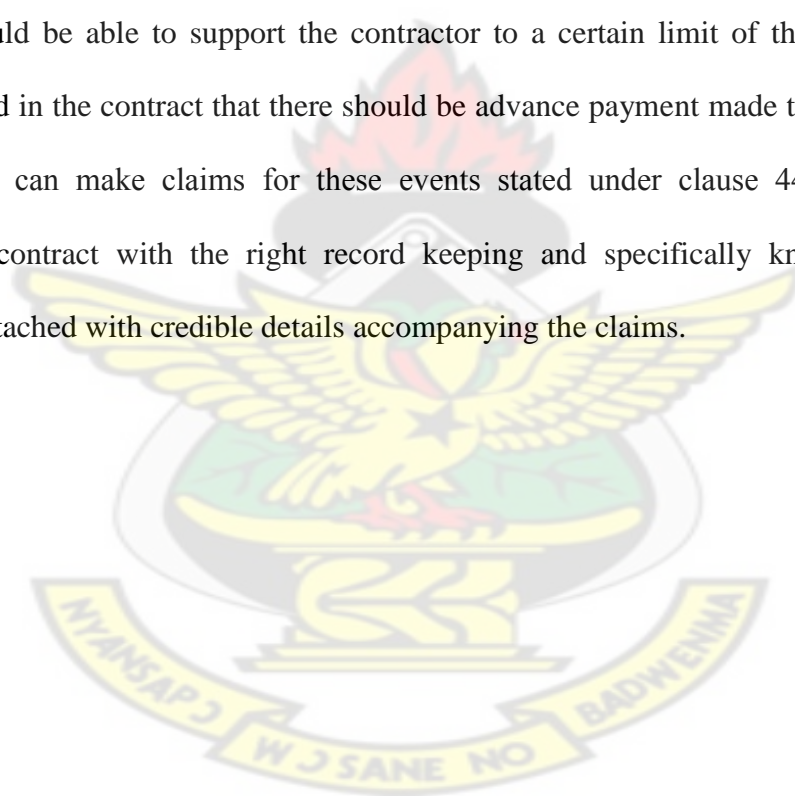
Another instance where the contractor can make claims for compensation events is delay of issuance of drawings. In this case, the contractor can make claims of delay by only producing the date of receipt of the drawing and the drawing number. This shows that, there was a delay in the submission of the drawings and therefore, he needs to be compensated for the delay.

Furthermore, when there is an indication that the structural form up (reinforcement) of an element is questionable, an instruction should be giving by the project manager to the contractor uncover works. If the uncovering proves otherwise, the contractor has to be recompensed for cost of uncovering and delayed time. In this case, the contractor has to attach a copy of the instruction giving by the project manager and also pictorial evidence as prove for compensation claims.



Other delays that need to be proven by written letters, records of receipts and correspondence with the client and the project manager include delay in advance payment, obstructions by public authorities. In Ghana, the lackadaisical attitudes of public authorities can frustrate your program of works, especially when their services are needed to divert a public service line from your site. In this case there has to be constant reminders in a written form sent to their outfit. These letters should again be copied to the client and the project manager and records of dates highlighted too.

The recent provision made in conjunction with advance payment is that the bank of the contractor should be able to support the contractor to a certain limit of the project unless otherwise stated in the contract that there should be advance payment made to the contractor. The contractor can make claims for these events stated under clause 44 of the PPA's conditions of contract with the right record keeping and specifically know what he is claiming for attached with credible details accompanying the claims.



## **CHAPTER THREE**

### **RESEARCH DESIGN AND METHODOLOGY**

#### **3.1 Introduction**

Chapter Two reviewed the literature on significance of compensation events under the PPA's conditions of contract and the assessment of multiple compensation events in practice. This review led to the proposition of the key research questions. The research questions focused on the significance of compensation events under the PPA's conditions of contract and how these events are assessed under the PPA in Ghana. The aim of the research is to identify significant compensation events and how they are assessed under the PPA (Public Procurement Authority's) conditions of contract for medium contracts (Lump sum contracts) in relation to time cost and profit.

This chapter explains the procedures of this study. The significance of compensation events and how they are assessed compensation claims in terms of cost, time and profit will be deduced from the review of the literature and developed into a survey questionnaire. The availability and selection of appropriate research design, strategy and method that will address the key questions raised are presented in the chapter.

#### **3.2 Research Strategy/Approach**

A quantitative strategy will be adopted in this research due to the fact that quantitative research follows a deductive approach in relation to theory and is concerned with the design measurement and sampling (Naoum, 2002). This strategy employs the use of statistical techniques to identify facts and casual relationships. Quantitative research is also objective in nature and based on testing a hypothesis or theory composed of variables (Naoum 2002). Naoum (2002) characterized the common data collection techniques used in quantitative research as questionnaires, tests and existing databases. Hard and reliable data are often

collected in quantitative research and, therefore, emphasizes quantification. The samples collected are often large and representative. This means that quantitative research results can be generalized to a larger population within an acceptable error limits.

The question which this research sorts to explore is to identify significant compensation events and the assessment of these compensation events under the PPA in Ghanaian construction projects from the perspective of consultants, clients and contractors in relation to time, cost and profit.

This assessment would form a basis for significant understanding of compensation events and categorizing compensation claims by contractors profit, time and cost in the Ghanaian construction industry.

### **3.3 Research Design and Its Justification**

Researchers collect evidence when they ask for individual opinion. Further attempts are then made to determine the prevailing opinion within a particular group.

A survey study was deemed appropriate for this research for three reasons (Kissiedu, 2009):

- Survey research involved data collection from a group, generalizing the result of study to predict the attitude of the population of interest;
- The survey questionnaire would be structured to obtain information from the population of interest in a systematic and unbiased manner; and
- They permit statistical analysis of data and generalization to a larger population, which makes them suitable to construction management research.

### **3.4 Sample Design Process**

The purpose of the sample was to gain information about the population by observing only a small proportion, i.e. the sample size.

### ***3.4.1 Population Definition***

The selection of the respondents was limited to only the Clients, D2 Building Contractors, and Consultants comprising mostly Quantity Surveyors and Architects and Clients in the Ashanti and Greater Accra regions.

The choice of this class of building contractors was made on the basis that they are well established firms and are exposed to compensation events issues, disagreements on compensation claims and conflicts by virtue of the type and size of projects they handle.

Furthermore they are the largest class of contractors and they are involved in most of the medium contracts district assemblies and public institutions award. This is due to the fact that the threshold of contracts the district assemblies and other public institutions can award and supervise are mostly within the medium contract categories and any quota that exceeds has to be sent to the regional levels or national tender board.

D1 contractors were not selected because they are very few in the country and they mostly tender for big contracts. Furthermore D3 contractors also were not considered because they normally do not have the prerequisite staffs that do not have knowledge about compensation events and claims.

### ***3.4.2 Sampling Techniques Used***

The non-probability and probability sampling technique were used in the study. In probability sampling, the decision whether a particular element is included in the sample or not, was answered in the questionnaires governed by chance alone. This technique allows each individual to be chosen randomly by chance.

Purposive sampling which is an example of the probability sampling technique was used in identifying the key respondents namely Contractors and Consultants. This was because the researcher required certain categories of respondents who have been involved in a lot of

construction projects and therefore had encountered contractors incurring extra cost due to natural occurrences (force majeure and adverse ground conditions) and the activities of the client and the client's representatives, on construction projects with other stakeholders to make inferences from their judgments

Purposive sampling was also used in the selection of contractors for the study. This resulted in the use of D2 contractors from the Greater Accra and Ashanti regions to be selected since the researcher believed that they are representatives to the population of interest and could give practical and convincing answers to the questions asked. The random sampling technique, as a means of selection, was used to obtain the sample size for consultants and contractors.

### ***3.4.3 Target Population***

The target population for the data collection using the questionnaires consisted of consultancy firms (architectural and quantity surveying) and construction organizations. Building construction organizations operating within Ghana, registered with the Ministry of Water Resource, Works and Housing (MWRWH).

### ***3.4.4 The sample size***

The MWRWH (2011) records on fully registered construction industries in Ghana indicate that there are 380 registered D2 building construction organizations in the Ashanti and Greater Accra Regions of Ghana.

The total number of registered contractor was 380. The sample size was determined using the formula (Kish, 1965).

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

Where

$n^1$  = sample size

N = Total population = 380

S = maximum standard deviation in the population elements

P = proportion of the population elements that belong to the defined category

i.e.  $p = 0.5$  (95% confidence level)

$v$  = standard error of sampling distribution i.e.  $v = 0.05$

Hence solving for  $n^1$

$$s^2 = p(1 - p) = 0.5(0.5) = 0.25$$

$$v^2 = 0.05^2 = 0.0025$$

$$n^1 = \frac{s^2}{v^2}, \quad n^1 = \frac{0.25}{0.0025} = 100$$

$$= \frac{100}{1 + \frac{100}{380}}$$

$n = 80$  this gives the minimum sample size

The sample size formula used above provides the minimum number of responses to be obtained. From previous works done; researchers such as Israel (1992) commonly add 5% increase on the sample size to compensate for non response.

As a result, eighty four (84) D2 building construction organizations were considered. The choice of D2 construction organizations is that, they fall under conditions of contract for medium contracts which is the major data base for this research. Furthermore, their assessment of compensation events will throw more light on impacts of compensation claims in terms of profit gains of the contractor, time influence of the events on the project and its reflection on the total cost of the project. A simple random sampling approach was used to



select the total number of 80 D2 firms for the study. In this approach, every unit had an equal chance of selection (Hoe, 2006).

All 114 fully registered architectural firms (ARCG, 2010) and 60 fully registered quantity surveying firms (GHIS, 2010) in Kumasi and Accra making a total of 174 consultancy firms were considered in the study. The sample size was determined using the formula (Kish, 1965).

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

Where

$n^1$  = sample size

$N$  = Total population = 174

$S$  = maximum standard deviation in the population elements

$P$  = proportion of the population elements that belong to the defined category

i.e.  $p = 0.5$  (95% confidence level)

$v$  = standard error of sampling distribution i.e.  $v = 0.05$

Hence solving for  $n^1$

$$s^2 = p(1 - p) = 0.5(0.5) = 0.25$$

$$v^2 = 0.05^2 = 0.0025$$

$$n^1 = \frac{s^2}{v^2}, \quad n^1 = \frac{0.25}{0.0025} = 100$$

$$= \frac{100}{1 + \frac{100}{174}}$$

$n = 63$  this gives the minimum sample size

Again, there will be an addition 5% increase on the sample size to compensate for non-response.

Thus a total of sixty seven (67) questionnaires would be personally sent (in the case of those offices which were easily located) and those whose offices could not be reached would be telephoned for directions.

Snowball sampling technique, which is an example of a non - probability technique was used to get the number of clients for the study due to the different types of clients available such as the Ministries, Departments, Agencies, Municipal, District Assemblies and Financial institutions. This sample technique is used to initially contact a few potential respondents who are then asked to give names of persons or organizations. Twenty (20) clients were selected from the list obtained from the consultants and contractors.

In all the sample sizes targeted for the study were 67, 20, and 84 for consultants, clients and contractors respectively, making the total of 171.

#### ***3.4.5 Procedure for Data Collection***

A sample of 20 clients, 84 D2 construction organizations and 67 consultancy (architectural and quantity surveying firms) in Accra and Kumasi will be considered for the administration of the questionnaires. The questionnaires are administered through a face-to-face session.

### **3.5 Data Collection**

In order to achieve the objectives: identifying significance compensation events and contractor's assessment of compensation events under the PPA's condition of contract for medium contracts in the Ghanaian construction industry, the study focused on clients, contractors and consultants in the industry. This was because these contact groups are those who are directly confronted with these issues as they occur in the industry.

Based on the objectives and the research questions, a questionnaire was developed to obtain an extensive a collection of data as practicable, from these contractors and consultants. A structured questionnaire will be prepared and self-administered to the various respondents. The questionnaire consisted of closed ended questions.

For the purpose of this study, the questions were grouped under three main categories.

The first is the series related to the respondent's profile which sort to elicit information about the background and experience.

The second category of question is identifying significant compensation events under the PPA and contractor's assessment of compensation events in relation to cost, time and profit.

A 5-point ranking system were used where respondents were asked to rank from the list of twenty five (25) order of importance compensation events that leads to compensation claims under contractors profit, time and cost. Thirteen (13) other questions were asked to know the contractor's knowledge on compensation events.

### **3.6 Responses to Questions**

The questions are expected to be answered as clearly as possible. The respondents were not under any pressure to rush through the questions as they are giving a maximum of one to two weeks to respond to questionnaires. Discussions were held with some of the respondents to obtain further information and reasons for their answers.

### **3.7 Analysis of Data**

A quantitative approach to data analysis was employed for the study. The data collected were edited, sorted, and coded. Statistical Package for Social Scientists, version 16 (SPSS Version 16) and Microsoft excel were then used to analyse the data. Frequency tables, percentages, bar charts and other descriptive are used to analyse the results. The results from these analyses provided the basis for finding out what patterns and common trends run through the responses with respect to the significance of compensation events and contractors'

assessment of these events under the PPA in Ghana. The basis for deviations from the common trends running through the responses will also be established from the analysis.

These were the statistical tools that were used

- **Significant Testing (P-Value Approach):** Significant test (at 95% confidence interval) was conducted on each of the factors which aided in identifying the significant factors for assessment of compensation events and identification of significant compensation events under the Compensation events of the PPA.

- **Relative Importance Index (RII)**  $= \frac{\sum W}{A \times N}$  Where,

**W** = the weighting given to each cause by respondents, ranging from 1 to 4

**A** = the highest weight (i.e. 5 in the study)

**N** = the total number of samples

This was used in ranking the significant factors in terms of degree of importance.

- **Agreement Analysis:** A Kendall rank correlation coefficient (W) which is a non-parametric statistic was used for assessing or evaluating the degree of similarity/agreement between the three sets of ranks to the same set of the probable assessment of compensation events in relation to contractor's profit, time and cost of the project in Ghana. This tool was used to enable the researcher find out whether there is a trend of agreement among the respondents.

$$W = \left[ \frac{\sum_{i=1}^k (R_i - R)^2}{n(n^2 - 1)/12} \right]$$

$n(n^2 - 1)/12$  = the maximum possible squared deviations, i.e. the numerator which will occur if there were perfect agreement among k sets of ranks, and the average ranking were 1,2,3,...n;

$R_i$  = the rank assigned by an individual judge to one factor.

$$0.0 \leq W \leq 1.0$$

**k** = the number of sets of ranking (3), **n** = the number of factors to be ranked (56)

**R** = average of the ranks assigned to the nth factor being ranked

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## **CHAPTER FOUR**

### **DATA PRESENTATION AND ANALYSIS**

#### **4.1 Introduction**

The purpose of this study is to identify significant compensation events in the PPA's conditions of contract in the Ghanaian construction industry. In order to achieve the purpose of the study, a methodology consisting of a review of literature and a survey of construction practitioners to identify significant compensation events in the PPA's conditions of contract in relation to time, cost and profit of the contractor in the Ghanaian construction industry was carried out.

This chapter therefore presents the survey results, analysis of the results and findings of the study.

#### **4.2 Survey Results**

Questionnaires were sent out to 171 personnel, consisting of clients, consultants and contractors of which 124 responses were received which represent 73% response rate. The responses were further analyzed to determine the profile of respondents, the identification of significant compensation events in order of importance and the knowledge on PPA in relation to compensation events. The respondents' position, experience in the industry, whether the respondents have experienced any form of compensation events, and how they identify the significant compensation event in order of importance were some of the major issues of concern.

##### ***4.2.1 Demographic Variables***

According to Table 4.1, out of the 57 consultants surveyed 62% were quantity surveyors with 69% from the contractors' outfit also being quantity surveyors. Also, 14% and 6% of the



consultants and contractors were Project Managers respectively, 5% each of the contractors and consultants were Architects.

The entire clients who took part in the answering of the questionnaires were managing directors.

94% from the contractors' outfit who were surveyed were professionals in the construction field (Architects, Quantity Surveyors, project managers and project engineers).

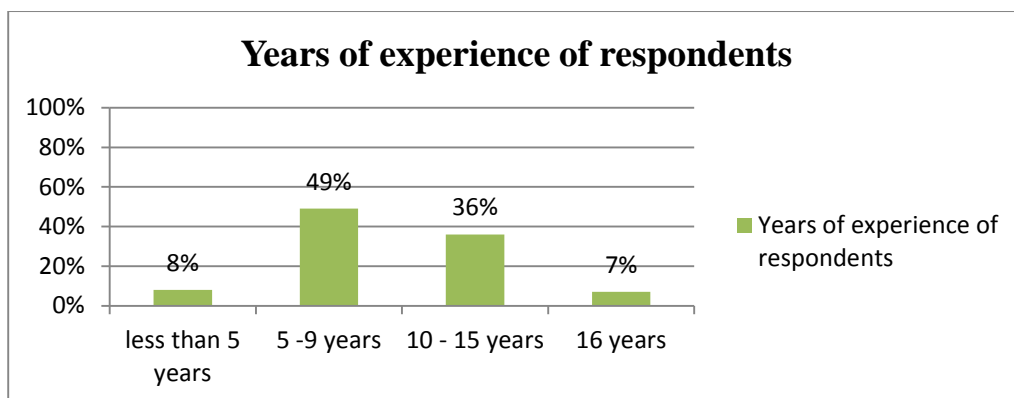
This information indicates that the majority of the respondents were professionals who might give accurate response to the questionnaires.

Majority of the respondents representing about 92% had more than 5-years of experience in the industry. It was necessary to find out the working experience of the respondents in order to ascertain practical and convincing answers to the questions asked since the years of experience of respondents have a greater reflection in the results of a survey. 82% of respondents were found to have experienced compensation events (Refer to Table 4.1), confirming the assertion that they have the capacity to rank the listed events in the questionnaires in order of importance and which ones are more significant to the contractor based on the bench mark of time, cost and profit.

The survey also showed that 10% of events that lead to compensation claims were due to Acts of nature, 60% clients while 30% originated from the consultants.

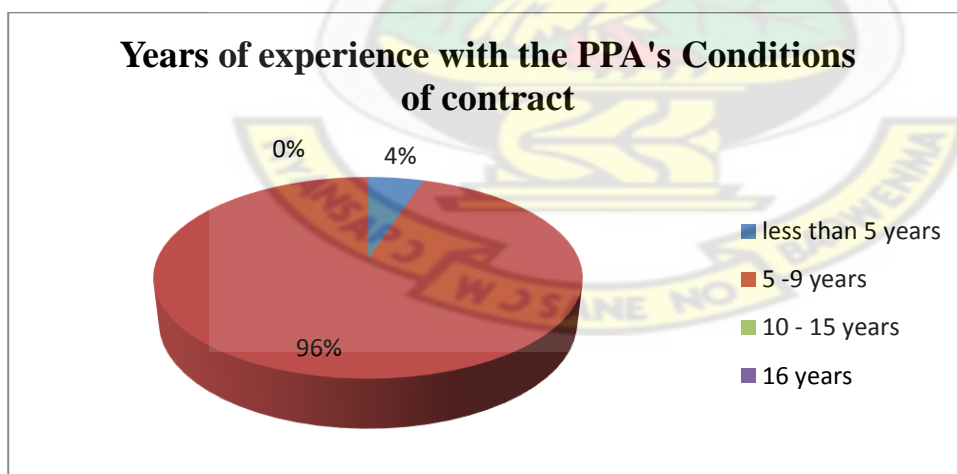
**Table 4.1 Profile of Respondents**

	<b>Client</b>		<b>Consultant</b>		<b>Contractor</b>	
	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>
<b><i>Position</i></b>						
Quantity surveyor	–	–	39	68%	38	70%
Project manager	–	–	8	14%	3	6%
Architect	–	–	5	9%	5	9%
Principal consultant	–	–	–	–	–	–
Managing director	13	100%	–	–	–	–
Contractor	–	–	–	–	3	6%
Engineer	–	–	5	9%	5	9%
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b><i>Years of experience in the Industry</i></b>						
Less than 5 years	–	–	2	4%	8	15%
5 - 9 years	3	23%	16	28%	42	78%
10 - 15 years	9	69%	31	54%	4	7%
16 years and above	1	8%	8	14%	–	–
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b><i>Years of experience with the PPA's conditions of contract</i></b>						
Less than 5 years	–	–	2	4%	4	7%
5 - 9 years	13	100%	55	96%	50	93%
10 - 15 years	–	–	–	–	–	–
16 years and above	–	–	–	–	–	–
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b><i>Have you ever experienced compensation events</i></b>						
Yes	10	77%	45	79%	46	85%
No	3	23%	12	21%	8	15%
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b><i>Origination of compensation events</i></b>						
Act of nature	1	10%	3	7%	6	11%
Client	2	20%	25	56%	25	62%
Consultant	7	70%	17	37%	15	27%
<b>Total</b>	<b>10</b>	<b>100%</b>	<b>45</b>	<b>100%</b>	<b>46</b>	<b>100%</b>



**Figure 4.1 Years of Experience of Respondents**

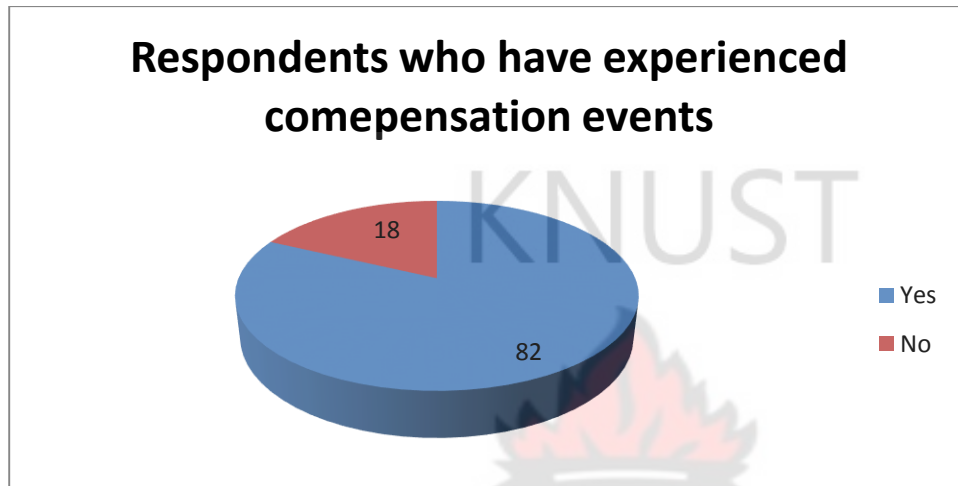
The survey had a response of 8% being less than 5 years working experience, 49% between 5-9 years working experience, 10-15 years having a percentage of 36% and 7% representing respondents with 16 years and above working experience. This gives a clear picture that most of the respondents have working experience between 5- 15 years clearly indicating a substantive age to make true inferences of compensation events and the order of significance in relation to time, cost and profit as shown in figure 4.1. This is also confirmed by Kissiedu (2009), stating that respondents with long term experience give true inference of the results.



**Figure 4.2 Years of Experience With The PPA's Conditions of Contract**

Figure 4.2 above indicates the number of years respondents have worked with the Public Procurement Authority's conditions of contract (PPA) for medium contracts. Majority of the

respondents representing 95% had worked with the PPA between 5-9 years. Significantly indicating that most of the respondents have had experiences for partaking in public contracts, also have the prerequisite experiences to assess its functionality and defects especially in relation to compensation events under the clause 44, section 3 of the PPA.



**Figure 4.3 Respondents Who Have Experienced Compensation Events**

The data from the survey had a majority response of 82% who have experienced compensation events and the remaining 18% responded otherwise. This gives a clear indication that respondents understand the subject being discussed and can make true inferences of compensation events and the order of significance in relation to time, cost and profit.

#### ***4.2.2 Ranking of Significant Compensation Events from All Respondents***

To determine the relative ranking of each group of respondents according to order of importance, the following formula (Tam et al, 2000) was used:

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

**W** = the weighting given to each cause by respondents, ranging from 1 to 5

**A** = the highest weight (i.e. 5 in the study)

$N$  = the total number of samples

This is used in ranking the significant factors in terms of degree of importance.

The values are shown in tables 4.2, 4.3, 4.4.

#### ***4.2.2.1 Consultants' View on Compensation Events in Relation to Cost***

From the field survey as seen in Table 4.2 the five (5) most important events in relation to cost (in order of importance) are identified as follows:

- Variations and late confirmation of variations
- Changes or modification of design
- Acceleration of works requested by client that affected works schedule
- Inaccurate valuation of variations and works in progress
- Cost overruns

Variations and late confirmation of variations were identified as the top most significant event by consultants (Table 4.2) that can increase project cost thereby warranting the contractor to raise claims for compensation when such events causes him extra cost. O'Brien (1998) also emphasised that the contractor may only welcome variation works if only there is an agreed negotiations between him and the client's party on the rate build up or contract figure.

This was followed by changes or modification of design and acceleration of works upon the request of the client which affected works schedule. This was also confirmed by Kissiedu (2009) that construction stakeholders operate in an environment in which their control over a project shifts as the project progresses, in which there are continual demands to deliver projects in a lesser time and lower cost. This is how come it was highlighted as part of the top rankings as an event which can cause extra cost to the contractor. Inaccurate valuation of

variations and works in progress and Cost overruns were the next to be listed respectively. Although insufficient time of compensation event to be notified and submitted and non-agreement of the compensation event between the consultant and the contractor were not highlighted as part of the top significant event. Other respondent indicated they were relevant to cost issues which can lead to claims by the contractor. These cost parameters are the most significant identified cost overruns to the projects.





**Table 4.2 Consultants' View on Compensation Event in Relation to Cost****CONSULTANTS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Cost					Total number of respondent	$\Sigma W$	RII = $\frac{\Sigma W}{(5 \times n)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	3	3	0	34	17	57	230	0.81	2nd
7.2	Failure of the client to honour payment of certificate	2	3	30	12	10	57	196	0.69	16th
7.3	Variations and late confirmation of variations	0	0	6	12	39	57	261	0.92	1st
7.4	Acceleration of works requested by client that affected works schedule	0	4	9	28	16	57	227	0.80	3rd
7.5	Adverse site conditions	0	0	31	12	14	57	211	0.74	8th
7.6	Lack of clarity regarding the time from which contractor can calculate interest on payment	3	5	33	8	8	57	184	0.65	20th
7.7	Disruptions or delays to the works caused by the client	3	3	31	8	12	57	194	0.68	17th
7.8	Non responses of the project manager to compensation claims	0	28	9	14	6	57	194	0.59	24th
7.9	Late responses of the project manager to compensation claims	0	30	8	13	6	57	169	0.58	25th
7.10	Inexperience on the part of the consultant	0	7	9	34	7	57	212	0.74	9th
7.11	Untimely issuance of site instructions	0	0	34	14	9	57	203	0.71	12th
7.12	Unconfirmed oral instructions	0	5	34	0	18	57	202	0.71	13th
7.13	Discrepancies/ambiguities in the contract document	0	8	25	10	14	57	201	0.71	14th
7.14	Delay in supply of working drawings	7	3	13	28	6	57	194	0.68	18th
7.15	Inaccurate valuation of variations and works in progress	0	3	9	29	16	57	229	0.80	4th
7.16	Ineffective communication between the parties on the project	6	7	35	0	9	57	170	0.60	23th
7.17	Remedying defects	3	0	31	12	11	57	199	0.70	15th
7.18	Uncovered defects	3	7	28	14	5	57	182	0.64	22nd
7.19	Poor records keeping by client, contractor and consultant	0	6	30	13	8	57	194	0.68	19th
7.20	Contractors failure to identify and deal with issues on time	0	0	17	33	0	50	183	0.73	11th
7.21	Differences in party interest	0	7	6	39	3	55	203	0.74	10th
7.22	Cost overruns	0	3	9	34	11	57	224	0.79	5th
7.23	Clients with no technical background	0	6	37	7	7	57	186	0.65	21 <sup>st</sup>
7.24	Insufficient time for compensation events to be notified and submitted	0	0	15	36	4	55	209	0.76	7th
7.25	Non - agreement of compensation events between consultants	0	6	6	30	13	55	215	0.78	6th

#### ***4.2.2.2 Consultants' View on Compensation Events in Relation to Time***

From the field survey as seen in Table 4.3 the five (5) most important events in relation to Time (in order of importance) are identified as follows:

- Inexperience on the part of the consultant
- Variations and late confirmation of variations
- Cost overruns
- Inaccurate valuation of variations and works in progress
- Disruptions or delays to the works caused by the client

Consultants again identified inexperience on the part of consultants as the top most priority events that can cause extra cost to the project. This was confirmed by Ahmed et al (2003) stating that lack of experience on the part of the consultant can cause delays on a project, therefore affecting the time delivery of the contractor. Again Variations and late confirmation of variations was also identified as the next event that commonly causes delays to the project which may lead to late delivery of the project by the contractor as already confirmed by O'Brien (1998). Introduction of variation could slow down the progress of works thereby causing the works to be finished late by the contractor. The rest which were next identified, are within the category of events that can cause delays. Therefore if these events occur; it gives the contractor's legitimate right to ask for extension of time or also to make substantive grounds for not being charged with liquidated and ascertained damages. Again consultants considered clients with no technical background, insufficient compensation events to be notified and submitted and non-agreement of compensation event between consultants and the contractor are not very relevant events which can cause delay of the contractor's time of delivery. This confirms what Al-Moumani (2000) said that events which causes compensation claims may be of basic phenomenon but may have divergent relevance from different responses from the construction field.

**Table 4.3 Consultants' View on Compensation Events in Relation to Time****CONSULTANTS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Time					Total number of respondent	$\Sigma W$	$R II = \frac{\Sigma W}{(S \times N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	0	3	5	31	18	57	235	0.82	6th
7.2	Failure of the client to honour payment of certificate	2	0	34	15	6	57	194	0.69	17th
7.3	Variations and late confirmation of variations	0	2	10	12	33	57	253	0.89	2nd
7.4	Acceleration of works requested by client that affected works schedule	0	4	21	13	19	57	208	0.76	12th
7.5	Adverse site conditions	0	3	25	12	17	57	214	0.75	13th
7.6	Lack of clarity regarding the time from which contractor can	6	8	25	12	6	57	175	0.61	24th
7.7	Disruptions or delays to the works caused by the client	0	0	9	31	17	57	236	0.83	5th
7.8	Non responses of the project manager to compensation claims	3	4	26	15	9	57	194	0.68	18th
7.9	Late responses of the project manager to compensation claims	3	0	12	33	9	57	216	0.78	9th
7.10	Inexperience on the part of the consultant	0	0	3	23	31	57	256	0.9	1st
7.11	Untimely issuance of site instructions	3	6	3	11	34	57	238	0.84	4th
7.12	Unconfirmed oral instructions	0	3	20	5	29	57	231	0.81	7th
7.13	Discrepancies/ambiguities in the contract document	3	3	3	37	11	57	221	0.78	10th
7.14	Delay in supply of working drawings	0	3	10	34	10	57	222	0.78	11th
7.15	Inaccurate valuation of variations and works in progress	3	8	28	12	6	57	181	0.64	22nd
7.16	Ineffective communication between the parties on the	0	3	30	10	14	57	206	0.72	14th
7.17	Remedying defects	0	25	6	8	18	57	190	0.67	19th
7.18	Uncovered defects	3	29	9	11	5	57	157	0.55	25th
7.19	Poor records keeping by client, contractor and consultant	3	10	28	3	13	54	173	0.64	23rd
7.20	Contractors failure to identify and deal with issues on time	0	3	9	34	11	57	224	0.79	8th
7.21	Differences in party interest	0	6	34	12	5	57	183	0.67	20th
7.22	Cost overruns	0	6	3	10	38	57	251	0.88	3rd
7.23	Clients with no technical background	0	4	34	14	5	57	191	0.67	21st
7.24	Insufficient time for compensation events to be notified and	0	6	14	31	4	57	198	0.72	15th
7.25	Non - agreement of compensation events between consultants	0	8	13	36	0	57	199	0.7	16th

**Table 4.4: Consultant View on Compensation Events in Relation to Profit****CONSULTANTS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Profit					Total number of respondents	$\Sigma W$	$R_{II} = \frac{\Sigma W}{(S \times N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	5	3	4	12	33	57	236	0.83	2nd
7.2	Failure of the client to honour payment of certificate	8	3	4	8	34	57	228	0.8	5th
7.3	Variations and late confirmation of variations	6	8	0	38	5	57	199	0.7	15th
7.4	Acceleration of works requested by client that affected works schedule	0	10	24	12	11	57	195	0.68	18th
7.5	Adverse site conditions	6	7	28	13	3	57	171	0.6	21st
7.6	Lack of clarity regarding the time from which contractor can	6	6	31	12	2	57	169	0.59	23rd
7.7	Disruptions or delays to the works caused by the client	0	0	12	29	16	57	232	0.81	4th
7.8	Non responses of the project manager to compensation claims	3	3	12	31	8	57	209	0.73	11th
7.9	Late responses of the project manager to compensation claims	0	3	6	19	29	57	245	0.86	1st
7.10	Inexperience on the part of the consultant	13	3	0	16	25	57	208	0.73	12th
7.11	Untimely issuance of site instructions	6	8	3	16	24	57	215	0.75	8th
7.12	Unconfirmed oral instructions	5	3	9	31	9	57	207	0.73	13th
7.13	Discrepancies/ambiguities in the contract document	8	3	34	9	3	57	167	0.59	24th
7.14	Delay in supply of working drawings	11	2	7	24	13	57	197	0.69	17th
7.15	Inaccurate valuation of variations and works in progress	0	6	9	33	9	57	216	0.76	7th
7.16	Ineffective communication between the parties on the project	2	13	12	3	27	57	211	0.74	10th
7.17	Remedying defects	3	4	12	24	14	57	213	0.75	9th
7.18	Uncovered defects	5	3	38	8	3	57	172	0.6	22nd
7.19	Poor records keeping by client, contractor and consultant	3	10	11	21	12	57	200	0.7	16th
7.20	Contractors failure to identify and deal with issues on time	10	0	28	9	10	57	180	0.63	19th
7.21	Differences in party interest	3	10	31	11	0	55	160	0.58	25th
7.22	Cost overruns	0	5	3	37	12	57	227	0.8	6th
7.23	Clients with no technical background	2	7	37	3	8	57	179	0.63	20th
7.24	Insufficient time for compensation events to be notified and submitted	0	3	12	15	25	55	227	0.83	3rd
7.25	Non - agreement of compensation events between consultants and contractor	6	3	0	42	4	57	200	0.73	14th

#### ***4.2.2.3 Consultants' View on Compensation Events in Relation To Profit***

From the field survey as seen in Table 4.4 the five (5) most important events in relation to profit (in order of importance) are identified as follows:

- Late responses of the project manager to compensation claims
- Changes or modification of design
- Insufficient time for compensation events to be notified and submitted
- Disruptions or delays to the works caused by the client
- Failure of the client to honour payment of certificate

The field survey again identified late responses of the project manager to compensation claims as a very significant factor which can affect the contractor's profit. This again was re-emphasised by Al- Moumani (2000) concluding that late deliveries by the project manager can affect the profit of the contractor. This event warrants the contractor to make claims for compensation whenever they occur on a project. The Consultants also identified changes or modification of design as next preceding events which can affect the contractor's profit as confirmed by Kissiedu (2009). The remaining listed above can significantly affect the profit of the contractor. The trend of the less relevant events found at the bottom of the table was similar under the profit category.

#### ***4.2.2.4 Contractors' View on Compensation Events in Relation to Cost***

From the field survey as seen in Table 4.5 the five (5) most important events in relation to Cost (in order of importance) are identified as follows:

- Cost overruns
- Failure of the client to honour payment of certificate
- Disruptions or delays to the works caused by the client



- Discrepancies/ambiguities in the contract document
- Changes or modification of design

Contractors identified Cost overruns as a very significant factor which can affect the cost of the project. This is also confirmed by Steen (2002) that cost overruns can be a subject of expensive and protracted claims and litigation and pose serious risk to the contractor.

The second most identified event which can cause extra cost to the contractor is the client's failure to honour payment of certificate. Ameer (2005) emphasised that if the employer does not pay the contractor within 3 to 5 month it is considered as late or failure of the client to honour payment of certificate and this can affect the expenditure of the contractor as works progresses. These tends to increase contractors cost both overheads and payment of idle workers. Since the payment of certificates are needed to purchase materials for the next stage of construction. Client causing delays, ambiguities in the contract document and changes of design were all ranked as the topmost significant events which cause extra cost to the contractor. Again contractors also did not consider the last 5 events listed in the questionnaires as very relevant issues affecting the cost of the contractor which can lead to compensation claims.

#### ***4.2.2.5 Contractors' View on Compensation Events in Relation to Time***

From the field survey as seen in Table 4.6 the five (5) most important events in relation to Time (in order of importance) are identified as follows:

- Cost overruns
- Changes or modification of design
- Failure of the client to honour payment of certificate
- Delay in supply of working drawings
- Disruptions or delays to the works caused by the client



Contractors identified Cost overruns as a very significant factor which can affect the time of delivery on the project as confirmed by Steen (2002) stating that cost overrun can affect the time delivery of the contractor. The second most identified event which can affect the time delivery of the project is the Changes or modification of design as confirmed by Kissiedu (2009). These tends to slow progress of works especially when there is a cost overrun of intended budget, the contractor may be forced to lay off competent workmen and cut down in-house acceleration of works. Cost overruns were indicated to be mainly blunders from consultants and clients whose action caused the project to exceed its limit thereby causing the project to slow down in progress when the clients is out of funding. This confirms Othman et al. (2006) statement that the actions of the client's team can lead to the project's cost overrun. The preceding events indicated by the contractors contribute to the delay of the project. These events when proven by the contractor as the cause for his extra stay on site can warrant for compensation claims. Again the last 5 events were not considered as relevant under the time category by the contractors.

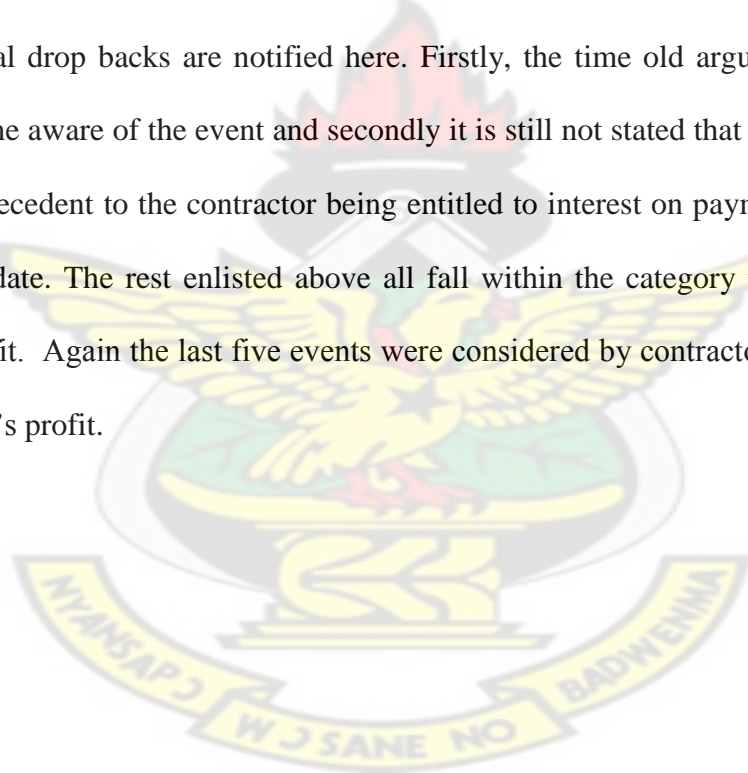
#### ***4.2.2.6 Contractors' View on Compensation Events in Relation to Profit***

From the field survey as seen in Table 4.7 the five (5) most important events in relation to profit (in order of importance) are identified as follows:

- Changes or modification of design
- Lack of clarity regarding the time from which contractor can calculate interest on payments
- Cost overruns
- Non - agreement of compensation events between consultants and contractor
- Disruptions or delays to the works caused by the client

Contractors identified changes and modification of design as the most significant factor which can affect the contractor's profit. When respondents were probed further, they

indicated that with a fixed contract where you cannot charge for fluctuation, any changes made especially with the design can affect the time, cost and profit of the contractors. Contractor's mark-up is fixed based on the project type and duration. Thus the contractor's profit margin can be affected if there are any changes in the project scope therefore confirming the assertion by Kissiedu (2009). The second most identified significant event is lack of clarity regarding the time from which contractor can calculate interest on payments. It is unclear whether the stated 28 days in the PPA is the ideal after which interest can be calculated on payments or whether to start from when the processed interim certificate was forwarded to the finance department for payment. This is re-emphasised by Seeley (2007) that two potential drop backs are notified here. Firstly, the time old argument of when the contractor became aware of the event and secondly it is still not stated that such a notification is a condition precedent to the contractor being entitled to interest on payment or changes to the completion date. The rest enlisted above all fall within the category that can affect the contractor's profit. Again the last five events were considered by contractors as less relevant to the contractor's profit.



**Table 4. 5 Contractors' View on Compensation Events in Relation to Cost****CONTRACTORS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Cost					Total number of respondent	$\Sigma W$	$RII = \frac{\Sigma W}{(S * N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	6	0	3	0	45	54	239	0.9	5th
7.2	Failure of the client to honour payment of certificate	3	3	2	0	46	54	244	0.92	2nd
7.3	Variations and late confirmation of variations	0	8	5	37	4	54	195	0.74	16th
7.4	Acceleration of works requested by client that affected works schedule	5	28	19	2	0	54	94	0.45	25th
7.5	Adverse site conditions	0	0	33	6	15	54	194	0.73	17th
7.6	Lack of clarity regarding the time from which contractor can	1	30	8	2	13	54	157	0.59	21st
7.7	Disruptions or delays to the works caused by the client	1	0	9	5	39	54	242	0.91	3rd
7.8	Non responses of the project manager to compensation claims	3	0	13	35	3	54	185	0.73	18th
7.9	Late responses of the project manager to compensation claims	3	28	6	7	10	54	153	0.58	23rd
7.10	Inexperience on the part of the consultant	1	2	17	2	32	54	223	0.84	7th
7.11	Untimely issuance of site instructions	0	15	12	3	24	54	122	0.81	9th
7.12	Unconfirmed oral instructions	2	3	14	20	15	54	248	0.81	10th
7.13	Discrepancies/ambiguities in the contract document	1	2	3	13	35	54	240	0.91	4th
7.14	Delay in supply of working drawings	5	25	9	0	15	54	156	0.59	22nd
7.15	Inaccurate valuation of variations and works in progress	1	0	8	30	15	54	219	0.83	8th
7.16	Ineffective communication between the parties on the project	0	6	7	28	13	54	206	0.78	11th
7.17	Remedying defects	2	32	6	6	8	54	144	0.54	24th
7.18	Uncovered defects	6	11	3	29	5	54	177	0.67	20th
7.19	Poor records keeping by client, contractor and consultant	2	3	11	33	5	54	193	0.73	19th
7.20	Contractors failure to identify and deal with issues on time	5	3	3	32	11	54	198	0.75	14th
7.21	Differences in party interest	0	5	6	38	5	54	192	0.75	15th
7.22	Cost overruns	0	0	3	10	41	54	249	0.94	1st
7.23	Clients with no technical background	0	8	6	29	11	54	203	0.77	12th
7.24	Insufficient time for compensation events to be notified and	0	5	8	28	13	54	196	0.77	13th
7.25	Non - agreement of compensation events between consultants and contractors	2	5	5	5	37	54	255	0.88	6th

**Table 4. 6 Contractors' View on Compensation Events in Relation to Time****CONTRACTORS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Time					Total number of respondent	$\Sigma W$	$RPI = \frac{\Sigma W}{(S \times N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	1	3	2	8	40	54	245	0.91	2nd
7.2	Failure of the client to honour payment of certificate	3	3	0	3	45	54	246	0.91	3rd
7.3	Variations and late confirmation of variations	1	3	6	15	29	54	230	0.85	8th
7.4	Acceleration of works requested by client that affected works schedule	6	8	6	2	32	54	208	0.77	14th
7.5	Adverse site conditions	1	3	5	32	13	54	215	0.8	9th
7.6	Lack of clarity regarding the time from which contractor can	1	27	11	4	11	54	159	0.59	24th
7.7	Disruptions or delays to the works caused by the client	0	4	6	8	36	54	238	0.88	5th
7.8	Non responses of the project manager to compensation claims	3	6	33	7	5	54	167	0.62	23rd
7.9	Late responses of the project manager to compensation claims	1	3	30	13	7	54	184	0.68	20th
7.10	Inexperience on the part of the consultant	1	0	11	35	7	54	209	0.77	15th
7.11	Untimely issuance of site instructions	1	0	13	30	10	54	210	0.78	13th
7.12	Unconfirmed oral instructions	1	3	5	34	11	54	213	0.79	11th
7.13	Discrepancies/ambiguities in the contract document	4	0	6	9	35	54	233	0.86	6th
7.14	Delay in supply of working drawings	1	0	6	12	35	54	242	0.9	4th
7.15	Inaccurate valuation of variations and works in progress	1	5	8	30	10	54	205	0.76	16th
7.16	Ineffective communication between the parties on the	1	3	5	35	10	54	212	0.79	12th
7.17	Remedying defects	3	35	3	2	11	54	145	0.54	25th
7.18	Uncovered defects	3	16	0	33	2	54	177	0.66	21st
7.19	Poor records keeping by client, contractor and consultant	7	4	3	36	4	54	188	0.7	19th
7.20	Contractors failure to identify and deal with issues on time	0	4	3	35	12	54	217	0.8	10th
7.21	Differences in party interest	3	3	9	32	7	54	199	0.74	17th
7.22	Cost overruns	1	2	3	5	43	54	249	0.92	1st
7.23	Clients with no technical background	1	3	42	0	8	54	173	0.64	22nd
7.24	Insufficient time for compensation events to be notified and	3	5	9	30	7	54	195	0.72	18th
7.25	Non - agreement of compensation events between consultants	3	2	8	3	38	54	233	0.86	7th

**Table 4. 7 : Contractors' View on Compensation Events in Relation to Profit****CONTRACTORS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Profit					Total number of respondent	$\Sigma W$	$RPI = \frac{\Sigma W}{(S \times N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	1	3	0	4	46	54	253	0.94	1st
7.2	Failure of the client to honour payment of certificate	1	7	8	36	2	54	193	0.71	13th
7.3	Variations and late confirmation of variations	4	29	8	11	2	54	140	0.52	23rd
7.4	Acceleration of works requested by client that affected works schedule	4	0	39	1	10	54	175	0.65	18th
7.5	Adverse site conditions	3	2	33	4	12	54	182	0.67	17th
7.6	Lack of clarity regarding the time from which contractor can calculate interest on profit	1	0	13	2	38	54	238	0.88	2nd
7.7	Disruptions or delays to the works caused by the client	6	0	9	7	32	54	221	0.82	5th
7.8	Non responses of the project manager to compensation claims	0	0	37	9	8	54	187	0.69	16th
7.9	Late responses of the project manager to compensation claims	1	0	28	18	7	54	192	0.71	14th
7.10	Inexperience on the part of the consultant	3	25	14	5	7	54	150	0.56	21st
7.11	Untimely issuance of site instructions	1	30	9	2	12	54	156	0.58	20th
7.12	Unconfirmed oral instructions	5	28	7	9	5	54	143	0.53	22nd
7.13	Discrepancies/ambiguities in the contract document	1	0	5	43	5	54	213	0.73	11th
7.14	Delay in supply of working drawings	7	33	8	0	6	54	127	0.47	25th
7.15	Inaccurate valuation of variations and works in progress	2	2	4	38	8	54	210	0.78	7th
7.16	Ineffective communication between the parties on the	2	0	10	35	7	54	207	0.77	8th
7.17	Remedying defects	2	35	3	11	3	54	140	0.52	24th
7.18	Uncovered defects	4	10	7	5	28	54	205	0.76	9th
7.19	Poor records keeping by client, contractor and consultant	5	0	15	30	4	54	190	0.7	15th
7.20	Contractors failure to identify and deal with issues on time	2	3	6	36	7	54	205	0.76	10th
7.21	Differences in party interest	0	8	6	36	4	54	198	0.73	12th
7.22	Cost overruns	0	7	4	10	33	54	231	0.86	3rd
7.23	Clients with no technical background	5	4	32	0	13	54	174	0.64	19th
7.24	Insufficient time for compensation events to be notified and	0	8	8	10	28	54	220	0.81	6th
7.25	Non - agreement of compensation events between consultants and contractor	0	3	13	7	31	54	228	0.84	4th



**Table 4.8 Clients' View on Compensation Events in Relation to Cost****CLIENTS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Cost					Total number of respondent	$\Sigma W$	$RII = \frac{\Sigma W}{(S * N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	1	2	8	2	0	13	37	0.57	21st
7.2	Failure of the client to honour payment of certificate	1	1	2	3	6	13	51	0.78	4th
7.3	Variations and late confirmation of variations	1	0	1	6	5	13	53	0.82	3rd
7.4	Acceleration of works requested by client that affected works schedule	5	0	1	2	5	13	41	0.63	12th
7.5	Adverse site conditions	1	0	1	11	0	13	48	0.74	7th
7.6	Lack of clarity regarding the time from which contractor can	3	1	6	0	3	13	38	0.58	18th
7.7	Disruptions or delays to the works caused by the client	2	2	4	2	3	13	41	0.43	14th
7.8	Non responses of the project manager to compensation claims	1	1	0	11	0	13	47	0.72	8th
7.9	Late responses of the project manager to compensation claims	1	0	1	1	10	13	58	0.89	1st
7.10	Inexperience on the part of the consultant	1	3	8	1	0	13	35	0.54	22nd
7.11	Untimely issuance of site instructions	1	2	8	0	2	13	39	0.6	16th
7.12	Unconfirmed oral instructions	4	2	0	5	2	13	38	0.58	19th
7.13	Discrepancies/ambiguities in the contract document	1	2	2	7	1	13	44	0.68	9th
7.14	Delay in supply of working drawings	3	2	1	5	2	13	40	0.62	15th
7.15	Inaccurate valuation of variations and works in progress	2	1	2	7	1	13	43	0.66	10th
7.16	Ineffective communication between the parties on the	2	3	7	1	0	13	33	0.51	23rd
7.17	Remedying defects	0	12	1	0	0	13	27	0.42	25th
7.18	Uncovered defects	0	0	3	10	0	13	49	0.75	6th
7.19	Poor records keeping by client, contractor and consultant	0	3	0	0	10	13	56	0.86	2nd
7.20	Contractors failure to identify and deal with issues on time	0	2	8	1	2	13	42	0.65	11th
7.21	Differences in party interest	1	8	2	2	0	13	31	0.48	24th
7.22	Cost overruns	3	1	2	5	2	13	41	0.63	13th
7.23	Clients with no technical background	1	3	6	2	1	13	38	0.58	20th
7.24	Insufficient time for compensation events to be notified and	1	2	7	2	1	13	39	0.6	17th
7.25	Non - agreement of compensation events between consultants	1	1	1	7	3	13	49	0.75	5th



#### ***4.2.2.7 Clients' View on Compensation Events in Relation to Cost***

From the field survey as seen in Table 4.8 the five (5) most important events in relation to cost (in order of importance) are identified as follows:

- Late responses of the project manager to compensation claims
- Poor records keeping by client, contractor and consultant
- Variations and late confirmation of variations
- Failure of the client to honour payment of certificate
- Non - agreement of compensation events between consultants and contractor

Clients identified late responses of the project manager to compensation claims as a very significant factor which can increase the project cost. Al-Moumani (2000) highlighted that late responses by management can affect the cost of the contractor. The next in line is poor records keeping by all the parties followed by variations and late confirmation of variations. The clients also placed late payment of contractor's certificate as fourth significant event that can increase cost. This is confirmed by Oyegoke (2006) that increase in contractors cost is due to poor record keeping by the client, contractor and consultant and this can also affect the claim of the contractor. Variations and late confirmation of variation which is the third listed event under cost was confirmed by O'Brien (1998) as a major event that can cause extra cost to the contractor. Failure of the client to honour payment of certificate was considered as the fourth listed event which could cause extra cost to the contractor. Ameer (2005) emphasised that if the contractor is not paid on time he could incur more cost.

Non agreement of compensation events between consultants and contractors was placed as the fifth significant events that can cause the contractor extra cost. This is emphasised by Judi and Rashid (2010) that non-payment of the contractors claim or non-agreement of compensation events could increase a cost of the contractor. From the client's perception, it

was affirmed that his team could contribute to extra project cost there by increasing the cost of the contractor as well.

#### ***4.2.2.8 Clients' View on Compensation Events in Relation to Time***

From the field survey as seen in Table 4.9 the five (5) most important events in relation to Time (in order of importance) are identified as follows:

- Acceleration of works requested by client that affected works schedule
- Differences in party interest
- Ineffective communication between the parties on the project
- Late responses of the project manager to compensation claims
- Contractors failure to identify and deal with issues on time

The clients identified acceleration of works requested by the clients that affected works schedule as the topmost event that can affect the project time delivery. Requested acceleration can alter the contractors' initial programme of works as he did not intend to increase pace initially. The contractor would have to reorganise his schedule to meet the acceleration schedules. By reorganising the whole programme, certain activities that were intended to take place initially could be pushed further only to embark on it later. The contractor would have to reorganise schedules with suppliers, sub-contractors and other works specialist. This can cause a great deal of delay especially when the contractor has to revisit works schedule which were taken out of the programme to enable acceleration and also valuing of works by the contractor to be paid could take an immense time to finish since all the activities were done in a haste. This is confirmed by Stipanowich (1998) that any action genuine or ignorant which may cause extra cost and delay may lead to vehement reactions from the contractor. Again the next event identified was differences in parties

followed by ineffective communication between the project parties. This is confirmed by Shoyilekov (2003) that the strong relationships and trust between the client, contractors and consultants has been replaced with growing distrust and conflict, thus each party guards his interest gains at the end of the project. Late responses of the project manager to compensation claims and late identification of the events by the contractors were the identified by clients as events that can affect the time delivery of the contractor on the project. This is confirmed by Al-Moumani (2000) as explained earlier on.



**Table 4. 9 Clients' View on Compensation Events in Relation to Time****CLIENTS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION IN ORDER OF IMPORTANCE**

Relative Importance: 1 - Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Time					Total number of respondent	$\Sigma W$	$RII = \frac{\Sigma W}{(S * N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	1	0	2	10	0	13	47	0.72	10th
7.2	Failure of the client to honour payment of certificate on time	1	0	11	1	0	13	38	0.58	21st
7.3	Variations and late confirmation of variations	3	0	2	7	1	13	42	0.65	17th
7.4	Acceleration of works requested by client that affected works schedule	1	0	2	10	0	13	47	72	1st
7.5	Adverse site conditions	3	0	2	7	1	13	42	0.65	18th
7.6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	1	1	0	11	0	13	47	0.72	11th
7.7	Disruptions or delays to the works caused by the client	1	0	1	11	0	13	48	0.74	8th
7.8	Non responses of the project manager to compensation claims	3	0	4	6	0	13	39	0.6	20th
7.9	Late responses of the project manager to compensation claims	1	1	1	0	10	13	56	0.86	4th
7.10	Inexperience on the part of the consultant	2	0	2	8	1	13	45	0.69	14th
7.11	Untimely issuance of site instructions	1	3	1	7	1	13	43	0.66	16th
7.12	Unconfirmed oral instructions	3	0	4	6	0	13	39	0.6	20th
7.13	Discrepancies/ambiguities in the contract document	1	1	2	5	4	13	49	0.75	7th
7.14	Delay in supply of working drawings	1	0	1	11	0	13	48	0.74	9th
7.15	Inaccurate valuation of variations and works in progress	3	2	1	5	2	13	40	0.62	19th
7.16	Ineffective communication between the parties on the project	1	0	1	1	10	13	58	0.89	3rd
7.17	Remedying defects	1	3	8	1	0	13	35	0.54	23th
7.18	Uncovered defects	1	4	0	3	5	13	46	0.71	12th
7.19	Poor records keeping by client, contractor and consultant	1	2	0	6	2	11	39	0.71	13th
7.20	Contractors failure to identify and deal with issues on time	1	0	2	4	6	13	53	0.82	5th
7.21	Differences in party interest	1	0	0	0	12	13	61	0.94	2nd
7.22	Cost overruns	1	3	1	3	5	13	47	0.72	11th
7.23	Clients with no technical background	1	3	1	8	0	13	42	0.65	17th
7.24	Insufficient time for compensation events to be notified and submitted	1	2	2	7	1	13	44	0.68	15th
7.25	Non - agreement of compensation events between consultants and contractor	6	1	0	1	5	13	37	0.57	22nd

**Table 4.10 Clients' View on Compensation Events in Relation to Profit****CLIENTS' RESPONSE ON IDENTIFYING SIGNIFICANT COMPENSATION IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Profit					Total number of respondent	$\Sigma W$	$RII = \frac{\Sigma W}{(S \cdot N)}$	Rank
		1	2	3	4	5				
7.1	Changes or modification of design	1	2	4	1	5	13	46	0.71	10th
7.2	Failure of the client to honour payment of certificate	1	2	0	3	7	13	52	0.8	2nd
7.3	Variations and late confirmation of variations	1	2	4	3	6	16	59	0.74	4th
7.4	Acceleration of works requested by client that affected works schedule	1	6	2	3	1	13	36	0.55	19th
7.5	Adverse site conditions	2	4	4	2	1	13	35	0.54	20th
7.6	Lack of clarity regarding the time from which contractor can	1	0	5	5	2	13	46	0.71	11th
7.7	Disruptions or delays to the works caused by the client	2	7	2	2	0	13	30	0.46	25th
7.8	Non responses of the project manager to compensation claims	1	3	6	3	0	13	37	0.57	18th
7.9	Late responses of the project manager to compensation claims	1	1	1	8	2	13	48	0.74	5th
7.10	Inexperience on the part of the consultant	1	1	2	3	6	13	51	0.78	3rd
7.11	Untimely issuance of site instructions	1	2	2	8	0	13	43	0.66	13th
7.12	Unconfirmed oral instructions	1	3	3	6	0	13	40	0.62	16th
7.13	Discrepancies/ambiguities in the contract document	5	3	0	5	0	13	31	0.48	24th
7.14	Delay in supply of working drawings	1	1	2	7	2	13	47	0.72	8th
7.15	Inaccurate valuation of variations and works in progress	1	3	3	6	0	13	40	0.62	17th
7.16	Ineffective communication between the parties on the	1	1	6	2	3	13	44	0.68	12th
7.17	Remedying defects	1	3	8	1	0	13	35	0.54	21st
7.18	Uncovered defects	1	1	7	3	1	13	41	0.63	15th
7.19	Poor records keeping by client, contractor and consultant	1	2	2	8	0	13	43	0.66	14th
7.20	Differences in party interest	1	1	2	7	2	13	47	0.72	9th
7.21	Contractors failure to identify and deal with issues on time	4	3	1	5	0	13	33	0.51	23rd
7.22	Cost overruns	1	1	4	2	5	13	48	0.74	6th
7.23	Clients with no technical background	1	3	8	1	0	13	35	0.54	22nd
7.24	Insufficient time for compensation events to be notified and submitted	0	0	0	0	13	13	65	1	1st
7.25	Non - agreement of compensation events between consultants	1	0	1	11	0	13	48	0.74	7th

#### ***4.2.2.9 Clients' View on Compensation Events in Relation to Profit***

From the field survey as seen in Table 4.10 the five (5) most important events in relation to Time (in order of importance) are identified as follows:

- Insufficient time for compensation events to be notified and submitted
- Failure of the client to honour payment of certificate
- Inexperience on the part of the consultant
- Variations and late confirmation of variations
- Late responses of the project manager to compensation claims

Clients further identified insufficient time for compensation events to be notified and submitted as the topmost significant event that can affect the profit of the contractor. This is confirmed by Williamson (2007) that normally the contractor does not have enough time to evaluate activities that could affect his profit. He also stated that the attention of the contractor on rare cases could be drawn on a possible compensation claim by the project manager. This issue does not give the contractor ample time to investigate the extent of cost he has incurred. The next identified event was failure of the client to pay the contractor and this could have adverse effect on the profit of the contractor. This is confirmed by Ameer (2005) as an event that could affect the profit of the contractor. Variations and late confirmation of variations and late responses of the project manager to compensation claims were further identified by the clients as events that can affect the profit of the contractor. This is confirmed by O'Brien (1998) as an event that can also affect the profit of the contractor.

#### **4.3 Agreement Analysis**

To investigate the agreement of the rank correlation between the three groups of respondents, a non - parametric statistical method, the Kendall's coefficient of concordance (W) was used for assessing agreement among the clients, consultants and contractors on how they ranked



the 25 events listed to be identified in order of significance under time, cost and profit of the contractor.

$$W = [\sum_{i=1}^k (R_i - R)^2 / n(n^2 - 1) / 12]$$

The value of coefficient of concordance (**W**), express the degree of agreement amongst the three groups of respondents in their opinion on the potential causes of construction disputes.

A coefficient of  $W = 1$  indicates a perfect agreement and zero (0) indicates no agreement.

Intermediate values of  $W$  indicate a greater or lesser degree of agreement among the various responses.

#### ***4.3.1 Agreement Level between Clients, Consultants and Contractors under Profit***

$$\sum_{i=1}^k (R_i - R)^2 = 1300$$

$$n(n^2 - 1) / 12 = 1300$$

$$W = 1300 / 1300$$

$$W = 1 \text{ (table 4.19)}$$

This indicate that there is a perfect agreement between clients, consultants and contractors (Table 4.19)

The value of  $W$  obtained from calculation is 1. This result therefore shows that there is a perfect level of agreement beyond chance alone amongst the respondents consisting of clients, consultants and contractors hence there is no bias on how respondents ranked the 25 events to identify in order significance.

#### ***4.3.2 Agreement level between Clients, Consultants and Contractors under time***

$$\sum_{i=1}^k (R_i - R)^2 = 1165$$

$$n(n^2 - 1) / 12 = 1300$$

$$W = 1165 / 1300$$

$$W = 0.89 \text{ (table 4.19)}$$

This indicate that there is a strong agreement between clients, consultants and contractors (Table 4.19)

The value of W obtained from calculation is 0.89. This result therefore shows that there is heading towards perfect level of agreement beyond chance alone amongst the respondents consisting of clients, consultants and contractors hence there is no bias on how respondents ranked the 25 events to identify in order significance.

#### ***4.3.3 Agreement level between Clients, Consultants and Contractors under Cost***

$$\sum_{i=1}^k (R_i - R)^2 = 1289$$

$$n(n^2 - 1)/12] = 1300 \quad W = 1289/1300 \quad W = 0.99 \text{ (table 4.19)}$$

This indicated that there is a strong agreement between clients, consultants and contractors (Table 4.19)

The value of W obtained from calculation is 0.99. This result therefore shows that there is a perfect level of agreement beyond chance alone amongst the respondents consisting of clients, consultants and contractors hence there is no bias on how respondents ranked the 25 events to identify in order significance.

##### ***4.3.3.1 All Respondents View on Compensation Events in Relation to Time***

From the field survey as seen in Table 4.11 the five (5) most important events in relation to Time (in order of importance) are identified as follows:

- Changes or modification of design
- Cost overruns
- Disruptions or delays to the works caused by the client
- Discrepancies/ambiguities in the contract document
- Contractors failure to identify and deal with issues on time

Majority of the respondents placed changes or modification of design as the topmost event which affects time in relation to compensation events. This was followed by Cost overruns. Disruptions or delays to works caused by the client were also considered as major factors that affect time when they occur during the project duration. Further, Ambiguities in the contract document was also highlighted as the major cause which can affect contractor's time on the project. When the contractors fail to identify and deal with issues on time, it tends to affect their time delivery of the project.



**Table 4.11 All Responses Identifying Compensation Events under Time****ALL RESPONSES ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	TIME					Total number of respondent	$\Sigma W$	RII = $\frac{\Sigma W}{(S * N)}$	Rank
		1	2	3	4	5				
1	Changes or modification of design	2	6	7	45	64	124	525	0.83	1 <sup>st</sup>
2	Failure of the client to honour payment of certificate	4	7	53	52	8	124	435	0.69	13 <sup>th</sup>
3	Variations and late confirmation of variations	7	31	20	30	36	124	418	0.67	17 <sup>th</sup>
4	Acceleration of works requested by client that affected works schedule	5	4	62	24	27	124	417	0.68	16 <sup>th</sup>
5	Adverse site conditions	6	5	60	23	30	124	429	0.69	14 <sup>th</sup>
6	Lack of clarity regarding the time from which contractor can calculate interest on payments	8	9	38	25	44	124	448	0.72	9 <sup>th</sup>
7	Disruptions or delays to the works caused by the client	7	0	19	49	49	124	498	0.8	3 <sup>rd</sup>
8	Non responses of the project manager to compensation claims	6	4	67	30	17	124	412	0.66	19 <sup>th</sup>
9	Late responses of the project manager to compensation claims	5	1	41	51	26	124	465	0.75	6 <sup>th</sup>
10	Inexperience on the part of the consultant	5	25	19	36	39	124	446	0.72	10 <sup>th</sup>
11	Untimely issuance of site instructions	5	39	13	20	47	124	426	0.69	15 <sup>th</sup>
12	Unconfirmed oral instructions	8	31	31	20	34	124	399	0.64	20 <sup>th</sup>
13	Discrepancies/ambiguities in the contract document	5	4	10	85	20	124	478	0.77	4 <sup>th</sup>
14	Delay in supply of working drawings	8	36	19	45	16	124	383	0.62	23 <sup>rd</sup>
15	Inaccurate valuation of variations and works in progress	8	12	33	55	16	124	413	0.67	18 <sup>th</sup>
16	Ineffective communication between the parties on the project	3	3	41	46	31	124	462	0.75	7 <sup>th</sup>
17	Remedying defects	3	63	17	20	21	124	312	0.5	25 <sup>th</sup>
18	Uncovered defects	8	43	16	19	38	124	348	0.56	24 <sup>th</sup>
19	Poor records keeping by client, contractor and consultant	8	12	46	41	17	124	395	0.64	21 <sup>st</sup>
20	Contractors failure to identify and deal with issues on time	1	12	40	48	21	124	473	0.76	5 <sup>th</sup>
21	Differences in party interest	1	12	40	48	21	124	433	0.71	11 <sup>th</sup>
22	Cost overruns	1	16	8	23	76	124	516	0.83	2 <sup>nd</sup>
23	Clients with no technical background	6	11	67	22	18	124	393	0.63	22 <sup>nd</sup>
24	Insufficient time for compensation events to be notified and submitted	1	16	24	48	35	124	459	0.74	8 <sup>th</sup>
25	Non - agreement of compensation events between consultants	6	12	26	44	36	124	442	0.71	12 <sup>th</sup>

**Table 4.12 All Responses Identifying Compensation Events under Cost**  
**ALL RESPONSES ON IDENTIFYING SIGNIFICANT COMPENSATION**  
**EVENTS IN ORDER OF IMPORTANCE**  
Relative Importance: 1 - Not important, 2 - Quite important 3 - Moderately Important,  
4 - Important, 5 - Very Important

	EVENTS	COST					Total number of respondent	$\Sigma W$	RII= $\frac{\Sigma W}{(S \times N)}$	Rank
		1	2	3	4	5				
1	Changes or modification of design	10	5	11	36	62	124	509	0.82	2 <sup>nd</sup>
2	Failure of the client to honour payment of certificate	6	7	34	15	62	124	486	0.78	5 <sup>th</sup>
3	Variations and late confirmation of variations	1	8	12	55	48	124	496	0.8	3 <sup>rd</sup>
4	Acceleration of works requested by client that affected works schedule	10	32	29	32	21	124	338	0.55	22 <sup>nd</sup>
5	Adverse site conditions	1	0	65	29	29	124	456	0.74	10 <sup>th</sup>
6	Lack of clarity regarding the time from which contractor can calculate interest on payments	7	36	47	10	24	124	315	0.51	24 <sup>th</sup>
7	Disruptions or delays to the works caused by the client	5	4	41	20	54	124	483	0.78	6 <sup>th</sup>
8	Non responses of the project manager to compensation claims	4	29	22	60	9	124	415	0.67	16 <sup>th</sup>
9	Late responses of the project manager to compensation claims	4	58	15	21	26	124	325	0.52	23 <sup>rd</sup>
10	Inexperience on the part of the consultant	2	12	34	37	39	124	467	0.75	9 <sup>th</sup>
11	Untimely issuance of site instructions	1	17	54	17	35	124	409	0.66	17 <sup>th</sup>
12	Unconfirmed oral instructions	6	10	48	25	35	124	437	0.7	14 <sup>th</sup>
13	Discrepancies/ambiguities in the contract document	2	12	30	30	50	124	482	0.78	7 <sup>th</sup>
14	Delay in supply of working drawings	15	30	23	33	23	124	336	0.58	21 <sup>st</sup>
15	Inaccurate valuation of variations and works in progress	3	4	19	66	32	124	491	0.79	4 <sup>th</sup>
16	Ineffective communication between the parties on the project	8	16	49	29	22	124	393	0.63	19 <sup>th</sup>
17	Remedying defects	5	44	38	18	19	124	309	0.5	25 <sup>th</sup>
18	Uncovered defects	9	18	34	53	10	124	390	0.63	20 <sup>th</sup>
19	Poor records keeping by client, contractor and consultant	2	12	41	46	23	124	444	0.72	12 <sup>th</sup>
20	Contractors failure to identify and deal with issues on time	5	7	32	67	13	124	443	0.71	13 <sup>th</sup>
21	Differences in party interest	1	22	14	79	8	124	428	0.7	15 <sup>th</sup>
22	Cost overruns	3	4	14	49	54	124	516	0.83	1 <sup>st</sup>
23	Clients with no technical background	1	17	49	38	19	124	412	0.66	18 <sup>th</sup>
24	Insufficient time for compensation events to be notified and submitted	2	7	31	66	18	124	451	0.73	11 <sup>th</sup>
25	Non - agreement of compensation events between consultants	4	13	16	38	53	124	485	0.78	8 <sup>th</sup>

#### ***4.3.3.2 All Respondents View on Compensation Events in Relation to Cost***

From the field survey as seen in Table 4.12 the five (5) most important events in relation to time (in order of importance) are identified as follows:

- Cost overruns
- Changes or modification of design
- Variations and late confirmation of variations
- Inaccurate valuation of variations and works in progress
- Failure of the client to honour payment of certificate

Cost overruns were categorised as the most significant event under cost by majority of the respondents. This was followed by changes or modification of design. Variations and late confirmation of variations was also listed as the third most significant event under cost. Inaccurate valuation of variations and failure of the client to honour payment of certificate were also prioritised as event that can affect cost

#### ***4.3.3.3 All Respondents View on Compensation Events in Relation to Profit***

From the field survey as seen in Table 4.13 the five (5) most important events in relation to profit (in order of importance) are identified as follows:

- Changes or modification of design
- Insufficient time for compensation events to be notified and submitted
- Disruptions or delays to the works caused by the client
- Cost overruns
- Late responses of the project manager to compensation claims



Changes or modification of design was the topmost event identified by the majority of the respondents that can affect the profit of the contractor. Further, insufficient time for compensation events to be notified was secondly placed under events that could affect the contractor's profit. Cost overruns also followed in the ranking. Again late response of the project manager to compensation events was also highlighted as an event that can affect the profit of the contractors.

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**Table 4.13 All Responses Identifying Compensation Events under Profit****ALL RESPONSES ON IDENTIFYING SIGNIFICANT COMPENSATION EVENTS IN ORDER OF IMPORTANCE**

Relative Importance: 1 - Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	PROFIT					Total number of respondent	$\Sigma W$	$RII = \frac{\Sigma W}{(S \times N)}$	Rank
		1	2	3	4	5				
1	Changes or modification of design	7	8	8	17	84	124	524	0.85	1 <sup>st</sup>
2	Failure of the client to honour payment of certificate	10	12	12	47	43	124	451	0.73	9 <sup>th</sup>
3	Variations and late confirmation of variations	11	36	12	52	13	124	337	0.53	22 <sup>nd</sup>
4	Acceleration of works requested by client that affected works schedule	5	16	65	16	22	124	409	0.66	14 <sup>th</sup>
5	Adverse site conditions	11	13	65	19	16	124	379	0.61	17 <sup>th</sup>
6	Lack of clarity regarding the time from which contractor can calculate interest on payments	8	6	49	19	42	124	447	0.72	10 <sup>th</sup>
7	Disruptions or delays to the works caused by the client	8	7	23	38	48	124	487	0.79	3 <sup>rd</sup>
8	Non responses of the project manager to compensation claims	4	6	55	43	16	124	429	0.69	12 <sup>th</sup>
9	Late responses of the project manager to compensation claims	2	4	35	45	38	124	485	0.78	5 <sup>th</sup>
10	Inexperience on the part of the consultant	17	29	16	24	38	124	348	0.56	19 <sup>th</sup>
11	Untimely issuance of site instructions	8	40	14	26	36	124	342	0.55	20 <sup>th</sup>
12	Unconfirmed oral instructions	11	34	19	46	14	124	333	0.54	21 <sup>st</sup>
13	Discrepancies/ambiguities in the contract document	14	6	39	57	8	124	399	0.64	15 <sup>th</sup>
14	Delay in supply of working drawings	19	36	17	31	21	124	300	0.48	24 <sup>th</sup>
15	Inaccurate valuation of variations and works in progress	3	11	16	77	17	124	463	0.75	6 <sup>th</sup>
16	Ineffective communication between the parties on the	5	14	28	40	37	124	461	0.74	8 <sup>th</sup>
17	Remedying defects	6	42	23	36	17	124	316	0.51	23 <sup>rd</sup>
18	Uncovered defects	10	14	52	16	32	124	396	0.396	25 <sup>th</sup>
19	Poor records keeping by client, contractor and consultant	9	12	28	59	16	124	434	0.7	11 <sup>th</sup>
20	Contractors failure to identify and deal with issues on time	13	4	36	52	19	124	417	0.67	13 <sup>th</sup>
21	Differences in party interest	7	21	38	52	19	124	368	0.6	18 <sup>th</sup>
22	Cost overruns	1	13	11	49	50	124	491	0.79	4 <sup>th</sup>
23	Clients with no technical background	8	14	77	4	21	124	382	0.62	16 <sup>th</sup>
24	Insufficient time for compensation events to be notified and submitted	0	13	20	25	66	124	500	0.81	2 <sup>nd</sup>
25	Non - agreement of compensation events between consultants	7	8	14	60	35	124	467	0.75	7 <sup>th</sup>

#### **4.4 Determination of Significant Factors that Affect the Time, Cost and Profit of the Contractor, in Relation to Compensation Events in The Ghanaian Construction Industry.**

For a factor to be considered as significant or important, the significance test method was conducted. The test involved the formulation of a null and alternative hypothesis, evaluation of the test statistic and determination of the probability (z) of observing a value of the test statistics.

The null hypothesis,  $H_o$ , is stated as:

*“A factor among the 25 listed events is NOT significantly important in affecting (time, cost and profit) in relation to compensation events in the Ghanaian construction Industry”*

The alternative Hypothesis  $H_a$  is stated as:

*“A factor among the 25 listed events is significantly important in affecting (time, cost and profit) in relation to compensation events in the Ghanaian construction Industry”*

Based on the ranking made by each group of respondents, the summation of weighting of each potential cause was computed for use to perform the significant test to enable the relevant ones to be selected. An evaluation of the test statistic (Xs) was done and the p-value of observing a value of the test statistic was also determined. The P-value was taken to be the smallest value at which the significance level ( $\alpha = 0.05$ ) could be present and still have been able to reject the H.

The five point ranking (i.e. 1, 2, 3, 4, &5) have a mean ( $\mu$ ) of three (3) with a standard deviation of 1.58.

The probability of observing the sample mean or larger if  $\mu = 3$

And standard deviation ( $\delta$ ) =1.58 was computed.

The test statistic was by Central Limit Theorem, approximately normally distributed with a  $\mu = 3$  and  $\delta / \sqrt{n}$  where  $n$  is the number of responses for that factor.

The  $z$  was determined through the evaluation of the test statistics at a significance level of 0.05 (95% confidence level).

$$\begin{aligned} z &= 0.5 - [\alpha/2] \\ &= 0.5 - [0.05/2] \\ &= 0.475 \end{aligned}$$

A test statistic less than  $z$  causes rejection of  $H_0$  thus, the  $H_0$  would be rejected when the P-value was considered to be less than 0.475.

All P-values which are greater than 0.475 are accepted while those less than 0.475 are rejected (95% level of confidence). From the standard normal distribution table, values of  $z$  are read.

#### 4.4.1 Calculation of the Test Statistic

The test statistic was obtained by the application of equation below.

$$\left[ z = \frac{X - \mu}{(s/N^{1/2})} \right]$$

Where:

$X$  = the weighting for a factor divided by  $n$

$z$  = the computed value of the test statistics

$\mu$  = mean of point rankings

$s$  = standard deviation of the point rankings

$n$  = number of respondents of each factor

#### ***4.4.2: Significant Testing For Cost under Consultants' Category***

Table 4.14 shows events which Consultants identified as significant under compensation events which affect cost in the Ghanaian construction industry.

1. Changes or modification of design
2. Variations and late confirmation of variations
3. Acceleration of works requested by client that affected works schedule
4. Adverse site conditions
5. Inexperience on the part of the consultant
6. Untimely issuance of site instructions
7. Unconfirmed oral instructions
8. Discrepancies/ambiguities in the contract document
9. Inaccurate valuation of variations and works in progress
10. Uncovered defects
11. Contractors failure to identify and deal with issues on time
12. Differences in party interest
13. Cost overruns
14. Clients with no technical background
15. Non - agreement of compensation events between consultants and contractor

These were the Fifteen (15) factors identified by the consultants as the most significant events under cost in the Ghanaian construction industry.

**Table 4.14 : Significant testing for cost under Consultants' category**

Significant testing for cost under Consultants' category									
		X Weighting for a factor divided by "n"	n number of response for each factor	n <sup>1/2</sup>	μ Mean of point rankings	σ Standard deviation for each point ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	4.04	57	7.5	3	1.58	3.26	Accepted	
2	Failure of the client to honour payment of certificate on time	2.44	57	7.5	3	1.58	1.50		Rejected
3	Variations and late confirmation of variations	4.58	57	7.5	3	1.58	2.50	Accepted	
4	Acceleration of works requested by client that affected works schedule	3.98	57	7.5	3	1.58	4.65	Accepted	
5	Adverse site conditions	3.7	57	7.5	3	1.58	3.32	Accepted	
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	2.13	57	7.5	3	1.58	-1.20		Rejected
7	Disruptions or delays to the works caused by the client	2.44	57	7.5	3	1.58	- 1.50		Rejected
8	Non responses of the project manager to compensation claims	2.96	57	7.5	3	1.58	- 0.19		Rejected
9	Late responses of the project manager to compensation claims	2.91	57	7.5	3	1.58	- 0.43		Rejected
10	Inexperience on the part of the consultant	3.72	57	7.5	3	1.58	3.42	Accepted	
11	Untimely issuance of site instructions	3.56	57	7.5	3	1.58	2.66	Accepted	
12	Unconfirmed oral instructions	3.54	57	7.5	3	1.58	2.56	Accepted	
13	Discrepancies/ambiguities in the contract document	3.53	57	7.5	3	1.58	2.52	Accepted	
14	Delay in supply of working drawings	2.40	57	7.5	3	1.58	-1.30		Rejected
15	Inaccurate valuation of variations and works in progress	4.02	57	7.5	3	1.58	4.84	Accepted	
16	Ineffective communication between the parties on the project	2.98	57	7.5	3	1.58	- 0.09		Rejected
17	Remedying defects	2.49	57	7.5	3	1.58	-1.79		Rejected
18	Uncovered defects	2.86	57	7.5	3	1.58	- 0.90		Rejected
19	Poor records keeping by client, contractor and consultant	2.60	57	7.5	3	1.58	-1.85		Rejected
20	Contractors failure to identify and deal with issues on time	3.66	57	7.5	3	1.58	3.13	Accepted	
21	Differences in party interest	3.69	57	7.5	3	1.58	3.28	Accepted	
22	Cost overruns	4.04	57	7.5	3	1.58	4.94	Accepted	
23	Clients with no technical background	3.93	57	7.5	3	1.58	4.41	Accepted	
24	Insufficient time for compensation events to be notified and submitted	2.26	57	7.5	3	1.58	-0.98		Rejected
25	Non - agreement of compensation events between consultants and contractor	3.91	57	7.5	3	1.58	4.32	Accepted	



**Table 4.15 Significant testing for cost under Clients' category**

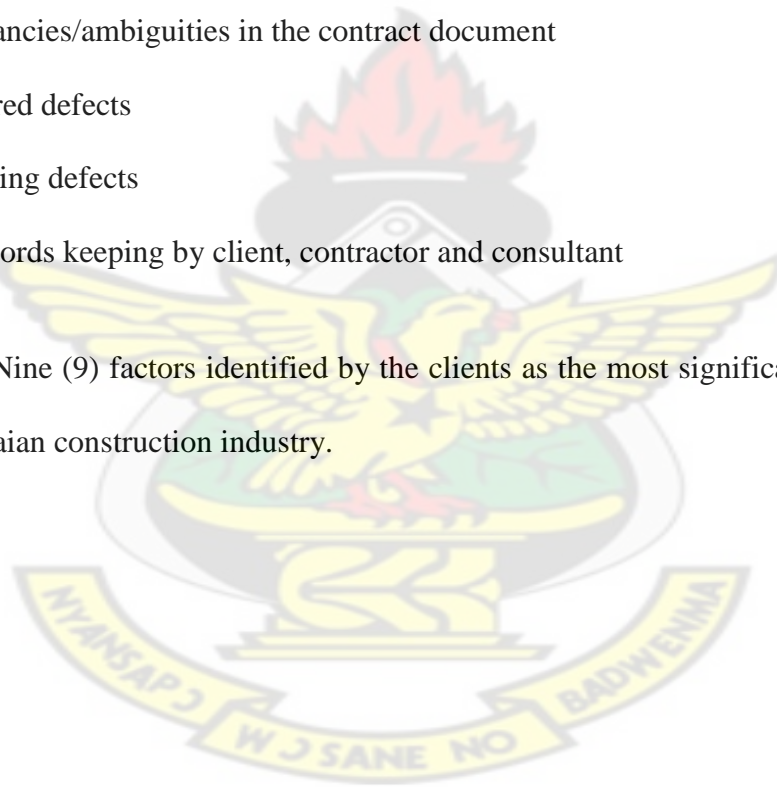
	Significant testing for Cost under Clients' category								
		X Weighting for a factor divided by "n"	n number of response for each factor	n <sup>1/2</sup>	μ Mean of point rankings	σ Standard deviation for each point ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	2.85	13	3.61	3	1.58	- 0.34		Rejected
2	Failure of the client to honour payment of certificate on time	3.92	13	3.61	3	1.58	2.10	Accepted	
3	Variations and late confirmation of variations	4.08	13	3.61	3	1.58	2.47	Accepted	
4	Acceleration of works requested by client that affected works schedule	2.15	13	3.61	3	1.58	- 0.34		Rejected
5	Adverse site conditions	3.69	13	3.61	3	1.58	1.58	Accepted	
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	2.92	13	3.61	3	1.58	- 0.18		Rejected
7	Disruptions or delays to the works caused by the client	3.69	13	3.61	3	1.58	1.58	Accepted	
8	Non responses of the project manager to compensation claims	3.62	13	3.61	3	1.58	1.42	Accepted	
9	Late responses of the project manager to compensation claims	4.46	13	3.61	3	1.58	3.34	Accepted	
10	Inexperience on the part of the consultant	2.69	13	3.61	3	1.58	- 0.71		Rejected
11	Untimely issuance of site instructions	2.80	13	3.61	3	1.58	-0.46		Rejected
12	Unconfirmed oral instructions	2.92	13	3.61	3	1.58	- 0.18		Rejected
13	Discrepancies/ambiguities in the contract document	3.38	13	3.61	3	1.58	0.87		Rejected
14	Delay in supply of working drawings	3.08	13	3.61	3	1.58	0.18		Rejected
15	Inaccurate valuation of variations and works in progress	3.08	13	3.61	3	1.58	0.18		Rejected
16	Ineffective communication between the parties on the project	2.54	13	3.61	3	1.58	- 1.05		Rejected
17	Remedying defects	2.08	13	3.61	3	1.58	- 2.10		
18	Uncovered defects	3.77	13	3.61	3	1.58	1.76	Accepted	
19	Poor records keeping by client, contractor and consultant	4.31	13	3.61	3	1.58	2.99	Accepted	
20	Contractors failure to identify and deal with issues on time	2.23	13	3.61	3	1.58	-0.53		Rejected
21	Differences in party interest	2.38	13	3.61	3	1.58	- 1.42		Rejected
22	Cost overruns	2.38	13	3.61	3	1.58	- 1.42		Rejected
23	Clients with no technical background	2.15	13	3.61	3	1.58	0.34		Rejected
24	Insufficient time for compensation events to be notified and submitted	2.95	13	3.61	3	1.58	- 0.11		Rejected
25	Non - agreement of compensation events between consultants and contractor	2.7	13	3.61	3	1.58	- 0.69		Rejected

#### ***4.4.3: Significant Testing For Cost under Clients' Category***

Table 4.15 shows events which Consultants identified as significant under compensation events which affect cost in the Ghanaian construction industry.

1. Failure of the client to honour payment of certificate on time
2. Variations and late confirmation of variations
3. Adverse site conditions
4. Non responses of the project manager to compensation claims
5. Late responses of the project manager to compensation claims
6. Discrepancies/ambiguities in the contract document
7. Uncovered defects
8. Remediating defects
9. Poor records keeping by client, contractor and consultant

These were the Nine (9) factors identified by the clients as the most significant events under cost in the Ghanaian construction industry.



**Table 4.16 Significant Testing For Cost under Contractors' Category**

	Significant testing for Cost under Contractors' category								
		X Weighting for a factor divided by "n"	n number of response for each factor	n <sup>1/2</sup>	μ Mean of point rankings	σ Standard deviation for each point ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	4.51	54	7.34	3	1.58	3.8	Accepted	
2	Failure of the client to honour payment of certificate on time	4.6	54	7.34	3	1.58	3.5	Accepted	
3	Variations and late confirmation of variations	3.68	54	7.34	3	1.58	3.16	Accepted	
4	Acceleration of works requested by client that affected works schedule	2.24	54	7.34	3	1.58	- 3.53		Rejected
5	Adverse site conditions	3.66	54	7.34	3	1.58	3.07	Accepted	
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	2.96	54	7.34	3	1.58	- 0.19		Rejected
7	Disruptions or delays to the works caused by the client	4.57	54	7.34	3	1.58	7.29	Accepted	
8	Non responses of the project manager to compensation claims	2.63	54	7.34	3	1.58	- 0.12		Rejected
9	Late responses of the project manager to compensation claims	2.89	54	7.34	3	1.58	- 0.51		Rejected
10	Inexperience on the part of the consultant	2.21	54	7.34	3	1.58	0.12		Rejected
11	Untimely issuance of site instructions	2.07	54	7.34	3	1.58	0.09		Rejected
12	Unconfirmed oral instructions	2.06	54	7.34	3	1.58	0.06		Rejected
13	Discrepancies/ambiguities in the contract document	4.53	54	7.34	3	1.58	7.11	Accepted	
14	Delay in supply of working drawings	2.94	54	7.34	3	1.58	- 0.28		Rejected
15	Inaccurate valuation of variations and works in progress	4.13	54	7.34	3	1.58	5.25	Accepted	
16	Ineffective communication between the parties on the project	3.89	54	7.34	3	1.58	4.13	Accepted	
17	Remedying defects	2.72	54	7.34	3	1.58	- 1.30		Rejected
18	Uncovered defects	2.34	54	7.34	3	1.58	0.19		Rejected
19	Poor records keeping by client, contractor and consultant	3.64	54	7.34	3	1.58	2.97	Accepted	
20	Contractors failure to identify and deal with issues on time	3.74	54	7.34	3	1.58	3.44	Accepted	
21	Differences in party interest	3.76	54	7.34	3	1.58	3.53	Accepted	
22	Cost overruns	4.7	54	7.34	3	1.58	7.90	Accepted	
23	Clients with no technical background	3.83	54	7.34	3	1.58	3.86	Accepted	
24	Insufficient time for compensation events to be notified and submitted	2.5	54	7.34	3	1.58	0.89		Rejected
25	Non - agreement of compensation events between consultants and contractor	2.36	54	7.34	3	1.58	0.82		Rejected

#### ***4.4.4: Significant Testing For Cost under Contractors' Category***

Table 4.16 shows events which Consultants identified as significant under compensation events which affect cost in the Ghanaian construction industry.

1. Changes or modification of design
2. Failure of the client to honour payment of certificate on time
3. Variations and late confirmation of variations
4. Adverse site conditions
5. Disruptions or delays to the works caused by the client
6. Discrepancies/ambiguities in the contract document
7. Inaccurate valuation of variations and works in progress
8. Ineffective communication between the parties on the project
9. Poor records keeping by client, contractor and consultant
10. Contractors failure to identify and deal with issues on time
11. Differences in party interest
12. Cost overruns
13. Clients with no technical background

These were the Thirteen (13) factors identified by the contractors as the most significant events under cost in the Ghanaian construction industry.

**Table 4.17 : Significant Testing For Time under Consultants' Category**

Significant testing for Time under Consultants' category									
		X Weighting for a factor divided by "n"	n number of response for each factor	n <sup>1/2</sup>	μ Mean of point rankings	Ó Standard deviation for each point Ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	4.12	57	7.5	3	1.58	3.32	Accepted	
2	<b>Failure of the client to honour payment of certificate on time</b>	<b>2.60</b>	<b>57</b>	<b>7.5</b>	<b>3</b>	<b>1.58</b>	<b>-0.17</b>		<b>Rejected</b>
3	Variations and late confirmation of variations	4.44	57	7.5	3	1.58	4.84	Accepted	
4	Acceleration of works requested by client that affected works schedule	3.78	57	7.5	3	1.58	2.70	Accepted	
5	Adverse site conditions	3.75	57	7.5	3	1.58	2.56	Accepted	
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	3.07	57	7.5	3	1.58	0.33		Rejected
7	Disruptions or delays to the works caused by the client	4.14	57	7.5	3	1.58	3.41	Accepted	
8	Non responses of the project manager to compensation claims	2.70	57	7.5	3	1.58	-0.70		Rejected
9	Late responses of the project manager to compensation claims	3.79	57	7.5	3	1.58	2.75	Accepted	
10	Inexperience on the part of the consultant	4.49	57	7.5	3	1.58	4.07	Accepted	
11	Untimely issuance of site instructions	4.18	57	7.5	3	1.58	3.60	Accepted	
12	Unconfirmed oral instructions	4.05	57	7.5	3	1.58	2.98	Accepted	
13	Discrepancies/ambiguities in the contract document	3.88	57	7.5	3	1.58	2.18	Accepted	
14	Delay in supply of working drawings	2.89	57	7.5	3	1.58	-0.72		Rejected
15	Inaccurate valuation of variations and works in progress	3.18	57	7.5	3	1.58	0.85	Accepted	
16	Ineffective communication between the parties on the project	3.61	57	7.5	3	1.58	2.90	Accepted	
17	Remedying defects	2.90	57	7.5	3	1.58	-0.72		Rejected
18	Uncovered defects	2.75	57	7.5	3	1.58	- 1.19		Rejected
19	Poor records keeping by client, contractor and consultant	2.95	57	7.5	3	1.58	-1.68		Rejected
20	Contractors failure to identify and deal with issues on time	3.93	57	7.5	3	1.58	4.41	Accepted	
21	Differences in party interest	2.90	57	7.5	3	1.58	-1.57		Rejected
22	Cost overruns	4.4	57	7.5	3	1.58	3.65	Accepted	
23	Clients with no technical background	2.95	57	7.5	3	1.58	-1.66		Rejected
24	Insufficient time for compensation events to be notified and submitted	3.6	57	7.5	3	1.58	2.85	Accepted	
25	Non - agreement of compensation events between consultants and contractor	-2.91	57	7.5	3	1.58	-1.61		Rejected

#### ***4.4.5: Significant testing for Time under Consultants' category***

Table 4.17 shows events which Consultants identified as significant under compensation events which affect time in the Ghanaian construction industry.

1. Changes or modification of design
2. Variations and late confirmation of variations
3. Acceleration of works requested by client that affected works schedule
4. Adverse site conditions
5. Disruptions or delays to the works caused by the client
6. Late responses of the project manager to compensation claims
7. Inexperience on the part of the consultant
8. Untimely issuance of site instructions
9. Unconfirmed oral instructions
10. Discrepancies/ambiguities in the contract document
11. Inaccurate valuation of variations and works in progress
12. Ineffective communication between the parties on the project
13. Contractors failure to identify and deal with issues on time
14. Cost overruns
15. Insufficient time for compensation events to be notified and submitted

These were the Fifteen (15) factors identified by the Consultants as the most significant events under time in the Ghanaian construction industry.



**Table 4.18 Significant Testing For Time under Clients' Category**

Significant testing for time under Clients' category									
		X Weighting for a factor divided by "n"	n number of response for each factor	$n^{1/2}$	$\mu$ Mean of point rankings	$\sigma$ Standard deviation for each point ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	3.69	13	3.61	3	1.58	1.58	Accepted	
2	Failure of the client to honour payment of certificate on time	2.92	13	3.61	3	1.58	- 0.18		Rejected
3	Variations and late confirmation of variations	3.69	13	3.61	3	1.58	1.58	Accepted	
4	Acceleration of works requested by client that affected works schedule	2.92	13	3.61	3	1.58	- 0.18		Rejected
5	Adverse site conditions	2.92	13	3.61	3	1.58	- 0.18		Rejected
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	3.62	13	3.61	3	1.58	1.42	Accepted	
7	Disruptions or delays to the works caused by the client	3.69	13	3.61	3	1.58	1.58	Accepted	
8	Non responses of the project manager to compensation claims	3.69	13	3.61	3	1.58	1.58	Accepted	
9	Late responses of the project manager to compensation claims	4.31	13	3.61	3	1.58	2.99	Accepted	
10	Inexperience on the part of the consultant	2.69	13	3.61	3	1.58	-0.17		Rejected
11	Untimely issuance of site instructions	2.92	13	3.61	3	1.58	- 0.18		Rejected
12	Unconfirmed oral instructions	2.92	13	3.61	3	1.58	- 0.18		Rejected
13	Discrepancies/ambiguities in the contract document	3.63	13	3.61	3	1.58	1.44	Accepted	
14	Delay in supply of working drawings	3.69	13	3.61	3	1.58	1.58	Accepted	
15	Inaccurate valuation of variations and works in progress	3.69	13	3.61	3	1.58	1.58	Accepted	
16	Ineffective communication between the parties on the project	4.46	13	3.61	3	1.58	3.34	Accepted	
17	Remedying defects	2.69	13	3.61	3	1.58	- 0.71		Rejected
18	Uncovered defects	2.59	13	3.61	3	1.58	-0.35		Rejected
19	Poor records keeping by client, contractor and consultant	3.62	13	3.61	3	1.58	1.42	Accepted	
20	Contractors failure to identify and deal with issues on time	4.08	13	3.61	3	1.58	2.47	Accepted	
21	Differences in party interest	3.62	13	3.61	3	1.58	1.42	Accepted	
22	Cost overruns	3.62	13	3.61	3	1.58	1.42	Accepted	
23	Clients with no technical background	2.98	13	3.61	3	1.58	-0.23		Rejected
24	Insufficient time for compensation events to be notified and submitted	2.93	13	3.61	3	1.58	-0.19		Rejected
25	Non - agreement of compensation events between consultants and contractor	3.69	13	3.61	3	1.58	1.58		Rejected

#### ***4.4.6: Significant Testing For Time under Clients' Category***

Table 4.18 shows events which Clients identified as significant under compensation events which affect time in the Ghanaian construction industry.

1. Changes or modification of design
2. Variations and late confirmation of variations
3. Lack of clarity regarding the time from which contractor can calculate interest on late payments
4. Disruptions or delays to the works caused by the client
5. Non responses of the project manager to compensation claims
6. Late responses of the project manager to compensation claims
7. Discrepancies/ambiguities in the contract document
8. Delay in supply of working drawings
9. Inaccurate valuation of variations and works in progress
10. Ineffective communication between the parties on the project
11. Poor records keeping by client, contractor and consultant
12. Contractors failure to identify and deal with issues on time
13. Differences in party interest
14. Cost overruns

These were the Fourteen (14) factors identified by the Clients as the most significant events under time in the Ghanaian construction industry.

**Table 4.19 Significant Testing For Time under Contractors' Category**

Significant testing for time under Contractors' c category									
		X Weighting for a factor divided by "n"	n number of response for each factor	n <sup>1/2</sup>	μ Mean of point rankings	σ Standard deviation for each point ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	4.60	54	7.34	3	1.58	3.43	Accepted	
2	Failure of the client to honour payment of certificate on time	4.62	54	7.34	3	1.58	3.53	Accepted	
3	Variations and late confirmation of variations	4.32	54	7.34	3	1.58	2.13	Accepted	
4	Acceleration of works requested by client that affected works schedule	4.3	54	7.34	3	1.58	2.04	Accepted	
5	Adverse site conditions	2.76	54	7.34	3	1.58	-0.02		Rejected
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	2.98	54	7.34	3	1.58	- 0.09		Rejected
7	Disruptions or delays to the works caused by the client	4.6	54	7.34	3	1.58	3.43	Accepted	
8	Non responses of the project manager to compensation claims	2.78	54	7.34	3	1.58	-0.05		Rejected
9	Late responses of the project manager to compensation claims	2.63	54	7.34	3	1.58	-0.03		Rejected
10	Inexperience on the part of the consultant	2.45	54	7.34	3	1.58	-0.01		Rejected
11	Untimely issuance of site instructions	3.94	54	7.34	3	1.58	1.37	Accepted	
12	Unconfirmed oral instructions	4	54	7.34	3	1.58	1.65	Accepted	
13	Discrepancies/ambiguities in the contract document	4.58	54	7.34	3	1.58	3.34	Accepted	
14	Delay in supply of working drawings	4.55	54	7.34	3	1.58	3.20	Accepted	
15	Inaccurate valuation of variations and works in progress	3.85	54	7.34	3	1.58	0.95	Accepted	
16	Ineffective communication between the parties on the project	3.98	54	7.34	3	1.58	1.55	Accepted	
17	Remedying defects	2.72	54	7.34	3	1.58	- 1.30		Rejected
18	Uncovered defects	2.99	54	7.34	3	1.58	-0.10		Rejected
19	Poor records keeping by client, contractor and consultant	2.95	54	7.34	3	1.58	-0.04		Rejected
20	Contractors failure to identify and deal with issues on time	4.06	54	7.34	3	1.58	1.92	Accepted	
21	Differences in party interest	3.84	54	7.34	3	1.58	0.90	Accepted	
22	Cost overruns	4.25	54	7.34	3	1.58	2.81	Accepted	
23	Clients with no technical background	4.68	54	7.34	3	1.58	3.80	Accepted	
24	Insufficient time for compensation events to be notified and submitted	2.45	54	7.34	3	1.58	-0.01		Rejected
25	Non - agreement of compensation events between consultants and contractor	4.51	54	7.34	3	1.58	3.01	Accepted	

#### ***4.4.7: Significant Testing For Time under Contractors' Category***

Table 4.19 shows events which Contractors identified as significant under compensation events which affect time in the Ghanaian construction industry.

1. Changes or modification of design
2. Failure of the client to honour payment of certificate on time
3. Variations and late confirmation of variations
4. Acceleration of works requested by client that affected works schedule
5. Disruptions or delays to the works caused by the client
6. Untimely issuance of site instructions
7. Unconfirmed oral instructions
8. Discrepancies/ambiguities in the contract document
9. Delay in supply of working drawings
10. Inaccurate valuation of variations and works in progress
11. Ineffective communication between the parties on the project
12. Contractors failure to identify and deal with issues on time
13. Differences in party interest
14. Cost overruns
15. Clients with no technical background
16. Non - agreement of compensation events between consultants and contractor

**Table 4.20 Significant Testing For Profit under Consultants' Category**

Significant testing for profit under Consultants' category									
		X Weighting for a factor divided by "n"	n number of response for each factor	n <sup>1/2</sup>	μ Mean of point rankings	σ Standard deviation for each point ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	4.14	57	7.5	3	1.58	3.41	Accepted	
2	Failure of the client to honour payment of certificate on time	4	57	7.5	3	1.58	2.75	Accepted	
3	Variations and late confirmation of variations	2.5	57	7.5	3	1.58	-0.80		Rejected
4	Acceleration of works requested by client that affected works schedule	2.56	57	7.5	3	1.58	-0.83		Rejected
5	Adverse site conditions	2.8	57	7.5	3	1.58	- 0.95		Rejected
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	2.96	57	7.5	3	1.58	-0.19		Rejected
7	Disruptions or delays to the works caused by the client	4.07	57	7.5	3	1.58	3.08	Accepted	
8	Non responses of the project manager to compensation claims	3.67	57	7.5	3	1.58	1.18	Accepted	
9	Late responses of the project manager to compensation claims	4.3	57	7.5	3	1.58	3.87	Accepted	
10	Inexperience on the part of the consultant	3.65	57	7.5	3	1.58	3.09	Accepted	
11	Untimely issuance of site instructions	3.77	57	7.5	3	1.58	3.66	Accepted	
12	Unconfirmed oral instructions	3.63	57	7.5	3	1.58	2.99	Accepted	
13	Discrepancies/ambiguities in the contract document	2.93	57	7.5	3	1.58	- 0.33		Rejected
14	Delay in supply of working drawings	2.70	57	7.5	3	1.58	-0.90		Rejected
15	Inaccurate valuation of variations and works in progress	3.79	57	7.5	3	1.58	1.75	Accepted	
16	Ineffective communication between the parties on the project	3.7	57	7.5	3	1.58	1.32		Rejected
17	Remedying defects	3.74	57	7.5	3	1.58	1.51	Accepted	
18	Uncovered defects	3.02	57	7.5	3	1.58	0.09	Accepted	
19	Poor records keeping by client, contractor and consultant	3.51	57	7.5	3	1.58	0.42	Accepted	
20	Contractors failure to identify and deal with issues on time	2.40	57	7.5	3	1.58	-0.76		Rejected
21	Differences in party interest	3.91	57	7.5	3	1.58	2.32	Accepted	
22	Cost overruns	3.98	57	7.5	3	1.58	2.65	Accepted	
23	Clients with no technical background	2.20	57	7.5	3	1.58	-0.66		Rejected
24	Insufficient time for compensation events to be notified and submitted	2.30	57	7.5	3	1.58	0.70		Rejected
25	Non - agreement of compensation events between consultants and contractor	3.64	57	7.5	3	1.58	1.04	Accepted	

#### ***4.4.8: Significant Testing For Profit under Consultants' Category***

Table 4.21 shows events which Consultants identified as significant under compensation events which affect Profit in the Ghanaian construction industry.

1. Changes or modification in design
2. Failure of the client honour certificate
3. Adverse site conditions
4. Disruptions or delays to the works caused by the client
5. Non responses of the project manager to compensation claims
6. Late responses of the project manager to compensation claims
7. Inexperience on the part of the consultant
8. Untimely issuance of site instructions
9. Unconfirmed oral instructions
10. Discrepancies/ambiguities in the contract document
11. Inaccurate valuation of variations and works in progress
12. Uncovered defects
13. Poor records keeping by client, contractor and consultant
14. Differences in party interest
15. Cost overruns
16. Non - agreement of compensation events between consultants and contractor

These were the Sixteen (16) factors identified by the consultants as the most significant events under time in the Ghanaian construction industry.



**Table 4.21: Significant Testing For Profit under Clients' Category**

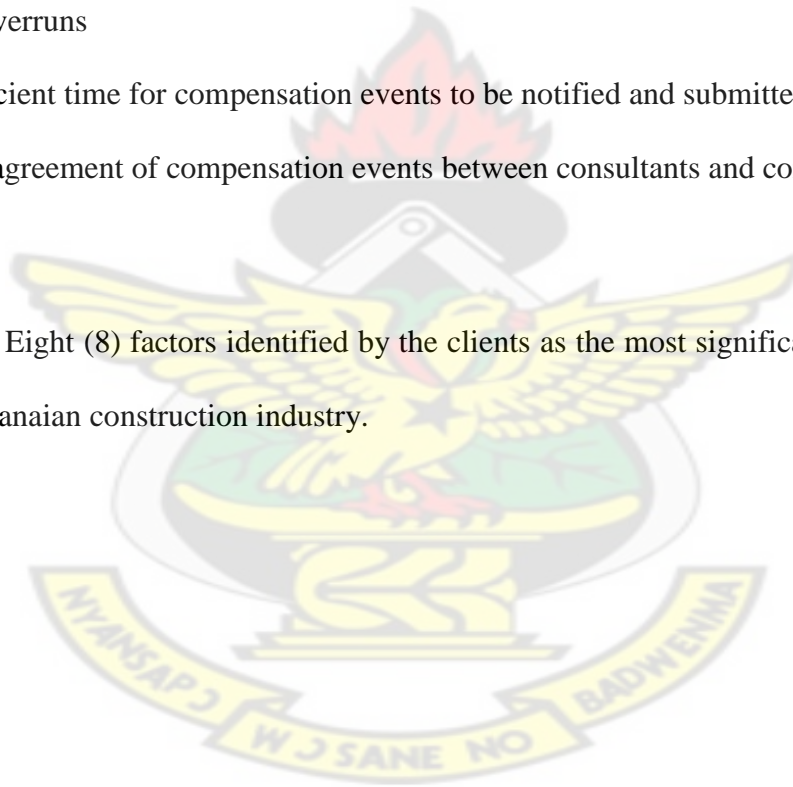
Significant testing for Profit under Clients' category									
		X Weighting for a factor divided by "n"	N number of response for each factor	n <sup>1/2</sup>	$\mu$ Mean of point rankings	$\sigma$ Standard deviation for each point ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	3.54	13	3.61	3	1.58	1.23	Accepted	
2	Failure of the client to honour payment of certificate on time	4	13	3.61	3	1.58	2.28	Accepted	
3	Variations and late confirmation of variations	2.50	13	3.61	3	1.58	-0.69		Rejected
4	Acceleration of works requested by client that affected works schedule	2.77	13	3.61	3	1.58	- 0.53		Rejected
5	Adverse site conditions	2.69	13	3.61	3	1.58	- 0.71		Rejected
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	2.54	13	3.61	3	1.58	- 1.05		Rejected
7	Disruptions or delays to the works caused by the client	2.31	13	3.61	3	1.58	- 1.58		Rejected
8	Non responses of the project manager to compensation claims	2.85	13	3.61	3	1.58	- 0.34		Rejected
9	Late responses of the project manager to compensation claims	3.69	13	3.61	3	1.58	1.58	Accepted	
10	Inexperience on the part of the consultant	3.92	13	3.61	3	1.58	2.10	Accepted	
11	Untimely issuance of site instructions	2.40	13	3.61	3	0.65	0.71		Rejected
12	Unconfirmed oral instructions	3.08	13	3.61	3	1.58	0.18		Rejected
13	Discrepancies/ambiguities in the contract document	2.38	13	3.61	3	1.58	- 1.42		Rejected
14	Delay in supply of working drawings	3.08	13	3.61	3	1.58	0.18		Rejected
15	Inaccurate valuation of variations and works in progress	3.0	13	3.61	3	1.58	0.12		Rejected
16	Ineffective communication between the parties on the project	2.89	13	3.61	3	1.58	0.09		Rejected
17	Remedying defects	2.69	13	3.61	3	1.58	- 0.71		Rejected
18	Uncovered defects	2.70	13	3.61	3	1.58	0.07		Rejected
19	Poor records keeping by client, contractor and consultant	2.60	13	3.61	3	1.58	0.05		Rejected
20	Contractors failure to identify and deal with issues on time	3.62	13	3.61	3	1.58	1.42	Accepted	
21	Differences in party interest	2.54	13	3.61	3	1.58	- 1.05		Rejected
22	Cost overruns	3.69	13	3.61	3	1.58	1.58	Accepted	
23	Clients with no technical background	2.69	13	3.61	3	1.58	- 0.71		Rejected
24	Insufficient time for compensation events to be notified and submitted	5	13	3.61	3	1.58	4.57	Accepted	
25	Non - agreement of compensation events between consultants and contractor	3.69	13	3.61	3	1.58	1.58	Accepted	

#### ***4.4.9: Significant Testing For Profit under Clients' Category***

Table 4.17 shows events which Clients identified as significant under compensation events which affect Profit in the Ghanaian construction industry.

1. Changes or modification of design
2. Failure of the client to honour payment of certificate on time
3. Late responses of the project manager to compensation claims
4. Inexperience on the part of the consultant
5. Contractors failure to identify and deal with issues on time
6. Cost overruns
7. Insufficient time for compensation events to be notified and submitted
8. Non - agreement of compensation events between consultants and contractor

These were the Eight (8) factors identified by the clients as the most significant events under profit in the Ghanaian construction industry.



**Table 4.22 Significant Testing For Profit under Contractors' Category**

Significant testing for Profit under Contractors' category									
		X Weighting for a factor divided by "n"	N number of response for each factor	n <sup>1/2</sup>	μ Mean of point rankings	Ó Standard deviation for each point Ranking	Z	Level of significance	
								> 0.475 Accepted	< 0.475 Rejected
1	Changes or modification of design	4.69	54	7.34	3	1.58	3.85	Accepted	
2	Failure of the client to honour payment of certificate on time	3.57	54	7.34	3	1.58	2.65	Accepted	
3	Variations and late confirmation of variations	2.65	54	7.34	3	1.58	- 1.63		Rejected
4	Acceleration of works requested by client that affected works schedule	3.69	54	7.34	3	1.58	3.21	Accepted	
5	Adverse site conditions	2.99	54	7.34	3	1.58	- 1.88		Rejected
6	Lack of clarity regarding the time from which contractor can calculate interest on late payments	4.47	54	7.34	3	1.58	6.83	Accepted	
7	Disruptions or delays to the works caused by the client	4.34	54	7.34	3	1.58	6.23	Accepted	
8	Non responses of the project manager to compensation claims	2.55	54	7.34	3	1.58	-1.50		Rejected
9	Late responses of the project manager to compensation claims	3.6	54	7.34	3	1.58	2.79	Accepted	
10	Inexperience on the part of the consultant	2.81	54	7.34	3	1.58	- 0.88		Rejected
11	Untimely issuance of site instructions	2.92	54	7.34	3	1.58	- 0.37		Rejected
12	Unconfirmed oral instructions	2.68	54	7.34	3	1.58	- 1.49		Rejected
13	Discrepancies/ambiguities in the contract document	4	54	7.34	3	1.58	4.65		Rejected
14	Delay in supply of working drawings	2.38	54	7.34	3	1.58	- 2.88		Rejected
15	Inaccurate valuation of variations and works in progress	3.91	54	7.34	3	1.58	3.23	Accepted	
16	Ineffective communication between the parties on the project	3.85	54	7.34	3	1.58	3.95	Accepted	
17	Remedying defects	2.58	54	7.34	3	1.58	- 1.95		Rejected
18	Uncovered defects	3.81	54	7.34	3	1.58	3.76	Accepted	
19	Poor records keeping by client, contractor and consultant	3.53	54	7.34	3	1.58	2.46	Accepted	
20	Contractors failure to identify and deal with issues on time	3.81	54	7.34	3	1.58	3.76	Accepted	
21	Differences in party interest	3.71	54	7.34	3	1.58	3.30	Accepted	
22	Cost overruns	4.3	54	7.34	3	1.58	6.04	Accepted	
23	Clients with no technical background	2.54	54	7.34	3	1.58	-1.40		Rejected
24	Insufficient time for compensation events to be notified and submitted	4.14	54	7.34	3	1.58	5.30	Accepted	
25	Non - agreement of compensation events between consultants and contractor	4.29	54	7.34	3	1.58	5.99	Accepted	

#### ***4.4.10: Significant Testing For Profit under Contractors' Category***

Table 4.22 shows events which Contractors identified as significant under compensation events which affect Profit in the Ghanaian construction industry.

1. Changes or modification of design
2. Failure of the client to honour payment of certificate on time
3. Acceleration of works requested by client that affected works schedule
4. Lack of clarity regarding the time from which contractor can calculate interest on late payments
5. Disruptions or delays to the works caused by the client
6. Late responses of the project manager to compensation claims
7. Inaccurate valuation of variations and works in progress
8. Ineffective communication between the parties on the project
9. Uncovered defects
10. Poor records keeping by client, contractor and consultant
11. Contractors failure to identify and deal with issues on time
12. Differences in party interest
13. Cost overruns
14. Insufficient time for compensation events to be notified and submitted
15. Non - agreement of compensation events between consultants and contractor

These were the Fifteen (15) factors identified by the contractors as the most significant events under profit in the Ghanaian construction industry.

## **4.5 Factor Analysis**

Factor Analysis is a statistical technique used to identify a relatively small number of factors that explain observed correlations among variables (Marija, 2003). It is primarily used for data reduction or structure detection.

### ***4.5.1 Assumptions***

Factor analysis is designed for continuous variables.

The variables should be normally distributed.

There is a good linear relation between variables.

Underlying dimensions or factors are responsible for the observed correlation.

### ***4.5.2 Uses of Factor Analysis***

Factor Analysis is used when you have measured people on several continuous variables and you wish to see whether these variables can be reduced to a smaller set of variables (Chris, 2004). Factor analysis can be used to identify any set of variables that correlate well with each other but less well with other items. Factor Analysis can be used to reduce a large number of correlated variables to a more manageable number of independent factors that you can then use in subsequent analysis (Marija, 2003).

### ***4.5.3 How Factor Analysis Works***

Factor Analysis identifies sets of inter-correlated items by using a process called Factor Extraction. In factor extraction, hypothetical variables are placed in the best position to capture the pattern of inter-correlations in the correlation matrix (Chris, 2004).

### ***4.5.4 Factor Rotation***

Factors are not placed in the best position at the factor extraction stage to enable you interpret the data for mathematical reasons. Therefore, they have to be rotated so that they are in the

best possible position to enable you interpret the results with ease. There are 2 types of rotations; orthogonal and oblique rotations.

Factors are actually referred to more correctly as components in the SPSS tables because principal components analysis is being carried out (Chris, 2004). Factor analysis and principal component analysis each produce something different. Factor analysis produce factors while principal component analysis produce components. Factor analysis is used if the purpose of the research is to understand the theoretical relationship between the variables.

#### **4.6 Steps to Carry Out Factor Analysis**

- Create (compute) correlation matrix
- Extracting factors
- Rotating factors
- Calculating factor scores
- Interpreting the results of the analysis

##### ***4.6.1 Computing The Correlation Matrix***

###### ***4.6.1.1 The Kaiser-Meyer-Olkin Measure of Sampling Adequacy***

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is an index that compares the sizes of the observed correlation coefficients to the sizes of the partial correlation coefficients (Chris, 2004). It is a statistic which indicates the proportion of variance in the variables which is common variance i.e. which might be caused by underlying factors. From Marija (2003),

If the ratio is close to 1.0, it means that all of the partial correlation coefficient are small, compared to the ordinary correlation coefficients. This indicates that the variables are linearly related. Small values of KMO measure tell you that the factor analysis of the variables may



not be a good idea since observed correlations between pairs of variables cannot be explained by the other variables.

#### ***4.6.1.2 The Bartlett's Test of Sphericity (BTS)***

The Bartlett's Test of Sphericity (BTS) is used to test the null hypothesis that the observed data are a sample from a multivariate normal population in which all correlation coefficients are 0. This test requires the assumption of multivariate normality and is very sensitive to deviations from the assumption. It is better off relying on the KMO measure (Marija, 2003).

The Bartlett's Test of Sphericity indicates whether the correlation matrix is an identity matrix, which would indicate that the variables are unrelated. The significance level gives the results of the test. Very small values (less than 0.05) indicate that there are probably significant relationships among the variables while a significant value greater than 0.10 indicates that, the data is not suitable for factor analysis (Chris, 2004).

#### ***4.6.1.3 Number of Factors Selected***

As many principal components as there are variables can be calculated by the SPSS and nothing will be gained if all the variables are replaced by principal components or factors. The researcher has to determine how many factors are needed to adequately represent the data i.e. to represent the observed correlations (Chris, 2004).

The SPSS default for number of factors to be used is based on the principal component analysis solution where the number of factors to be used is chosen with the goal of explaining as much variance as possible using fewer factors as possible.

#### ***4.6.2 Interpreting The Results of The Analysis***

The results of factor analysis (after factor rotation) indicate the amount of variance between the variables that each factor accounts for, and provides loadings of all the variables on each factor (Chris, 2004). The convention is to take seriously any loading that equal to 0.50.

According to Comrey and Lee (1992), factor loadings of over 0.71 can be considered excellent, 0.63 to 0.70 very good, 0.55 to 0.62 good, 0.45 to 0.54 fair, and 0.32 to 0.44 poor.

The last step is to label the factors as principal component analysis can only identify sets of inter-correlated variables, it is up to the researcher to interpret what these sets are and to give them a name (Chris, 2004).

#### 4.7 Cronbach's Alpha Coefficient

Cronbach's alpha is a statistic used to calculate the reliability of a measurement scale (Chris, 2004). If questions designed to measure variables are doing their job well, then the questions are expected to reasonably correlate highly. If there is little or no relationship between how respondents score on one of the questions and how they score on others, it suggests that, it cannot be claimed that the questions are measuring the same construct (Chris, 2004).

$$\alpha = N.C \frac{N.c}{n+(N-1).c}$$

Where

$\alpha$  = Cronbach's alpha

c = Average inter item covariance among items

N = Number of items

N = Average variance

The size of Cronbach's alpha is a function of two things: the average correlation between a set of items and the number of items. The use of Cronbach's alpha is common when questionnaires are developed for research in organizations, and an alpha coefficient of 0.70 is

usually taken as the minimum level acceptable (Chris, 2004). If an alpha is less than this, the indication is that the items are unlikely to be reliably measuring the same thing.

#### **4.8 Results of Factor Analysis of Research**

Twenty five variables were listed from literature as events to be identified in order of significance under compensation events in relation to profit, time and cost. Construction stakeholders were asked to rank the variables' importance, in their opinion, as indicated earlier. The rankings of the 124 received responses were entered into SPSS and analyzed. The correlation matrix of the 25 variables was created and the matrix is shown in Appendix.

##### **4.8.1 Reliability Tests**

Cronbach's alpha is used to test the reliability of the questions in measuring the same construct. The Cronbach's alpha score for profit, time and cost is as follows respectively of 0.832, 0.828 and 0.706 (Table 4.23, 4.24 and 4.25) obtained for this test indicate that the question was measuring the same construct in this study. The respondents were either measuring highly or lowly for each variable.

**Table 4.23 Profit  
Reliability Statistics**

Cronbach's	
Alpha	N of Items
.832	25

**Table 4.24 Time  
Reliability Statistics**

Cronbach's	
Alpha	N of Items

### Reliability Statistics

Cronbach's	
Alpha	N of Items
.828	25

**Table 4.25 Cost  
Reliability Statistics**

Cronbach's	
Alpha	N of Items
.706	25

Table 4.26 below show the KMO measure of sampling adequacy and Bartlett's test of sphericity for profit.

**Table 4.26 KMO And Bartlett's Test For Profit**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.583
Bartlett's Test of Approx. Chi-Square	759.457
Sphericity df	66
Sig.	.000

From table 4.26 above the overall KMO measure of 0.583 for the data indicate that it is reasonable to go ahead with the factor analysis. The observed correlations between pairs of variables can be explained by other variables in the data, that is, the variables are linearly related. The Bartlett's Test of Sphericity significance level of 0.00 from table 4.27 above

indicate that the data is suitable for factor analysis and that there is significant relationship between the variables and also suggest that the correlation (Appendix) matrix was not an identity matrix.

Table 4.27 below show the KMO measure of sampling adequacy and Bartlett's test of sphericity for time.

**Table 4.27 KMO And Bartlett's Test For Time**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.660
Bartlett's Test of Approx. Chi-Square	317.228
Sphericity df	28
Sig.	.000

From table 4.27 the overall KMO measure of 0.66 for the data indicates that it is reasonable to go ahead with the factor analysis. The observed correlations between pairs of variables can be explained by other variables in the data i.e. the variables are linearly related. The Bartlett's Test of Sphericity significance level of 0.00 from table 4.28 above indicate that the data is suitable for factor analysis and that there is significant relationship between the variables and also suggest that the correlation (Appendix) matrix was not an identity matrix.

Table 4.28 below show the KMO measure of sampling adequacy and Bartlett's test of sphericity for time.

**Table 4.28 KMO And Bartlett's Test For Cost**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.597
Bartlett's Test of Approx. Chi-Square	703.437
Sphericity df	66
Sig.	.000

From table 4.28 above the overall KMO measure of 0.597 for the data indicate that it is reasonable to go ahead with the factor analysis. The observed correlations between pairs of variables can be explained by other variables in the data i.e. the variables are linearly related. The Bartlett's Test of Sphericity significance level of 0.00 from table 4.29 above indicate that the data is suitable for factor analysis and that there is significant relationship between the variables and also suggest that the correlation (Appendix) matrix was not an identity matrix.

#### ***4.8.2 Extraction of Factors***

After establishing that the variables are linearly related from the KMO and Bartlett's tests above, the factors that explain the observed correlation were looked for. Observed correlations between variables result from the sharing of these factors. This study is to identify these factors and to find a small number of easily interpretable factors that represent the variables.

##### ***4.8.2.1 Extraction Method***

The method used for extracting the factors is the principal component analysis where linear combinations of observed variables are formed. The first principal component (factor) is the combination that account for largest amount of variance and the second principal component (factor) account for the next largest amount of variance and is uncorrelated with the first. As many components as there are variables are first extracted as shown in tables 4.29,4.30 and 4.31 below. This is the default for principal component analysis extraction.

Tables 4.29,4.30 and 4.31, which is a table of the total variance explained of the significant identification of compensation events selection variables, is divided into 4 main columns comprising Component, Initial Eigenvalues, Extraction Sums of Squared Loadings And Rotation Sums of Squared Loadings. The component column indicates the components extracted initially by the principal component analysis method.



**Table 4.29 Total Variance Explained For Profit**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.857	29.670	29.670	3.857	29.670	29.670	3.050	23.459	23.459
2	3.159	24.298	53.968	3.159	24.298	53.968	2.461	18.930	42.388
3	1.418	10.909	64.876	1.418	10.909	64.876	2.160	16.614	59.002
4	1.349	10.376	75.253	1.349	10.376	75.253	2.113	16.250	75.253
5	.763	5.872	81.124						
6	.687	5.285	86.409						
7	.525	4.042	90.451						
8	.360	2.772	93.223						
9	.295	2.269	95.492						
10	.244	1.873	97.365						
11	.158	1.219	98.584						
12	.114	.876	99.460						
13	.070	.540	100.000						

Extraction Method: Principal Component Analysis.

**Table 4.30 Total Variance Explained For Time**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.037	33.739	33.739	3.037	33.739	33.739	2.334	25.935	25.935
2	2.415	26.839	60.578	2.415	26.839	60.578	2.274	25.266	51.201
3	1.022	11.355	71.933	1.022	11.355	71.933	1.866	20.731	71.933
4	.757	8.415	80.347						
5	.652	7.245	87.592						
6	.395	4.387	91.980						
7	.332	3.690	95.670						
8	.233	2.589	98.259						
9	.157	1.741	100.000						

Extraction Method: Principal Component Analysis.

**Table 4.31 Total Variance Explained For Cost**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.026	33.550	33.550	4.026	33.550	33.550	2.929	24.412	24.412
2	1.834	15.287	48.837	1.834	15.287	48.837	2.637	21.976	46.388
3	1.574	13.115	61.952	1.574	13.115	61.952	1.868	15.563	61.952
4	1.331	11.088	73.040						
5	.943	7.857	80.897						
6	.623	5.193	86.090						
7	.495	4.127	90.217						
8	.357	2.972	93.189						
9	.322	2.684	95.873						
10	.230	1.918	97.792						
11	.173	1.445	99.237						
12	.092	.763	100.000						

Extraction Method: Principal Component Analysis.

#### **4.8.2.2 Number of Factors Extracted**

For simplicity, the SPSS standardize all variables and factors with mean of 0 and variance of 1. In the Total column, under the initial eigenvalue column (Tables 4.29, 4.30 and 4.31) there are the total variances explained by each factor. The column labelled % of variance is the percentage of total variance attributable to each factor.

##### **1. Under Profit**

Factor 1 has total variance of 3.85, which is 29.67 % of the total variance of the 25 factors, factor 2 has total variance of 3.159 which is 24.298 % of the total variance of the 25 factors. The Cumulative % column is the sum of the percentage variances for that factor and the factors that precede it in the table. From Table 4.29 it is seen that about 55% of the total variance is explained by the first three factors.

## **2. Under Time**

Factor 1 under time category has total variance of 3.037, which is 33.73 % of the total variance of the 25 factors, factor 2 has total variance of 2.415 which 26.839 % of the total variance of the 25 factors. The Cumulative % column is the sum of the percentage variances for that factor and the factors that precede it in the table. From Table 4.30 it is seen that about 55% of the total variance is explained by the first three factors.

## **3. Under Cost**

Factor 1 has total variance of 4.026, which is 33.55 % of the total variance of the 25 factors, factor 2 has total variance of 1.83 which 15.28 % of the total variance of the 25 factors. The Cumulative % column is the sum of the percentage variances for that factor and the factors that precede it in the table. From Table 4.31 it is seen that about 50% of the total variance is explained by the first three factors.

The factors are arranged in decreasing order of total variance explained. It must be noted that the goal of this factor analysis is to explain as much variance as possible using a few factors as possible.

The eigenvalue-greater-than-two criterion, suggesting that only factors that account for variances greater than two should be included in the factor extraction, was applied in the factor extraction. Eigenvalues are the variances of the factors.

The convention of component matrix coefficients greater than or equal to 0.50 to be shown was adopted. As a result, only factor scores greater than 0.50 are shown on component matrix in tables 4.29, 4.30 and 4.31 and the rotated component matrix in table 4.32,4.33and 4.34

With The eigenvalue-greater-than-two criterion, five factors were extracted which will be explained in due course.

**Table 4.32 Component Matrix for Profit**

	Component			
	1	2	3	4
Changes or modification of design[P]	.858			
Failure of client to honor payment of certificate	.649			
Variations and late confirmation of variations[P]	.636		.624	
Acceleration of works requested by client that affected schedule[P]			.584	
Lack of clarity regarding the time from which contractor can calculate interest on late payments[P]	.505			
Disruptions or delays to the works caused by the client[P]	.571			
Inexperience on the part of the consultant[P]		.819		
Untimely issues of site instructions[P]		.794		
Unconfirmed oral instruction[P]		.709		
Delay in supply of working drawings[P]		.652		
Inaccurate valuation of variations and works in progress[P]	.590			
Uncovered defects[P]	.657			
Cost overruns [P]	.589			

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

**Table 4.33 Component Matrix for Time**

	Component		
	1	2	3
Changes or modification of design[P]	.868		
Variations and late confirmation of variations[P]	.718		-.557
Disruptions or delays to the works caused by the client[P]		.622	
Untimely issuance of site instructions[P]		.738	
Unconfirmed oral instruction[P]	.592	.564	
Delay in supply of working drawings[P]		.514	.602
Cost of overruns [P]	.593		
Uncovered defects[P]	.547		
Inexperience on the part of the consultant[P]	.553	.424	

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

**Table 4.34 Component Matrix for Cost**

	Component		
	1	2	3
Failure of client to honor payment of certificate	.611		
Variations and late confirmation of variations[P]			.5 54
Unconfirmed oral instruction[P]	.741		
Inaccurate valuation of variations and works in progress[P]		.753	
Remedying defects[P]		.572	
Cost of overruns and schedule of delays[P]	.824		
Insufficient time for compensation events to be notified and submitted[P]	.537		
Non-agreement of compensation events between consultants and contractor[P]	.820		
Clients with no technical background[P]	.753		
Discrepancies/ambiguities in the contract document[P]	.668		
Delay in supply of working drawings[P]		.356	.536
Changes or modification of design[P]		.466	

Extraction Method: Principal Component Analysis.

a. 3 components extracted.



#### 4.8.2.3 Relationship Between Variables And Factors

Using the coefficients in the components matrix in table 4.33, 4.34 and 4.35 produced by the principal components analysis, each variable can be expressed as a linear function of the factors.

That is for **Profit**, the following is exhibited:

The identification of event variable can be expressed as;

$$\text{Variations and late confirmation of variations} = 0.636 (\text{factor 1}) + 0.624 (\text{factor 2}) + U$$

Variations and late confirmation of variations

The coefficients 0.636 and 0.624, also known as factor loadings, tell how much weight is assigned to factor 1 and factor 2 for Variations and late confirmation of variations.

For **Time**, the following is exhibited:

$$\text{Unconfirmed oral instruction} = 0.592 (\text{factor 1}) + 0.564 (\text{factor 2}) + U$$

Unconfirmed oral instruction

$$\text{Delay in supply of working drawing} = 0.514 (\text{factor 1}) + 0.604 (\text{factor 2}) + U$$

working drawing

For **Cost**, the following is exhibited:

$$\text{Delay in supply of working drawing} = 0.356 (\text{factor 1}) + 0.536 (\text{factor 2}) + U$$

working drawing

The variable correlates highly with factors **a** and factor **b** or vice versa of the above variables stated under the profit, time and cost categories. The factor loading coefficients are also the correlation coefficients between the factors and the variables since the factors are uncorrelated with each other (orthogonal rotation).

#### 4.8.2.4 Communalities

Table 4.32 shows the communalities of the variables, which shows the proportion of variance explained by the common factors. For principal component analysis, the column labeled initial has values of 1 for the communality of each variable because all the factors together explain all of the observed variability in each of the variables. Reducing the factors to 5 reduce the communalities of each variable as shown in the extraction column.

Because factors are uncorrelated in this research, the total proportion of variance explained for a variable is the sum of the variance proportions explained by each factor.

**Table 4.35 Communalities For Profit**

	Initial	Extraction
Changes or modification of design[P]	1.000	.828
Failure of client to honor payment of certificate	1.000	.797
Variations and late confirmation of variations[P]	1.000	.818
Acceleration of works requested by client that affected schedule[P]	1.000	.630
Lack of clarity regarding the time from which contractor can calculate interest on late payments[P]	1.000	.769
Disruptions or delays to the works caused by the client[P]	1.000	.760
Inexperience on the part of the consultant[P]	1.000	.771
Untimely issues of site instructions[P]	1.000	.784
Unconfirmed oral instruction[P]	1.000	.811
Delay in supply of working drawings[P]	1.000	.740
Inaccurate valuation of variations and works in progress[P]	1.000	.607
Uncovered defects[P]	1.000	.679
Cost of overruns [P]	1.000	.788

Extraction Method: Principal Component Analysis.

**Table 4.36 Communalities For Time**

	Initial	Extraction
Changes or modification of design[P]	1.000	.806
Variations and late confirmation of variations[P]	1.000	.826
Disruptions or delays to the works caused by the client[P]	1.000	.735
Untimely issues of site instructions[P]	1.000	.797
Unconfirmed oral instruction[P]	1.000	.676
Delay in supply of working drawings[P]	1.000	.702
Cost of overruns and schedule of delays[P]	1.000	.817
Uncovered defects[P]	1.000	.689
Inexperience on the part of the consultant[P]	1.000	.426

Extraction Method: Principal Component Analysis.

**Table 4.37 Communalities For Cost**

	Initial	Extraction
Failure of client to honor payment of certificate	1.000	.482
Variations and late confirmation of variations[P]	1.000	.109
Unconfirmed oral instruction[P]	1.000	.660
Inaccurate valuation of variations and works in progress[P]	1.000	.726
Remedying defects[P]	1.000	.518
Cost of overruns and schedule of delays[P]	1.000	.711
Insufficient time for compensation events to be notified and submitted[P]	1.000	.776
Non-agreement of compensation events between consultants and contractor[P]	1.000	.844
Clients with no technical background[P]	1.000	.786
Discrepancies/ambiguities in the contract document[P]	1.000	.732
Delay in supply of working drawings[P]	1.000	.650
Changes or modification of design[P]	1.000	.439

Extraction Method: Principal Component Analysis.

#### **4.8.3 Rotation**

From the component matrix, Tables 4.32, 4.33 and 4.34, it can be seen that some of the variables are more highly correlated with some factors than others. In order to make it easier to assign meaning to the factors, it is ideal to see groups of variables with large coefficients for one factor and small coefficients for the others.

The component matrix is therefore rotated to achieve simple structure, where each factor has large loadings in absolute value for only some of the variables, making it easier to identify.

Varimax orthogonal rotation is used in this research as it is the most frequently used rotation method (Marija, 2003). Table 4.38, 4.39 and 4.40 shows the rotated component matrix after varimax rotation and after the variables have been sorted by the absolute values of the loadings. To make it easier to identify factors, the display of small coefficients (less than .5) was suppressed.

In tables 4.29, 4.30 and 4.31 and 4.32, 4.33 and 4.34 correlations less than 0.5 are not shown. Four (4), Three (3), Three (3) sets of variables are seen in tables 4.38, 4.39 and 4.40 respectively.

#### **Time:**

Three variables are highly correlated to factor 1, Four and Two variables correlate highly with factors 2 and 3 in that order for time in table 4.38.

#### **Profit:**

Four variables are highly correlated to factor 1, three, three and three variables correlate highly with factors 2, 3 and 4 in that order for time in table 4.39.

#### **Cost:**

Four variables are highly correlated to factor 1, four and three variables correlate highly with factors 2 and 3 in that order for time in table 4.40.

Figures 4.4, 4.5 and 4.6 are a three-dimensional plot of the first three components to examine the success of the orthogonal rotation. The variables are plotted, using the factor loadings as

the coordinates. The SPSS produces a plot of the first three factors when the factor solution involves three or more factors (Chris, 2004). The coordinates in figure 4.4, 4.5 and 4.6 are the factor loadings for the varimax-rotated solution. It can be seen that the factors have very strong clusters of variables associated with them.

**Table 4.3832 Rotated Component Matrix For Time**

	Component		
	1	2	3
Changes or modification of design[P]			.733
Variations and late confirmation of variations[P]			.888
Disruptions or delays to the works caused by the client[P]	.855		
Untimely issuance of site instructions[P]		.724	
Unconfirmed oral instruction[P]		.752	
Delay in supply of working drawings[P]		.792	
Cost overruns [P]	.896		
Uncovered works[P]	.718		
Inexperience on the part of the consultant[P]		.633	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.



**Table 4.39 Rotated Component Matrix For Profit**

	Component			
	1	2	3	4
Changes or modification of design[P]				.658
Failure of client to honor payment of certificate			.818	
Variations and late confirmation of variations[P]				.861
Acceleration of works requested by client that affected schedule[P]			.697	
Lack of clarity regarding the time from which contractor can calculate interest on late payments[P]				.622
Disruptions or delays to the works caused by the client[P]		.845		
Inexperience on the part of the consultant[P]	.802			
Untimely issuance of site instructions[P]	.776			
Unconfirmed oral instruction[P]	.843			
Delay in supply of working drawings[P]	.736			
Inaccurate valuation of variations and works in progress[P]			.698	
Uncovered works [P]		.705		
Cost overruns [P]		.880		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

**Table 4.40 Rotated Component Matrix For Cost**

	Component		
	1	2	3
Failure of client to honor payment of certificate		.613	
Variations and late confirmation of variations[P]			.580
Unconfirmed oral instruction[P]		.723	
Inaccurate valuation of variations and works in progress[P]			.756
Remedying defects[P]			.695
Cost of overruns [P]	.669		
Insufficient time for compensation events to be notified and submitted[P]	.852		
Non-agreement of compensation events between consultants and contractor[P]	.816		
Clients with no technical background[P]	.870		
Discrepancies/ambiguities in the contract document[P}		.821	
Delay in supply of working drawings[P]			.725
Changes or modification of design[P]		.642	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

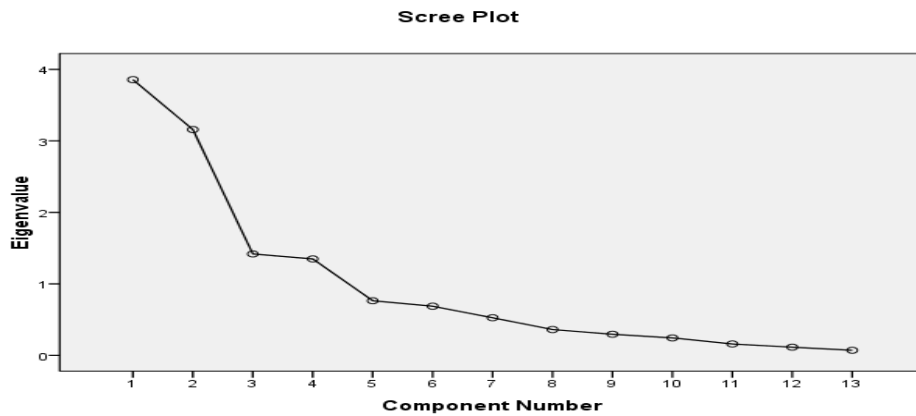


Figure 4.4 Scree Plot For Time

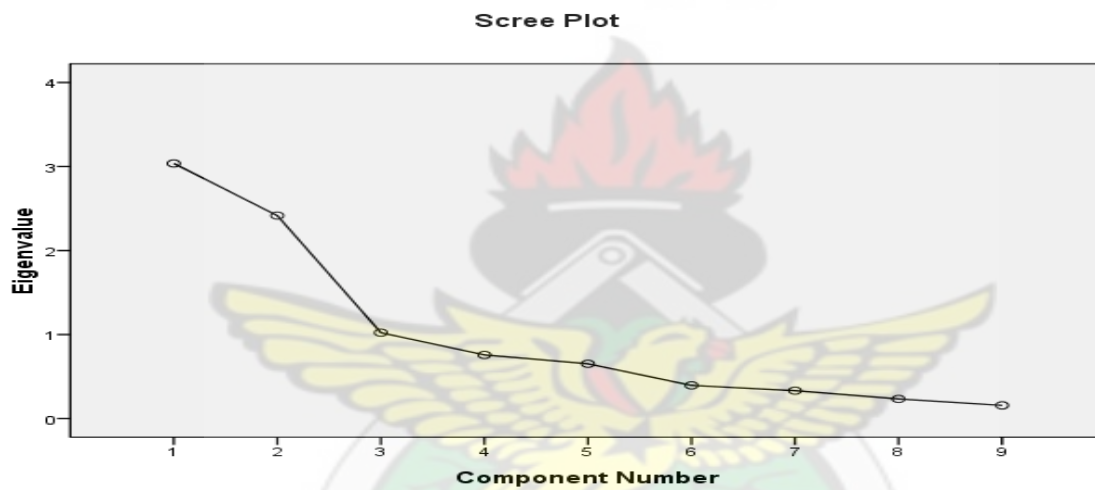


Figure 4.5 Scree Plot For Cost

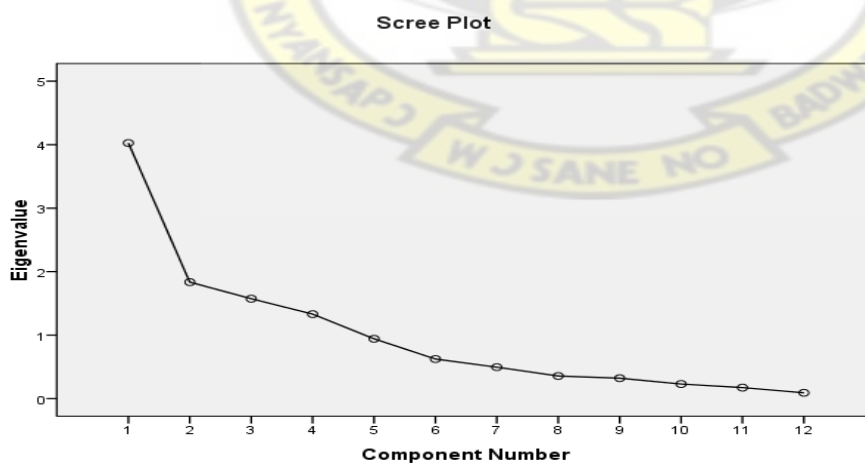


Figure 4.6 Scree Plot For Profit

When the factors were rotated, the cumulative percentage of explained variance did not change. However, the variance attributed to individual factors did. The variance is reallocated across the factors as shown in Tables 4.29, 4.30, 4.31.

**For profit, It would be seen that:**

The first factor accounted for 29.67% of the variance after extraction and 23.45% after rotation. The Second factor accounted for 24.298% of the variance after extraction and 18.93% after rotation. The third factor accounted for 10.91% of the variance after extraction and 16.614% after rotation. Likewise the fourth factor accounted for 10.37% of the variance after extraction and 16.25% after rotation.

**For time, It would be seen that:**

The first factor accounted for 33.73% of the variance after extraction and 25.935% after rotation. The Second factor accounted for 26.93% of the variance after extraction and 25.26% after rotation. Likewise the third factor accounted for 1.022% of the variance after extraction and 20.731% after rotation.

**For cost It would be seen that:**

The first factor accounted for 33.55% of the variance after extraction and 24.41% after rotation. The Second factor accounted for 15.28% of the variance after extraction and 21.97% after rotation. Likewise the third factor accounted for 13.11% of the variance after extraction and 15.56% after rotation.

Component Plot in Rotated Space

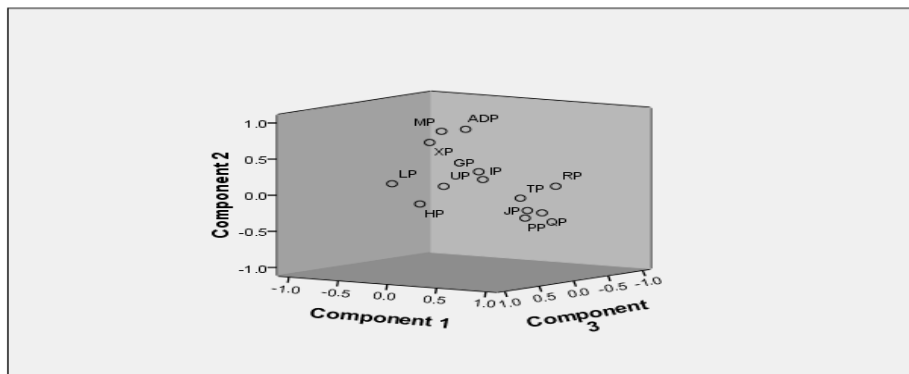


Figure 4.7 Component Plot Rotated Space For Profit

Component Plot in Rotated Space

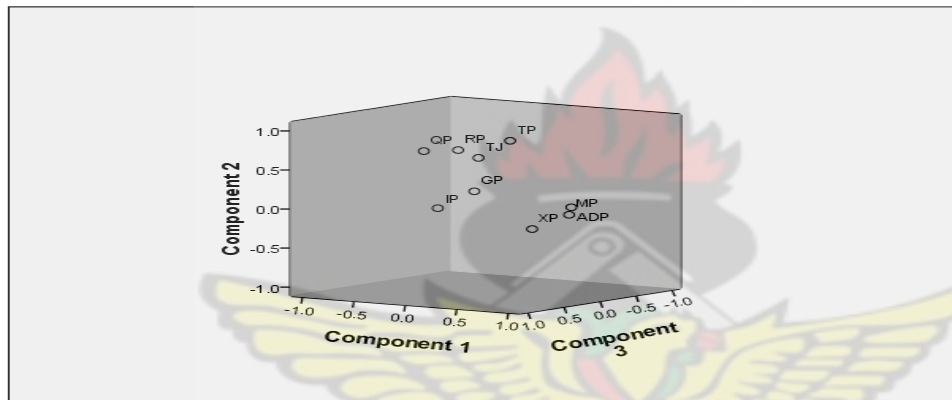


Figure 4.8 Component Plot Rotated Space For Time

Component Plot in Rotated Space

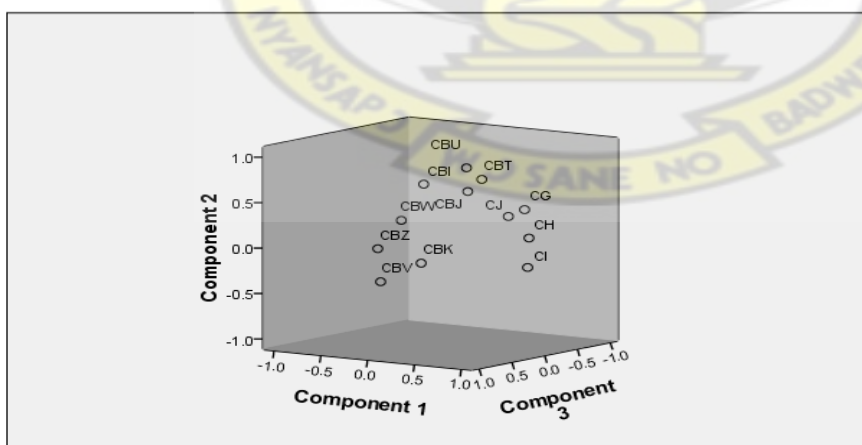


Figure 4.9 Component Plot Rotated Space For Cost

## 4.9 RESULTS

The 25 events that lead to payment of the compensation to the contractor selection variables in this study, were designed to find those among them that correlate highly with each other. This was distributed to 171 stakeholders in the construction industry (Client, Consultant and contractor) and 124 were returned. A factor analysis (principal component analysis) with varimax rotation was used to investigate how these variables correlate with each other and for that matter indicate how the variables can be reduced to a smaller number of factors that can represent the variables.

In this study, the eigenvalues produced in the extraction were examined on both the total variance explained table and the scree plot (Figure 4.4,4.5,4.6) with the following results;

### - PROFIT

4 factors, representing about 75% of the variables' variance, were extracted to represent thirteen (13) out of the 25 variables. The 4 factors with eigenvalues greater than two are reported here. Factor loadings, after varimax rotation is shown in Table 4.39 as the rotated component matrix table.

### - TIME

3 factors, representing about 71% of the variables' variance, were extracted to represent nine (9) out of the 25 variables. The 3 factors with eigenvalues greater than two are reported here. Factor loadings, after varimax rotation is shown in Table 4.340 as the rotated component matrix table.

### - COST

3 factors, representing about 61% of the variables' variance, were extracted to represent twelve (12) out of the 25 variables. The 3 factors with eigenvalues greater than two are



reported here. Factor loadings, after varimax rotation is shown in Table 4.41 as the rotated component matrix table.

#### **4.9.1. PROFIT**

##### **Factor 1: Delays from consultants**

Factor 1 is comprised of 4 of the variables with 2 of them loading excellently with 0.81- 0.89 , 2 of them too very good with loadings of 0.71-0.79

The 4 extracted variables after rotation with factor loadings, were as follows;

- Inexperience on the part of the consultant (0.802)
- Untimely issuance of site instruction (0.776)
- Unconfirmed oral instruction( 0.843)
- Delay in supply of working drawings (0.736)

These set of 4 variables accounted for 29.67% of the variances, after rotation of the factors (Table 4.38), and are generally concerned about delays from consultants and poor performance of consultants which may lead to payment of compensation to client.

Delays from consultants were confirmed by Ahmed et al (2003) and Alagbari (2007). Thus, the factors highlighted above may delay the contractor's progress of works which will affect the contractor's profit margin leading to payment of compensation if they are not avoided. Alaghbari et al., 2007, confirms this by stating that "Delay is generally acknowledged as the common, costly, complex and risky problem encountered in construction projects and all stakeholders should try as much as possible to avoid them.

## **Factor 2: Extra Cost**

Factor 2 is comprised of 3 of the variables with 2 of them loading excellently with 0.81- 0.89, 1 of them too very good with loadings of 0.705

The 3 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Disruption or delays to the works caused by client (0.842)
- Uncovered defects (0.705)
- Cost overruns ( 0.880)

These set of 3 variables accounted for 24.298% of the variances, after rotation of the factors (Table 4.38), and are generally concerned about the contractor not incurring cost to affect his profit.

Extra cost to the contractor may at the end affect his profit margin and this is confirmed by steen (2002) and Vidokah and Ndekugri (1998). Thus, the above factors may cause for compensation claims if the contractor is incurring extra cost due to these activities. Steen (2002), states that the client may want the edifice to suit his modern day ideas while the contractor may be interested in his profit gains at the end of the project. This confirms the fact that any monetary issues that affects profit of the contractor may lead to claims from the contractor to make up for his loss.

## **Factor 3: Programme of Works**

Factor 3 basically talks about rescheduling of works programme by the client's party and it comprises of 3 variables with 2 of them loading with 0.61- 0.69 and 1 of them too with loadings of 0.818

The 3 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Failure of the client to honor payment of certificate (0.818))
- Acceleration of works requested by the client that affected schedule (0.697)
- Inaccurate valuation of variations of works in progress ( 0.698)

These set of 3 variables accounted for 10.909% of the variances, after rotation of the factors (Table 4.38), and are generally concerned with rescheduling of actual works schedule which may affect the contractor's profit.

Rescheduling of works program can totally disorganise the contractor's plan of action. If there is a request to accelerate works, introduction of variation which at the long run is not valued accurately and finally the contractor's certificate is not paid, it disorganises the entire contractor's party especially his profit. This is confirmed by Othman et al., 2006, that each activity involving the contractor from the site possession date to handing over has a cost implication either to the benefit or detriment of the contractor. This definitely warrants the contractor to claim for lost of profit which is affirmed in Murdoch and Hughes (2006) statement that "it is common to find a contractor who has not been paid threatening to be compensated for all monetary loss"

#### **Factor 4: Increase or Decrease in Project Duration**

Factor 3 is comprised of 3 of the variables with 2 of them loading with 0.61- 0.69 and 1 of them too with loadings of 0.818

The 3 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Changes or modification in design (0.658))
- Variation and late confirmation of variation (0.861)
- Lack of clarity regarding the time from which the contractor can calculate interest on late payments ( 0.622)

These set of 3 variables accounted for 10.376% of the variances, after rotation of the factors (Table 4.38), and are generally concerned changes often effected constraint with time which may affect the profit of the contractor.

Change of events constraint with time is one of the major issues that affect the profit of the contractor. This is confirmed in the section 3, clause 44 of the PPA (2003) stating that “the employer modifies the schedule of other contractors in a way that affects the work of the contractor under the contract, the contractor has the legitimate right to claim for compensation. The above listed indicate changes from the normal outlined construction procedures coupled with limited time. When these changes occur, they really affect the profit of the contractor as stated by Balabat (2010).

#### **4.9.2 Time**

##### **Factor 1 Works Interruption**

Factor 1 is comprised of 3 of the variables with 2 of them loading excellently with 0.855-0.896 , 1 of them too very good with loadings of 0.718

The 3 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Disruption or delays to the works caused by the client (0.855)
- Cost overruns (0.896)
- Uncovered defects (0.622)

These set of 3 variables accounted for 33.739% of the variances, after rotation of the factors (Table 4.39), and are generally concerned untimely interruption of works which may affect the time delivery of the contractor.

Untimely interruption of works affecting cost can lead to dispute affecting the time delivery of the contractor. The contractor can make claims when these incidents occur in the course of

the project. This is confirmed by Chin (2003) indicating that “construction is a project based with each being unique hence notorious for its high levels of conflict and disputes”. Kissiedu (2009), also confirms this by stating that “when one party interested supersedes the other, one party tends to suffer negative returns at the long run.” When the contractor is faced with this situation, it warrants him to claim for compensation to avert risk of being charged for delay as confirmed by Kissiedu (2009).

## **Factor 2: Inconsistent Instructions from Consultants**

Factor 2 is comprised of 4 of the variables with 3 of them loading excellently with 0.710-0.792, 1 of them too very good with loadings of 0.633

The 4 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Untimely issuance of site instructions (0.724)
- Unconfirmed oral instruction (0.752)
- Delay in supply of working drawings (0.792)
- Inexperience on the part of the consultant (0.633)

These set of 4 variables accounted for 2.415% of the variances, after rotation of the factors (Table 4.39), and are generally concerned about actions of the consultants affecting time schedules of the contractor which at the end may delay the progress of works of the contractor.

Actions of consultants affecting time schedules affect the project delivery of the contractor. These indicators listed, delay the contractor unnecessarily as confirmed by the (Alaghbari et al., 2007) that “delay is a costly risk encountered on a project and as such attracts claims from the contractor when they occur”. As these have been highlighted as consultant’s contribution to contractor’s delay, it also confirms a statement by Ahmed et al., 2003 saying “Basically

delay is one of the most highlighted events under time category and as such the actual causes of delay should be identified and dealt with on time.

### **Factor 3: Late Implementation**

Factor 3 is comprised of 2 of the variables with 1 of loading excellently with 0.888 and 1 of too very good with loadings of 0.733

The 2 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Changes and modification of design (0.733)
- Variation and late confirmation of variation (0.888)

These set of 2 variables accounted for 1.022% of the variances, after rotation of the factors (Table 4.39), and are generally late changes affecting time affecting the contractor's time delivery.

Late changes affecting the time delivery of the contractor is confirmed by Chan and Kumaraswamy (1998) that "late changes are as a result of poor contract management and improper planning". When these occur, the contractor can make claims for delay or cannot be charged with delay damages. Also Kissiedu (2009) stated that more often than not management tries to shed risk by making suitable changes to themselves. Which means that time issues of the contractor may be affected by management late changes and can be lead to claims by the contractor as confirmed by Kissiedu (2009).

#### **4.9.3 Cost:**

### **Factor 1: Cost Benefit to Stakeholders**

Factor 1 is comprised of 4 of the variables with 3 of them loading excellently with 0.81- 0.89 , 1 of them too very good with loadings of 0.66



The 4 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Cost overruns (0.669)
- Insufficient time for compensation events to be notified and submitted (0.882)
- Non Agreement of compensation events between consultants and contractor ( 0.816)
- Clients with no technical background (0.870)

These set of 4 variables accounted for 33.53% of the variances, after rotation of the factors (Table 4.40), and are generally concerned management action and time causing extra cost to contractor.

Management action and time factor causing the contractor extra cost can be one of the major causes for payment of compensation. Alaghbari et al., 2007 stated that time factor of the project is very necessary and that any activity that would cause delay may contribute to the contractor incurring more cost. Kissiedu (2009) also stated that the construction industry is a comprehensive field of activities engaging a lot of stakeholders and as such it is common for management's action to cause the contractor extra cost. Therefore management should be very cautious in any decision the make.

## **Factor 2: Additional Works**

Factor 2 is comprised of 4 of the variables with 1 of them loading excellently with 0.821, 2 of them too with loadings of 0.61-0.69, the next is 0.723.

The 4 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Failure of the client to honour payment of certificate (0.613)
- Unconfirmed oral instruction (0.723)
- Discrepancies and ambiguities in contract document ( 0.821)
- Changes or modification of design (0.642)

These set of 4 variables accounted for 15.287% of the variances, after rotation of the factors (Table 4.40), and are generally concerned factors from consultants causing extra cost to the contractor.

Actions from consultants that causes extra cost to the contractor which has been listed above is a good indication because Oyegoke (2006) indicated that the contractor should recognize the occurrence of these events so that any actions which can cause the contractor extra cost can be avoided. Archarya et al., (2006) also stated that although what have been categorised above may be basic phenomenon often experienced, there are divergent actions too by consultants which may indirectly affect the contractor's cost.

### **Factor 3: Technical Errors**

Factor 3 is comprised of 4 of the variables with 2 of them loading excellently with 0.71- 0.79, 2 of them too very good with loadings of 0.61 – 0.70 the next 1 has a loading of 0.580

The 4 extracted variables after rotation with factor loadings (in bracket), were as follows;

- Inaccurate valuation of variation and works in progress (0.756)
- Variations and late confirmation of variations (0.580)
- Remedying Defects ( 0.756)
- Delay in supply of working drawings (0.870)

These set of 4 variables accounted for 13.115% of the variances, after rotation of the factors (Table 4.40), and are generally concerned about the contractor incurring extra.

Technical Errors increasing cost confirms what Fisk (2000) stated that “there is always a tendency of conflict on the technicalities of the project therefore all the stakeholders should make it a point to avoid technical errors. Kissiedu (2009) also indicated to confirm that all the project stakeholders should work together to avoid unnecessary technical errors.

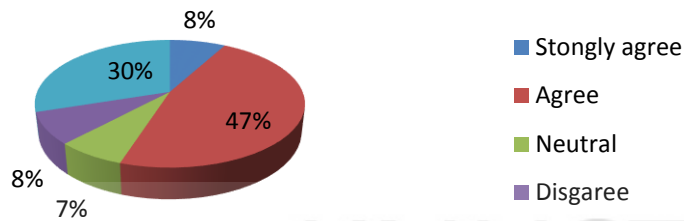
**Table 4.41 Knowledge on Compensation Events under Section 3, Clause 44 of The PPA**

	Client		Consultant		Contractor	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<i>The PPA's conditions of contract have the principles of Flexibility, Clarity and Simplicity and Motivation to good Management.</i>						
Strongly agree	4	31%	5	8%	8	15%
Agree	6	46%	49	86%	15	28%
Neutral	3	23%	3	6%	28	52%
Disagree	–	–	–	–	3	5%
Strongly Disagree	–	–	–	–	–	–
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<p><i>The PPA's conditions of contract have the principles of Flexibility, Clarity and Simplicity and Motivation to good Management.</i></p> <p>Clients had majority of respondents (46%) agreeing to the statement. This was also followed by 86% of the consultants also agreeing to the statement. Contractors remained neutral with 52% of the respondents. Indicating that the parties understand the statement is valid.</p>						
<b>Do clients, consultants and contractors cooperate to manage compensation claims?</b>						
Yes	5	38%	48	84%	25	46%
No	8	62%	9	16%	29	54%
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<p><i>Do clients, consultants and contractors cooperate to manage compensation claims?</i></p> <p>62% of the clients said no to the above mentioned statement. 84% of consultants admitted to the statement mentioned and 54% of the contractors also said no to the statement. Indicating that majority of the parties established that there is no collaboration to resolve compensation claims.</p>						
<b>From your experience, is early warning notices clause effective in handling a compensation event?</b>						
Yes	8	38%	46	81%	43	85%
No	5	62%	11	19%	11	15%
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<p><i>From your experience, is an early warning notices clause effective in handling a compensation event?</i></p> <p>Consultant and contractors agreed to the statement with a majority response of 81% and 85% respectively whilst 62% of the clients said no to the statement. The majority of the respondent agreed that early warning notification is an effective tool for handling compensation.</p>						
<b>Early warning notification of compensation events is a useful tool for mitigating compensation claims.</b>						
Strongly agree	2	15%	7	12%	1	2%
Agree	7	55%	43	76%	8	15%
Neutral	2	15%	4	7%	3	6%
Disagree	2	15%	3	5%	5	9%
Strongly Disagree	–	–	–	–	37	68%
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<p><i>Early warning notification of compensation events is a useful tool for mitigating compensation claims.</i></p> <p>55% of the clients agreed to the statement followed by 76% of the contractors who also agreed. On the other hand 68% of the contractors disagreed to the statement. Indicating that the early warning notification is seen by the contractors as redundant whilst the clients' team saw it to be an effective tool.</p>						

<b>The PPA's conditions of contract offer a more effective way of dealing with changes.</b>						
Strongly agree	3	23%	6	11%	5	9%
Agree	2	15%	43	75%	36	67%
Neutral	5	39%	5	9%	10	19%
Disagree	3	23%	3	5%	3	5%
Strongly Disagree	–	–	–	–	–	–
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b>The PPA's conditions of contract offer a more effective way of dealing with changes.</b> 39% of the clients remained neutral on the statement whilst 75% of the consultants agreed to the statement. 67% Contractors also agreed to the statement. This indicate that majority of the population agreed to the statement.						
	<b>Client</b>		<b>Consultant</b>		<b>Contractor</b>	
	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Cost, time and profit of the contractor's compensation clauses are clearly set out in the contract.</b>						
Strongly agree	–	–	–	0%	5	9%
Agree	4	31%	25	44%	33	61%
Neutral	7	54%	32	56%	9	17%
Disagree	2	15%		0%	7	13%
Strongly Disagree	–	–	–	–	–	–
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b>Cost, time and profit of the contractor's compensation clauses are clearly set out in the contract.</b>  54% of the clients remained neutral on the statement whilst also 56% of the consultants also did same. Contractors were the only respondents who agreed to the statement. Indicating that majority of the respondents do not agree that cost, time and profit clauses are clearly set out in the contract except contractors						
<b>The language the PPA contract uses to describe compensation events clauses is easy to understand.</b>						
Strongly agree	2	15%	3	5%	3	6%
Agree	3	23%	22	39%	8	15%
Neutral	8	62%	32	56%	32	59%
Disagree	–	–	–	0%	11	20%
Strongly Disagree	–	–	–	–	–	–
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b>The language the PPA contract uses to describe compensation events clauses is easy to understand.</b> Majority of all the respondents remained neutral on the statement with percentages of 62, 56, and 59 respectively for clients, consultants and contractors. This indicates that the PPA should be presented in a more elaborate way.						
<b>The compensation event procedure is a positive step forward in how cost changes should be dealt with.</b>						
Strongly agree	2	–	–	0%	4	7%
Agree	8	23%	55	96%	47	87%
Neutral	2	69%	2	4%	2	4%
Disagree	1	8%	–	0%	1	2%
Strongly Disagree	–	–	–	–	–	–
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>

<b>The compensation event procedure is a positive step forward in how cost changes should be dealt with.</b>						
69% of the clients remained neutral whilst 96% of the consultants agreed to the statement. The contractors also had a similar trend of 87% also agreeing to the statement. This shows that majority of the respondents agree that procedures towards handling of compensation events resolves how cost changes should be dealt with.						
<b>Compensation claims are evaluated and resolved in a timely manner?</b>						
Strongly agree	2	15%	9	16%	8	15%
Agree	4	31%	28	49%	42	78%
Neutral	6	46%	8	14%	4	7%
Disagree	1	8%	12	21%		
Strongly Disagree						
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b>Compensation claims are evaluated and resolved in a timely manner?</b>						
46% of the clients remained neutral whilst 49% and 78% of the consultants and clients agreed that compensation claims are resolved on time						
<b>Positive effects on the relationship of project partners exist after successful compensation claims.</b>						
Strongly agree	4	31%	32	56%	12	22%
Agree	7	53%	6	11%	37	69%
Neutral	1	8%	15	26%	5	9%
Disagree	1	8%	4	7%		
Strongly Disagree						
<b>Total</b>	<b>13</b>	<b>100%</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>
<b>Positive effects on the relationship of project partners exist after successful compensation claims.</b>						
56% of Contractors strongly agreed while 69% of the contractors also agree. The client also indicated that there is cordial relationship after resolving compensation claims.						

**Early warning notification of compensation events is a useful tool for mitigating compensation claims.**



**Figure 4.10 Early warning notification compensation event is a useful tool for mitigating compensation claim.**

The survey had a response of 8% representing strongly agreed, 47% as agree, 7% as neutral, 30% as strongly disagree from the respondents to the questionnaire. Although those who agreed were more than those who strongly agreed, they did not have a convincing lead. This means that early warning notification is not convincing clear for mitigating compensation claims.

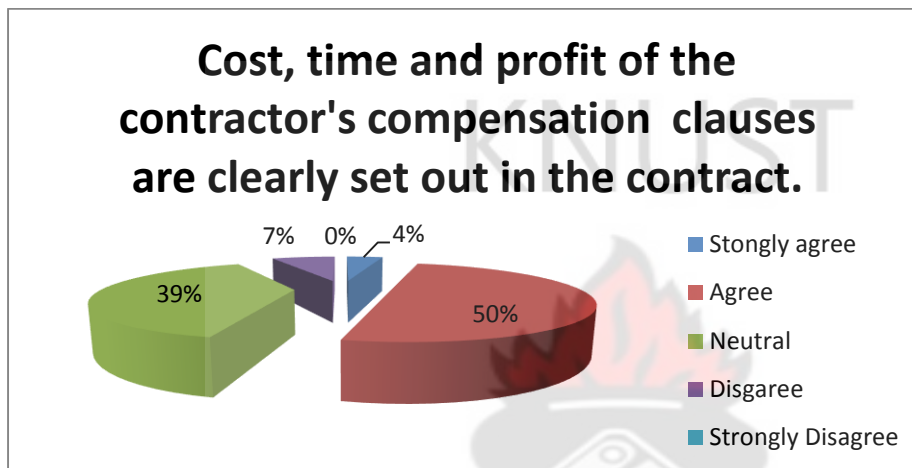
**The PPA's conditions of contract offer a more effective way of dealing with changes.**



**Figure 4.11: The PPA's conditions of contract offer a more effective way of dealing with changes**



The survey had a response of 11% representing strongly agree, 66% as agree, 16% as neutral, 7% as strongly disagree. This shows that majority of the respondents agree that the PPA's conditions of contract offer a more effective way of dealing with changes. This is as result of respondents having knowledge of clauses available in PPA for dealing with changes of projects.



**Figure 4.12 Cost, Time and Profit of the contractor's compensation clauses are clearly set out in the contract**

The survey again had a response of 4% representing strongly agree, 50% as agree, 39% as neutral, 7% as disagree. This shows that majority of the respondents agree that Cost, Time and Profit of the contractor's compensation clauses are clearly set out in the contract but then they do not establish a convincing lead of accepting the above stated fact.

## CHAPTER FIVE

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 INTRODUCTION

This chapter presents the conclusions of the study and recommendations made to address the main findings obtained from the analysis in relation to the objectives of the study. This research identified significant compensation events in relation to time, cost and profit of the Ghanaian contractor based on the Public Procurement Authority's (PPA) conditions of contract for small and medium contracts on construction projects in Ghana from the perspective of clients, contractors and consultants.

Identifying significant compensation events in relation to time, cost and profit is a complex decision process for construction professionals. It requires a large number of variables to be simultaneously measured and/or evaluated. Many of these variables are related to one another in a complex way. Variables very often conflict as improvement in one often results in decline of another(s) (Sonmez et al, 2001).

The events that lead to compensation claims tend to drag the project and increase cost. This effect is evident on late delivery of project, decrease in contractor's profit and increased cost of the contractor. Therefore, a uniform set of guidelines for identifying significant events that lead to payment of compensation claims to contractors is essential to ensure that compensation events and origination of compensation events are thoroughly assessed and the best solution to these events are implemented for a successful project delivery (Alaghbari et al., 2007).

The variables used in evaluation and in identifying significant compensation events are many and often have common underlying factors. Factor analysis was used in finding those

variables that have common underlying factors in Ghana according to the opinion of construction professionals.

## 5.2 CONCLUSIONS

Based on the aims and objectives of this study, the following conclusions can be drawn from the analysis in the preceding chapters.

1. 82% of construction professionals (respondents) in Ghana who have used the Public Procurement Act 2003 (Act 663) have experienced compensation events.
2. Most respondents are of the opinion that clients are the main causes of events that lead to payment of compensation claims to the contractor.
3. Respondents prefer early warning notification as an averting tool for compensation events than allowing later solution to the compensation events.
4. Changes and Modification of Design and Cost Overruns were identified as most significant events under time, cost and profit categories that can lead to payment of compensation to the contractor.
5. There is a need for clients, contractors and consultants to collaborate to resolve compensation events issues as majority of the respondents indicated that there is no collaboration between parties to manage compensation claims.
6. Most of the variables used in identifying events that lead to compensation claims by the contractor have common underlying factors and therefore correlate very well with each other. As a result the 25 variables used in this study were reduced to four common factors representing 75% of the variances of the variables under profit category, three common factors representing 71% of the variances of the variables under time category and three common factors representing 61% of the variances of the variables under cost category.

7. Based on the Factor Analysis;

- a. Profit: The common factors were named; Delays from consultants (4 variables), Extra Cost (3 variables), Programme of works (3 variables) and Increase or Decrease in Project Duration (3 variables) Factors.
- b. Time: The common factors were named; Works Interruption (3 variables), Inconsistent Instructions from Consultants (4 variables) and Late Implementation (2 variables) Factors.
- c. Cost: The common factors were named; Cost Benefit to Stakeholders (4 variables), Additional Works (4 variables) and Technical Errors (4 variables) Factors.

### 5.3: RECOMMENDATION

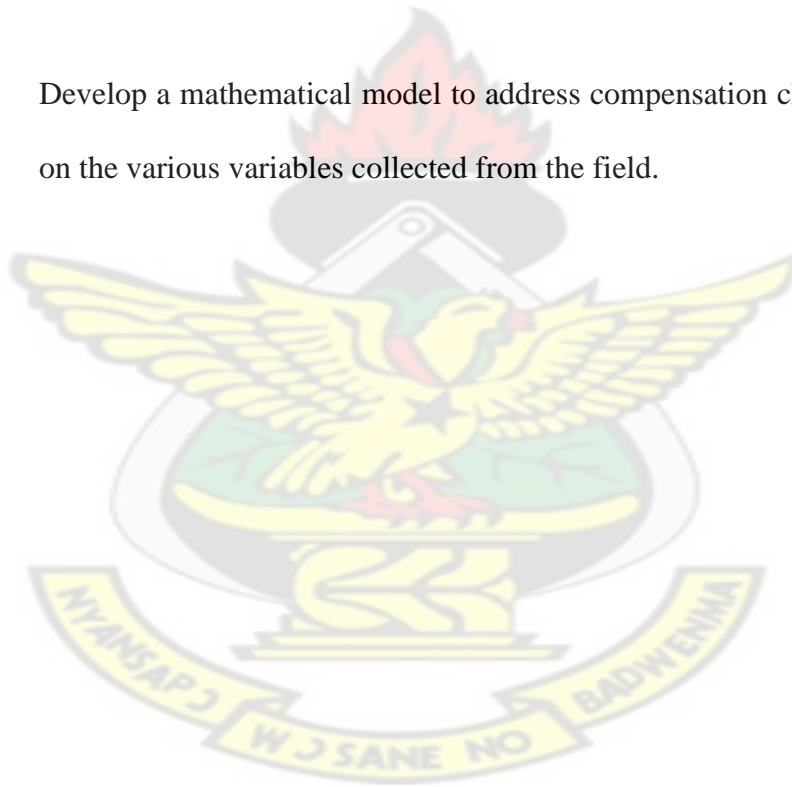
The following are recommendations:

- a) Financial and project goals should be met accordingly to prevent dissatisfaction among client, consultants and contractors.
- b) Consultants, clients and contractors should strictly adhere to stipulated communication channels as stated per the contract.
- c) Regular seminars should be organised by the various professional bodies in the construction industry to inform and update its members on the current best practices in relation to the Public Procurement Act with emphasis on compensation events.
- d) The clients' representative should be proactive to make sure that the consultants deliver all requisite documents on time.
- e) Consultants should be unbiased in their judgment so as to maintain credibility when dealing with both clients and contractors.

## 5.4 FURTHER RESEARCH

The government of Ghana being a major player in the Ghanaian construction industry, should take the initiative and encourage other stakeholders to:

- i. Extend research to identify the impact of compensation claims on project delivery.
- ii. Conduct further research on disputes on compensation claims under the PPA's conditions of contract.
- iii. Develop a mathematical model to address compensation claims depending on the various variables collected from the field.



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## **APPENDICES**

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**COLLEGE OF ARCHITECTURE AND PLANNING**  
**FACULTY OF ARCHITECTURE AND BUILDING TECHNOLOGY**  
**DEPARTMENT OF BUILDING TECHNOLOGY**  
**SURVEY QUESTIONNAIRE**



Research topic: **CRITICAL ANALYSIS OF COMPENSATION EVENTS UNDER THE PUBLIC PROCUREMENT AUTHORITY'S CONDITIONS OF CONTRACT FOR MEDIUM CONTRACTS IN GHANA.**

## **INTRODUCTION**

Compensation events are claims for which risk in terms of money or time are transferred away from the contractor onto the employer. In other words, compensation events are extra cost caused to the contractor by the client or the client's representative or any other unforeseen physical discrepancies. This turns to have adverse effect on the contract period, cost and also the profit of the contractor.

For this reason, there is a need to identify significant compensation events and contractors assessment of these events in relation to project time, cost and profit. This will ascertain ranking the significance of compensation events under the PPA's clause 44 of the conditions of contract.

This research is embarked on to find out from the primary stakeholders to any construction project (namely the client, consultant and contractor), in their opinion the identification of significant compensation events and the contractors assessment of compensation events in the Ghanaian construction industry. This study is conducted as part of a graduate study at KNUST. It is my hope that the stakeholders will provide practical and convincing answers to the questions below to enable me present a good report on critical analysis of compensation events under the public procurement authority's conditions of contract for medium contracts. Thank you in advance for your contribution to this research study.

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

### **SECTION ONE- RESPONDENT PROFILE**

1. What type of organisation do you belong?

- a) Client's organisation ☐ b) contracting firm ☐ c) consulting firm ☐  
d) Others (specify).....

2. Which of the following describes your position?

☐☐



- a) Quantity surveyor ☐ b) Project manager ☐ c) Architect ☐  
d) Principal consultant ☐ e) Managing director ☐ f) contractor ☐  
g) Engineers ☐ h) Others please specify.....

3. How many years of experience do you have in the construction industry?

- a) Less than 5years ☐ b) 5years ☐ c) 10 years to 15 years ☐  
d) 16 years and above ☐

4. How many years of have you worked with the PPA's conditions of contract in the construction industry?

- a) Less than 5years ☐ b) 5 to 9 years ☐ c) 10 years to 15 years ☐  
d) 16 years and above ☐

5. Have you ever experienced compensation events on a project? Yes ☐ No ☐

6. If yes who originated it?

- a) Act of nature ☐ b) client ☐ c) consultant ☐  
d) Others (specify).....

## SECTION TWO

QUESTIONS RELATED TO IDENTIFYING SIGNIFICANT COMPENSATION EVENTS AND THE ASSESSMENT OF THESE EVENTS UNDER PUBLIC

PROCUREMENT AUTHORITY ON CONSTRUCTION PROJECTS

Below are a number of events that lead to compensation claims. From experience, rank These in order of importance.

Relative Importance: 1- Not important, 2 - Quite important 3 - Moderately Important, 4 - Important, 5 - Very Important

	EVENTS	Profit					Time					Cost				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
7.1	Changes or modification of design															
7.2	Failure of the client to honor payment of certificate on time															
7.3	Variations and late confirmation of variations															

7.4	Acceleration of works requested by client that affected schedule																			
7.5	Adverse site conditions																			
7.6	Lack of clarity regarding the time from which contractor can calculate interest on late payments																			
7.7	Disruptions or delays to the works caused by the client																			
7.8	Non responses of the project manager to compensation claims																			
7.9	Late responses of the project manager to compensation claims																			
7.10	Inexperience on the part of the consultant																			
7.11	Untimely issuance of site instructions																			
7.12	Unconfirmed oral instructions																			
7.13	Discrepancies/ambiguities in the contract document																			
7.14	Delay in supply of working drawings																			
7.15	Inaccurate valuation of variations and works in progress																			
7.16	Ineffective communication between the parties on the project																			
7.17	Remedying defects																			
7.18	Uncovered defects																			
7.19	Poor records keeping by client, contractor and consultant																			
7.20	Contractors failure to identify and deal with issues on time																			
7.21	Differences in party interest																			
7.22	Cost overruns																			
7.23	Clients with no technical background																			
7.24	Insufficient time for compensation events to be notified and submitted																			
7.25	Non - agreement of compensation events between consultants and the contractor																			

### SECTION THREE

#### Contractors Assessment on Compensation Events

##### General

- 1 The PPA's conditions of contract have the principles of Flexibility, Clarity and Simplicity and Motivation to good management.

☐

Strongly Agree

☐

Agree

☐

Neutral

☐

Disagree

☐

Strongly disagree

- 2 Do clients, consultants and contractors cooperate to manage compensation claims?

☐ Yes

☐ No

**Early Warning Notices**

3 From your experience, is early warning notices clause effective in handling a compensation event?

☐ Yes

☐ No

4 Early warning notification of compensation events is a useful tool for mitigating compensation claims.

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly disagree

<b><u>Compensation Events</u></b>		Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
5	The PPA's conditions of contract offer a more effective way of dealing with changes.					
6	Cost, time and profit of the contractor's compensation clauses are clearly set out in the contract.					
7	The language the PPA contract uses to describe compensation events clauses is easy to understand.					
8	The compensation event procedure is a positive step forward in how cost changes should be dealt with.					
9	The compensation event clause is a vital tool to determine the appropriate risk allocation on a building project.					
10	Compensation events are evaluated and resolved in a timely manner?					
11	Positive effect on the relationship of project partners exists after successful compensation claims.					

**Appendix (b): Compensation Events (clause 44, section 3 of the Public Procurement Authority)**

44.1 The following shall be Compensation Events:

- (a) The Employer does not give access to part of the Site by the Site Possession Date stated in the Contract Data.

- (b) The employer modifies the schedule of other contractors in a way that affects the work of the contractor under the contract.
- (c) The project manager orders a delay or does not issue drawings, specifications, or instructions required for execution of the works on time.
- (d) The project manager instructs the contractor to uncover or carry out additional tests upon work, which is then found to have no defects.
- (e) The project manager unreasonably does not approve a subcontract to let.
- (f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the letter of acceptance from the information issued to tenderers (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.
- (g) The project manager gives an instruction for dealing with an unforeseen condition, caused by the employer, or additional work required for safety or other reasons.
- (h) Other contractors, public authorities, utilities, or the employer does not work within the dates and other constraints stated in the contract, and they cause delay or extra cost to the contractor.
- (i) The advance payment is delayed.
- (j) The effects on the contractor of any of the employer's risks.
- (k) The project manager unreasonably delays issuing a certificate of completion.
- (l) Other compensation events described in the contract or determined by the project manager shall apply.

44.2 If a compensation event would cause additional cost or would prevent the work being completed before the intended completion date, the contract price shall be increased and/or the intended completion date shall be extended. The project manager shall decide whether and by how much the contract price shall be increased and whether, and by how much the intended completion date shall be extended.

44.3 As soon as information demonstrating the effect of each compensation event upon the contractor's forecast cost has been provided by the contractor, it shall be assessed by the project manager, and the contract price shall be adjusted accordingly. If the contractor's forecast is deemed unreasonable, the project manager shall adjust the contract price based on the project manager's own forecast. The project manager will assume that the contractor will react competently and promptly to the event.

44.4 The contractor shall not be entitled to compensation to the extent that the employer's interests are adversely affected by the contractor not having given early warning or not having co-operated with the Project Manager.

