KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

"INVESTIGATING THE CAUSAL RELATIONSHIPS AND EFFECTS OF MORAL HAZARD AND ADVERSE SELECTION ON PUBLIC-PRIVATEPARTNERSHIP CONSTRUCTION PROJECTS"

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A Thesis submitted to the Department of Building Technology, College of Art and Built Environment in partial fulfillment of the requirement for the degree of

MASTER OF PHILOSOPHY

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DECLARATION

I hereby declare that, this thesis submission is my own work towards the MPhil. Construction Management and that to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the university except where due acknowledgement has been made in the text.

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ABSTRACT

Globally, failures of Public-Private-Partnership (PPP) contracts are more often than not ascribed to moral hazard and adverse selection problems, which arise under conditions of inadequate and asymmetric information when an agent is hired by a principal. Currently in Ghana, there is no law on PPP but rather a draft bill. This fact makes the tendency of moral hazard and adverse very high in PPP construction projects. The aim of this research was to investigate the causal relationship and effects of moral hazard and adverse selection on Public-Private-Partnership projects. Literature review was carried out and it explored the motivating factors for entering into PublicPrivate-Partnership construction projects; causes of moral hazard and adverse selection of PPP construction projects; effects of moral hazard and adverse selection on PPP construction projects and the causal relationships of moral hazard and adverse selection of PPP construction projects. Questionnaires were used to collect data from respondents in the Accra and Kumasi metropolis. Two hundred and ten (210) questionnaires were retrieved out of two hundred and eighty (280) distributed representing a response rate of seventy five percent. SPSS, STATA and AMOS softwares aided in the analysis of data. Analytical tools used were descriptive statistics, mean score ranking, ANOVA, one sample t-test and Structural Equation Modeling (SEM). *Reduction of public expenditures, faster delivery time of construction projects, achieving improved value for money (VFM), use of innovative materials and technologies* and *increased certainty of projects* were the most significant motivations for the public sector entering into PPP construction projects. Furthermore, *increase in accessible capital, gaining of profits, creation of goodwill for private partner, improvement in private sector's international image* and *sharing of risks* were the most significant motivations for the private sector entering into PPP construction projects. One way ANOVA was used to test the significance of perception among respondents in ranking these motivating factors for the public and private sectors. *Effort dimensions which are not verifiable, low transfer of risk, lack of accurate information about project conditions, wrong party chosen to execute project* and *renegotiation of contracts* were the most important causes of moral hazard and adverse selection problems in PPP

construction projects. In addition, *reduction of competition, high transaction costs, consequences on profitability of project, siphoning of funds* and *negative implications on enforceability of contract* were the most important effects of moral hazard and adverse selection problems in PPP construction projects. One sample t-test was conducted on the causes and effects to establish the relative significance of these variables. SEM was used to explore the causal relationships between the causes and effects with causes being the independent variables (IV) and effects the dependent variables (DV). A model culminated out of these relationships. The findings of this research will serve as a guide to construction stakeholders helping them minimize the problems of adverse selection and moral hazard. This will ultimately lead to obtaining value-for-money projects and consequent immense satisfaction from the entire project. Despite the significance of these findings, there exist inevitable shortcomings and limitations in this study. These limitations are anticipated to be the basis for recommendations for prospective research studies. It is recommended that there should be increased incentives to control costs and construction risks should be managed.

Keywords: Moral hazard, Adverse selection, PPP, Causal relationships, effects, construction, projects

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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DEDICATION

I first of all dedicate this piece of work to Almighty God for his love, protection and faithfulness. Secondly, I also dedicate this work to my lovely mother Mrs. MaryTheodora Kukah for her support and encouragement.

LIST OF ABBREVIATIONS

Analysis of Moment Structures ……AMOS

Analysis of Variance ……..……..ANOVA

Build-Lease-Operate-Transfer ……..……BLOT

Build-Lease Transfer ……..……BLT

Build-Own Operate ……...BOO

Build-Own-Operate-Transfer ……..…BOOT

Build-Operate Transfer ……..BOT

Build-Transfer-Lease ……..BTL Build

Transfer Operate ……...BTO

Comparative Fit Index ……CFI Confirmatory

Factor Analysis…….CFA

Confidence Interval …….CI

Critical Ratio……CR

Dependent Variables ……...DV

Design-Build-Finance-Maintain ……..…DBFM

Design-Build Finance Operate ……....DBFO

Design-Construct-Manage-Finance ……....DCMF

Exploratory Factor Analysis ……..EFA

General Linear Modeling ……GLM

Goodness of fit ……GFI

Independent Variables ……..……...IV

Measurement Invariance……..MI

Missing Values ……..….MV

Multiple Regression ……..MR

Multivariate Analysis of Variance ……..MANOVA Partial Least Squares ……...PLS

Private Finance Initiative…….……PFI

Public-Private Collaboration ……PPC

Public-Private-Partnership ……..PPP

Public-Private Infrastructure Advisory Facility ……..PPIAF

Research Instrument ……..……..RI

Residual Mean Square Error of Approximation ……RMSEA

Robust Maximum Likelihood……..…RML

Satorra-Bentler Scaled Chi-square ……S – Bχ2

Special Purpose Entity ……..……...SPE

Standardized Root Mean Square Residual……..SRMSR

Statistical Package for Social Sciences ….....SPSS

Structural Equation Modeling ……...SEM

United Kingdom ……....UK

Value for Money ……VFM

GLOSSARY

Moral hazard

Moral hazard is the situation in which one party of a contract cannot monitor the actions of the remaining party. Hence, moral hazard is every now and then referred to as a hidden action dilemma. The tendencies of one party, the one having superior information are not apparent to the other party. This unevenness of information causes unseen deeds which are regularly unfavorable to humanity (than if there had been perfect knowledge and information).

Adverse selection

Adverse selection results when there is a lack of symmetric information prior to a contract involving a buyer and a seller. Adverse selection depicts an undesired consequence because the condition where one stakeholder of a contract possesses more precise and different information as compared to the other stakeholder. The party with smaller information is disadvantaged than the partner

having superior information. The asymmetry results in inefficiency in the quantity and price of services and goods.

Public-Private-Partnership (PPP)

Public-Private-Partnership (PPP) is an alliance between a government and one or additional private sector conglomerate to make available a public high-quality project. Both government and the private sector unite to supply the project deliverable and furthermore put up with some of the conventional parts of uncertainty that may arise on the project.

Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) is a statistical method that verifies factor structure of a set of observed variables. It is normally used in the measurement of SEM models. The CFA is conducted by the investigator applying knowledge of theory, experimental research or using both to assume relationship trend and tests statistically the hypothesis.

One-sample t-test

The purpose of one-sample t-test is to compare a sample with a population that has been defined. T-tests approximate the standard deviation of the population using sample data.

ANOVA

ANOVA is used for testing perceptions of research respondents about factors under study.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

The most general method of price determination in construction procurement of projects is tendering. In the building construction industry, contractors are normally selected using a competitive bidding process (Blombäck and Axelsson, 2007). According to Anderson and Narus (1999), contractors may offer their lowest possible prices and best quality in order to gain customer penchant because of the attractiveness of the contract and the fear of losing to competitors (Biong, 2013). Contracts are usually awarded to the lowest responsive bidder. The award of contract to the lowest bidder is typically carried out in the public sector predominantly since it poses superior accountability (Blombäck and Axelsson, 2007; Lingard and Hughes, 1998). Countless private clients also award contracts to the lowest bidder for reasons of cost. The lowest responsive bidder is therefore characteristically the price setter (Wuyts *et al*., 2009).

Agency theory describes the relationship between a principal or a buyer who contracts with an agent or a seller for the supply of a goods or a service (Buvik and Rokkan, 2003). It may be possible for the principal and agent to have contradictory interests in such contract. This divergence of interests can cause moral hazard and adverse selection.

Moral hazard is the contractor's discretionary actions not observed by the buyer and which can however influence both contract costs and quality (Buvik and Rokkan, 2003). Example of moral hazard is the supply of a quality level of materials and products lower than the contracted level when the action cannot be observed by buyer in the desire to save costs

(Biong, 2013). Moral hazard happens when the information asymmetry appears after the principal has made a decision. It is also called "hidden action", because the principal is not fully aware of the activity of the agent (Pana, 2010). Within the extant literature, adverse selection is acknowledged to be the exclusive or private information possessed by the contractor and which is not available to buyer (Biong, 2013). According to Buvik and Rokkan (2003), the agent can hide such private information in order to derive substantial information rents from it. Adverse selection occurs when the gap in information appears before the principal has made his decision. It is also known as "hidden knowledge" because the prospective agent has some information that the principal does not possess, which will lead to the latter making an uninformed decision. Within construction tendering, agency problems are created by both types of information asymmetry (Pana, 2010). Adverse selection causes risky contractors to bid for projects, and moral hazard leads to contractors who could be less careful after the contract has been awarded, knowing that a form of insurance has been made available (Jayasena, 2005).

Public-Private-Partnership (PPP) is an alliance between a government and one or additional private sector conglomerate to make available a public high-quality project. Both government and the private sector unite to supply the project deliverable and furthermore put up with some of the conventional parts of uncertainty that may arise on the project (Gray and Larsson, 2008). Currently in Ghana, there is no law on PPP but rather a draft bill. This fact makes the tendency of moral hazard and adverse very high in

PPP contracts (GNDPC, 2013).

The situation of asymmetric information brings about moral hazard problems and adverse selection issues (Ahadzi and Bowles, 2001; Ouattara, 2009). In a Public-PrivatePartnership

contract, the public sector is the principal and the private sector is the agent. Considering that both are utility maximisers, public and private sectors are apt to have diverse goals. The government would be inclined to ensuring social welfare and providing public with qualified services (Schjelderup, 1990). The private sector faces the enticement of capitalizing on profits as much as they can. Governments are at disadvantage in this partnership because they are not able to scrutinize the proficiency and expertise provided by project constructors and operators. Governments therefore seek to maneuver and manipulate the behavior of constructors and operators so that they will perform in ways that align with governments' interests and preferences (Waterman and Meier, 1998).

1.2 PROBLEM STATEMENT

Globally, failures of Public-Private-Partnership contracts are more often than not ascribed to the agency problem (Schjelderup, 1990), which arise under conditions of inadequate and asymmetric information when an agent is hired by a principal. In Public-PrivatePartnership projects, the government has to cope with corrupt behaviour of bidders. According to Yang and Yang (2010), the contract pricing phase is the most decisive and critical stage in the Public-Private-Partnership process, regularly causing delays and overruns of the advisory and bidding costs of approximately 25% to 200%. Altogether, 85 per cent of the Public-Private-Partnership projects overrun time because of ineptness in the contracting procedure (Ahadzi and Bowles, 2001; Edlin and Hermalin, 2000). DePalma *et al*. (2007) indicates that Public-Private-Partnership unions undergo contractual risks that need to be covered including moral hazard and adverse selection. Due to the very long-term scope of Public-

Private-Partnership projects, there is paucity of accurate information about the present conditions, the future and the indirect social cost of the project (Rao and Monroe, 1996; Biong, 2013). Moral hazard and adverse selection troubles are even tougher to discover (Monteiro, 2010; Zolkiewsky *et. al*., 2007).

There has been theoretical development over the recent years in researching on the problems of moral hazard and adverse selection by different authors (Biong, 2013; Monteiro, 2010; Wuyts *et al*., 2009; Blombäck and Axelsson, 2007). Biong (2013) investigated on reputation and pricing effects on choosing subcontractors in asymmetric markets. Furthermore, Monteiro (2009) explored risk management in agency relationships. However some gaps do exist in their literature since there is dearth and scarcity of literature in these areas especially in contract pricing of Public-PrivatePartnership projects. This study not only extends existing work by examining agency theory, it goes on further to investigate the causal relationship and effects of moral hazard and adverse selection on Public-Private-Partnership projects. Due to the problems aforementioned, this research seeks to determine the causal relationship and effects of moral hazard and adverse selection on Public-Private-Partnership projects in the Ghanaian construction industry.

1.3 AIM AND OBJECTIVES

1.3.1 Aim

The aim of this research was to investigate the causal relationship and effects of moral hazard and adverse selection on Public-Private-Partnership projects.

1.3.2 Objectives

In a bid to accomplish the above stated aim, the following specific objectives were lucidly set:

1. To ascertain the motivating factors for entering into Public-Private-Partnership construction projects;
2. To identify causes of moral hazard and adverse selection of PPP construction projects;
3. To assess the effects of moral hazard and adverse selection on PPP construction projects; and
4. To investigate causal relationships of moral hazard and adverse selection of PPP construction projects.

1.4 RESEARCH QUESTIONS

1. What are the motivating factors for entering into Public-Private-Partnership construction projects?
2. What are the causes of moral hazard and adverse selection of PPP construction projects?
3. What are the effects of moral hazard and adverse selection on PPP construction projects? and
4. What are the causal relationships of moral hazard and adverse selection of PPP construction projects?

1.5 SCOPE OF STUDY

Geographically, the scope of this study was restricted to the building construction industry in the Accra and Kumasi metropolis. This is because; they are the largest cities in Ghana with numerous consulting and construction firms which aided in representing a true assessment needed for the research. Accra and Kumasi are also the country's major economic and administrative hubs and are resident to lots of construction projects and their related activities. This brought about diverse responses to the study making it more detailed and practical in terms of its findings. Accra and Kumasi were also advantageous in proximity thereby reducing challenges of questionnaire retrievals.

Contextually, the scope was limited to government agencies in charge of Public-PrivatePartnership projects, procurement offices, consultancy firms and D1 construction companies involved in PPP projects. The respondents therefore included quantity surveyors, project managers, cost engineers, consultants, contractors and procurement officers working in the built environment. Finance officers and directors of ministries and public agencies also formed part of the respondents.

1.6 METHODOLOGY

Quantitative research strategy was employed in this research. This approach built upon previous works which have developed principles that helped to decide the data requirements of this particular research. The methodology adopted for this study engrossed a detailed review of extensive and pertinent literature relevant to moral hazard and adverse selection in construction contract pricing of Public-Private-Partnership projects. This aided in the identification of the previous works done, contributions made, criticisms, limitations,

current findings and their applications. Apt and suitable ontology, epistemology and axiology were adopted to help steer the data collection, analysis and the eventual interpretation of the findings appropriate to tackle the aim and objectives.

Correlational research design was espoused for this study. This design helped to establish relationships among variables by collecting data using standardized questionnaires and relied on primary and secondary source of information. Secondary data was gathered from books, journals and the internet. Primary data was collected through the design of structured survey questionnaires based on variables obtained from the literature review of the study. Questionnaires comprising of closed-ended questions were administered to respondents. The questionnaires consisted of two parts. The first segment covered demographic information. The second section assessed the specific objectives of the study. The completed questionnaires were coded and entered into the Statistical Package for Social Sciences version twenty three (SPSS v 23), STATA version 13 and Analysis of Moment Structures (AMOS) software for statistical analysis. Data analysis was accomplished with the aid of charts and descriptive statistics. Hypotheses were tested by using non-parametric inferential statistical methods such as the one way ANOVA. Other statistical tools adopted included parametric inferential statistical methods like one sample T-test and mean score ranking. To further analyze causal relationships, Structural Equation Modeling (SEM) was employed.

1.7 SIGNIFICANCE OF STUDY

This research in particular is of much significance to the construction industry since adverse selection and moral hazard are problems faced in construction projects (Biong,

2013). This study will bring to the fore the causal relationship and effects of moral hazard and adverse selection on Public-Private-Partnership projects. Furthermore, the strategies to reduce them will also be identified. The findings will also serve as a guide to construction stakeholders helping them minimize adverse selection and moral hazard. This will ultimately lead to obtaining value-for-money projects and consequent immense satisfaction from the entire project.

The Government of Ghana will be a vital beneficiary of the findings since there are many Public-Private-Partnership projects in Ghana. Innovative Public-Private-Partnership is advantageous to the government because it grants government access to supplementary sources of capital that are not available to the conventional and traditionally procured projects. Furthermore, the additional sources of private funds allow the government to steer clear of waiting for future budget phases for funding and thus speeds up the execution of construction projects. The findings of this study will increase knowledge on reducing effects of moral hazard and adverse selection on these PPP projects. This research presents the first attempt in Ghana at endeavouring to investigate causal relationships and effects of moral hazard and adverse selection on Public-Private-Partnership projects. This study will ultimately benefit academia as it will serve as a major and critical contribution to knowledge. It will bridge the knowledge gap and stimulate others to engage in more research on agency theory in Public-Private-Partnership construction projects.

1.8 STRUCTURE OF STUDY

This study was structured into six main different but interwoven chapters. Chapter one was the introduction, and included the background to the study, problem statement, aim and objectives, hypothesis, scope, methodology, justification, limitations and the structure of the study. Chapters two and three encompassed the literature review. They discussed in detail agency theory with emphasis on moral hazard and adverse selection. Furthermore, a conceptual understanding of Public-Private-Partnership projects was espoused. The chapter culminated in the explanation of causes and effects of moral hazard and adverse selection on PPP construction projects. Chapter four emphasized the methodology adopted for the research. It detailed out the framework and guiding principles for the conduct of the study correctly and concretely spelling out the research philosophy; sample population; sample size determination; sampling technique; research design; sources of data; data gathering techniques; administration of data and statistical tools for presentations; analysis and testing of the various hypotheses. The philosophical position of this research by way of ontology was objectivism. It is evident that the fundamental causes and effects of moral hazards and adverse selection of PPP construction projects exist and not invented by the researcher. Considering the stance of epistemology, the study entailed the systematic documentation and scrutiny of all the essential issues regarding the causes and effects of moral hazards and adverse selection of PPP construction projects. This implies the study could be replicated. Axiologically, the ideals and opinions of the researcher did not influence the identification of factors and their eventual explanation and discussion in developing a structural equation model to analyse the causal relationships of causes and effects of moral hazards and adverse selection of PPP construction projects. Chapter five

was the analysis and discussion of the responses articulated by the respondents using a combination of both inferential and descriptive statistical methods to present an amalgamation of the findings by the responses from the questionnaires.SPSS, STATA and AMOS softwares aided in the analysis of data. Analytical tools used were descriptive statistics, mean score ranking, ANOVA, one sample t-test and Structural Equation Modelling (SEM). Chapter six was the summary, conclusion and recommendations for the study. Recommendations for future research and limitations of study were also espoused in this chapter. Figure 1.1 below demonstrates the work flow of the study.

Chapter One	**General Introduction**: Background, Problem Statement, Aim, Objectives, Scope, Methodology, Significance, Structure of study.
Chapter Two	**Concept of Public Private Partnerships** General overview of PPP, PPP motivations, characteristics and global trends
Chapter Three	**Information asymmetry and PPP projects** Information asymmetry, causal relationships of moral hazard and adverse selection on PPP projects
Chapter Four	**Research Methodology**: Research Philosophy Sampling Frame, Design of Instrument and Administration, Statistical Analysis Tools.
Chapter Five	**Analysis and Discussion of Results**

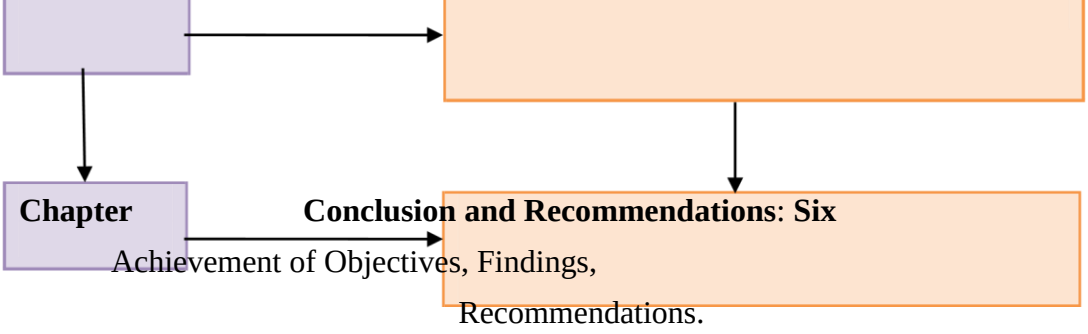

Figure 1.1: Summary of work flow of the study

CHAPTER TWO

UNDERSTANDING THE CONCEPT OFPUBLIC-PRIVATE-PARTNERSHIPS

2.1 INTRODUCTION

This chapter gives a thorough review of literature on Public-Private-Partnerships (PPPs). The review of the existing literature and related work recognizes the limitations in the current knowledge of PPPs. This chapter starts by providing a general overview of PPP. This was followed by PPP motivations, characteristics and global trends. The literature also delves into contemporary inclinations of PPP projects and bidding of PPP projects.

2.2 TOWARDS A CONCEPTUAL EXPLANATION OF PUBLIC-PRIVATEPARTNERSHIPS

Public-Private-Partnerships are not a recent happening, in view of the fact that there are cases in point dating back several years ago (Wettenhall, 2010). The contemporary inclination of governments signing agreements with private bodies to make available services, nonetheless, officially started around the year 1992 in the United Kingdom (UK) once the government had the desire of employing private financial support as an alternative for state-owned investment. At the commencement stages of the British projects, named

Private-Finance-Initiatives (PFIs), were focused in the sector of transportation. At the present time, PPPs are used in countless other fields (Hodge and Greve, 2007).

In a research undertaken by Torres and Pina (2001) it was revealed that, a crucial component (above 30%) of the projects undertaken by the bigger local governments are supplied under PPP. A Public-Private-Partnership is seen to be a substitute to procurement in the traditional public sector. In conventional procurement in public sector, the government is responsible for settling on design and specifications of the facilities (Bovaird, 2010).

Subsequently, after the bidding process, a private sector contractor is remunerated to construct the infrastructure. In a Public-Private-Partnership, the public sector details only the outputs, which are to be offered by the facility. However, it does not spell out how these outputs should be delivered. The private sector or group supervises and undertake the project. It obtains disbursements over the span of the PPP contract, which should repay the funding expenditures and generate a return for the financiers (Van-Ham and Koppenjan, 2001).

Public-Private-Partnerships are carried out in countless diverse sectors, for example: transportation, residential facilities, metropolitan development, municipal renaissance, operating institutions of culture, educational areas. PPP refers to ways of collaboration between communal authorities and the field of business which purposes to guarantee the financing, building, refurbishing, administration or preservation of a service or an infrastructure (Torres and Pina, 2001).

In a study by Budäus and Gründing (1997), Public-Private-Partnership is characterized in a smaller way by:

- Relations among government and private stakeholders
- Placing emphasis on accomplishment of similar objectives
- Probability of synergy by way of mutual aid
- Orientation of process
- The associate's distinctiveness and conscientiousness
- Stipulation of cooperation relationship

Budäus (2006) further accentuates the lasting requirement of synchronization at the contract stage and the unstructured preliminary state, as a vital attribute of PPPs. Due to the extended contract period (around thirty years), it is not feasible to lay down the exact privileges, risks, rights, expenditures, accomplishments and liabilities in advance.

Budäus and Gröning (1997) also bring out the disparity between a PPP and other contracts where varying goals are present within the partners. Cases in point are leasing and contracting out. Contracting out portrays varieties of collaboration between government and private sector partners whose distinctive feature is that the private associate is not concerned with performance of the facility, but in the resultant proceeds. A significant issue to segregate PPPs from other types of cooperation is the incompleteness of agreements and contracts, resulting in a continuous necessitation for collaboration and harmonization. Schäffer and Loveridge (2002) differentiate simply four forms of public-private collaboration. The choice of the suitable type of public-private collaboration is dependent upon the allocation of risks, the anticipated profits, and the extent of interest identification.

Table 2.1 Features of varying forms of Public-Private Collaboration (PPC)

	Leader-Follower	Buyer-Seller	Joint Venture	Partnership
Purpose	Likely to be specific (e.g. investing to stimulate private redevelopment of a neighborhood)	Limited, specific (e.g., business recruitment)	Limited and specific (e.g., construction and/or operation or a facility)	Broad, general open ended (e.g., planning a strategy for the redevelopment of a neighborhood)
Decision making	Independent (leader), dependent/ conditional (follower)	Negotiated and competitive	Coordinated or joint, cooperative may also be egalitarian	Joint, cooperative, and egalitarian
Rewards	Individual	Individual, distribution depends on market strengths (which determine clout in negotiation the terms of the cooperation)	Shared, usually string correlation between rewards of participants	Shared, strong correlation between rewards of partners
Risks	Individual but correlated, limited	Individual, distribution depends on sequencing of actions (those who have to act first face the highest risk) and market strengths (which determine clout in	Shared, usually unevenly; distribution of risk(s) depends on agreement that establishes the joint venture; strong correlation between risks of all participants,	Shared, usually unevenly distributed but strongly correlated, limited or unlimited

		negotiation the terms of the cooperation), limited	limited	
Formal agreement	Depends on size of necessary investment by the leader	Depends on complexity of transaction	Yes	Yes
Duration	Limited, short to long (most likely short do medium)	Individual exchange relationship or almost always limited, but pursuit of purpose is often open ended; short to medium, depending on complexity of transaction	Limited or open ended; medium to long, depending on the complexity of the project	Open ended, long

2.3 UNDERLYING CHARACTERISTICS OF PUBLIC-PRIVATEPARTNERSHIPS

Present explanations of Public-Private-Partnerships are quite unclear and hence do not portray them vividly. On the other hand, Public-Private-Partnerships have distinguishing features that cause them to stand out.

The European Commission spelt out the subsequent characteristics of PPPs in its *Green Paper on public-private partnerships and community law on public contracts and concessions:*

- "The comparatively extended period of the collaboration, comprising cooperation between the public and private partners on varying portions of a designed project."
- "The means of financing the project, partly from the private partner, occasionally through compound agreements between the different stakeholders.

  Nevertheless, government finances can be combined with private finances."
- "The crucial responsibility of the economic operative, who partakes at varying phases in the project (planning, finishing, performance, financing). The public sector focuses mainly on identifying the goals to be achieved regarding societal interest, excellence of provided services and policy of pricing; and it takes accountability for scrutinizing conformity with these goals."
- "The sharing of risks among the public and private partners, to whom the liabilities normally borne by the public sector are shifted. Nonetheless, a PPP does not automatically imply that the private sector bears all risks, or yet still the larger portion of the liabilities connected to the venture. The exact sharing of risk

is resolved gradually, by way of the particular capacity of the sectors involved to review, organize and deal with the risk."

In a research by Iossa and Martimort (2008), it was revealed that a Public-PrivatePartnership engrosses a bigger risk and liability transfer to the private sector as compared to conventional procurement. Given that the public sector only indicates the fundamentals of the infrastructure it desires to be carried out, the plan, design, building and functional risks are extensively shifted to the private sector (DeCarolis, 2009).

Faulkner (2004) stated three characteristics of a proper partnership in the public private perspective:

- they distribute risks instead of transferring;
- boundaries between the sectors become vague rather instead defining them too precisely; and
- they entrust to mutual profit

Grout (1997) affirms three major standards that a project has to attain before belonging to the grouping of public-finance initiatives (PFIs).

- the project should be completely or at the minimum be funded by the private partner and the agreement shows details regarding consumption of service and not the asset itself.
- a considerable amount of the liability should be transmitted to the private sector,
- the project should be established to add value for money to the taxpayer.

2.3.1 Types of Public-Private Partnerships

Essentially, there exist four various types of Public-Private Partnerships, distinguished by the legal character of private-sector participation in the venture (Yang and Yang, 2010).

Table 2.3 Types of Public-Private-Partnerships

Contract Type	**Design-Build Finance Operate (DBFO) (1)**	**Build Transfer Operate (BTO)(2)**	**Build-Operate Transfer (BOT)(3)**	**Build-Own Operate (BOO)**
Construction	Private	Private	Private	Private
Operation	Private	Private	Private	Private
Ownership*	Public	Private sector during construction, then public sector	Private sector during contract, then public sector	Private
Who pays?	Public sector or users	Public sector or users	Public sector or users	Private-sector off taker public sector, or users
Who is paid?	Private	Private	Private	Private

Source: Yang and Yang (2010)

* in all cases, ownership may be in form of a joint-venture between the public and the private partner

(1) Also known as Design-Construct-Manage-Finance (DCMF) or Design-BuildFinance-Maintain (DBFM).

(2) Also known as Build-Transfer-Lease (BTL), Build-Lease-Operate-Transfer (BLOT) of Build-Lease Transfer (BLT).

(3) Also known as Build-Own-Operate-Transfer (BOOT).

2.4 PPP: CONTEMPORARY TRENDS AND INCLINATIONS

Globally, trends for Public-Private Partnerships involving both the overall sum of investment and the quantity of projects originate from the Private-Participation in Infrastructure Project Database mutually created by the Infrastructure Policy Unit of the World Bank's Sustainable Development Network, and the Public-Private Infrastructure Advisory Facility (PPIAF). The numbers represent cumulative amounts from regional and sectoral records.

It is seen that beginning 1991 toward 2012, the general inclination for the investing in Public-Private Partnership projects was escalating, even though a low was attained just about 2002.

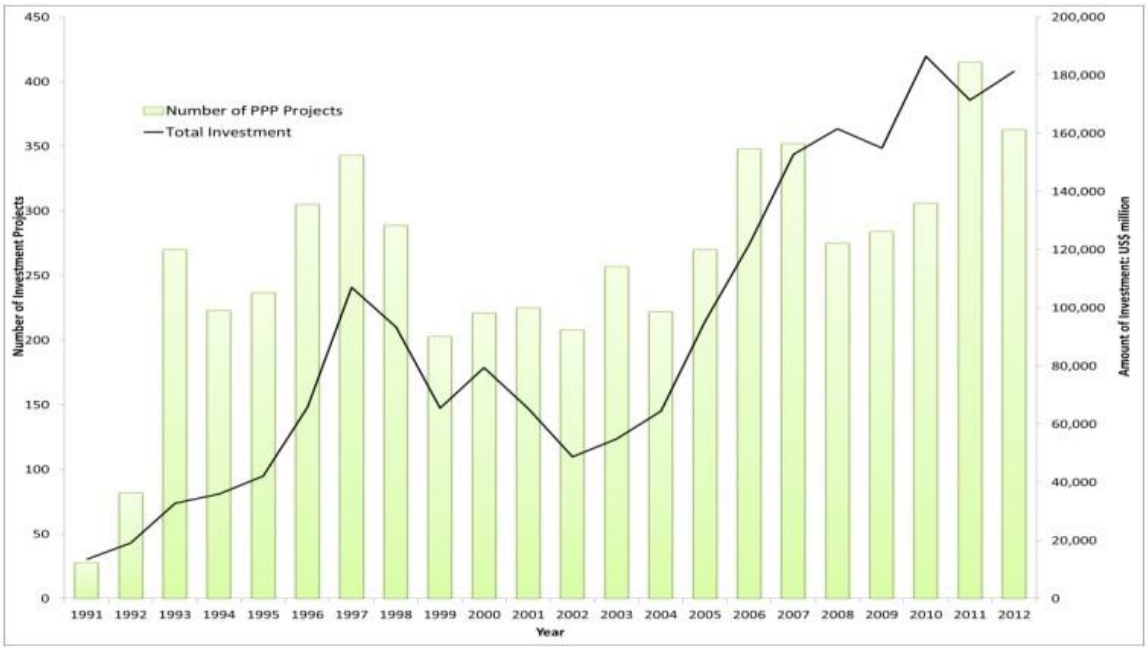

Figure 2.1: Global Trends for PPP Projects from 1991 to 2012

Source: World Bank and PPIAF, PPI Project Database

2.4.1 Sectoral trends

The *energy sector* drew the bulkiest quantity of investments in the year 2012 having around 244 projects and $76.8. Commencing 1990 en route 2012, there existed 111 nations having energy PPPs and 2,653 projects realizing fiscal closure. The very significant section was renewable energy, expanding at a yearly standard of 21% as of

2007, increasing twofold from 2007 to 2012.

The *telecom sector* was the next biggest segment for PPPs in the year 2012 having investments amounting to $52.4 billion (fifteen percent less than the $60.2 billion in 2011). Relating to investments, this comprises the least amount from 2005. The quantity of PPP

projects getting to fiscal closure is not more than four, the least number from the time of accessibility of time progression cycle. Within varying sectors, sixty percent of investments were used for individual mobile operators.

Investments in the *transport sector* have been escalating more and more in current years, summing $46.2 billion in the year 2012 with eighty three projects, primarily in Brazil and India, which resulted in seventy eight percent of total investments in the year 2012. Investments in the transport sector went up around 25% from 2002 to 2012. Contrasting the energy and the telecom sectors, concessions were the major type of partnership resulting in fifty nine percent of the projects and investments. Caribbean and the Latin America is the mainly active region, with forty two percent of all the investments. The quantity of cancelled projects or under stress consisted six percent of all investments comprising 78 cases from 1990 to 2012.

The *water and sewage sector* recorded the minimum investment with US$4 billion in 32 projects attaining fiscal closure in 2012. In spite of its undersized virtual size, the totality of investments and quantity of projects increased conspicuously over the previous years. In 2012, the two nations having the maximum quantity of water and sewerage projects were Brazil (eleven projects) and China (fourteen projects). The principal type of partnership was concession resulting in sixty two percent of all investments and forty one percent of all projects.

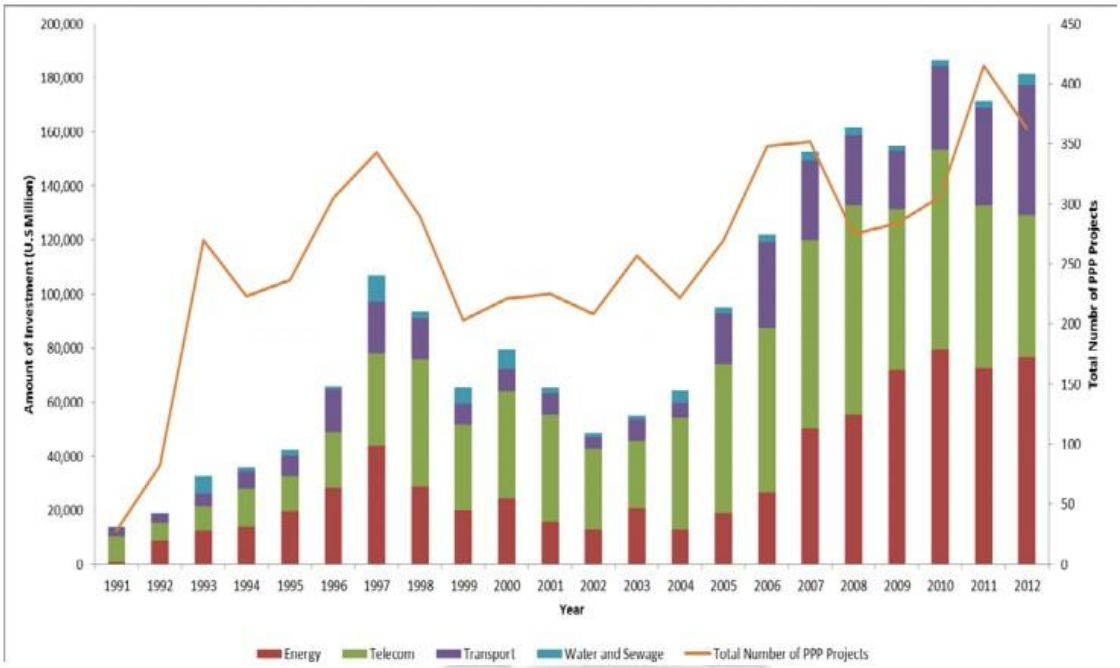

Figure 2.2 Sectoral breakdown of investments

Source: World Bank and PPIAF, PPI Project Database

2.4.2 Regional trends

The *East Asia and Pacific regions* developed by nineteen percent in 2011, realizing $17.2 billion in the year 2012. In 2012, much of the investment originated from the energy sector ($8.9 billion), next of all by the telecom sector ($4.3 billion), the transport sector ($3.5 billion), and the water and sewage sector ($355 hundred million). China got the majority projects (33 in total) in the year 2012 and Malaysia drew the biggest investment ($5.1 billion).

PPP investment in *Europe and Central Asia*, reduced around forty eight percent in 2011 to $22.5 billion. Notwithstanding this quick plummet, the region yet provided 12 percent of worldwide investment in PPP. In 2012, Ukraine was the most active country with 16 energy projects and commitments of $520 million.

The *Latin America and Caribbean region* witnessed an investment increase from $56.9 billion in 2011 to $87.0 billion in 2012, even though the number of PPP projects reduced from 95 in 2011 to 78 in 2012. In summation, this region provided for forty eight percent of investment worldwide, the biggest universal allocation for a specific region for the previous twenty years.

In the *Middle East and North Africa region*, investments of PPPs enlarged speedily from $3.9 billion to $6.7 billion U.S dollars, even though there was a resultant boost with doubling-up of quantity of project closures. Nevertheless, investments in this particular region in 2012 consisted of just 4% percent of worldwide investments, around 0.4 % of the regional GDP. The telecom sector led, escalating 64 percent from the year 1990 to the year 2012.

South Asia had a 20 percent reduction in PPP project investment in 2012, downward from $43.1 billion in 2011 to 35.1 billion. The quantity of projects attaining fiscal closing continued to be stable from 123 in 2011 to 128 in 2012. In spite of the considerable slump in overall investments, South Asia turned out to be one of the most involved regions on the globe. India drew the majority of regional investments ($31.2 billion) with 106 projects in 2012. In entirety, private investment totaled 1.5 % of the regional investment.

In *Sub-Saharan Africa*, investments in PPP expanded around 16% to $12.8 billion in 2012, getting 7% of the worldwide investment. From 1990 to 2012, 471 projects attained fiscal closure. The telecom sector provided 77 percent of total investments. The total quantity of projects called off or distressed in the region within the timeframe of 1990 to 2012 was approximately 5 percent of all investments (50 cases).

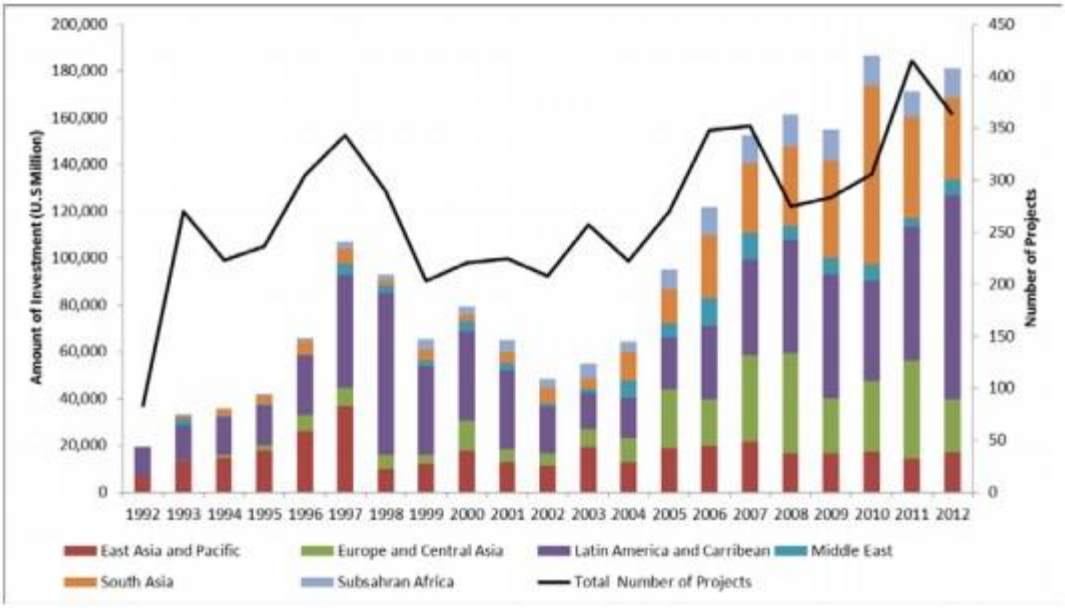

Figure 2.3 Regional breakdown of investments

Source: World Bank and PPIAF, PPI Project Database

2.5 PPPs: MOTIVATION AND OBJECTIVES

The parties involved have different motivations and follow diverse objectives within the partnership. Logically, private and public interests are to an extent complex to coordinate.

2.5.1 Motivation for the public sector

The impetuses and inspirations for PPPs are varied within different nations. Predominantly in developed nations there is a tendency to reduce public and increase private within the past years. Newly developing nations and industrializing states center less on upgrading policies (Vining and Boardman, 2008). More significant is the production of necessary facilities for financial enhancement, particularly in nations which have exceeding population expansion. There are considerable infrastructure spending needs especially in Africa (Dewatripont and Legros, 2005). Nonetheless, because of the rigid budget limitations which several emerging nations have encountered in recent times, the greater

part of these states are not able to have the funds for the needed capital for infrastructure (Vining and Boardman, 2008).

Regarding past literature, *the lack of public funds* is the most vital incentive for the state to grant communal services within PPPs. Conversely, the preliminary arrangements are very diverse. In mechanized nations, the intent is to enlarge the current advanced infrastructure (Dewatripont and Legros, 2005).

Emerging industrializing nations and budding states, in contrast, require to assuage essential requirements of living and to offer a sturdy and safe fiscal state of affairs. Public-Private-Partnerships aid the government to relinquish jobs from public funds so as to certify conformity of the norms. Vining and Boardman (2008) critic the basis for reduction of budget state expenses and/or the craving not to swell existing debt stocks, as a cause for the government's partaking in PPPs, as scrawny. Finally, the state or the consumers have to pay for building and servicing of the facility, autonomous of its mode of funding.

Using a public-private-partnership basically alters the public administration's scheme of disbursement, i.e. it can dispense its expenditure requirements over an extended phase, but it will most likely not diminish its price. Relating to long-lasting infrastructural ventures, which profit more generational followers, shifting of time can be preserved by virtue of inter-generational effectiveness (Vining and Boardman, 2008).

Dewatripont and Legros (2005) further affirm these as exploiting communal accounting decrees which accurately do not reflect state liabilities and assets. Ascertaining this from the cost-effective viewpoint is nonetheless not needed as effective PPPs are not impacted.

An extra resource in shortage, separate from government's source of funding, is *specific competence* owned by the specific private sector. Vining and Boardman (2008) explain

the motives why, services and infrastructure could be offered more cost effectively, by way of PPP. Foremost, private partners have more specialties and are experienced in building and managing of several trades and, consequently, better savings attained. Private partners may be universal functioning ventures, whereas public sector usually has lesser experience and proficiency needed by the job. Another rationale for the private sector's cost effectiveness is because the private stakeholder possesses more incentive to reduce the costs. These enticements and incentives are prone to turn out to be most obvious in much enthusiasm to modify job specifications and to employ the use of modern technologies so as to lower costs (Dewatripont and Legros, 2005).

Past literatures affirm *risk-reduction* for government as an additional justification for partaking in a public-private-partnership. The public sector partner no longer puts up with the monetary risk associated with handling costs of construction, costs of maintenance and revenues. There is the likelihood of the private stakeholder possessing much knowledge with compound monetary arrangements and improved availability to markets which offer effective allocation of risk. A further factor is the fact that private partners encounter reduced political risk as compared to governments. Nevertheless, since publicprivate-partnerships do not decrease the actual risk, but rather spreads and transfers risk more generally, Vining and Boardman (2008) explain this rationalization for partaking in public-private-partnerships as not being convincing enough. There is the need to know at what price the risk is shifted to the private partner.

Vining and Boardman (2008) go on to give a further justification for governments to join a public-private partnership. Governments consider that in offering the project service by a public-private-partnership, it is *politically more attainable to initiate user-fees* which lead

to reduced public administration total expenses. There exists enhanced approval from the voters and users for the private partner's necessity to generate returns so as to cater for costs; reimburse arrears or create profits, instead of the government behaving in that manner (Dewatripont and Legros, 2005).

2.5.2 Motivation for the private partner

Essentially, the inspiration for the private sector to partake in a PPP is seen to be directly or indirectly linked to gaining profits. The desire for profit is the indispensable intent for every organization. The primary motivation for a private sector to partake in a PPP venture is to utilize and increase the accessible capital and also to make profits. Financial assistance and monetary benefits enable the public-private partnership projects the realization of extra profits (Dewatripont and Legros, 2005).

Profit maximization should not be viewed as a one-period occurrence. Private partners desire to make best use of profits throughout contract lifespan and therefore will locate latest profit sources as the contract goes on. To thwart opportunistic tendencies in this perspective, agreements and contracts have to be written rigidly (Vining and Boardman, 2008).

Private partners may be universal functioning ventures, whereas public sector usually has lesser experience and proficiency needed by the job. Another rationale for the private sector's cost effectiveness is because the private stakeholder possesses more incentive to reduce the costs. These enticements and incentives are prone to turn out to be most obvious in much enthusiasm to modify job specifications and to employ the use of modern technologies so as to lower costs (Dewatripont and Legros, 2005).

Another incentive, indirectly linked to profits, is the synergy occurring when the PPP permits a resource, created by the public-private partnership or made available by the private sector, to be made use of greatly. A further inspiration is that participation in a PPP is a channel of creating for the private partner goodwill. By way of PPP, the private partner can expose its top quality job and its dependability as a business partner. This eventually improves the private stakeholder's international image, and diminishes the public doubt about likely prospective contracts (Dewatripont and Legros, 2005).

2.6 BIDDING OF PPP PROJECTS

From the view point of contractors, Wang *et al*. (2009) relate a phase categorization for bidding competitively, beginning with the gaining of the project information then proceeded by a pre-evaluation of the project and choosing to bid or not. By the middle of assessment of the venture, the private stakeholder chooses the way to bid and subsequently the execution of the project can be dealt with (Blanc-Brude, 2013). If the government is considered, the process of bidding is seen as comprising of the following:

(1) the government initiates a project and it asks for tenders,

(2) the private stakeholders will assess the venture and choose if to bid or not,

(3) the government undertakes a pre-qualification,

(4) the bidders undertake more feasibility investigation and choose which bid to commence,

(5) the government decides on the ideal bidder and may carry out the bid compensation model by refund the private stakeholders for the costs of pre-tendering.

According to Wang *et al.* (2009), pre-evaluation implies the resolution by the private stakeholder on if it is worthwhile or not to dedicate time and capital on the bidding process.

Countless variety of choice methodologies exists in various literature for the private stakeholder on the way to settle on the various facets of the bid, for example the likelihood or probability of winning a bid (Cagno *et al.*, 2001), the optimal duration of the concession phase (Ng *et al.*, 2007) and what comprises a project portfolio (Wang *et al.*, 2009). These methodologies have a common approach and not always induced to a public-private-partnership framework. The frequently used are cost analysis techniques (Okpala, 1991), analytical hierarchy process techniques (Alidi, 1996), linear and integer programming (Gori, 1996), fuzzy logic techniques (Wong *et al.*, 2000) and evaluations that rely on utility theory (Moselhi and Deb, 1993). Zitron (2006) posits that the possibility of winning a bid has an important position in the bid/no-bid dialogue, subsequent to the apparent risks and liabilities of the project (Blanc-Brude, 2013).

From the government's viewpoint, McAfee and McMillan (1986) assert that lack of bidders can involve the interference of the value for money theory and, conversely, a greater number of bidders may cause strong bidders to be unenthusiastic to bid due to the low possibility of winning, while they face a probable huge sunk cost of feasibility and tendering expenditures (Blanc-Brude, 2013).

Accordingly, government may intervene by stimulating competition during the stage of bidding. A research by Zou and Fang (2008) acknowledged lack of competition as a crucial determinant of failure. A game-theoretical technique to model a likely bid compensation structure by government in where the second best bidder is remunerated a compensation amount to cater for the costs of bid preparation was used by Ho (2008). It may produce superior attempts in the stage of bidding by private stakeholders. It is seen that simply under a restricted number of circumstances, bid compensation may be useful. However, in

totality, the consequence is not forthright and governments are advised against recompensing the bidders (Blanc-Brude, 2013). Nevertheless, the postulations applied could be debated. Each and every one of the bidders is presumed to be equally excellent, the ascription of the project is exclusively reliant on price and the bid compensation is solely given to the second best bid, which is not actually a reproduction of realism (Ho, 2008). Governments may use varying formats for bid compensation and it may be argued that an equivalent allocation of reimbursement to all the preselected bidders or a diminishing portion attributed in declining order of bid quality is a more improved alternative. Reservations have been raised concerning potential obstinate incentives of non-qualitative bidders which, motivated by the attractive compensations, will anyway bid devoid of appropriately competent of undertaking the venture (BlancBrude, 2013).

The contractor has the responsibility of deciding how much he has to put into the preparation of plans, possibility and feasibility studies including risk analysis to propose a bid which has adequate quality for approval and that rakes in the profit desired (BlancBrude, 2013). The likelihood of winning is factored into account and hence the bidding challenges can be rearticulated in the following way: make the most of the anticipated profit under the environmental stipulations identified as the number of other bidders, the features of the job (partnerships, risk, relationships) and the diverse policies and attitude of stakeholders (Blanc-Brude, 2013).

The public side gives the ultimate decision. The bids and proposals will be evaluated using manifold criteria according to the distinctive project attributes. A methodology that takes care of the compound structures of decision making is the multi-criteria decision theory. Sometimes, the choosing is roughly forty percent for price and sixty percent for the quality

and content of the proposal. There exists a challenge however to guarantee a rational assessment of financial and non-monetary features. Analytical hierarchy process

(Cagno *et al.,* 2001), Vertex methods with a probability distribution (Mohamed and McCowan, 2001), regression analysis, fuzzy logic and fuzzy multiple criteria decision making (Hsieh *et al.,* 2004) all endeavor to evaluate the quality of bids.

The game of bidding is an inert game with asymmetric information, frequently named a static Bayesian game, amid diverse contractors and with the government dictating partially how the determination of payoffs are made (Gibbons, 1992). Public sector settles on the payoffs by way of establishing the decision criteria of the task and the policy on bid compensation. The various bidders have asymmetric information, since they do not have an idea about the bid of each other. Game theory is a likely tool to scrutinize the behaviour of every agent (Blanc-Brude, 2013).

CHAPTER THREE

INFORMATION ASSYMETRY AND PPP PROJECTS

3.1 INTRODUCTION

This chapter gives a thorough review of literature on information asymmetry and PublicPrivate-Partnerships (PPPs). It presents information on moral hazard and adverse selection and their effects on PPP projects. The review of the existing literature and related work recognizes the limitations in the current knowledge of agency theory. The review is imperative since it endeavours to address the research problem, objectives and research

questions and identify causal relationships and effects of moral hazard and adverse selection on PPP projects. This chapter starts by providing a general overview of moral hazard and adverse selection. The literature also delves into the causal relationships of moral hazard and adverse selection on PPP projects; the effects and strategies to reduce moral hazard and adverse selection on PPP projects.

3.2 MORAL HAZARD AND ADVERSE SELECTION: CONCEPTUAL UNDERPINNINGS AND ANTECEDENTS

Moral hazard and adverse selection are two expressions employed in economics, risk management and insurance to portray circumstances in which one party is at a disadvantage.

The linkage between moral hazard and adverse selection lie in the fact that adverse selection occurs before the contract is entered into while moral hazard occurs after the contract has been entered into. Therefore the tendencies of adverse selection give rise to and cause moral hazard actions.

3.2.1 Moral hazard

Moral hazard as a concept became extensive in the insurance industry of the seventeenth century. At that time, it was detected that individuals who were insured had the propensity to act in more risky ways over people without insurance (Dembe and Boden, 2000). The perception was that insurance diminishes the motivations to be careful, thereby increasing the possibility of the incident being indemnified.

Moral hazard became tantamount with the incentive to deceive and exploit insurance claims, and usually carried derogatory connotations. This unacceptable and morally

hazardous tendency of the insured was brought on by the conviction that even if an unwanted occurrence took place, the insured individuals will not put up with the total load of probable losses (Leach, 2004).

Books on economics educate that moral hazard is a condition originated by information asymmetry. According to Varian (1990), moral hazard is the situation in which one party of the contract cannot monitor the actions of the remaining party. Hence, moral hazard is every now and then referred to as a hidden action dilemma. The tendencies of one party, the one having superior information are not apparent to the other party. This unevenness of information causes unseen deeds which are regularly unfavorable to humanity (than if there had been perfect knowledge and information). In a study by Leach (2004), absolute fraud may be the normal pattern, but there are several supplementary fewer remarkable instances of moral hazard resulting in distortion of market and ineffectiveness.

Examples of moral hazard:

- Not exerting maximum effort in work
- Stealing and cheating
- Breach of contract
- Making false threats
- Delivering substandard projects
- Withholding information
- Cover ups

- Misrepresentation
- Not paying on time
- Refusal to approve work even if done by contract

3.2.2 Adverse selection

Adverse selection results when there is a lack of symmetric information prior to a contract involving a buyer and a seller. Adverse selection depicts an undesired consequence because the condition where one stakeholder of a contract possesses more precise and different information as compared to the other stakeholder. The party with smaller information is disadvantaged than the partner having superior information. The asymmetry results in inefficiency in the quantity and price of services and goods (Varian, 1990).

Adverse selection comes about when the seller values the good more highly than the buyer, for the reason that the seller has a superior knowledge of the worth of the good. Because of this asymmetry of information, the seller is not willing to sell the good for any price below the value the seller is aware it has. Conversely, the buyer, who is unsure of the worth of good, is not willing to pay above the expected value of the good, which factors the likelihood of receiving a bad piece (Leach, 2004).

Examples of adverse selection:

- Withholding of information
- Entering into contract without the necessary approval

- Client having little or false information of the contractor's technology, management, credit etc.
- Dishonesty in the bidding process
- Bidders being unclear of the tender's intention of building, financial capacity, and business reputation

3.3 PPPs AND INFORMATIONAL ASSYMETRIES

An instantaneous challenge which comes about in PPPs is the existence of informational asymmetries among the government and the private firm. For this reason, they must be factored during design of contract. In several instances, for the duration of the carrying out the contract, the firm is (or becomes) better informed as compared to the government concerning various pertinent portions of the activity, and its own actions which impact on these portions. For example, the government cannot observe (or, yet still if it does, no outside party, like a court of justice, can substantiate this) if the firm applies a definite intensity of effort, that is desirable from the societal perspective in constructing the infrastructure (Loben, 2009).

The two information problems do not exist disjoint, on the whole. This is as a result of the existence of synergies between stages of the venture, accounting for why different tasks are bundled in a distinct activity and delegated to a sole responsible private firm. The effort that the firm exerts at the construction stage influences the circumstances it encounters at the operation stage. For example, exerting effort might enhance the chance of encountering a high demand for the service (since the infrastructure is more dependable) or a reduced

price of production (since the cost is an internal attribute of the project). This explains why provision of effort by the private firm is advantageous (Blanc-Brude, 2013).

3.3.1 Moral hazard

A moral hazard problem arises when the agent's action is not verifiable, or when the agent receives private information after the partnership has been commenced. Moral hazard should not pose as a challenge or problem if both the principal and agent had the same objective functions. The misunderstanding about which action should be taken out is the basis for agency costs (Loben, 2009).

There exist two potential forms of the problem of moral hazard:

Case 1

The parties possess similar information at the time the relationship is set up. The informational asymmetry arises because immediately the contract has been signed, the principal will not be able to verify and observe the effort and action of the agent, or in any case, the principal cannot flawlessly control the action. In modelling this condition, the assumption is made that the agent's effort, made subsequent to signing the contract, is not confirmable, and accordingly this variable cannot be plainly added to the stipulations of the contract. Thus, the agent's payoff cannot rely on the effort he proffers, or which he has been contracted to provide. The timeline is illustrated in Figure 2.4.

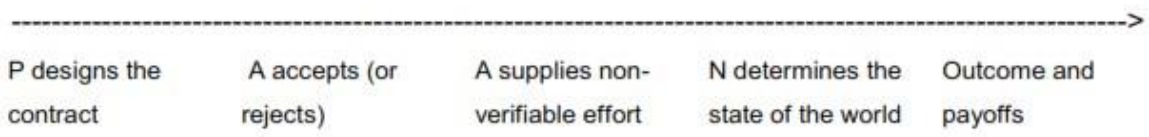

Figure 3.1: The standard moral hazard problem Source: Lobner (2009)

If the agent is risk-neutral, there will be no consequence on trade effectiveness ensuing from non-verifiability of efforts. The principal could gain the first and best result through offering a contract that is reliant on the level of production. The contract comprises incentives for excellent production and penalties for substandard production. The riskneutral agent is enthusiastic to agree to this contract if his ex ante involvement constraint is fulfilled by the anticipated payment. There is the likelihood of inducing the optimal effort level devoid of breaching the agent's participation restriction (Loben, 2009). For example, in the situation of a risk-neutral principal and a risk adverse agent, the way out will apparently be at variance from the optimal contract under symmetric information. A stable wage in this instance gives full insurance but does not stimulate the agent to exert any effort. To be able to do this, the principal should let the agent bear an amount of risk. Consequently, the agent has to acquire a risk premium from the principal. There is disagreement between the participation and the incentive constraint that causes an "insurance-effectiveness transaction" (Loben, 2009).

In this second-best instance, the agent's effort is not visible, and once he has signed the contract, he will make the least achievable effort (e^{min}). The principal would then achieve a lesser anticipated profit as compared to the symmetric information circumstances since the agent's effort is lesser than the level of efficiency. The principal would predict this behavior, and hence if he/she tenders a contract reliant on a fixed payoff, he/she would opt for the wage (w^{min}) that precisely recompenses the agent for the effort he exerts (Loben, 2009).

Formally, the problem can be written like this:

$$\underset{[e,\{w(x_i)\}_{i=1,\ldots,n}]}{Max} \quad \sum_{i=1}^{n} p_i(e)B(x_i - w(x_i))$$

$$\text{s.t.} \sum_{i=1}^{n} p_i(e)u(w(x_i)) - v(e) \geq \underline{U} \qquad \textit{participation constraint}$$

$$e \in \arg\underset{\hat{e}}{Max}\left\{\sum_{i=1}^{n} p_i(\hat{e})u(w(x_i)) - v(\hat{e})\right\} \qquad \textit{incentive compatibility constraint}$$

The principal has a preference for high effort to low, because better results are more achievable when the agent works hard than when lazy.

p^H first order stochastically dominates p^L:

$$\sum_{i=1}^{k} p_i{}^H < \sum_{i=1}^{k} P_i^L \text{, for all } k = 1,\ldots,n-1$$

A more easy approach to obtaining majority of the wrapping up of more broad models it takes to revise the trouble, where the agent can just choose between two likely effort levels, high (H) and low (L):

$$e \in \{e^H, e^L\}$$

There is the assumption that the disutility for the agent is more when he/she provides superior effort than when he makes lesser effort:

$$v(e^H) > v(e^L)$$

For all results,

$$x_1 < x_2 < \ldots < x_n$$

and from worst to best, the probabilities

$$p_i{}^L = p_i(e^L) \quad p_i{}^H = p_i(e^H)$$

that the result will be, from worst to best, the probabilities, x_i when the agent gives low (high) effort, are greater than zero.

The principal has a preference for high effort to low, because better results are more achievable when the agent works hard than when lazy.

p^H first order stochastically dominates p^L:

$$\sum_{i=1}^{k} p_i^{\,H} < \sum_{i=1}^{k} P_i^{\,L} \text{ , for all } k = 1,\ldots,n-1$$

This articulates that productivity is better when there is high effort as compared to low effort. To simplify the analysis, the principal is assumed to be risk-neutral. The situation where the agent is risk-neutral is easier to work out and not very perceptive because the answer (a franchise contract) is similar like in the symmetric information situation (Loben, 2009).

Hence, the focal point is only on a partnership concerning a risk-averse agent. If the principal requires e^L, no moral hazard problem is encountered. Therefore, the principal gives a fixed amount to the agent (like within symmetric information) and the agent provides low effort. If the principal pays a fixed amount, he will not be able to prevail on the agent to make extra effort than e^L. On the other hand, if the principal claims high effort e^H, which implies that the excellent results are extremely striking, he/she has to locate a contract where the agent's payoff relies on his/her effort. The analogous incentive compatibility constraint is written as follows:

$$\sum_{i=1}^{n} P_i^{\,H} u(w(x_i)) - v(e^H) \geq \sum_{i=1}^{n} p_i^{\,L} u(w(x_i)) - v(e^L) \qquad \textit{incentive compatibility constraint}$$

The agent makes the effort e^H if the anticipated utility increase linked with this effort is higher than the implied addition in expenditure. The principal must solve the same program as above, but with the current incentive compatibility limitation.

Case 2

A number of moral hazard problems are attributed to informational asymmetries that come about when, before accomplishing the contract effort, the agent monitors the product of environment's decision but the principal does not. After the contract has been signed the uncertainty is identical for both, but prior to starting the contract action, the agent will have an informational benefit by observing an appropriate variable (Loben, 2009).

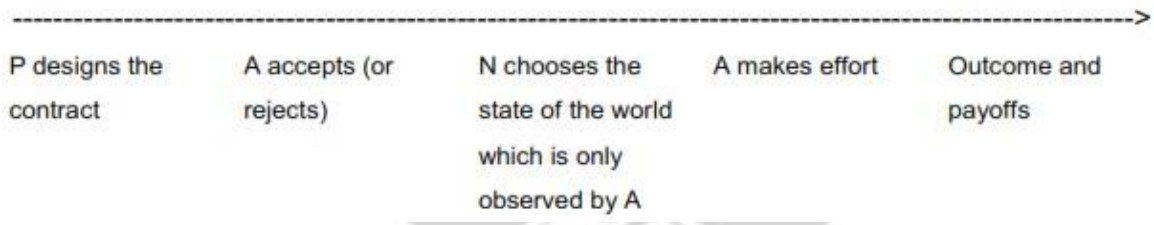

Figure 3.2: Moral hazard with hidden information Source: Lobner (2009)

To this type of moral hazard challenge, literature is silent. A case in point for this type of problem can be the relationship between an investor (individual) and a financial mediator who possesses information concerning the existing stock-market provisions which the individual does not have.

Following the signing of the contract, the agent observes if circumstances are favourable or not, θ^B or θ^G. In the second instance, the agent may regret after signing it, as he/she usually will obtain smaller efficacy within unfavorable situations (Loben, 2009).

There exist two kinds of models. One comprises an ex ante participation constraint (considering the anticipated utility at the time the contract is signed), where the agent cannot terminate the contract having already signed. The further model type comprises ex post participation constraints, in order that the agent receives an anticipated utility which is by no means smaller than reservation utility (Loben, 2009).

If the principal proposes a fixed wage, at whatever time the agent detects the good condition of the world θ^G he/she will be concerned in making an effort smaller than the optimum, and then informing the principal that the market conditions were θ^B. Under the optimal contract in this instance, when the agent gets to know that the conditions are good, the contract will cause him to make an effort e^G, where w^G is the corresponding wage. A distortion occurs in relation to the effort that is demanded when the market is not favourable. The import of this is to let the contract be less attractive to the agent when the market circumstances are good (Loben, 2009).

3.3.2 Adverse Selection

An adverse selection problem happens when the agent holds private information before the relationship begins. The principal can authenticate the agent's behavior; however the optimal decision, the cost of this decision relies on the agent's type which is private information to the agent. The principal is aware that the agent can be one of several possible types but he/she cannot identify it (Loben, 2009).

In disparity to the moral hazard problem where the uncertainty is exogenous, in this instance, the uncertainty is exogenous to the principal.

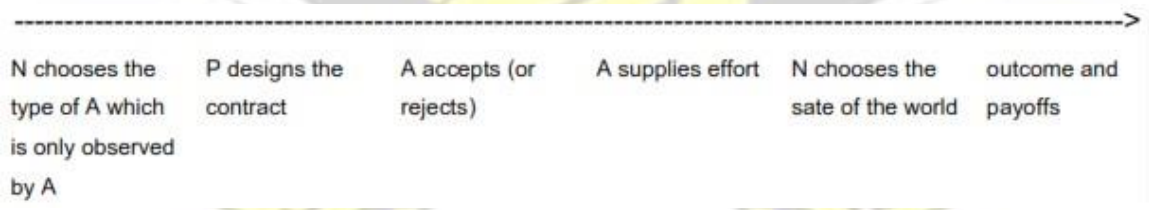

Figure 3.3: Adverse selection problem Source: Lobner (2009)

An instance for a circumstance where the principal does not possess all the relevant information about the agent is that of someone who hires a carpenter for home renovations.

In this circumstance, the specific task may be clearly defined, but situations like the ability of worker's, attitude, and cleanness are not.

The adverse selection challenge exists not only when the agent's informal actions relates to his private features, but also when there is asymmetric information relating to any variable relevant to the contract partnership. Macho-Stadler and Pérez-Castrillo (2001) give the circumstance of a firm bargaining a license agreement for the purchase of a technology. A further example is that of a public agency which contracts a private firm for the building of a hospital lacking knowledge concerning the most current technological innovations, regarding the building of hospitals (Loben, 2009).

In their model, Macho-Stadler and Pérez-Castrillo (2001) consider a principal who is risk-neutral who gives a contract to a risk-neutral or risk-averse agent to execute some action on his/her stead. The making an effort e is related with an anticipated payment to the principal of:

$\prod(e)$

The agent's effort is presupposed to be confirmable. The objective function is concave, hence the assumption that:

$\prod'(e) > 0$ and $\prod''(e) < 0$

The agent could be of two varying forms, which is not discernible by the principal. The two agent types vary only about their effort disutility function, which is $v(e)$for type 1, and $Kv(e)$, with $k > 1$ for type 2. Hence, the disutility for a specific effort level is smaller for type 1. The first type is given the term the "good" type (G) and the second is termed "bad" type (B).

The agent's utilities are:

$U^G(w,e) = u(w) - v(e)$ and $U^B(w,e) = u(w) - kv(e)$

Had there been no adverse selection dilemma, there would be two varying optimal contracts relating to the agent's type. Relating to the optimum, the principal requires further effort from the good agents: $e^{G*} > e^{B*}$.

Within information which is symmetric, the wage amount the two agent types should get is reliant on the specific trouble. The optimal contract relating to asymmetric information portrays a transaction between efficiency and rent extraction (Loben, 2009).

If regarding asymmetric information, the principal gave out the two id contracts to any of the agent, permitting him to unreservedly choose the contract that he likes best, this will result in the bad agent choosing the contract that is devised for him, yet the good agent also desires

$(e^{B}*, w^{B*})$ to (e^{G*}, w^{G*}):

$$U^G(w^{B*}, e^{B*}) + u(w^{B*}) - v(e^{B*}) > u(w^{B*}) - kv(e^{B*}) + \underline{U}.$$

Within asymmetric information, the principal will not be able to discover the agent's type. Hence, the principal deems it that the probability of an agent belonging to type G is q, where $0 < q < 1$.

The principal, therefore, optimizes his anticipated profits relating to the restrictions that, the agent chooses to sign the contract drawn for his unique type:

$$\underset{[(e^G, w^G),(e^B, w^B)]}{Max} \quad q\left[\prod(e^G) - w^G\right] + (1-q)\left[\prod(e^B) - w^B\right]$$

s.t.	$u(w^G) - v(e^G) \geq \underline{U}$	*participation constraint (good agent)*
	$u(w^B) - kv(e^B) \geq \underline{U}$	*participation constraint (bad agent)*
	$u(w^G) - v(e^G) \geq u(w^B) - v(e^B)$	*incentive compatibility constraint*[79] *(good agent)*
	$u(w^B) - kv(e^B) \geq u(w^G) - kv(e^G)$	*incentive compatibility constraint (bad agent)*

The first participation constraint is implied by the second and the third equation. Hence, it is likely to leave out the first constraint, which is an essential characteristic of the adverse selection trouble. The principal only requires to factor the participation constraint to the least efficient agent.

Subsequent to solving the id problem, the following features of the optimal contract menu can be observed:

$$\{(e^G, w^G),(e^B, w^B)\}$$

The distinct trait of adverse selection contracts is that the most effective agent gets bigger utility than his level of reservation because of his private knowledge- the high- effective agent's involvement restraint is constantly fulfilled. This is because if a set of choices of contracts create the possibility for the low-efficient agent to attain his reservation utility, it is also probable for a high-effective agent which encounters lesser costs of production. Hence it is just the effective type gains a positive information rent.

The incentive stipulation for the best agents connects the solution, whereas that parallel to low-efficient agents do not (Loben, 2009).

3.4 ASYMMETRIC INFORMATION MODELS OF PPPs

There are a number of asymmetric information models discussing public-private partnerships.

Table 3.1 Asymmetric Information Models of PPPs

TASK BUNDLING	
Model	***Features and Assumptions***
Bentz *et al.* (2005)	1. two different equilibriums: low one off service set up cost high one off service set up cost 2. All the agents are risk-neutral
Iossa and Martimort (2008)	1. two different externality-settings:
	positive externality: quality-improvement reduces operational cost negative externality: quality-improvement increases operational cost 2. incentive constraints rely on sign of externality 3. government: risk-neutral, private firm/consortium: risk-averse
Iossa and Martimort (2009)	1. a little dissimilar purpose as compared to their preceding paper: 2. focus on transportation sector reveals further how task bundling is related with risk transfer 3. government: risk-neutral, private firm/consortium: risk-averse
FINANCING	
Model	***Features and Assumptions***
Iossa and Martimort (2008)	1. extension of their basic model 2. Modelling transaction cost: external financiers possess expertise to gain access

	to some educational signal, which the government cannot monitor.
	□□ Government: risk-neutral, private firm/consortium: risk-averse

Adapted from Lobner (2009)

3.5 CAUSES OF MORAL HAZARD AND ADVERSE SELECTION ON PUBLICPRIVATE-PARTNERSHIP CONSTRUCTION PROJECTS IN THE CONSTRUCTION INDUSTRY

3.5.1 Low incentives to control costs:

When the liability and risk of escalated costs of construction is not borne by the party that is in control of building- like exists in conventional government infrastructure procurement, it leads to moral hazard since there is little motivation to manage costs (Blanc-Brude, 2013).

3.5.2 Wrong party chosen to execute project:

Public-Private-Partnership procurement methods have the likelihood to experience from adverse selection. This occurs when the partner chosen to construct the facility might not be the very excellent one when the issue of controlling costs arises (Loben, 2009).

3.5.3 Low transfer of risk:

In the situation there exist two kinds of private companies which can undertake infrastructural projects. The foremost group is effective and has the capability of lowering costs and managing risks; the remaining group is not and does not have the capability (Blanc-Brude, 2013). The government desires to assign the duty of constructing and managing public facilities but has the challenge of knowing which of the firms to hand over the works to. If the government gives out a contract assigning small or no risk to the

company, as exists for majority of conventional public procurement, the effective companies have an inducement to imitate the ineffective firms at the bidding phase (adverse selection) and make no attempt to lower and manage costs (moral hazard) (BlancBrude, 2013).

In this circumstance, whichever company is engaged, the government has to bear any potential expenditures and evidence confirms that considerable cost overruns are certainly the standard in government works. Simply put, when a suitable incentive format is absent, confidential information about companies' type (whether efficient or otherwise) and actions (management of risk or otherwise) results in escalated procurement charges for taxpayers (BlancBrude, 2013).

3.5.4 Lack of accurate information about project conditions

Due to the extremely long-term scope of Public-Private-Partnership projects, oftentimes three decades and above, specific risk aspects reveal the delicate attributes of PPPs. There exists a deficiency of exact and accurate information concerning the current conditions, the future and the implied social costs of the job. This leads to moral hazard and adverse selection. Moral hazard and adverse selection challenges are even tougher to recognize in this instance (Blanc-Brude, 2013). The competitive tendering process is already a channel of circumventing cost ambiguity. The risk of contracting has been discussed earlier because of the strategic approach of the bidders in the negotiation process. The saying "allocate risks to the stakeholder most able to deal with it" is not always easy to fulfill.

There abound countless failed jobs because exposure to hazardous risks exists (BlancBrude, 2013).

3.5.5 Effort dimensions which are not verifiable

With effort dimensions that are not verifiable, things become problematic. This is the root of the moral-hazard problems. Because providing effort is costly for the firm, but the degree of effort cannot be specified in contracts, a moral-hazard problem arises, as is usual when the source of private information is "endogenous." That is, the firm has an incentive to shirk from exertion of effort during the construction phase in order to maximize returns (Guasch, 2004). In addition, there can be adverse-selection problems. The firm may well hold some private information, say, about the costs of the activity, from which it can take advantage in its contractual relationship with the government (Guasch, 2004).

3.5.6 Renegotiation of contracts

A particular difficulty in most PPPs leading to moral hazard and adverse selection is that contracts are renegotiated before reaching their agreed termination date. Renegotiation incidents are persistent, though not absolutely in less developed countries. In Caribbean and Latin American nations, a lot of projects were deserted because of the public or private partners' failure to comply with contractual obligations (Guasch, 2004, and Iossa and Martimort, 2008).

3.5.7 Limited ability to commit to contractual obligations

In past research on contract design, instances in which the contractual parties are not able to abide by their obligations have been termed as conditions of restricted commitment. Estache and Wren-Lewis (2008) demonstrate that this label can be utilized to include diverse probable conditions. Primarily, with "limited enforcement," the partner might renege on the contract for the period of its implementation, even if the public administration does not agree. On the other hand, in a similar instance, also known as "non-

commitment," the government might renege on the contract, even if it is unfavorable for the party. There exists also a third instance, called "renegotiation and commitment," where the stakeholders abide by their responsibilities yet, if they together desire, the contract may be renegotiated at a later time (Iossa and Martimort, 2008).

3.6 EFFECTS OF MORAL HAZARD AND ADVERSE SELECTION ON PUBLICPRIVATE-PARTNERSHIP PROJECTS IN THE CONSTRUCTION INDUSTRY

3.6.1 Cost overruns on budget:

Whereas external construction risk is nearly entirely distinctive, internal construction risk is to some extent logical if procurement options promote moral hazard and adverse selection. This is precisely what extant literature of construction risk indicates: the price of constructing conventional infrastructural procurement is seen to be methodically above budget (Blanc-Brude, 2013). This supposed 'optimism bias' is a candid case of the effects of moral hazard during procurement: bid prices are small since bidders are not really exposed to risks in construction. With time, costs shoot up (Flyvbjerg and Holm 2003; Flyvbjerg *et al.,* 2004).

Past studies on cost overruns abound and fewer still by means of great samples and testing for statistical connotations (Flyvbjerg *et al.,* 2002, 2004, MottMac 2002). Researchers including (Lee *et al*., 2008, Creedy 2006, Bordat *et al.*, 2004; NAO, 2009) investigate the direct practical sources of cost overruns in conventional procurement projects. They further center on the transportation infrastructure which consists of road and rail (Blanc-Brude, 2013).

3.6.2 High transaction costs

Being a long term and global contract, the partnership contract enhances the traditional issues of moral hazard and adverse selection related to the choice of a bidder. It implies high transaction costs for both the public and private partners, due to duration of the negotiation and the skills and resources involved (Allen, 2003). The requirements of the contract are generally complex and expressed in terms of outputs rather than inputs.

Moral hazard and adverse selection in PPPs could raise transaction costs because the government has to negotiate with and monitor the private sector partners who have their own interests and agendas.

3.6.3 Reduction of competition

Each bidder must present an innovative offer, with the underlying risk of losing the tender without being repaid for its innovation. Both of these characteristics tend to limit the number of bidders and in the long term reduce the competition, as most firms would get out of the PPP market after a costly series of lost bids. The ability of a Public Private Partnership to maintain the competitive pressure ex post must also be questioned (Chong *et al.,* 2007). If they were no asymmetries of information, a simple cost plus contract would be optimal. A fixed price contract would owe a rent to the private partner. In both cases, it remains difficult or very costly to identify the type of bidder and to measure its performance (Laffont and Tirole, 1986). Furthermore, the contractor benefits from the contractual irreversibility and the informational rent built up during the contract duration.

3.6.4 Consequences on profitability of project

Knowing the challenge in producing accurate demand estimates, the firm's profits are largely uncertain before the operation phase begins (Chong *et al.*, 2007). A natural consequence is that it becomes difficult to attract private investment, especially when projects are big and private sponsors are averse to risk. For example, cross-border infrastructure has gained very small concern from private financiers in Europe (EC White Paper, 2006). Even if private investors do turn up, they are inclined to conduct themselves opportunistically.

3.6.5 Negative implications on enforceability of contract

This is possible because, at the time when the right to run the project is awarded, they are generally required to present traffic forecasts, which are used to define the contractual arrangements. Thus, at that stage, they have an incentive to present overoptimistic forecasts, in order to obtain the right to the activity. However, once this is acquired, it becomes clear that traffic flows are poor, in fact (Chong *et al.*, 2007).

3.6.6 Corruption

Politicians and bureaucrats might be willing to receive bribes from firms, and other forms of immediate or future gains like, career assurances for friends and relatives, in return for a favourable revising of contract conditions. In projects of infrastructure, corruption might also appear as softer ex-post price regulation, where both firms by way of larger profits and officials by way of rent-seeking to help at the expense of consumers. Martimort and Straub (2008) posit that relying on a private stakeholder might provide avenues for further corruption, when compared with government provision. This happens, when the cost of public monies, to be borne by citizens as long as government receives subsidies from the national budget to render the service, is lower, compared to the alteration that the price

increase encourages, to the disadvantage of consumers, when a private firm is given the work. This would be the case even if the taxation schemes are mainly ineffective, if bureaucrats and officials are corrupted at different levels, and are prejudiced and influenced by the private partner. Nations that have multi level systems of government are more exposed to corruption (Martimort and Straub, 2008).

3.6.7 Dishonesty

The widespread problem of moral hazard and adverse selection in the construction market are the main reason for the dishonesty of the construction market and is the primary cause of the construction project risk as well. If the problem of adverse selection can't get effective settled, it will be difficult to form a "win-win" situation in the construction market, which leads to the harmonious project management being not formed.

3.6.8 Opportunistic behavior

Asymmetric information gives rise to opportunistic behavior which is the primary cause of breaking faith in the construction market and essentially drives construction project. In the bidding phase of the project, the tender doesn't know clearly of the bidder's technical strength, level of management, service quality, and so on; also the bidder is unclear of the tender's intention of building, financial capacity, and business reputation etc. at the same time. So the adverse selection is very prone to occur as a result of the current situation that the two parties' information is asymmetric.

The problem of adverse selection is particular prominent in domestic construction market. Each contractor's strength level is uneven, which is the fundamental cause of adverse selection. Because of asymmetric information, the owner has little or false information of the contractor's technology, management, credit etc., leading to the owners tend to be at a

disadvantage position in the game of both sides, which leads to adverse selection –that is "bad money drives out good money"

Problems resulting from moral hazard and adverse selection are economic disadvantages for one of the parties, the inefficient use of resources, and the resulting losses of welfare.

3.6.9 Siphoning of funds

Working against the principal, however, is the agent's ability to siphon funds: Rather than expend effort on work that will lead towards success, the agent can divert funds to private consumption and use the rest to give the illusion of productivity. This monitoring structure creates three separate challenges. First, firms may attempt to win the contract even though they have no intention of exerting any effort, and are merely planning to siphon all the funds. Second, a firm that has worked and succeeded might then begin siphoning funds, waiting to exercise the option of revealing success at a later, more lucrative date. Finally, late in its contract, a firm might cease exerting effort and begin siphoning funds, since the likelihood of success fails to justify further effort. For example, a construction firm might succeed at the crux of a large scale project, then delay completion of less demanding tasks over time to stretch out the payments from the principal.

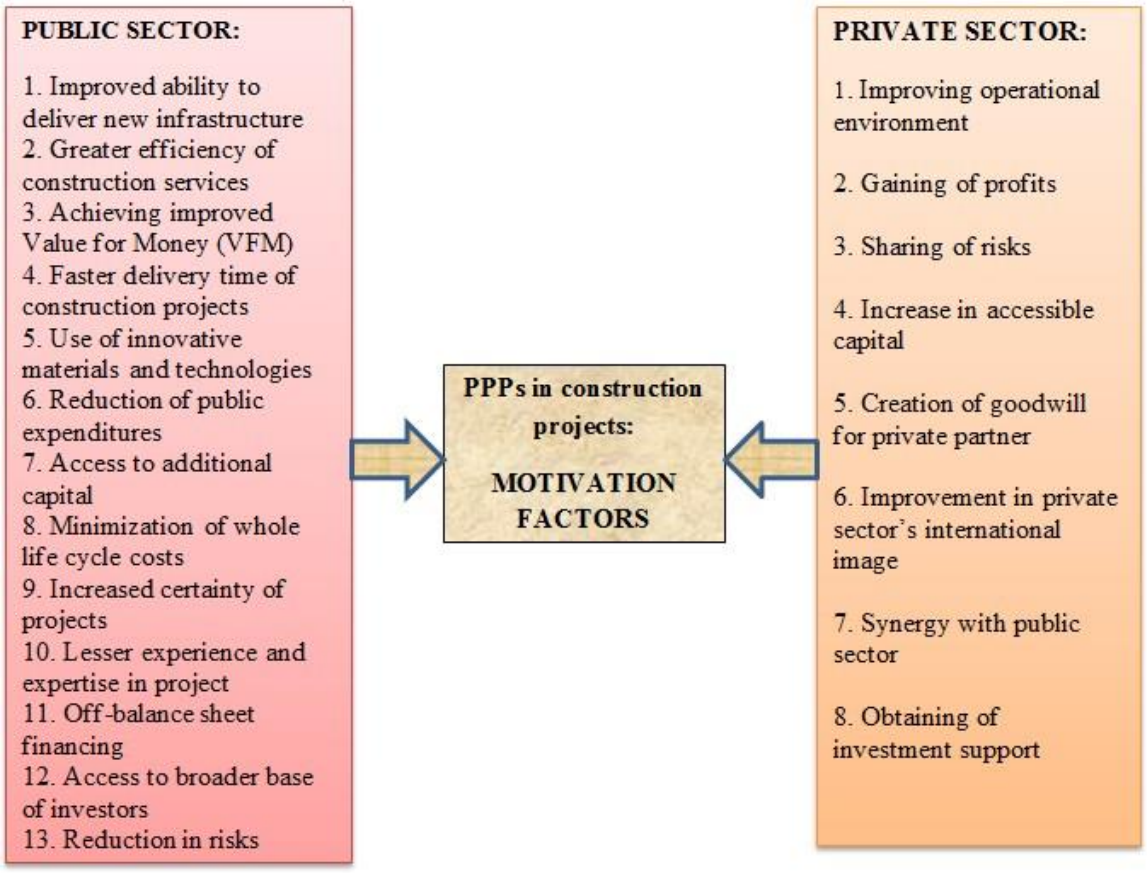

Figure 3.4 Conceptual Framework for Motivation Factors of Public and Private Sectors Engaging in Public-Private-Partnership (PPP) Construction Projects

3.7 STRATEGIES TO REDUCE MORAL HAZARD AND ADVERSE SELECTION ON PUBLIC-PRIVATE-PARTNERSHIP PROJECTS IN THE CONSTRUCTION INDUSTRY

3.7.1 Transfer of risks:

Transfer of risk by way of enforceable contracts curtails extremely greatly with moral hazard and adverse selection. If the stakeholder constructing the job is partially or entirely liable for the variance of costs, two circumstances occur: the building team now has great incentives to manage costs and, if enough liabilities transferred, only the builders who are aware they can manage costs well will bid for the projects. Simply put, transfer of

construction risk results in projects where only the most qualified builders have to control their own construction liabilities and risks (Blanc-Brude, 2013).

3.7.2 Increased incentives to control costs:

The self-selection of the most qualified construction companies merged with the incentive to manage costs as a remaining claimant curtails with moral hazard and adverse selection (Blanc-Brude, 2013). It intimates that, a fraction of construction risk existent in infrastructural projects is a product of who is exposed to the risk (Laffont and Martimort, 2002).

3.7.3 Managing of construction risks:

In financing of projects, not excluding Public-Private-Partnerships, construction risks are controlled by way of a network of contracts (Blanc-Brude, 2008; Gatti, 2013) and transferred to construction companies which efficiently make available insurance against unanticipated construction costs to the financiers and sponsors of the Special Purpose Entity (SPE).

3.7.4 Benchmarking:

Asymmetries of information on the operating costs can also be reduced through benchmarking and market testing processes (yardstick competition). Elementary parts of the service provided by the contractor can be periodically evaluated against market prices (Bureau and Mougeot, 2007). Prices exceeding the benchmark should be lowered to market prices. The operator will ultimately select new sub-contractors so as to lower costs. These systems seem more appropriate for soft services within PFI contracts (Farquharson, 2007).

Proofs of operational PFI contracts show that public contractors consider soft services as not performing as the other constituents of PFI (Partnerships UK, 2006).

3.7.5 Financial unbundling:

Financial unbundling is an effective way of ensuring transparency in projects by inducing a disclosure of the contract financial main points. A separate funding competition both favours the entrance of new actors, which are susceptible to reinforce the competitive character of the PFI market and the partial solving of the issues induced by the asymmetrical information context. The commitment of financial institutions into the contract allows, the assessment of the completion of value for money and reinforces, and the monitoring upon the SPE (Gatti, 2013).

3.7.6 Bond spread:

An inadequate risk transfer to the contractor can be discovered by the reasonability of the bond spread. For instance, if the public partner takes on almost all the demand risk, it can be, in financial expressions, like providing to the contractor an advance contract for free (Välilä, 2005). The private partner has the guarantee to get an amount of revenue in spite of the real level of demand. This reasoning is similar in the instance of a guarantee of minimum revenue level. The private stakeholder further benefits from a put option for free. If he will not deliver the service, its cash flows will be set at the option strike price. In both instances, a funding competition will expose such contractual disequilibrium (Dewatripont and Legros, 2005). The consequence will be similar in symmetrical situation. If unbearable level of risks is shifted to the private contractor, a separate funding competition will result in an excessive risk premium or unproductive tendering (Välilä, 2005).

3.7.7 External finance:

Dewatripont and Legros (2005) distinguish two types of external financiers, outside shareholders and debt creditors. They consider that the financial structure of the contract is not without significance on the private partner incentives. Commercial finance literature reiterates that outside debt or equity might lower incentives to exert effort for the contractor (Jensen and Meckling, 1976). If the bundling of construction and operating stages in a PPP contract results in proper incentives for the private partner (Hart, 2003), it looks like that external finance induces the loss of a part of its rent. External finance brings about a new agency relationship to the contract. It is positive to the public contractor since the interests of external financiers are similar to its objective. In this way, part of the monitoring expenses can be externalized.

3.7.8 Funding competition:

At the negotiation period, funding competition helps to raise the public sector's information on the deal. However, the cost of gathering this information should not override the savings it brings about. In this instance, the size of the deal, and the number of bidders, has a crucial role in the trade-off (Singh *et al.,* 2006).

Running a debt funding competition is a more attractive option due to the development of the PFI financing market, which tolerates a greater flexibility within the impending funders and causes a reduction in risk premium. In UK, the emerging attractiveness of

PPP has opened the way for a more PFI mature funding market and a further effective secondary market (Singh *et al.,* 2006). The financing of PFI contract turns out to be attractive for financial organizations.

3.7.9 Contain private liabilities to small size:

Private liabilities should be contained to an adequately small size (Blanc-Brude, 2013). As well as requiring that the firm not spend so much in the project, in spite of its assets, this necessitates that the firm not depend on debt greatly, even if it has unrestricted access to the credit market. PPP projects are to be effectively run and should not be extremely leveraged (Danau and Vinella, 2014).

3.7.10 Securing contract enforcement:

To be able to induce the firm to fulfill the contract, there should be the requirement of investing a satisfactorily worthy quantity of money in advance, and it should be allowed to recuperate that investment by the passage of time at the execution stage (Blanc-Brude, 2013). Since the firm is conscious that disintegration of the partnership will obstruct recuperation of the original investment, it has an incentive to safeguard the partnership with the government (Danau and Vinella, 2014). This requires that the private stakeholder should be affluent enough so as to offer huge contribution to induce it to fulfil the contract. To be brought on to partake in the partnerships, private firms should be wealthy to start with. This would discourage the speculative and probable unpredictable investors (Danau and Vinella, 2014).

3.7.11 Contract guarantees and technical assistance:

On the whole, the responsibility of a modern development banks or current multilateral banks would involve steps at national and international stages, comprising from fiscal and risk mitigation features, including the terms of technical guidance (Blanc-Brude, 2013). At the national point, the bank will offer state authorities with technical assistance, assisting them compute their comprehension of the country specific factors, which are important for the

choosing, expansion, and administration of projects exhibiting the uppermost social returns. Further, it will improve credibility of institutions, synergies, promoting dedication and risk reduction both in the partnerships between public and private sectors and in the association between various governmental levels, relating to how multi-level governance situations are involved (Dewatripont and Legros, 2005). Internationally, it will offer monetary support, assuring guarantees and giving out the most excellent international actions for project evaluation and risk appraisal, and the best techniques of innovative finance (Hart, 2003). All these help reduce moral hazard and adverse selection.

3.7.12 Screening

Screening refers to the term for all activities whereby the principal attempts to gain more accurate information on the quality attributes of the agent which are pertinent. These include: references, work probes, certificates, and credit worthiness (Dewatripont and Legros, 2005). A further option to prevent adverse selection is to design the contracts in a manner that only desired contractors will sign them since only they would have the selfinterest to render the service under these situations. Examples include guarantees or a likely loss of reputation for the agent. Screening is significant before the signing of contracts. The aim of screening is to gain useful information to the principal in an attempt to be more conversant with the qualifications of the agent (Blanc-Brude, 2013).

3.7.13 Monitoring

Monitoring is essential after a contract has been signed. The intent of monitoring is to make certain that the agent is acting in harmony with the contract. This in the long term decreases the problems of information asymmetry: moral hazard and adverse selection (Dewatripont and Legros, 2005).

3.7.14 Signaling

The market party which has more information, e.g. the contractor, signals its type to the client who is the least informed market stakeholder, using some signals. In case of signaling, the initiative goes out from the better informed market participants who send out their signals first and who only then get contracts offered by the worse informed market party (Dewatripont and Legros, 2005). Accordingly, the planner can present his qualities and prove them by way of references or certificates. The benefits of signaling must be higher for desired agents than signaling costs. Simultaneously, the advantages of signaling should be lower for undesired agents than signaling costs. Supposing the client carries out efforts to enquire further about the qualities of the contractor by his own ingenuity, it is referred to as screening. In undertaking public construction projects therefore, VOF-processes must be undertaken for the choice of construction services.

Private principals too may carry out pre-qualifications (Dewatripont and Legros, 2005).

3.7.15 Cooperation among project participants

In connection with moral hazard, the frequency of the cooperation of the project participants is of major importance. If the contractual partners repeatedly cooperate with one another, this can lead to a reduction of information asymmetries. The mutual trust resulting from long-term cooperation will cause a reduction of risk costs (Loben, 2009).

Trust takes time to develop between the parties, and it is very fragile, but once developed it outshines all the other strategies in terms of project control and risk minimization. Formal planning and control systems create more transparency with regard to the actions of the project participants (Danau and Vinella, 2014). Here, the competence of the project management installed plays an important role.

3.7.16 Clarifying the need for information in the project

The necessity for information which a project participant requires to accomplish his tasks within a definite period of time is explained according to quality, type and quantity. In this instance, subjective and objective need for information can be distinguished (Gatti, 2013). The former refers to the amount of information that the project participant needs from his subjective point of view on the project while the latter refers to the amount of information that is imperative for achieving the task. To align these amounts of information and to guarantee the optimal supply of all essential information for the project participants, it is vital to define the factors for success of the project. Hence, those factors and parameters are recognized which are of exceptional significance for the respective participant (Martimort and Straub, 2008). Particularly in complex and technically challenging projects, this will afford each individual project participant with better understanding of those processes which are the most important ones for the success of the project in an opportunistic way. Within the scope of the project management a special focus should be on the design of information duties of the involved partners (Gatti, 2013). When the project management has developed awareness about possible information imbalances, this can be addressed better when designing the flow of information. Using a proper reporting system causes the transparency within the project to increase. The use of project communication systems may support the project management in the manner of handling the information (Danau and Vinella, 2014). The benefits of a project communication system are: responsibilities within the project are transparent for all project participants. The worker who is responsible in the corresponding case will be informed automatically by e-mail over the tasks and contributions allocated to him. All project contributions are available 24

hours a day and consequently allow an overview over the current state of the project at any time. Information can be recorded, processed and viewed regardless of time. The more and better the communication within the project is organized, the easier it is to prevent information asymmetries (Loben, 2009).

3.7.17 Information disclosure

The agent delivers information to the client using some special files for client's reference. The client will esteem the agent's reputation as a significant evaluation index when he selects agent, which is because the project implementation needs the agent's strength, experience, credibility, moral qualities among others, and these all constitute private information of the agent (Gatti, 2013).

6.5.18 Well-designed contract

Contract is the most vital instrument that regulates the information between the project owner and contractor. Therefore, a well-designed contract which defines the ways of information transfer is the most effective way to decrease the information asymmetry risk. A well-defined contract aids in reducing risks to the minimum (Loben, 2009).

3.7.19 Create a clear and transparent process

Routinization and standardization will create a market for PPPs that provides the public and private sector with a clear roadmap for success. This will ultimately lead to a reduction of the agency problems of moral hazard and adverse selection (Martimort and Straub, 2008).

3.7.20 Harmonization of interests

A main instrument for reducing the risks of moral hazard is the harmonization of interests, e.g. by profit sharing of the contractor. For the planning participants, contractual incentives must be given so that the targets of the principal may be achieved (Dewatripont and Legros, 2005). Among these incentives are the exact projections of the costs and the meeting of these costs by a corresponding planning performance. A contract that leads to cost optimization without reductions of the quality is highly incentive. If the payment is linked to the overall success, it is no longer attractive for the individual project participants to pursue only their own interests (Dewatripont and Legros, 2005; Loben, 2009).

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter clarifies the rationale for the selected research methodology. It further explains the various steps undertaken to attain the objectives of the research. The choice of appropriate research design and techniques are explained. The explanation for the

techniques and methods used to collect data, analyses, and interpretation are further depicted. Research terms and methodology concept are also thoroughly explained.

4.2 PHILOSOPHICAL CONSIDERATIONS

Research paradigms are categorized into four according to Guba and Lincoln (2004). They are: positivism; post positivism; constructivism and critical theory. Guba (1990) posits that a paradigm is an elemental set of beliefs which direct actions. A paradigm comprises three main constituents: epistemology, ontology and methodology according to Denzin and Lincoln (1998). Nonetheless, Creswell (1994) and Collis and Hussey (2003) centered their philosophical reasoning on ontological, epistemological, axiological and methodological assumptions. While epistemological, ontological and axiological postulations mark the philosophical perspective of a research, methodological and rhetorical postulations tackle language and process of the research likewise (Thurairajah, *et al.,* 2006). As a result, philosophical matters of ontology, epistemology, axiology and methodology hypotheses affect the choice of research instruments (Christou, *et al.,*

2008).

Ontology tackles reality of unchallengeable nature against behaviour of humans (Saunders *et al*., 2009; Christou *et al*., 2008); and the inferences researchers observe about the way the world is controlled and the allegiance held to definite opinions (Saunders *et al*., 2009). Conversely, ontology questions the reality of the true world which is independent on man's intellect (Marsh and Stoker, 2002). Ontological standpoint is either objectivism or subjectivism. *Objectivism* holds the view that societal entities exist in reality which are away from our reach of power and are nonessential to combined stakeholders (Saunders *et al*., 2009; Bryman, 2005). *Subjectivism* relates that societal happenings occur because of

the judgments and ensuing actions of the stakeholders involved with their existence (Saunders *et al*., 2009; Christou *et al*., 2008). **Epistemology** relates to the study of knowledge and the procedure of gaining knowledge and its validation (Gall *et al*., 2003). It tackles what constitutes adequate knowledge or theory in a field of study (Saunders *et al*., 2009; Campana, 2010). It shows the relationship between the observer (researcher) and subject of inquiry (reality of knowledge), and how the researcher gains the truth of that reality by openly observing the external world; the observer and the subject of inquiry must interact to create knowledge (Christou *et al*., 2008). Epistemology is the science of knowledge (Babbie, 1995) or the questioning how knowledge is produced (Orlikowski and Baroudini, 1991) or gathering and analysing of information (Saunders *et al*., 2009). There are three epistemological standpoints: positivism, realism and interpretivist.

Positivism assumes the philosophical position of the natural scientist (Saunders *et al*., 2009; Remenyi *et al*., 1998). Positivist investigators expand knowledge by utilizing current theory to extend hypotheses, collection of facts and then subjecting them to numerical analysis for subsequent hypothesis testing (Saunders *et al*., 2009; Campana, 2010). The purpose of positivism is to predict, explain and control a phenomenon (Guba and Lincoln, 2004). Positivism relates epistemological theory that physical and social reality are independent of those who observe it; the observation of this reality is unbiased and constitute scientific knowledge (Gall *et al*., 2003).

Realism explains to scientific enquiry. Its essence is that what the senses show us as reality is the truth and that objects have an existence independent of the human mind. The philosophy of realism is that there is a reality quite independent of the mind. In this sense, realism is opposed to idealism, the theory that only the mind and its contents exist. Realism

is similar to positivism in that it assumes a scientific approach to the development of knowledge. This assumption supports the gathering of data and the implications of those data (Saunders *et al*., 2009).

Interpretivism adopts the subjective appreciations of humans as social actors (Christou *et al*., 2008; Saunders *et al*., 2009). Critics of positivists' tradition state that the rich insight into social world is complex to lower this intricacy to a sequence of generalizations. They believe that this rich insight is lost if they are only brought down to laws as the physical sciences (Saunders *et al*., 2009). Interpretivism promotes that it is essential for the investigator to comprehend variations between humans in our role as social actors. This stresses the disparity between conducting research among people instead objects like cars and computers (Saunders *et al*., 2009).

The disparity between positivism and interpretivism is their approach to knowledge. For positivists, scientific knowledge is gotten by the gathering of confirmed facts (Bryman, 2005). Interpretivism rather states that social phenomena are not existent independently of our interpretation of them; but this interpretation or meaning of social phenomena, which has an effect on social reality (Christou *et al*., 2008). Interpretivists are therefore more apt to use case studies, action research and ethnography (Christou *et al*., 2008). *Axiology* is a field of philosophical investigation which considers problems like the difference between a matter of fact and a matter of value (Bossé, 2006). Axiological positioning deems that researchers possess values and they aid in resolving what are recognized as facts and the explanations made. The task that the researcher's values play in all stages of the research process is of great importance if the research results are to be credible (Saunders *et al*., 2009).

The choice of philosophical approach is an indication of the researcher's values, as is the option of data collection techniques. The axiological position may be realism or social constructivism (Bossé, 2006).

Table 4.1 Ontological considerations

Ontological considerations	
Realist External world comprises pre-existing hard and tangible structures Structures exit independent of individual's ability to acquire knowledge	**Relativist** Existence of multiple realities as subjective construction of the mind Perception of reality is directed by varying socially transmitted terms
Epistemological considerations	
Positivist Application of natural science methods to the study of social reality and beyond World conforms to the law of causation and complex issues can be resolved by reductionism	**Interpretivist** Absence of universal truth and emphasis on realism of context Understanding and interpretation come from researcher's own frame of reference
Axiological considerations	
Positivist Research and science are value free	**Social consideration** Research and science are value laden i.e. values influence research

Source: Baiden (2006)

For this research, *epistemologically*, this study chose positivist tradition. Positivist allows the possibility of establishing the study relating to the theory and literature. This makes it possible for the study to be repeated with ease if essential. For positivists, by way of accumulation of established facts, scientific knowledge is proved (Bryman, 1992).

Ontologically, this research chose a realist position. This research saw the research to be practical instead of abstract. Moreover, understanding of causes and effects of moral hazard and adverse selection of PPP projects in the Ghanaian construction industry exists as external facts that are beyond the reach and influence of the researcher.

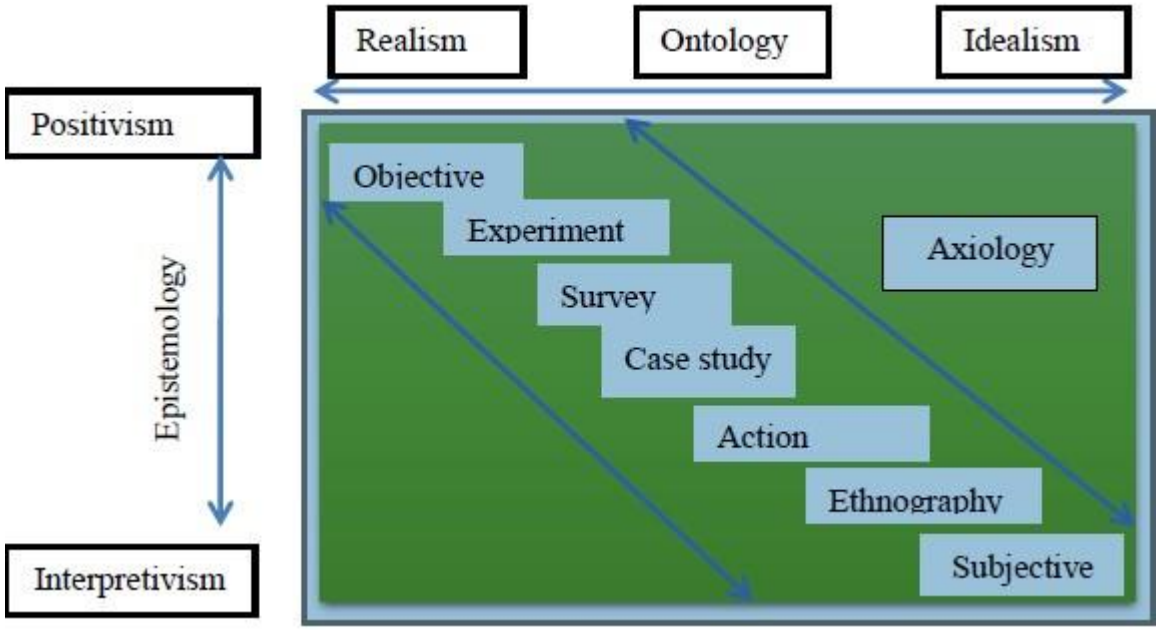

Figure 4.1: Research Philosophical Assumptions
Source: Adopted from Pathirage (2005)

The figure below is a summary of the research approach including the philosophical thoughts and position adopted for the study.

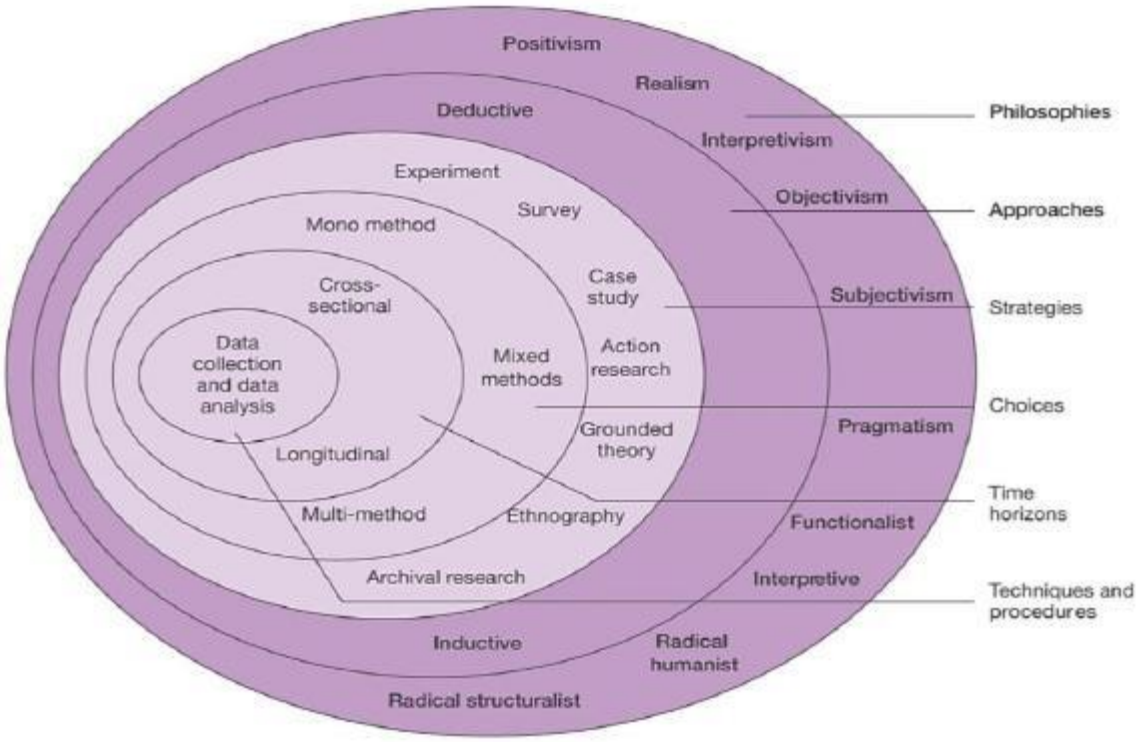

Figure 4.2 Research Onion Source: (Saunders *et al.*, 2009)

4.3 RESEARCH STRATEGY

4.3.1 Qualitative Research

Qualitative research is naturalistic; it attempts to study the everyday life of different groups of people and communities in their natural setting; it is particularly useful to study educational settings and processes. "….qualitative research involves an interpretive, naturalistic approach to its subject matter; it attempts to make sense of, or to interpret, phenomena in terms of the meaning people bring to them (Denzin and Lincoln, 2003). This means that in qualitative studies, researcher study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them. According to Jean (1992) qualitative research is "….a form of social interaction in which the researcher converses with, and learns about the phenomenon being studied".

In other words, the researcher is part of the research process and is actively involved in creating the meaning of reality (Crotty, 1998).

In qualitative research, different knowledge claims, enquiry strategies, and data collection methods and analysis are employed (Creswell, 2003). Qualitative data sources include observation and participant observation (fieldwork), case studies, interviews and questionnaires, documents and texts, and the researcher's impressions and reactions (Bryman, 2004). Data is derived from direct observation of behaviours, from interviews, from written opinions, or from public documents (Sprinthall *et al.,* 1991). Written descriptions of people, events, opinions, attitudes and environments, or combinations of these can also be sources of data. Again, qualitative research examines the patterns of meaning which emerge from the data and these are often presented in the participants own words (Denzin and Lincoln, 1994). The goal of qualitative research is to discover patterns, which emerge after close observation, careful documentation, and thoughtful analysis of the research topic (Patton, 1990). ***Drawing on from the above works cited***, qualitative research is a systematic inquiry into the nature or qualities of complex social group behaviours by employing interpretive and naturalistic approaches. Qualitative study lends itself to thick narrative description of the group behaviours in the group's natural environment. It attempts to be non-manipulative and takes into account the unperturbed views of the participants as the purpose is generally to aim for objectivity. Qualitative research are most appropriate when the researcher wants to become more familiar with the phenomenon of interest, to achieve a deep understanding of how people think about a topic and to describe in great detail the perspectives of the research participants.

4.3.2 Quantitative Research

According to Wadsworth (1997), quantitative research is the systematic scientific investigation of quantitative properties and their relationships. Quantitative research approach however looks at past words, actions and records to their mathematical significance and quantifies the results of these observations (Cresswell, 1994).

Wadsworth (1997) stated that quantitative research is about "how many; to what extent, or how much aspect which involves counting and other data analysis. The objective of quantitative research is to develop and employ mathematical models, theories, *hypotheses* concerning the natural phenomena (Sarantakos, 2005). Quantitative research makes use of questionnaires, surveys and experiments to gather data that is revised and tabulated in numbers, which allows the data to be characterized by the use of statistical analysis (Hittleman and Simon, 1997). Quantitative researchers measure variables on a sample of subjects and express the relationship between variables using effect statistics such as correlations, relative frequencies, or differences between means. Measurement process is key to quantitative research because it provides the basis for connection between empirical observation and mathematical expression of quantitative *relationships* (Gall *et al*., 2003). The quantitative research generally uses critical approaches such as the generation of models, *theories and hypotheses*; the development of instruments and measurement; experimental control and manipulation of variables; *collection of empirical data*; modeling and analysis of data; and evaluation of results (Gall *et al*., 2003). This means that quantitative research results can be generalized to a larger population within acceptable error limits. A positivist, objectivist and realist approach investigate and *explain how one variable affects another* (Creswell, 2005). It allows for a design to evolve rather than

having a complete design in the beginning of the study because it is difficult if not impossible to predict the outcome of interactions due to the diverse perspectives and values systems of the researcher and participants, and their influence on the interpretation of reality and the outcome of the study. However, all quantitative research requires a hypothesis before research can commence.

Table 4.2 Differences between quantitative and qualitative research

	Quantitative	Qualitative
Objective	Gather factual data and study relationships between facts and relationships in accordance with theory.	Study issues in depth and detail and seeks to gain insight and understand people's perceptions
Orientation to the role of theory to research	Deductive and thus associated with verification of theory and hypothesis testing.	Inductive and geared towards the generation of theory from specific instances.
Common data collection techniques	Questionnaires, tests and existing databases.	Interviews, observations and documents.
Data characteristics	Hard data, structured, large sample size, analyzed using statistical methods.	Soft data, descriptive, less structured analyzed using non-statistical methods.
Outcome	Conclusive findings used to recommend a final course of action.	Exploratory and/or investigate and findings are contextual.

Sources: Bryman (2004); Fellow and Liu (2003); Naoum (2002); Neuman (2003) and Sherif (2002)

4.3.3 Data

For the purpose of answering the research questions, meeting the objectives, and achieving the research strategy, quantitative data was used for the analysis. Quantitative data refers to numbers in a raw form before they are processed and analyzed. Until they are processed and analyzed, they convey very little meaning to most people. These data, therefore, need to be processed to make them useful; that is, to turn them into information. Quantitative

data can either be primary or secondary type. Primary data refers to a new data collected specifically for a particular purpose. Secondary data implies data which has already been generated for other purpose but taken again and used for a varied reason from the original. Secondary data includes both raw data and published summaries (Saunders *et al.*, 2009). Such data may be raw data which has seen little processing, or compiled data that have received some form of selection or summarizing (Saunders *et al*., 2009).

Secondary data (comprising both quantitative and qualitative data) are used principally in both descriptive and explanatory research. According to Saunders *et al*. (2009), secondary data may be classified into three main sub-groups: documentary data, surveybased data, and those compiled from multiple sources (Robson, 2002). Multiple-source secondary data can be based entirely on documentary or on survey secondary data, or can be an amalgam of the two. The key factor is that different data sets have been combined to form another data set prior to accessing the data (Saunders *et al*., 2009).

4.3.3.1 Types of Data

Quantitative data is normally grouped into data types using a scale, frequently in ascending order of numerical precision (Berman and Saunders, 2008; Dancey and Reidy, 2008). The varying stages of numerical measurement determine the choice of techniques existing for presentation, summary and analysis of the data. Knowing discrepancies between types of quantitative data is needful. Firstly, it allows analytical software to produce suitable statistics from the data. Secondly, the more accurate the scale of measurement is, the better the options of analysis tools accessible to the researcher.

Quantitative data can be grouped into two distinctive groups: categorical and numerical (Saunders *et al.*, 2009).

Categorical Data

Categorical data is data having values which cannot be calculated numerically but grouped into categories regarding the features which classify or portray the variable (Berman and Saunders, 2008 in Saunders *et al.*, 2009). Even though these data are totally descriptive, they could be measured to ascertain which group has the most and if the cases are evenly spread. Categorical data is divided into two: nominal (or dichotomous or binary) data and ordinal (or ranked) data (Saunders *et al*., 2009).

Nominal (or dichotomous) data permits only qualitative categorization. They can be calculated only by means of if the individual items originate from different groups, yet those categories cannot be quantified. Nominal data cannot be measured but only counted (Jaykaran, 2010). They include gender, race, colour. They are grouped as categorical data yet their order is of no meaning (Jaykaran, 2010).

Ranked (ordinal) data is a much more accurate form of categorical data and the categories are in logical order (Saunders *et al.,* 2009; Jaykaran, 2010). The relative position of each case within the data set is well-known, even though the definite numerical measures on which the position is dependent on are not confirmed. It is used for rating or scale questions where a respondent is solicited to rate how strongly she or he agrees with a statement (Saunders *et al.*, 2009). These data could be ranked in order of magnitude (Jaykaran, 2010).

Numerical Data

Numerical data are values which are counted as quantities. This is also referred to 'quantifiable' (Berman and Saunders, 2008). This implies that they are more accurate than categorical as there can be assignment of each data value a place on a numerical scale

(Saunders *et al.,* 2009). Numerical data could moreover be divided again into interval or ratio data and, then again, into continuous or discrete data (Saunders *et al.,* 2009). *Continuous data* are have values which can take any value given that it can be assessed exactly (Dancey and Reidy 2008 in Saunders *et al.,* 2009).*Discrete data* is a data which can be measured precisely. Every case gets one of a fixed number of values from a scale which measures differences in discrete units. They are generally whole numbers (integers) (Saunders *et al.,* 2009). Data for this research are grouped into *nominal, ordinal and discrete data* types.

4.4 SURVEY PROCESS

According to Cohen *et al.* (2005), researchers who espouse positivist perception employ an array of choices like questionnaires and surveys. Survey research helps in answering questions, to answer problems, evaluate goals and needs, to assess if the definite objectives have been resolved, to ascertain benchmarks for which potential comparisons could be made, to investigate inclinations within time, and commonly to portray what subsists. The survey process for this study was implanted in the philosophy of the researcher that the survey process since it allows data to be collected from a huge number of respondents so as to generalize the findings. Survey process was chosen since it allows for aggregating attitude and opinions of respondents on the information under study.

4.4.1 Research Scope

The research was conducted in Accra and Kumasi. Accra is the political administrative and capital of the nation Ghana. Accra is further the capital of the Greater Accra region of Ghana surrounded by the Volta Region, Central Region, Eastern Region and the Gulf of

Guinea. Accra is resident to every facet of the Ghanaian economy. Construction is a primary sector in Accra. As construction activities increase in Accra, the implication is that more professionals settle towards Accra.

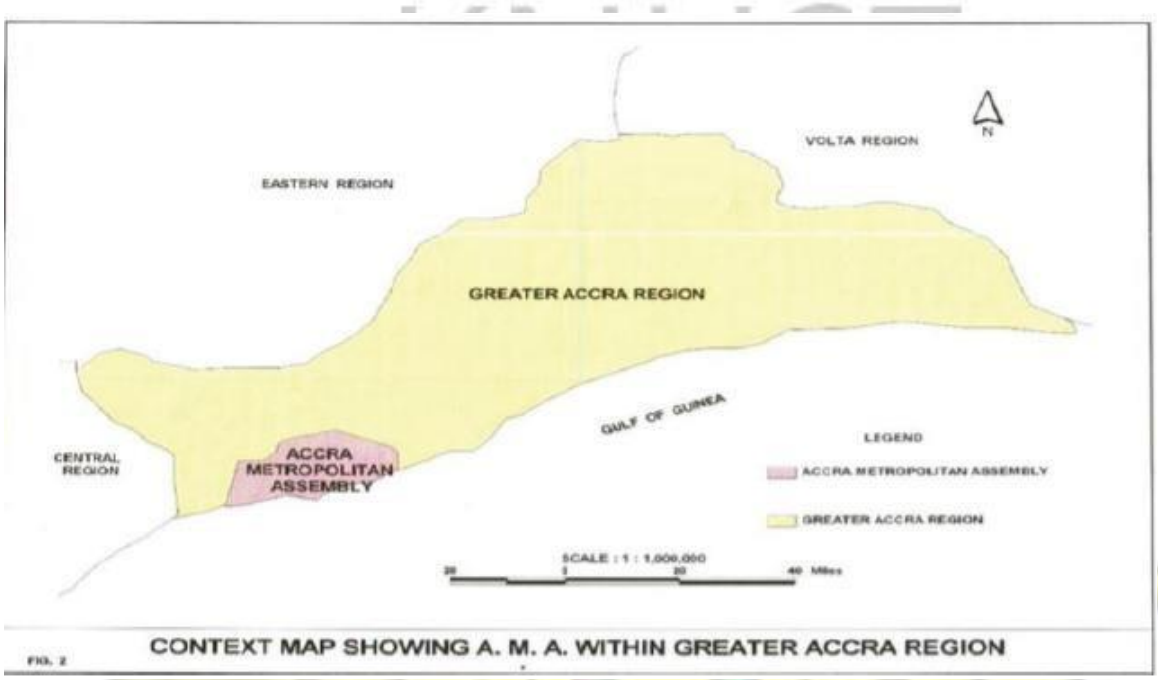

Figure 4.3 Map of Greater Accra Region (Source: UN HABITAT, 2009)

Kumasi is the capital of Ashanti Region. Kumasi is situated not far from Lake Bosomtwe, and is the commercial, manufacturing and traditional capital of Asante land. Because of huge deposits of gold mined, Kumasi is the most affluent city in Ashanti Region. Construction is also a major industry in Kumasi. It therefore houses various construction professionals.

Figure 4.4 Map of Ashanti Region (Source: UN HABITAT, 2009)

4.4.2 Sampling Techniques and Sample Frame

According to Salant and Dillman (1994), sample selection is underpinned on size of population and the level of accuracy required. Participants in the sample must be selected at random with equal chance. A requirement to sample selection is to characterize the target population as smaller as achievable (Salant and Dillman, 1994). Conversely, it may not be possible to identify the true population therefore it was suggested that a theoretical sample might be employed. Theoretical sample is useful for purposively selecting groups that exhibit the required features being sought for.

The term "sample" implies a component of a total (population) chosen to represent the rest (Naoum, 1998). Sampling thus indicates the procedure of choosing a portion of the population to stand for the whole population. A sample comprises of elements which make up the population (Polit and Hungler, 1999). Using a sample is much practical and less expensive as compared to retrieving data from the total population. Polit and Hungler 1999)

stated that, the biggest risk of utilizing a chosen sample is that it may not sufficiently replicate the traits, behaviours, or beliefs of the whole population.

The sampling technique for this study with relation to its design, purpose, and realistic inference on this research topic is purposive sampling. The researcher chooses what needs to be identified and undertakes to locate respondents who are willing to release the information by merit of experience or knowledge (Bernard, 2002; Lewis and Sheppard, 2006; Tongco, 2007). In the context of this research, this strategy involves identifying the professionals involved in Public-Private-Partnership (PPP) construction projects.

Purposive sampling indicates the strategies where the researcher applies discretion as to who will best provide answers concerning field of study, and then deliberately requests those definite viewpoints into the study. Purposive sampling is very useful for instances where one needs to contact a targeted sample fast (Tongco, 2007).

Furthermore, snowball sampling was used in getting the sample size due to the challenges encountered in evaluating the population size. Snowball sampling is a procedure for locating research subject (Atkinson and Flint, 2001). This strategy is a solution to reaching hard-to-reach or concealed populations. It exists on the assumption that a link exists among the original sample and extras in the similar target population (Berg, 1988; Atkinson and Flint, 2001). Hence, the snowball sampling was used for identifying respondents with rich information that are relevant to the study. This process continued till a representative sample size of fifty six (56) government agencies, consultancy firms and construction companies in charge of Public Private Partnership projects was obtained. Questionnaires were distributed to five (5) respondents in each of these companies and agencies resulting in a total of two hundred and eighty (280) respondents.

4.4.2.1 Establishing an appropriate sample size

Sample size has an important effect on model fit in SEM analysis and model testing. For this research, SEM was the primary analytical tool for analyzing the data and developing the model (Tong, 2007). Past studies and research have debated on what makes up the right sample size to give best results towards model fitting and testing. Tong (2007) however stressed that small sample size leads to more bias in model fit and makes the model ineffective. Taking in mind that SEM was the primary tool for the analysis of this work, this influenced the sample size for the study. Bentler (2005) posits that the quality of results intrinsic in a research with small sample size is dependent on the features of the model being considered. Quality of results is also influenced by the nature of statistical tests like parameter estimates, standard error, test statistics and z-statistics. According to Iacobucci (2010), a sample size of 100 is considered small leading to undesirable results in SEM. For best SEM analysis, sample size of 200 or more with a specific number of variables is taken to be ideal for a good fit model analysis. Past studies confirm that the variable ratio is also useful in determining sample size (Curran *et al.*, 2004). The recommended variable ratio of SEM analysis is a minimum of 5:1 for it to be taken to be a suitable sample size. For example, SEM model having 20 observed variables must have above 100 respondents as the suitable sample size.

4.5 DATA COLLECTION METHODS

The strategy of data collection which is best preferred by quantitative researchers is questionnaires or survey (Sarantakos, 2005). Surveys questionnaires are the mainly used method of collecting data in the social sciences (Sarantakos, 2005). According to Cohen *et al*. (2005) and Creswell (2005); survey questionnaires are employed in many manners to

collect data. Survey questionnaires are exceptional methods of collecting data using both open and closed ended questions (Sarantakos, 2005). Creswell (2005) stated that quantitative research utilizes instruments to determine variables of a research. This instrument is made up of definite questions and alternatives of response which the investigator already ascertained.

4.5.1 Development of Questionnaires

The questionnaires were devised to deal with the aim, objective and research questions of the research (Oppenheim, 1996). A good questionnaire is made up of questions which generate varying kinds of information from the respondents (Gall *et al*., 2003).

Questionnaires should be short, and questions set in a simple way (Gall *et al*., 2003). The design of an effectual survey questionnaire is dependent on four essential factors: question wording, categorization, coding of variables and general acceptance (Sarantakos, 2005). Survey instrument design must first clearly define the focus of the research. It must translate the objectives to measureable features which add to the research focus (Salant and Dillman, 1994). A good question is one that generates responses which are valid and reliable (Fowler and Floyd, 1995). Survey questions must employ words which match the levels of education of respondents (McIntyre, 1999).

Fowler and Floyd (1995) implied that the question and response options should be clear to the respondent and the investigator. Wording must avoid ambiguous understandings (Salant and Dillman, 1994; Fowler and Floyd, 1995).

4.5.1.1 Questionnaire Format

Literature recommends that the optimal length of questionnaire varies from one side of

A4 paper to eight pages of A4 paper (Naoum, 1998; Oppenheim 2000; Saunders *et. al*., 2000; Fellows and Liu, 2003).

4.5.1.2 Content of Questionnaires

After identifying the respondents for the questionnaire and their characteristics was to concentrate on the design of the questions that provided the essential knowledge for the study. The way in which the survey questions were presented has an effect on the quality of the responses hence needful to guarantee that accurate questions were posed, understood well and presented in the correct format (Wahab, 1996). The questionnaire comprised questions primarily closed-ended and scaled-response type and the questions were typed on normal A4, white colour sheets including a cover page.

4.5.2 Pre-Testing of the Questionnaire Instrument

The designed questionnaire instruments were pre-tested and piloted before the main survey. As stated by Oppenheim (2003) and Creswell (2009), pre-testing and piloting surveys being conducted before a main survey are very crucial to uphold and establish an organizational and complete consistency in the collection of data (Yin, 2009). The purpose of pre-testing questionnaires is to assess the extensiveness, clarity and viability of the design instrument and the whole survey plus the time taken to answer the questionnaires by respondents. It is also intended to draw needful feedbacks in perfecting the questionnaire and minimize ambiguity in the questions posed (Oppenheim, 2003). Pre-testing and piloting are very vital and influential in minimizing likely difficulties to be faced in the actual survey in completing the questionnaires (Creswell, 2009). Using stratified sampling technique, two respondents each from government agencies, consultancies and construction firms involved in PPP projects with insightful expertise and

having features of proposed respondents were asked to pre-test the questionnaires. These six respondents were asked to check the research instrument (RI) for ambiguity, clearness and time used to finish answering the questionnaires. They were also to give insights which will improve the preciseness of the questionnaires. Feedbacks received indicated that the questionnaires were very clear to comprehend and were very likely to get pertinent answers in the main survey. Comments from the piloting were used to make a few additions and fine-tuning of the questionnaires for the main survey.

4.5.3 Undertaking the fieldwork

The fieldwork involved the distribution of questionnaires and was conducted in Accra and Kumasi. Respondents from government agencies, consulting firms and contracting firms in charge of PPP projects were purposively chosen to answer the research instrument. One field assistant was engaged to help with the distribution of the questionnaires. She distributed in Accra while the main researcher distributed in Kumasi. Physical visits were made to these firms and agencies. The field assistant was well orientated. The survey begun on 25th February, 2016 and was proposed to end after three weeks. However, after this period, only 162 questionnaires had been successfully retrieved. This was not enough since SEM requires at least 200 responses for analysis.

The fieldwork was therefore extended for another one week. As a result, more follow ups were done on the respondents to gather supplementary responses leading to a total of 210 questionnaires.

4.6 DATA ANALYSIS METHODS

The measurement of a variable's scale shows which statistical methods are useful and needed (Agresti, 2002). A variable is a feature that is evaluated on individuals (Tebbs,

2006). Ryan (2004) posits that a variable portrays the characteristics of a population which may have different values. Agresti (2002) states that variables are fitting for evaluating attitudes and opinions and the subjective evaluation of definite features. For a research, response scales decides attributes, attitudes, cultural beliefs and values; client satisfaction (Kapadia-Kundu and Dyalchand, 2007).

4.6.1 Entry and organization of data

The purpose of editing and organizing field data before the main statistical analysis is to aid in perfecting the data quality and to minimize errors and other shortfall that may affect findings and eventual outcome (Yuen, 2007). After checking and filtering the questionnaires retrieved for completeness, the data was entered into SPSS version 23. Even though, Missing Values (MV) and incomplete questionnaires are frequent in research works and may be attributed to varying reasons, yet it is needful to make sure that the missing values do not have an effect on the analysis so as to improve validity (Bentler, 2005). The SPSS software is automated and designed to control the effect of incomplete and missing data. The questionnaires retrieved for this research did not have any missing values. After successfully, inputting the data into SPSS, the analysis began in order to help solve the research questions and meet the research objectives.

4.6.2 Descriptive Analysis

The descriptive statistics is the analytical tool for presenting data. Descriptive statistics comprises of methods for summarizing and presenting data. The descriptive statistics in the analysis of data helps for easy comprehension of huge amounts of data; and provides chance to correspond the research results to people (Ryan, 2004).

4.6.2.1 Data Presentation Using Tables

Tables are useful in presenting and packaging data to audience (Kapadia-Kundu and Dyalchand, 2007; O'Keefe, 1991; Menard, 2004). Tables are useful in minimizing the quantity of data values in a text; and help in reducing needless variables in discussing data (UN, 2009; Carpio *et al*., 2007). The UN (2009) identified the five support components essential in describing data presented in a format to include the table title, column headers, row stubs, footnotes and source line.

4.6.3 Inferential Analysis: Hypothesis Testing

According to Gabrenya (2003), the purpose of inferential analysis is to create generalizations from a sample to the broader population. Inferential analysis mainly exists on using statistical techniques to test hypotheses to deduce inferences (Baddie and Halley, 1995; Kolawole, 2001). Inferential analyses are mainly grouped into two parameters. The first is parametric analysis and constitutes of Pearson Product Moment Correlation Coefficient; one sample t-test and analysis of variance (ANOVA). The second group is non-parametric analysis and is made up of the Kolmogorov-Sminov test, Mann-Whitney U test, Sign test; Chi-square test, Wilcoxon matched-Pairs Signed–ranks test and the Lambda symmetrical/ asymmetrical test (Adeyemi, 2009; Berenison and Levine, 1979). The selection of any of the two groups of analyses depends on features related to the study instrument used or nature of the study. These factors include sample size; scale of measurement of data collection instruments; sampling method adopted and the number of independent variables (Adeyemi, 2009; Berenison and Levine, 1979). According to Siegel (1988), non-parametric tests are distribution-free tests suitable for samples which are assumed to be not normal. Non-parametric tests are also appropriate for data by way of nominal and ordinal scales of

measurement. They are also apt when the nature of research distribution is not known (Siegel, 1988).

According to Hun (2010) and Deveries (2007), hypothesis testing enables researchers to make conclusions based on results collected data so as to generate deductions on a population. Hypothesis implies a supposition about the feature of a specific population of study. Hypothesis must be adequately accurate to be made false to allow for testing. Procedures for testing of hypotheses comprise ANOVA, one sample t-tests, correlations, chi square, z-tests among others (Deveries, 2007).

Deveries (2007) posited that hypothesis testing is undertaken to ascertain the influence a variable of interest has on a specific population. The testing of hypothesis for research also focuses on defining the level of relationship among variables.

Testing of hypothesis leads to a 'null hypothesis (Ho)' or 'alternative hypothesis (H_1). The *p*-value represents probability of gaining an outcome large as that observed in the sample if the null hypothesis remained true. *Alpha* stands for the probability of falsely rejecting the null hypothesis. Usually, alpha value is fixed at 0.01 or 0.05 (Kochanski, 2005; Anglim, 2007).

The *p*-value represents values that do not occur. The *p*-value is calculated by way of the distribution of test statistic supposing the null hypothesis being true (Anderson *et al*., 2000). The *p*-value also specifies the degree of data consistency with null hypothesis (Ho) (Anderson *et al*., 2000). The *p*-value further represents the degree of risk which researchers use to reject the null hypothesis (Hun, 2010). If the *p*-value is below 1%, it conjectures that the alternative hypothesis is true and can be concluded that the test is very significant. *P*-values from 1% to 5% are estimated to imply that the alternative hypothesis is true therefore significant result. Correspondingly, *p*-values from 5% to

10% mean there is little indication to confirm that the alternate hypothesis is true. *P*-values of above 5% show that the test is statistically insignificant. *P*-values above 10% imply there exists no confirmation of the alternate hypothesis being true (Kochanski, 2005; Anglim, 2007).

As stated by Anglim (2007), when the *p*-value is below the alpha, the likelihood of the null hypothesis existing as true is little, therefore reject the null hypothesis but accept the alternate hypothesis. Test statistic is determined first from the sampled data and compared with the hypothesized null distribution in order to evaluate the reliability of the data by means of the null hypothesis. Supposing the test statistic values are greater, it means the sample data is not consistent as against null hypothesis. Finally, a subjective or arbitrary limit or cutoff (α) is fixed to aid in determining results that are either statistically significant or statistically insignificant (Anderson *et al*., 2000).

4.6.3.1 Steps for Hypothesis Testing

First of all, the null hypothesis (Ho) should be mentioned which must anticipate that there exists no change due to the study. Null hypothesis (Ho) hypothesizes that the independent variables do not affect the dependent variables thereby causing the mean to be the same.

Alternate hypothesis (H_1) posits that there exists some change in the mean and the independent variable affects the dependent variable. Alternate hypotheses demonstrate that a change is either negative or positive.

Next of all, the critical region must be set. This entails describing the alpha level and the critical region that are two extreme scores which are hard to get if the null hypothesis (H_0) exists as true. Results must go further than these two extreme values to be deemed as statistically significant. The alpha level in this situation is a probability value and used to

set the critical region signifying that the probability that a result happens outside the critical region is by coincidence.

Thirdly, data must be collected and manipulated using statistical test after which results are used to ascertain if null hypothesis must be rejected or accepted. The final step is to make a decision. This entails rejecting null hypothesis which indicates that there exists a substantial change in the mean and therefore alternate hypothesis be accepted. Failure to reject the null hypothesis implies no variation in mean. The null hypothesis is rejected so as to prevent falsifying of results by way of further research (Deveries, 2007).

4.6.3.2 Approaches/Criteria to Hypothesis Testing

According to Hun (2010), criteria for testing hypothesis include test statistic approach; *p*value approach; and Confidence Interval (CI) approach (state H_0 and H_1; determine test size α or 1- α, and a hypothesized value; construct the (1- α) 100% confidence interval; reject Ho if a hypothesized value does not exist in CI; and substantive interpretation). Test statistic approach computes a test statistic from the observed data and equates it with the critical figure and a test statistic bigger than the critical figure causes rejecting the null hypothesis. The *p*-value approach involves calculating the *p*-value by way of a test statistic and comparing with the significance level (test size). If the *p*-value is lower compared to the significance level, the null hypothesis will be rejected. The confidence interval (CI) approach generates a confidence interval and ascertains whether the hypothesized values are within this range. Suppose the hypothesized value is not found within the confidence interval, the null hypothesis is rejected (Hun, 2010).

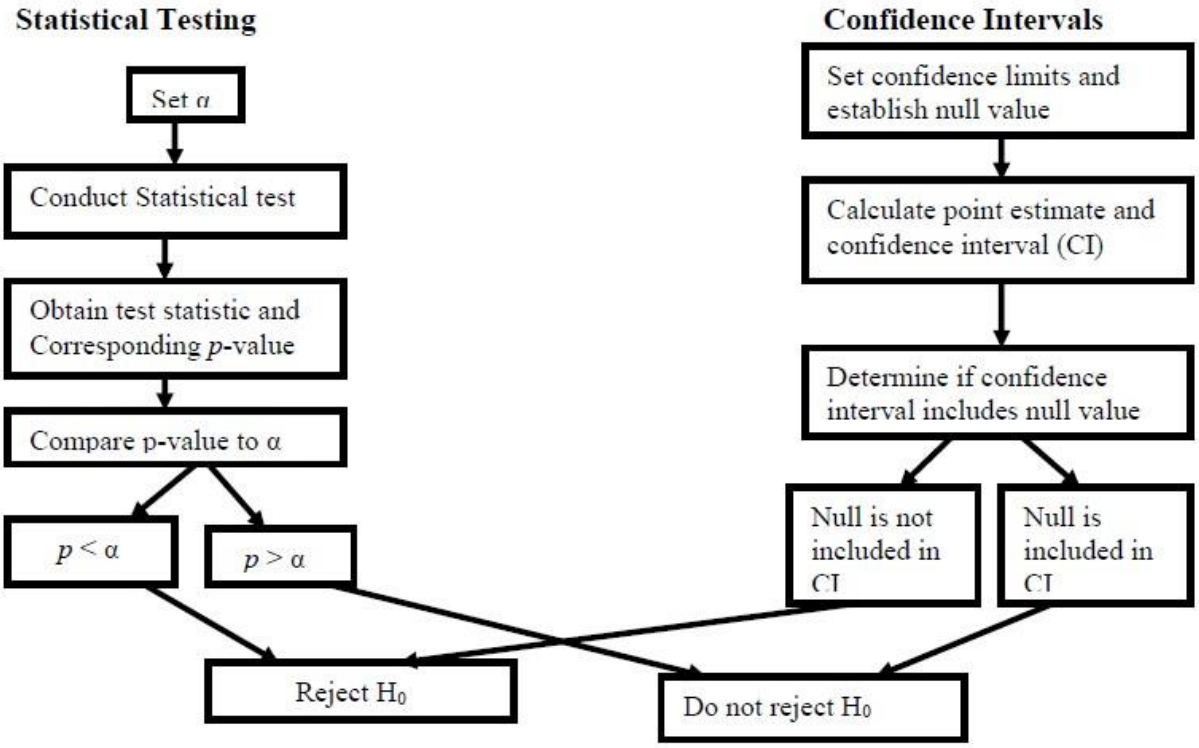

Figure 4.5: Methods for hypothesis testing

Source: (Cohen, 2010)

4.6.3.3 Interpreting Hypothesis Test Result

In order to assign meaning to the results of a hypothesis test, it ought to be interpreted. The determinant of the kind of interpretation is the approach of statistical testing used.

In statistical testing, if the p-value is bigger than α, there is no rejection of the null hypothesis and the implication is that the difference of the groups is due to probability.

When the confidence interval (CI) approach is adopted, there is no rejection of the null hypothesis if the confidence interval encompasses the pre-set null value and hence the implication is that the difference of the groups is because of probability (Cohen *et al.*, 2005).

4.6.3.4 Key Statistical Tools used for Hypothesis testing in the analysis

4.6.3.4.1 Analysis of Variance (ANOVA)

According to Tang *et al.* (2008), ANOVA is used for testing perceptions of research respondents about factors under study. If the F value is higher, it implies the difference in perception among the respondents is significant. The primary characteristic of ANOVA is to compare variability among groups as against variability within different groups by means of the F-statistic ratio (Anderson, 2006). The bigger the F value, the null hypothesis (H_0) will more likely be not different amongst the group means (Anderson *et al.*, 2000).

4.6.3.4.2 One sample t-test

The purpose of one-sample t-test is to compare a sample with a population that has been defined. T-tests approximate the standard deviation of the population using sample data (S). The assumptions of the one-sample t-test are similar to one-sample Z-test. These are: random sampling should be from a defined population; scale of measurement should be interval or ratio and population must be normally distributed means (Anderson *et al.*, 2000).

4.6.4 Suitable analysis for the model

The purpose of the model is to help achieve the structural relationships between the causes and effects of moral hazard and adverse selection. It is essential to utilize the right tool which is robust to help attain the model. Considering past works in the development of models, General Linear Modeling (GLM), statistical tools like Multilevel multivariate analysis(MANOVA), Analysis of Variance (ANOVA),multiple regression and multilevel

multivariate analysis like Structural Equation Modeling (SEM) are the foremost analytical methods (Hair *et al.,* 2013; Kline, 2010; Field, 2009). SEM however is superior over the other GLM group of analyses in model development since it caters for running other multilevel multivariate analysis on factors and variables plus identifying latent (unobserved) features which cannot be done in multiple regression and Analysis of Variance (ANOVA). With this background, SEM tool was adopted as the best and most apt tool for developing the structural model. Another advantage of SEM over Multiple Regression (MR) is its ability to reveal causal relationships between several variables as compared to Multiple Regression which is only exploratory. SEM is also effectual when conducting analysis that involves indirect and direct assessment of one or more independent variable(s) on one or more dependent variable(s) as compared to MR which handles only one dependent variable (Bentler, 2005). Furthermore, SEM determines and reveals difference between error variance and true variance. This is a useful requirement when developing models.

According to Kline (2010), Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) exist as the most useful approaches in analyzing SEM variables. They are useful in improving upon the robustness in measurement model in SEM analysis (Bentler, 2005). The purpose of EFA is in exploring the probable fundamental factor structure in a set of observed variables (Byrne, 2006). CFA conversely verifies and confirms already recognized factor structure of a set of observed variables. CFA further permits the researcher to test the hypothesis that a relationship between observed variables and their underlying latent constructs exists (Hair *et al.,* 2013). For this study, CFA was the best in

analyzing the construct in the model and the causal relationship among the dependent and the independent variables. Confirmatory Factor Analysis

(CFA) was undertaken on the exogenous variables to define its best-fit for the model. This research used the STATA and AMOS softwares for the SEM analysis. These softwares are user friendly, have graphical user interface and are compatible with SPSS plus they offer extensive variety of goodness-of-fit measures as compared to other softwares.

4.6.4.1 Model Analysis and Fit Indices

The main approaches used in SEM to suitably develop models are score reliability and validity, covariance analysis, z-tests, test of significance and measure of goodness of fit of model. Data retrieved from fieldwork was inputted into SPSS and later extrapolated into STATA and AMOS for further analysis. The statistical significance of the constructs was thoroughly evaluated so as to develop a robust model that fits. P-values were used to explain the statistical significance. This was done by convention and further comparing to past studies such as Kwofie *et al.* (2014). The p-value was set at 0.05 and infers a ninety five percent chance that the population mean is inside a stated range of values. As recommended by Hair *et al.*(2014), this research adopted multi approaches to assess model fit.

Practically, the Standardised Root Mean Square Residual (SRMR), Goodness of Fit Index(GFI), Bentler Comparative Fit Index (CFI), Chi-square ($\chi 2$), Satorra-Bentler Scaled Chi-square(S – B$\chi 2$), Root Mean Square Error of Approximation with its 90% or 95% confidence interval and Root Mean Square Error of Approximation (RMSEA) deliver the most essential sign of how best the theory fits the data (Hair *et al.,* 2014).A mixture of

incremental/comparative fit indices and absolute fit index is however recommended for SEM analysis.

Fit indexes of CFI, $\chi 2$, GFI and S – B$\chi 2$ are under the incremental/comparative fit indices and RMSEA and SRMR instead, are under the absolute fit indices (Kline, 2010). The RMSEA and SRMR further define how best a model fits the data and indicates if proposed model is the best fit(McDonald and Ho, 2002). This research utilized three indices. These are Comparative Fit Index (CFI), RMSEA and Goodness of Fit Index (GFI). This was done so as to achieve a rigorous and robust standard to assess the model fit. The $\chi 2$ was chosen to evaluate the acceptance of the mode generated. By convention, GFI result nearer to 0.95 or greater than 0.90 is desired and appropriate for model test of fit (Kline, 2010). According to Wong (2011), the satisfactory or acceptable cut-off benchmarks of fit statistics are: CFI= value should be ≥ 0.95 for good fit and 0.90 for acceptable fit; Chi-square ($\chi 2$) Ratio to df ≤ 3 or5 with an insignificant or significant *p value* ($p > 0.05$); SRMR= value should be $\leq$ 0.05 as good fit and $\leq$0.08for acceptable fit (value of 0.1 is also acceptable); RMSEA= value should be < 0.05 for good fit (values < and 0.08 indicate a reasonable and acceptable error of approximation and values of > 0.10 suggests a poor fit) and RMSEA at 90% CI= values to be < 0.05 to0.08 with confidence interval.

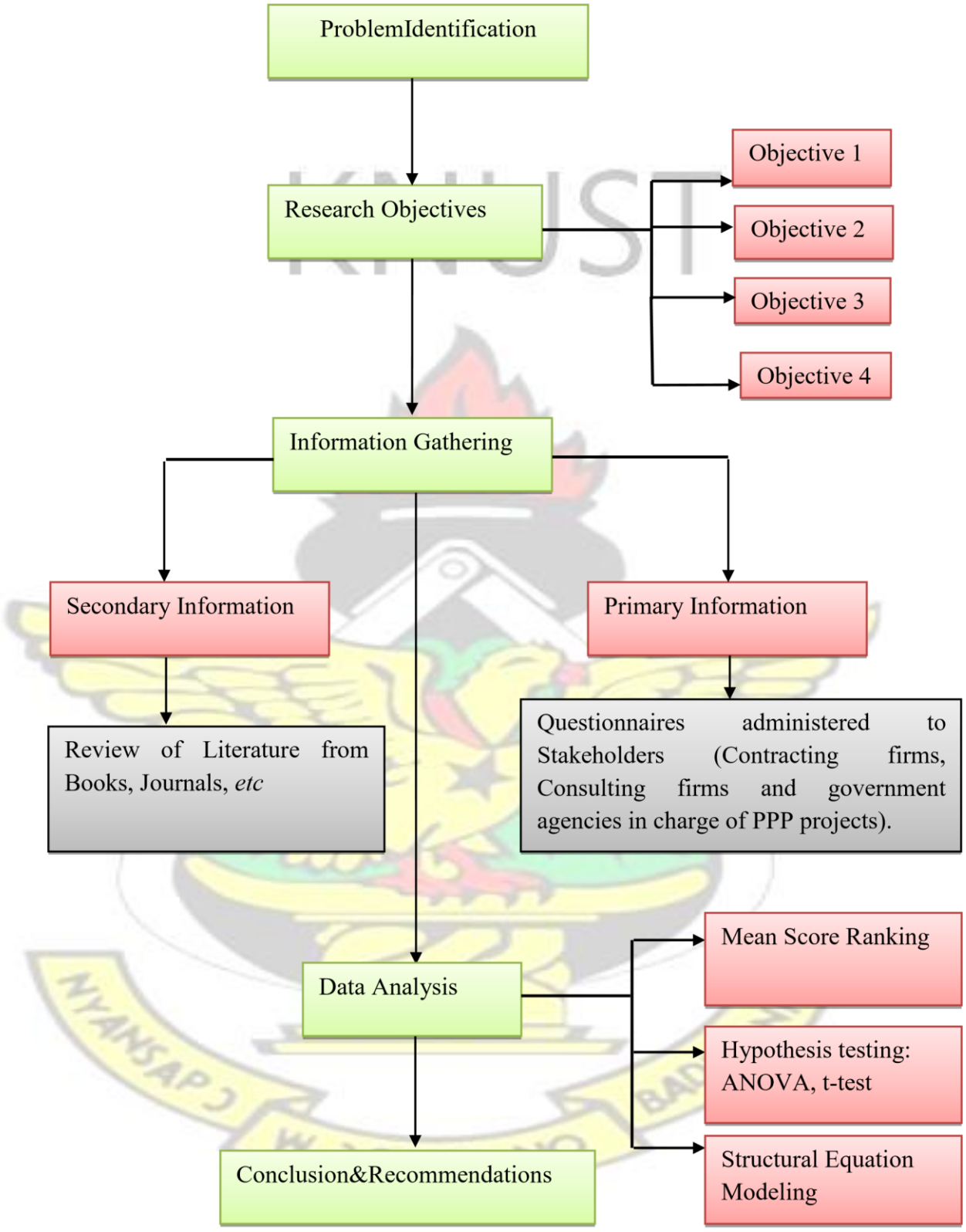

Figure 4.6: Flow chart of methodology

CHAPTER FIVE

ANALYSIS AND DISCUSSION OF RESULTS

5.1 INTRODUCTION

This chapter is the presentation, analysis and thorough discussion of results from questionnaire survey undertaken to solve the research questions and attain the research objectives. This chapter contains the descriptive statistics, inferential statistics and testing of hypothesis results of data gotten. Analysis of respondents' profile is contained in the first section. In answering the specific objectives, statistical tools like mean score ranking, ANOVA and one sample t-test were used. To assess causal relationships, different functions and statistical evaluation under the Structural Equation Modeling (SEM) technique were all utilized to enable the development of a well-fitting and acceptable model. The chapter further goes on to do an elaborate discussion of the importance of the findings and their implications for stakeholders involved in PublicPrivate-Partnership (PPP) construction projects.

5.2 DATA COLLECTION AND RESPONSE RATE

According to Creswell (2009), the importance of the respondents' profile in a data gathering survey is to confirm the reliability and validity of the findings. This is to enable conclusions to be drawn for generalization purposes. Another importance is to engender credibility and confidence in data gathered.

210 questionnaires were retrieved out of the 280 sent out to the contracting firms, consultancy firms and government agencies. This amounted to a response rate of 75 percent. This response rate attained is deemed to be adequate and high enough to proceed

with the statistical analysis. The attainment of this response rate came from consistent follow up on respondents through personal visits and telephone calls. This was necessary in order to get the minimum number of 200 respondents prerequisite for Structural Equation Modelling (SEM) analysis.

5.3 RESPONDENTS' PROFILE ANALYSIS

To be able to have an in-depth knowledge of the data obtained, descriptive statistics aided in the analysis of the respondents' profile. This was done by way of frequency distribution and percentages and presented in charts and tables. The purpose of this was to aid provide background information on the respondents and to assess their expertise so as to lend credence to the responses and whole findings of the research.

This part of the questionnaire related to respondents' profile had three questions which enquired on the category respondents belonged to, the educational level of the respondents and finally the working experience of the respondents. According to Hallowell and Gambatese (2009), assessing the profile of the respondents especially the years of experience in profession is highly seen as important indicators in knowing the expertise of respondents.

The results presented below from the descriptive statistics establish and prove that the respondents for this study have the adequate level of experience and expertise required in generating confidence in responses to variables and the whole research findings. Accordingly, the respondents for this study are very involved in the industry and therefore offer tangible and credible answers.

5.3.1 Category of firm of respondents

This section enquired from the respondents of the study the category of firm they belonged to. From Figure 5.1 below, 40 percent of respondents work with government agencies in charge of PPP construction projects. 39 percent of respondents work with consulting firms in charge of PPP construction projects. Finally, 21 percent of respondents work with contracting firms in charge of PPP construction projects. This research comprises respondents who are working in various sectors and firms responsible with construction projects and are knowledgeable about the operations of PPP construction ventures. This therefore lends credence to the reliability of the study.

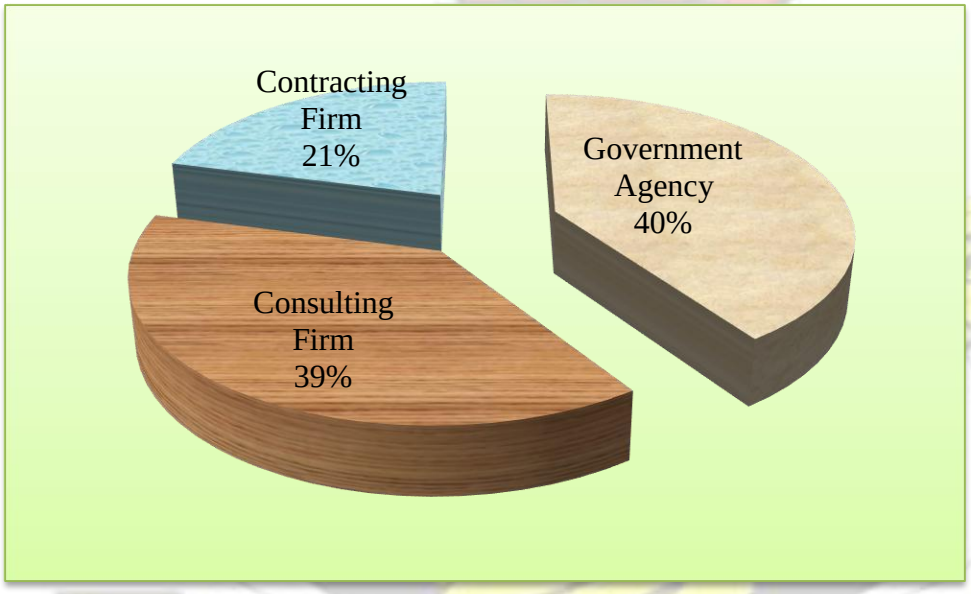

Figure 5.1 Category of firm of respondents

5.3.2 Years of working experience

This section enquired from the respondents their years of working experience. The table below presents their responses. 22 of the respondents representing 10.5 percent have less than 5 years' experience. 59 respondents representing 28.1 percent have 5-10 years' experience. Furthermore, 74 respondents representing 35.2 percent have 11-15 years'

experience. 30 respondents representing 14.3 percent have 16-20 years of working experience while the remaining 25 respondents representing 11.9 percent have above 20 years of experience.

In conventional work practice and relying on the practical perception of employment practice in Ghana, having at least six years of working experience qualifies a worker for the position of senior management. In addition, possessing at least ten years of working experience makes a worker suitable for the position of senior management. Inferring from this, it can be deduced that the respondents for this study have adequate working experience in the industry. In summary, their responses for this study are seen to be reliable and valid.

Table 5.1 Years of working experience

	Frequency	Percent	Cum. Percent
Less than 5 years	22	10.5	10.5
5-10 years	59	28.1	38.6
11-15 years	74	35.2	73.8
16-20 years	30	14.3	88.1
Above 20 years	25	11.9	100.0
Total	210	100.0	

5.3.3 Educational level of respondents

From the table below, 22 respondents representing 10.5 percent have an HND degree. 100 respondents representing 47.6 percent have a BSc degree. Furthermore, 84 of the respondents representing 40 percent have an MSc degree while the remaining 4 respondents representing 1.9 percent have a PhD. Considering the practical standpoint of

the teaching and training courses offered by varying professionals in the industry in the nation of Ghana, it can be seen from this results that the majority have passed through the tertiary level with the minimum being a BSc degree. The implication for this study is that, the respondents have satisfactory background in education and hence have the propensity to better understand and interpret the variables. Their responses are therefore anticipated to be credible and consistent.

Table 5.2 Educational level of respondents

	Frequency	Percent	Cum. Percent
HND	22	10.5	10.5
BSc	100	47.6	58.1
MSc	84	40.0	98.1
PhD	4	1.9	100.0
Total	210	100.0	

5.4 MOTIVATIONS FOR ENTERING INTO PUBLIC PRIVATE PARTNERSHIP (PPP) PROJECTS

5.4.1 Motivations for public sector

Parties entering into Public-Private-Partnership construction projects have their motivations for entering the partnership. This section sought to find out the motivations for the public sector entering into PPP construction projects. Respondents were asked to rank the motivations on a scale of 1 to 5 where 1=Not significant; 2=Less significant; 3=Moderately Significant; 4= Significant; 5=Very significant. This portion of the study was interested in knowing the order of significance of these motivations for entering into PPP construction projects.

Consequently, mean score ranking using the mean values and standard deviations were used in ranking these factors. From Table 5.3 below, *faster delivery time of construction projects* was ranked 1st with a mean of 4.07 and standard deviation of 0.695. *Achieving improved Value for Money (VFM)* was ranked 2nd with a mean of 4.01 and standard deviation of 0.699. *Reduction of public expenditures* was ranked 3rd with a mean of 3.98 and standard deviation of 0.794. *Use of innovative materials and technologies* was ranked 4th with a mean of 3.98 and standard deviation of 0.797. *Increased certainty of projects* was ranked 5th with a mean of 3.97 and standard deviation of 0.776.

All the mean values for the factors in the table were above the population mean (3.5). It can be inferred that all these factors are significant as far as motivations for the public entering into PPP construction projects is concerned.

Similarly, standard deviations on a statistical data imply the measure of variability and consistency linked with interpreting the variables by respondents (Field, 2009). It is deemed critical concerning statistical reliability and credibility of data (Motulsky, 2005; Field, 2009). Small standard deviations (lower than 1.0) linked with mean values being measured imply high consistency and low variability between respondents in interpreting variables (Motulsky, 2005; Field, 2009). Large standard deviations (above 1.0) imply low consistency and high variability between respondents in interpreting variables (Motulsky, 2005; Field, 2009). Drawing on the results in Table 5.3, it is seen that all the values are below 1.0. This indicates that respondents accurately understood and interpreted variables and that there exists little variability in data and great consistency among respondents. This lends trust and credibility in the findings and interpretations used in this study.

Table 5.3 Motivations for entering into PPP projects (Public Sector)

	Mean	Std. Deviation	Ranking
Reduction of public expenditures	4.08	0.794	1
Faster delivery time of construction projects	4.07	0.695	2
Achieving improved Value for Money (VFM)	4.01	0.699	3
Use of innovative materials and technologies	3.98	0.797	4
Increased certainty of projects		0.776	5
Minimization of whole life cycle costs		0.772	6
	3.97		
	3.95		
Access to additional capital	3.94	0.726	7
Lesser experience and expertise in project	3.81	0.771	8
Access to broader base of investors	3.77	0.716	9
Off-balance sheet financing	3.76	0.758	10
Reduction in risks	3.71	0.703	11
Greater efficiency of construction services	3.64	0.733	12
Improved ability to deliver new infrastructure	3.53	0.780	13

According to literature, PPP provides important public benefits in the area the facility is constructed or service delivered. Furthermore, employment chances in the local areas are abundant since the indigenes are engaged for the construction. By partnering with the private sector, the public sector receives technological innovation and knowledge from the private sector. Facilities and services are also produced at a reduced cost (Chan *et al.*, 2006). Because of the rigid budget limitations which several emerging nations have

encountered in recent times, the greater part of these states are not able to have the funds for the needed capital for infrastructure (Vining and Boardman, 2008).

The government also adopts the private sectors' approach of delivering construction projects. Another rationale for the private sector's cost effectiveness is because the private stakeholder possesses more incentive to reduce the costs. These enticements and incentives are prone to turn out to be most obvious in much enthusiasm to modify job specifications and to employ the use of modern technologies so as to lower costs

(Dewatripont and Legros, 2005).

Vining and Boardman (2008) go on to give a further justification for governments to join a public-private partnership. Governments consider that in offering the project service by a public-private-partnership, it is *politically more attainable to initiate user-fees* which lead to reduced public administration total expenses. There exists enhanced approval from the voters and users for the private partner's necessity to generate returns so as to cater for costs; reimburse arrears or create profits, instead of the government behaving in that manner (Dewatripont and Legros, 2005).

5.4.1.1 Hypothesis testing

ANOVA was conducted to test the perceptions among the categories of respondents (consulting firm, contracting firm and government agencies) on the motivations for the public sector entering into PPP construction projects.

Null Hypothesis (H_0): There is no difference among the categories of respondents on the motivations for public sector entering into PPP construction projects.

From Table 5.4, out of the 13 factors, one factor had significant different perception among the categories of respondents (consulting firm, contracting firm and government agencies)

on the motivations for the public sector entering into PPP construction projects. This factor is *lesser experience and expertise in project*. Contrarily, the remaining 12 factors had no significant difference perception among the categories of respondents (consulting firm, contracting firm and government agencies) on the motivations for the public sector entering into PPP construction projects.

Table 5.4 ANOVA test results for motivations for entering into PPP projects (Public Sector)

	df	F cal	F tab	P val.	Sig	Decision
Reduction of public expenditures	209	0.513	3.94	0.600	NS	Accept
Faster delivery time of construction projects	209	0.820	3.94	0.442	NS	Accept
Achieving improved Value for Money (VFM)	209	0.772	3.94	0.464	NS	Accept
Use of innovative materials and technologies	209	0.987	3.94	0.374	NS	Accept
Increased certainty of projects	209	0.648	3.94	0.524	NS	Accept
Minimization of whole life cycle costs	209	3.450	3.94	0.034	NS	Accept
Access to additional capital	209	0.018	3.94	0.982	NS	Accept
Lesser experience and expertise in project	*209*	*4.505*	*3.94*	*0.012*	*S*	*Reject*
Access to broader base of investors	209	2.722	3.94	0.068	NS	Accept
Off-balance sheet financing	209	0.358	3.94	0.699	NS	Accept
Reduction in risks	209	0.263	3.94	0.769	NS	Accept
Greater efficiency of construction services	209	0.264	3.94	0.768	NS	Accept
Improved ability to deliver new infrastructure	209	1.843	3.94	0.161	NS	Accept

95% confidence interval, $\alpha = 0.05$

5.4.2 Motivations for private sector

This section sought to find out the motivations for the private sector entering into PPP construction projects. Respondents were asked to rank the motivations on a scale of 1 to 5 where 1=Not significant; 2=Less significant; 3=Moderately Significant; 4= Significant; 5=Very significant. This section of the research was intent on knowing the order of significance of these motivations for entering into PPP construction projects.

As a result, mean score ranking using the mean values and standard deviations were used in ranking these factors. From Table 5.4 below, *increase in accessible capital* was ranked 1st with a mean of 4.04 and standard deviation of 0.763. *Gaining of profits* was ranked 2nd with a mean of 4.01 and standard deviation of 0.731. *Creation of goodwill for private partner* was ranked 3rd with a mean of 3.90 and standard deviation of 0.743. *Improvement in private sector's international image* was ranked 4th with a mean of 3.89 and standard deviation of 0.696. *Sharing of risks* was ranked 5th with a mean of 3.77 and standard deviation of 0.667.

All the mean values for the factors in the table were above the population mean (3.5). It can be inferred that all these factors are significant as far as motivations for the public entering into PPP construction projects is concerned.

Similarly, standard deviations on a statistical data imply the measure of variability and consistency linked with interpreting the variables by respondents (Field, 2009). It is deemed critical concerning statistical reliability and credibility of data (Motulsky, 2005; Field, 2009). Small standard deviations (lower than 1.0) linked with mean values being measured imply high consistency and low variability between respondents in interpreting variables (Motulsky, 2005; Field, 2009). Large standard deviations (above 1.0) imply low

consistency and high variability between respondents in interpreting variables (Motulsky, 2005; Field, 2009). Drawing on the results in Table 5.4, it is seen that all the values are below 1.0. This indicates that respondents accurately understood and interpreted variables and that there exists little variability in data and great consistency among respondents. This lends trust and credibility in the findings and interpretations used in this study. According to literature, private sector has the capability of raising huge funds for large and comprehensive construction projects thereby minimizing public sectors financial load. Due to the infrastructural gap in several developing countries, projects cannot be provided only by the government since it will place a lot of pressure on government's coffers. Private stakeholders therefore increase accessible capital for projects. Private sector investors render better services to the public sector and are also able to maintain good business relationship. Another motivation for private sector entering into PPP projects is the sharing of risk. The partnership of PPP allows risk to be shared among the stakeholders. The private sector manages risk better by way of effectual asset procurement (Cheung *et al.,* 2010).

The private sector also enters into PPP as a way of gaining realistic profit and a good return on investments on long term basis (Cheung *et al.*, 2010). Essentially, the inspiration for the private sector to partake in a PPP is seen to be directly or indirectly linked to gaining profits. The desire for profit is the indispensable intent for every organization. The primary motivation for a private sector to partake in a PPP venture is to utilize and increase the accessible capital and also to make profits. Financial assistance and monetary benefits enable the public-private partnership projects the realization of extra profits (Dewatripont and Legros, 2005).

Another incentive, indirectly linked to profits, is the synergy occurring when the PPP permits a resource, created by the public-private partnership or made available by the private sector, to be made use of greatly. A further inspiration is that participation in a PPP is a channel of creating for the private partner goodwill. By way of PPP, the private partner can expose its top quality job and its dependability as a business partner. This eventually improves the private stakeholder's international image, and diminishes the public doubt about likely prospective contracts (Dewatripont and Legros, 2005).

Table 5.5 Motivations for entering into PPP projects (Private Sector)

	Mean	Std. Deviation	Ranking
Increase in accessible capital	01	0.763	1
Gaining of profits	4.04 4.	0.731	2
Creation of goodwill for private partner	3.90	0.743	3
Improvement in private sector's international image	3.89	0.696	4
Sharing of risks	3.77	0.667	5
Synergy with public sector	3.73	0.695	6
Obtaining of investment support		0.643	7
Improving operational environment	3.70 3.54	0.685	8

5.4.2.1 Hypothesis testing

ANOVA was conducted to test the perceptions among the categories of respondents (consulting firm, contracting firm and government agencies) on the motivations for the private sector entering into PPP construction projects.

Null Hypothesis (H_0): There is no difference among the categories of respondents on the motivations for private sector entering into PPP construction projects.

From Table 5.6, out of the 8 factors, two factors had significant different perception among the categories of respondents (consulting firm, contracting firm and government agencies) on the motivations for the private sector entering into PPP construction projects. These factors are *synergy with public sector* and *obtaining of investment support*. On the contrary, the remaining 6 factors had no significant difference perception among the categories of respondents (consulting firm, contracting firm and government agencies) on the motivations for the private sector entering into PPP construction projects.

Table 5.6 ANOVA test results for motivations for entering into PPP projects (Private Sector)

	df	F cal	F tab	P val.	Sig	Decision
Increase in accessible capital	209	0.413	3.94	0.662	NS	Accept
Gaining of profits	209	0.237	3.94	0.789	NS	Accept
Creation of goodwill for private partner	209	0.609	3.94	0.545	NS	Accept
Improvement in private sector's international image	209	0.811	3.94	0.446	NS	Accept
Sharing of risks	209	1.047	3.94	0.353	NS	Accept
Synergy with public sector	*209*	*8.743*	*3.94*	*0.000*	*S*	*Reject*
Obtaining of investment support	*209*	*10.353*	*3.94*	*0.000*	*S*	*Reject*
Improving operational environment	209	1.588	3.94	0.207	NS	Accept

95% confidence interval, α = 0.05

5.5 CAUSES OF MORAL HAZARD AND ADVERSE SELECTION OF PUBLICPRIVATE-PARTNERSHIP CONSTRUCTION PROJECTS

5.5.1 Descriptive Statistics for Causes

It was deemed necessary to know the causes of moral hazard and adverse selection of PPP construction projects and to know their level of importance. In this section, respondents ranked these causes on a Likert scale of 1 to 5 were 1=Not important; 2=Less important; 3=Moderately Important; 4= Important; 5=Very important. Mean values and standard deviation were used for the ranking. From Table 5.5 below, *effort dimensions which are not verifiable* was ranked 1st with a mean of 4.10; standard deviation of 0.780 and standard error mean of 0.054. *Low transfer of risk* was ranked 2nd with a mean of 4.09, standard deviation of 0.892 and standard error mean of 0.062. *Lack of accurate information about project conditions* was ranked 3rd with a mean of 4.06, standard deviation of 0.746 and standard error mean of 0.051. *Wrong party chosen to execute project* was ranked 4th with a mean of 3.93, standard deviation of 0.712 and standard error mean of 0.049. *Renegotiation of contracts* was ranked 5th with a mean of 3.78, standard deviation of 0.770 and standard error mean of 0.053.

All of the factors had a standard deviation less than one, indicating that there exists consistency in agreement between respondents' interpretations. This is probably because the respondents understood these factors very well. Moreover, almost all the factors had means greater than the hypothesized mean of 3.5 and their standard error means were also close to zero indicating that there was great consistency among agreement between the

respondents. Only *low incentives to control costs* had mean less than the hypothesized mean of 3.50.

Table 5.7 One sample statistics for causes

CAUSES	*Mean*	*Std. Deviation*	*Std. Error Mean*	*Rank*
Effort dimensions which are not verifiable	4.10	0.780	0.054	1
Low transfer of risk	4.09	0.892	0.062	2
Lack of accurate information about project conditions	4.06	0.746	0.051	3
Wrong party chosen to execute project	3.93	0.712	0.049	4
Renegotiation of contracts	3.78	0.770	0.053	5
Inexperience	3.76	0.687	0.047	6
Limited ability to commit to contractual obligations	3.69	0.767	0.053	7
Low incentives to control costs	3.35	0.846	0.058	8

5.5.2 One sample t-test for causes

The one sample t-test was used to establish the relative significance of the variables. This is used in ascertaining whether a sample mean is significantly deviant from a hypothesized mean (Ahadzie, 2007). For a single sample test, its hypothesis is:

Ho: U= Uo

Ha: U<, >Uo

With Ho representing the null hypothesis, Ha representing the alternative hypothesis and Uo representing the hypothesized mean. Ahadzie (2007) records that for a usual one sample t-test, the mean of the test group, degree of freedom for the test (an approximate of the sample size), the t-value (strength of test) and the p-value (probability of test being

significant) are reported usually. A statistical test of the mean was done to decide whether the population considered a particular variable to be important or not. The mean ranking of each criterion was compiled in order to articulate the decisions that the respondents expressed. Moreover, the mean for each variable with its corresponding standard deviation and standard error are presented. For each variable, the null hypothesis was that this variable was not significant (Ho: U=Uo). The Uo is the critical rating above which the variable is considered important. In this research, the higher ratings of 4 and 5 were chosen for the rating scale as important and very important respectively while the Uo was set at 3.5.). In this study, the hypothesized mean is set at 3.5. This is for the reason that if 5= very important, and 4= important, then for a variable to be consistently considered agreed, it should have a mean above the neutral point 3. Hence the hypothesized mean was set between 3 and 4 i.e. 3.5. All the means that are above 3.5 are considered as consistently agreed to by the respondents of the study. The significance level was set at 95% in accordance with the levels of risk. This is premised on the five point Likert scale rating where a success variable is deemed important if its mean was equal to or more than 3.5 (Field, 2005).

All the factors had t-values (the strength of the test) that were positive indicating that their means were above the hypothesized mean of 3.5 except *Low incentives to control costs* which had a t-value of -2.610. This is because it had a mean of 3.35 which is below the hypothesized mean of 3.5. All of the factors had a p-value (significance of the test) less than 0.05 and this implies that the means of these variables are not significantly different from the hypothesized mean of 3.5. Furthermore, the 95% confidence level interval estimates the difference between the population mean weight and the test value (i.e. 3.5).

Table 5.8 One-Sample Test for causes

	Test Value = 3.5					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Effort dimensions which are not verifiable	10.965	209	.000	.590	.48	.70
Low transfer of risk	9.511	209	.000	.586	.46	.71
Lack of accurate information about project conditions	10.921	209	.000	.562	.46	.66
Wrong party chosen to execute project	8.724	209	.000	.429	.33	.53
Inexperience	5.425			.257	.16	.35
Limited ability to commit to contractual obligations	3.600	209	.000	.190	.09	.29
Low incentives to control costs	-2.610	209	.010	-.152	-.27	-.04
		209	.000			
Renegotiation of contracts		209	.000	5.287	.281	.18 .39

5.5.3 Discussion of causes

According to literature relating to causes of moral hazard and adverse selection of PPP construction projects, with effort dimensions that are not verifiable, things become problematic. This is the root of the moral-hazard problems. Because providing effort is costly for the firm, but the degree of effort cannot be specified in contracts, a moralhazard problem arises, as is usual when the source of private information is

"endogenous." That is, the firm has an incentive to shirk from exertion of effort during the construction phase in order to maximize returns (Guasch, 2004).

In the situation there exist two kinds of private companies which can undertake infrastructural projects. The foremost group is effective and has the capability of lowering costs and managing risks; the remaining group is not and does not have the capability (Blanc-Brude, 2013). The government desires to assign the duty of constructing and managing public facilities but has the challenge of knowing which of the firms to hand over the works to. If the government gives out a contract assigning small or no risk to the company, as exists for majority of conventional public procurement, the effective companies have an inducement to imitate the ineffective firms at the bidding phase (adverse selection) and make no attempt to lower and manage costs (moral hazard) (BlancBrude, 2013).

In this circumstance, whichever company is engaged, the government has to bear any potential expenditures and evidence confirms that considerable cost overruns are certainly the standard in government works. Simply put, when a suitable incentive format is absent, confidential information about companies' type (whether efficient or otherwise) and actions (management of risk or otherwise) results in escalated procurement charges for taxpayers (BlancBrude, 2013).

Due to the extremely long-term scope of Public-Private-Partnership projects, oftentimes three decades and above, specific risk aspects reveal the delicate attributes of PPPs. There exists a deficiency of exact and accurate information concerning the current conditions, the future and the implied social costs of the job. This leads to moral hazard and adverse selection. Moral hazard and adverse selection challenges are even tougher to recognize in

this instance (Blanc-Brude, 2013). The competitive tendering process is already a channel of circumventing cost ambiguity. The risk of contracting has been discussed earlier because of the strategic approach of the bidders in the negotiation process. The saying "allocate risks to the stakeholder most able to deal with it" is not always easy to fulfill. There abound countless failed jobs because exposure to hazardous risks exists (BlancBrude, 2013).

5.6 EFFECTS OF MORAL HAZARD AND ADVERSE SELECTION ON PUBLICPRIVATE-PARTNERSHIP CONSTRUCTION PROJECTS

5.6.1 One sample statistics for effects

In this section, respondents ranked the effects of moral hazard and adverse selection on PPP construction projects and to know their level of severity on a Likert scale of 1 to 5 were 1=Not severe; 2=Less severe; 3=Moderately Severe; 4= Severe; 5=Very severe. Mean values and standard deviation were used for the ranking. From Table 5.5 below, *reduction of competition* was ranked 1st with a mean of 4.18 and standard deviation of 0.84. *High transaction costs* was ranked 2nd with a mean of 4.06 and standard deviation of 0.81. *Consequences on profitability of project* was ranked 3rd with a mean of 3.98 and standard deviation of 0.80. *Siphoning of funds* was ranked 4th with a mean of 3.88 and standard deviation of 0.78. *Negative implications on enforceability of contract* was ranked 5th with a mean of 3.87 and standard deviation of 0.77.

All of the factors had a standard deviation less than one, indicating that there exists consistency in agreement between respondents' interpretations. This is probably because the respondents understood these factors very well. Moreover, all the factors had means greater than the hypothesized mean of 3.5 and their standard error means were also close

to zero indicating that there was great consistency among agreement between the respondents.

Table 5.9 One sample statistics for effects

EFFECTS	*Mean*	*Std. Deviation*	*Std. Error Mean*	*Rank*
Reduction of competition	4.18	0.766	0.053	1
High transaction costs	4.06	0.743	0.051	2
Consequences on profitability of project	3.98	0.708	0.049	3
Siphoning of funds	3.88	0.760	0.052	4
Negative implications on enforceability of contract	3.87	0.739	0.051	5
Corruption	3.86	0.695	0.048	6
Cost overruns on budget	3.81	0.820	0.057	7
Dishonesty	3.81	0.693	0.048	8
Opportunistic behavior	3.69	0.695	0.048	9

5.6.2 One-Sample Test for effects

The one sample t-test was used to establish the relative significance of the variables. This is used in ascertaining whether a sample mean is significantly deviant from a hypothesized mean (Ahadzie, 2007). For a single sample test, its hypothesis is:

Ho: U= Uo

Ha: U<, >Uo

With Ho representing the null hypothesis, Ha representing the alternative hypothesis and Uo representing the hypothesized mean. Ahadzie (2007) records that for a usual one sample t-test, the mean of the test group, degree of freedom for the test (an approximate of the

sample size), the t-value (strength of test) and the p-value (probability of test being significant) are reported usually. A statistical test of the mean was done to decide whether the population considered a particular variable to be important or not. The mean ranking of each criterion was compiled in order to articulate the decisions that the respondents expressed. Moreover, the mean for each variable with its corresponding standard deviation and standard error are presented. For each variable, the null hypothesis was that this variable was not significant (Ho: U=Uo). The Uo is the critical rating above which the variable is considered important. In this research, the higher ratings of 4 and 5 were chosen for the rating scale as important and very important respectively while the Uo was set at 3.5.). In this study, the hypothesized mean is set at 3.5. This is for the reason that if 5= very important, and 4= important, then for a variable to be consistently considered agreed, it should have a mean above the neutral point 3. Hence the hypothesized mean was set between 3 and 4 i.e. 3.5. All the means that are above 3.5 are considered as consistently agreed to by the respondents of the study. The significance level was set at 95% in accordance with the levels of risk. This is premised on the five point Likert scale rating where a success variable is deemed important if its mean was equal to or more than 3.5 (Field, 2005).

All the factors had t-values (the strength of the test) that were positive indicating that their means were above the hypothesized mean of 3.5. All of the factors had a p-value (significance of the test) less than 0.05 and this implies that the means of these variables are not significantly different from the hypothesized mean of 3.5. Furthermore, the 95% confidence level interval estimates the difference between the population mean weight and the test value (i.e. 3.5).

Table 5.10 One-Sample Test for effects

	Test Value = 3.5					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Reduction of competition	12.800	209	.000	.676	.57	.78
High transaction costs	10.869	209	.000	.557	.46	.66
Consequences on profitability of project	9.741	209	.000	.476	.38	.57
Siphoning of funds	7.171	209	.000	.376	.27	.48
Negative implications on enforceability of contract	7.186	209	.000	.367	.27	.47
Corruption	7.544	209	.000	.362	.27	.46
Cost overruns on budget	5.473	209	.000	.310	.20	.42
Dishonesty	6.472	209	.000	.310	.22	.40
Opportunistic behavior	3.973	209	.000	.190	.10	.28

5.6.3 Discussion of effects

According to literature, each bidder in PPP project must present an innovative offer, with the underlying risk of losing the tender without being repaid for its innovation. Both of these characteristics tend to limit the number of bidders and in the long term reduce the competition, as most firms would get out of the PPP market after a costly series of lost bids. The ability of a Public Private Partnership to maintain the competitive pressure ex post must also be questioned (Chong *et al.,* 2007). If they were no asymmetries of information, a simple cost plus contract would be optimal. A fixed price contract would owe a rent to the private partner. In both cases, it remains difficult or very costly to identify the type of bidder and to measure its performance (Laffont and Tirole, 1986). Furthermore,

the contractor benefits from the contractual irreversibility and the informational rent built up during the contract duration.

Moral hazard and adverse selection in PPPs could raise transaction costs because the government has to negotiate with and monitor the private sector partners who have their own interests and agendas. Being a long term and global contract, the partnership contract enhances the traditional issues of moral hazard and adverse selection related to the choice of a bidder. It implies high transaction costs for both the public and private partners, due to duration of the negotiation and the skills and resources involved (Allen, 2003). The requirements of the contract are generally complex and expressed in terms of outputs rather than inputs.

Information asymmetry has an effect on profitability. Knowing the challenge in producing accurate demand estimates, the firm's profits are largely uncertain before the operation phase begins (Chong *et al.*, 2007). A natural consequence is that it becomes difficult to attract private investment, especially when projects are big and private sponsors are averse to risk. Even if private investors do turn up, they are inclined to conduct themselves opportunistically.

Working against the principal, however, is the agent's ability to siphon funds: Rather than expend effort on work that will lead towards success, the agent can divert funds to private consumption and use the rest to give the illusion of productivity. This monitoring structure creates three separate challenges. First, firms may attempt to win the contract even though they have no intention of exerting any effort, and are merely planning to siphon all the funds. Second, a firm that has worked and succeeded might then begin siphoning funds, waiting to exercise the option of revealing success at a later, more lucrative date. Finally,

late in its contract, a firm might cease exerting effort and begin siphoning funds, since the likelihood of success fails to justify further effort. For example, a construction firm might succeed at the crux of a large scale project, then delay completion of less demanding tasks over time to stretch out the payments from the principal.

5.7 STRUCTURAL EQUATION MODELING (SEM)

Structural Equation Modeling (SEM) indicates measurement model and path analysis as the two main ways of testing models which have been hypothesized (Bentler, 2005; Kline, 2010; Wong, 2011; Hair *et al.,* 2013). The choice among these two types is influenced by the fundamental construct of the research. Furthermore, it is inspired by three requisite conditions namely: isolation, degree of association and directionality which establish causality (Bentler, 2005; Kline, 2010; Wong, 2011; Hair *et al.,* 2013). The measurement or factor models however are more apt for the testing of theory in complex theoretical latent constructs (Kwofie, 2015). Conversely, the path model encompasses only variables which can be observed and every variable possesses one indicator and further operates with the assumption that the variables measured do not have errors (Bentler, 2005; Kline, 2010; Wong, 2011; Hair *et al.,* 2013). It is however impossible for constructs being measured by way of analytical tools to be without any error. This makes the path model not suitable and effective for interactive measures like education, psychology among others (Hair *et al.,* 2010). Path models are best used for demonstrating linear causal relationships (directionality). They are however unable to illustrate the extent of association and isolation (Lei and Wu, 2008).

On the other hand, measured models take the latent or unobserved variables to show the measurement error so as to make them better fitting and effectual in measuring constructs (Bentler, 2005; Kline, 2010; Wong, 2011; Hair *et al.*, 2013). In light of this study, it can be revealed that variables in the instrument contain latent factors. These cannot be measured straight away but instead are conditioned by responses to a number of observed variables and indicators.

The causal relationships between the causes and effects of moral hazards and adverse selection of Public Private Partnership construction projects is a complex construct. This feature makes the measured model better appropriate for this research since it can predict, estimate and depict the complex causal relationships i.e. the directionality. It can further show degree of association and isolation of the unobserved variables on the indicator factors (Lei and Wu, 2008). These advantages caused the utilization of measured (factor) model to investigate the causal relationships between the causes and effects of moral hazards and adverse selection of Public Private Partnership construction projects.

5.7.1 Analytical Strategy of Structural Equation Modelling

According to Kline (2010) and Hair *et al.* (2013), SEM must go through a distinct procedure. The analytical strategies must also meet the hypothesized construct model. Every analysis of SEM undergoes some steps. These steps include model identification, model specification, data collection, model estimation, model evaluation and sometimes model modification (Bentler, 2005; Kline, 2010; Wong, 2011; Hair *et al.*, 2013). In analysis of SEM whereby the theoretical framework supports the hypothesized model, both the analysis and model evaluation should depend on Confirmatory Factor Analysis (CFA)

to allow for uni dimensionality of the model. This must be followed by scale reliability tests and construct validity before assessment of main model.

This research used the CFA style to evaluate the model. According to past studies, the best style to model assessment using CFA is to undertake assessment of the factor structure, goodness of fit indices, significance of parameter estimates, explained variance, factor loading and finally residual analysis (Bentler, 2005; Kline, 2010; Wong, 2011; Hair *et al.*, 2013).

According to Lei and Wu (2008) and Kline (2010), in using the CFA approach, the detailed assessment of the fit of the model is important so that the model does not have any redundant component.

5.7.2 Statistics on SEM assumptions

The data distribution characteristics normally determine the estimation approach to be used in SEM. Many software packages of SEM presume multivariate normality. These software packages also assume that in order to obtain good results in the best suitable good fit model, there is the necessity of examining the distribution characteristics of the data before choosing a fitting estimation method for the model analysis (Kwofie, 2014). This is in consonance with past studies including Frank and Hennig-Thurau (2008) and Kline (2010). Univariate normality of a sample describes the distribution of only a single variable in the sample (Gao *et al.*, 2008). Even though it is relevant, it is not a satisfactory condition for having multivariate normal distribution (Lei and Lomax, 2005). Multivariate normal distribution explains the shared distribution of all variables within a sample (Gao *et al.*, 2008). If a data is not normal, the approach of estimation used should be more efficient in minimizing the effects of non-normality and must be able to help improve the model.

In SEM analysis, a factor that affects the quality of model fit results and reliability of the model is the sample size (Bollen *et al.,* 2007; Iacobucci, 2010). The structural equation modelling is an analytical method that is sample size sensitive. The results are more reliable if the sample size is larger and is distributed normally (Bentler, 2005). Sample size lesser than one hundred (100) is taken to be small. This small sample size is more likely to generate estimates which are not stable. A sample size of 100 to 200 is taken as moderate sample. It may be accepted in model analysis but should have a suitable estimation method and the model should be selected (Kwofie, 2015; Kline, 2010).

Ideally, a sample size of more than 200 is taken to be large and suitable for analysis of SEM. However, sometimes in large samples, unreliable standard errors can generate results which can affect the standard errors, parameter estimates and produce small model fit (Kwofie, 2015; Kline, 2010).

Factors that affect the results and conclusions include communality of variables, degree of non-normality in data, missing data and estimation used (Muthen and Muthen, 2002; Bollen *et al.,* 2007; Iacobucci, 2010). It is best not to ignore the multivariate normality assumption in the data characteristics in the choice of the most effective estimation approach (Hair *et al.,* 2013). The Robust Maximum Likelihood (RML) is best suited to give robust standard results which are robust against the effect of non-normality on parameter estimates. It also yields precise results even when sample is less than 200.

The Partial Least Squares (PLS) approach is used if normality assumption is not achieved in data to be assessed. This method is mostly biased with estimates and is not effective in factor construct of measurement models. This study therefore used the robust maximum

likelihood estimation method for estimating and evaluating the hypothesized model to satisfy normality. For this study, results are accounted from the robust statistics for the chi-square.

5.7.3 Identifiability of model

Identifiability of structural model is a necessary step and should be done without fail (Hair *et al.,* 2013). It should be examined statistically if a model is identified theoretically or otherwise before there can be accurate analysis. According to Kaplan (2009), a model is identifiable if there is the possibility of deriving a unique estimate for the parameters.

According to Kline (2010), a model is identified if there exists at least as many observations as free model parameters i.e. degree of freedom. Every latent variable should be given a scale. A model can be under-identified, over-identified or justidentified (Bryne, 2006). If a model will be accepted or rejected, it depends on the examination of its identification. A model having more variances in data and covariances of the observed variables exceeding number of parameters to be estimated that causes positive degree of freedom is an over estimated model.

A just identified model is one that has an equal number of parameters which will be estimated as the number of co-variances of variables observed. Under identified models are not possible to generate solutions.

Under the SEM technique, models which will be estimated are normally represented in graphical diagrams. These diagrams indicate the assumed relationship between the variables by linking arrows among the independent and dependent variables. It is

recommended that a very stable identified model must indicate positive degree of freedom for parameters in over identified model (Lei and Wu, 2008).

In this study, preliminary analysis by way of Confirmatory Factor Analysis (CFA) produced values of 2 and 14 as minimum and maximum degrees of freedom respectively. This proves a very suitable positive value of degree of freedom. It can be concluded that this model can be estimated.

5.7.4 Confirmatory Factor Analysis (CFA) of unobserved constructs

Confirmatory Factor Analysis (CFA) is a statistical method that verifies factor structure of a set of observed variables. It is normally used in the measurement of SEM models. The CFA is conducted by the investigator applying knowledge of theory, experimental research or using both to assume relationship trend and tests statistically the hypothesis. It examines the observed or measured variables. The assessment of independent and dependent variables as being enough indicators is crucial in evaluating measurement invariance (MI). CFA should firstly be done on every latent variable by evaluating the coefficients and to confirm the factor structure of every variable. This is to prevent any likely measurement invariance (MI) which may affect the good-fit of the model. CFA is used to evaluate the fit of items to latent constructs. If the fit of each model is good and the item loading adequate, it is assumed that the indicators of the factors are fitting.

5.7.5 Fit Statistics

This research conducted Diagnostic Fit analysis using Robust Maximum Likelihood to test statistical significance of parameter estimates. Results are presented and discussed below:

5.7.5.1 ANALYSIS OF *LOW INCENTIVES TO CONTROL COSTS* FACTOR

This was analyzed using the 210 responses obtained from the data collection. Preliminary evaluation of responses indicated no missing data. Hence all the 210 responses were used. Confirmatory Factor Analysis (CFA) was done on the nine (9) variables in the construct. There is the need to analytically evaluate all variables to settle on the ones in the model which succinctly measure and explain a construct (Bentler, 2005; Wong, 2010). Normally, correlations, standard errors and standardized residual covariance are important guidelines in choosing most acceptable variables which must be in the construct for further analysis (Field, 2009).

The table below shows the summary of variables which sufficiently define the construct. The variables C1A, C1E, C1F and C1G were cut off. The remaining five variables were subjected to detailed CFA tests. The effects of moral hazard were coded as: B. High transaction costs; C. Reduction of competition; D. Consequences on profitability of project; H. Opportunistic behavior and I. Siphoning of funds. A good and detailed structural equation model should have both fixed and free parameters to be estimated from the data (Bentler, 2005). Their significance, validity, model fit and parameter estimates were found.

Table 5.11 Constructs and final items: Low Incentives to Control Costs

Variables	Standardized Coefficient	Std. Err	C.R/ Z-Value	R-Square	Sig-Value
C1B: High transaction costs	0.463	0.079	5.880	0.214	0.000
C1C: Reduction of competition	0.660	0.077	8.570	0.436	0.000
C1D: Consequences on profitability of project	0.504	0.076	6.650	0.254	0.000
C1H: Opportunistic behavior	0.458	0.080	5.760	0.210	0.000
					0.000

Fit Index	Cut-Off Value			Estimate	Remark
S-Bχ^2				9.481	
Df				5	
Sig. Value	x > 0.05			0.091	
CFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)				
GFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)			0.983	Good Fit
RMSEA	x ≤ 0.08 (Acceptable), x < 0.05 (Good Fit)			0.065	Acceptable
C1I: Siphoning of funds		0.330	0.082	4.010	0.109

Robust Fit Index: Low Incentives to Control Costs

					Good Fit
				0.951	Good Fit

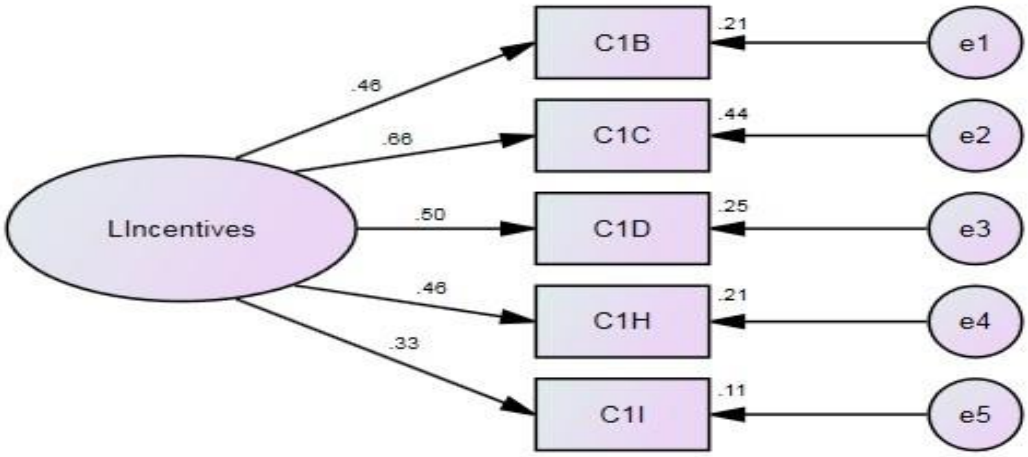

Figure 5.2 Path diagram for *Low Incentives to Control Costs*

The model fit assessment must utilize multiple standards of both absolute and incremental fit indices to support the chi square test. In this research, a mixture of

Residual mean square error of Approximation (RMSEA), Goodness of fit (GFI), and Comparative fit index (CFI) were used. CFI belongs to absolute fit indices while GFI and RMSEA belong to incremental fit indices. The advantage of the CFI is that it can reflect fit at any sample size and it also measures comparative reduction in non-centrality (Bentler, 2005). It operates on the presumption that multiple indices give better robust way to ascertain and determine negative bias linked to single index (Kline, 2010). Although chi square is taken to be a good measure of fit, it is innately affected by the sample size and hence gives erroneous probability figures (Byrne, 2006).

The Satorra-Bentler scaled chi square (S – Bχ_2) was used for this study since it is seen to give a much better fit result (Iacobucci, 2010). From the table above, the CFI and GFI values were 0.951 and 0.983 correspondingly. As opined by Bentler (2005), CFI values above 0.90 are taken to be good fit. GFI test values of 0.90 and above are taken to be acceptable good fit (Lei and Wu, 2008). The RMSEA value was 0.065. According to Bentler (2005) and Lei and Wu (2008), RMSEA figures below 0.05 are good fit while values below 0.08 are acceptable fit. From the table above, sample data on *low incentives to control cost* measurement model produced $S - B\chi_2$ to be 9.481 with degree of freedom (df) to be 5. The sig. value (p-value) was 0.091. The overall goodness of fit is revealed by the magnitude of discrepancy amongst the sample covariance matrix and the covariance matrix (population) inferred by the model such that the good model fit must possess df value greater than 0 and sig. values (p values) more than 0.05. A p-value more than 0.05 related to $S - B\chi_2$ shows that, the difference between the sample data and *low incentives to control cost* measurement model is insignificant and hence the model fits the data (Kline, 2010).

According to Hair *et al.* (2014) and Kaplan (2009), Z-values (critical ratios) and coefficient of determination (R^2) figures are important in explaining the significance and effects of parameters within a model. From the table, correlation values and standard errors showed that all the coefficient values were less than 1.00. Z statistics had positive value greater than 1.96 and therefore deemed to be very suitable. The Z test statistics showed the significance or otherwise of the path coefficients of the model. As indicated by Kline (2010), utilizing a two-tailed Z-test with a significance level of 0.05, path coefficient is significant if Z statistics exceeds 1.96. All Z-values exceeded 1.96 and therefore implies the indicator variables loadings are very significant.

R^2 which is the coefficient of determination measures the predictive accuracy of the model. The effect of measurement of R^2 spans between 0 and 1. The value 1 signifies perfect accuracy of prediction (Hair *et al.*, 2014). A value of 0.75 or greater is seen as substantial, 0.50 is moderate while 0.25 or lesser signifies weak accuracy of prediction (Henseler *et al.*, 2010).

It can be observed from the results of CFA analysis that, the robust fit indices met the prescribed cut-off criteria and hence the model sufficiently fits the data. Furthermore, all parameter estimates were seen to be significant statistically and viable.

5.27.5.2 ANALYSIS OF *WRONG PARTY CHOSEN TO EXECUTE PROJECT* FACTOR

The construct originally had nine indicator variables. A preliminary CFA analysis was conducted to identify the variables to be added in the CFA analysis to evaluate the fitting of the model. The variables C2F and C2G were cut off. The remaining seven variables were subjected to detailed CFA tests. The effects of moral hazard were coded as: A. Cost

overruns on budget; B. High transaction costs; C. Reduction of competition; D. Consequences on profitability of project; E. Negative implications on enforceability of contract; G. Dishonesty; H. Opportunistic behavior and I. Siphoning of funds. This analysis detected the importance of the indicator variables to the factor, significance of variables, factor structure, parameter estimation and model fit.

Table 5.12 Constructs and final items: Wrong Party Chosen to Execute Project Variables

	Standardized Coefficient	Std. Err	C.R/ Z-Value	R-Square	Sig-Value
C2A: Cost overruns on budget	0.403	0.094	4.280	0.163	0.000
C2B: High transaction costs	0.527	0.099	5.340	0.278	0.000
C2C: Reduction of competition	0.434	0.094	4.620	0.189	0.000
C2D: Consequences on profitability of project	0.311	0.102	3.050	0.097	0.002
C2E: Negative implications on enforceability of contract	0.203	0.097	2.080	0.041	0.037
C2I: Siphoning of funds	0.268	0.096	2.800	0.072	0.005
C2H:Opportunistic behavior	0.360	0.090	4.010	0.130	0.000

Robust Fit Index: Wrong Party Chosen to Execute Project	Fit Index Cut-Off Value		
S-Bχ^2		28.269	
Df		14	
Sig. Value	x > 0.05	0.013	
CFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)		
GFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)	0.963	Good Fit
RMSEA	x ≤ 0.08 (Acceptable), x < 0.05 (Good Fit)	0.07	Acceptable
		0.787	

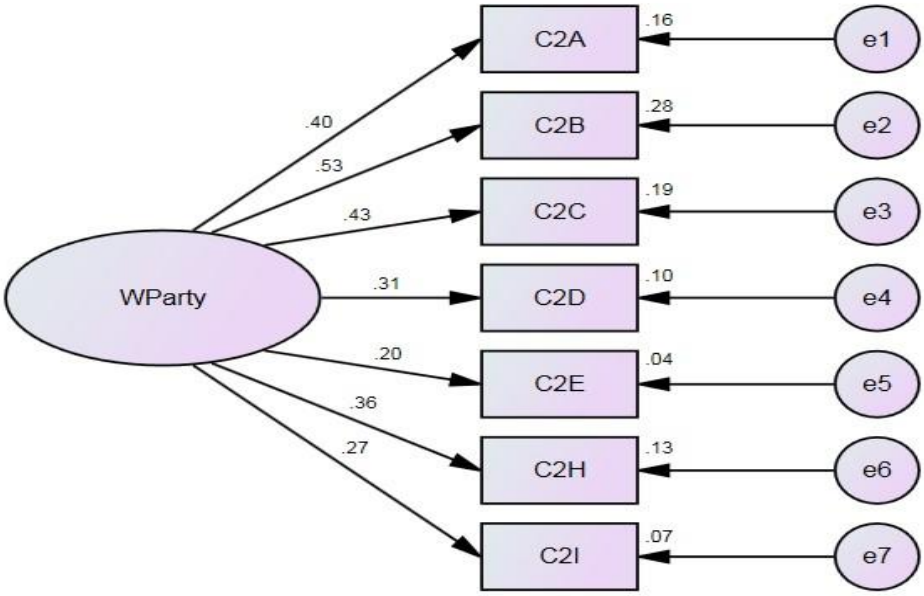

Figure 5.3 Path diagram for *wrong party chosen to execute project*

From the tables and figure above, S – Bχ_2 value was 28.269 and 14 degrees of freedom (df) with a p- value of 0.013. The CFI value was 0.787 and GFI value was 0.963. This is found to be close to the standard cut-off value of x≥0.90 (acceptable) and x≥0.95 (good fit). It can therefore be observed to be good fit. Furthermore, the RMSEA value was 0.07 which is acceptable since cut-off values are x≤0.080 (acceptable) and x≤0.05 (good fit) (Kline, 2010).

In addition, the Z-statistic figures were above 1.96 and the resultant significant test figures below 0.05 ($p<0.05$). This proves results are statistically significant and acceptable. In conclusion, it can be construed from results of the CFA analysis that, robust fit indices met the prescribed cut-off points and in essence, the model fits the data.

The parameter estimates were also significant statistically.

5.7.5.3 ANALYSIS OF *LOW TRANSFER OF RISK* FACTOR

This construct was explained by nine indicator variables (effects). After preliminary CFA analysis was run, three (3) variables were cut off. These variables were C3F, C3H and C3I. The remaining six (6) variables were subjected to detailed CFA tests. The effects of moral hazard were coded as: A. Cost overruns on budget; B. High transaction costs; C. Reduction of competition; D. Consequences on profitability of project; E. Negative implications on enforceability of contract; and G. Dishonesty. *Low transfer of risk* factor was analyzed with all the 210 responses obtained from the survey. In order to know how best the model fits the factor and variables, tests were conducted for the statistical significance at probability level of five percent, fit statistics and standardized residual covariance distribution matrix.

Table 5.13 Constructs and final items: Low Transfer of Risk

Variables	Standardized Coefficient	Std. Err	C.R/ Z-Value	R-Square	Sig-Value
C3A: Cost overruns on budget	0.387	0.074	5.230	0.150	0.000
C3B: High transaction costs	0.518	0.071	7.310	0.268	0.000
C3C: Reduction of competition	0.614	0.064	9.580	0.378	0.000
C3D: Consequences on profitability of project	0.500	0.070	7.130	0.250	0.000
C3E: Negative implications on enforceability of contract	0.646	0.065	9.940	0.417	0.000
C3G: Dishonesty	0.382	0.074	5.170	0.146	0.000

Robust Fit Index: Low Transfer of Risk			
Fit Index	**Cut-Off Value**	**Estimate**	**Remark**
S-Bχ^2		16.395	
Df		9	
Sig	x > 0.05	0.059	
CFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)	0.951	Good Fit
GFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)	0.974	Good Fit
			Acceptable
RMSEA	x ≤ 0.08 (Acceptable), x < 0.05 (Good Fit)	0.063	Acceptable

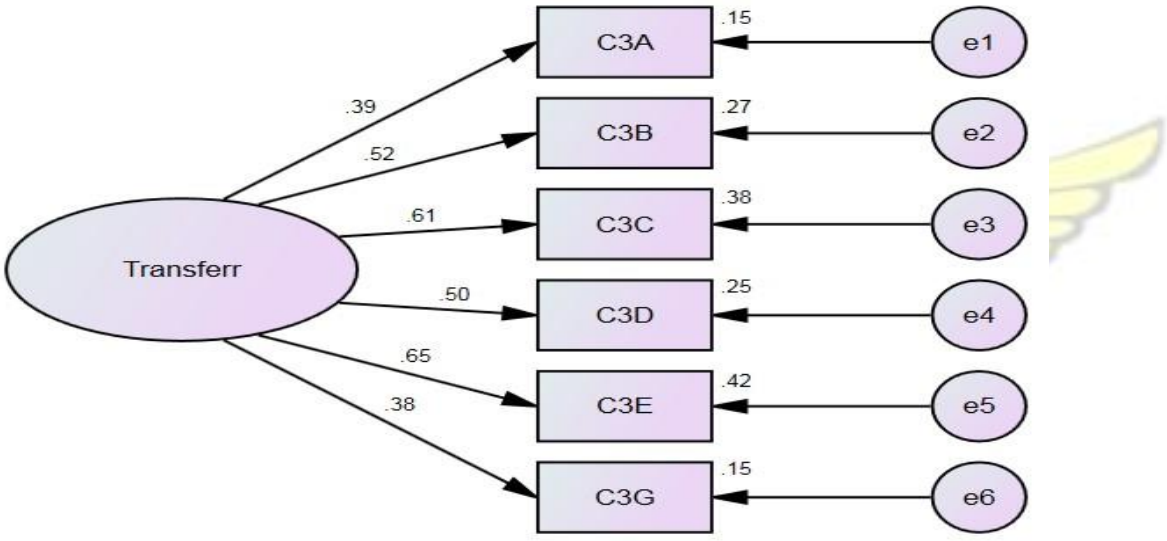

Figure 5.4 Path diagram for *low transfer of risk*

Low transfer of risk factor model had an $S-B\chi_2$ figure of 16.395 with 9 degrees of freedom. The corresponding p-value was 0.059. As established by Kline (2010), a chisquare figure above 0.05 (p>0.05) implies that, the difference between the hypothesized *low transfer of risk* factor model and the sample data is not significant and indicates the data fits the model well. It further reveals there is no inconsistency among the sample and population (Kline, 2010). The robust CFI and GFI indices were 0.951 and 0.974 correspondingly. The

RMSEA value was 0.063 which is deemed acceptable. It can therefore be proposed that this model sufficiently fits the data and therefore taken to be good fit.

Aside from conducting the fit test analysis, an assessment of parameter estimates, test statistics and standard errors are important to determine if the model functioned properly and was practicable (Kline, 2010). From the table, all the standard errors were below 1.00 and therefore acceptable and reasonable. The Z values were all above the standard value of 1.96 based on the probability level of 0.05. All the p-values were below 0.05. This proves that the variables were truly significant statistically to the factor. The parameter estimates indicated satisfactory linkages with the factor construct. The R^2 values had moderate and weak levels of predictive accuracy. In summary, the robust fit indices satisfied the cut-off benchmarks and the parameter estimates gave statistically significant figures. Therefore, *low transfer of risk* factor model has acceptable fit to the sample data.

5.7.5.4 ANALYSIS OF *LACK OF ACCURATE INFORMATION ABOUT PROJECT CONDITION* FACTOR

After preliminary CFA tests were conducted on the nine variables indicated that four of the variables had to be cut off. These variables were C4A, C4B, C4D and C4F. Since they were dropped, they did not form part of the detailed CFA analysis. The effects of moral hazard were coded as: C. Reduction of competition; E. Negative implications on enforceability of contract; G. Dishonesty; H. Opportunistic behavior and I. Siphoning of funds. The sample data on this model gave an $S - B\chi_2$ value of 8.94 having 5 degrees of freedom. The p-value for the sample size of 210 is 0.111. Because the chi square value is greater than 0.05, it indicates that the difference between the sample data and the

hypothesized *lack of accurate information about project condition* factor is not significant. It means that there exists no significant discrepancy between the population and the sample data. In essence, the fit function is good and well specified leading to the model being retained.

Table 5.14 Constructs and final items: Lack of Accurate Information about Project Condition Variables

	Standardized Coefficient	Std. Err	C.R/ Z-Value	R. Square	Sig Value
C4C: Reduction of competition	0.198	0.120	1.660	0.039	0.097
C4E: Negative implications on enforceability of contract	0.403	0.122	3.300	0.162	0.001
C4G: Dishonesty	0.794	0.230	3.450	0.630	0.001
C4H: Opportunistic behavior	0.229	0.088	2.590	0.052	0.010
C4I: Siphoning of funds	-0.011	0.085	-0.120	0.000	0.901

Robust Fit Index: Lack of Accurate Information about Project Condition Fit

S-Bχ^2		8.94	
Df		5	
Sig	x > 0.05	0.111	
CFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)		
GFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)	0.984	Good Fit
RMSEA	x ≤ 0.08 (Acceptable), x < 0.05 (Good Fit)	0.061	Acceptable

Index	**Cut-Off Value**	**Estimate**	**Remark**
		0.885	Good Fit

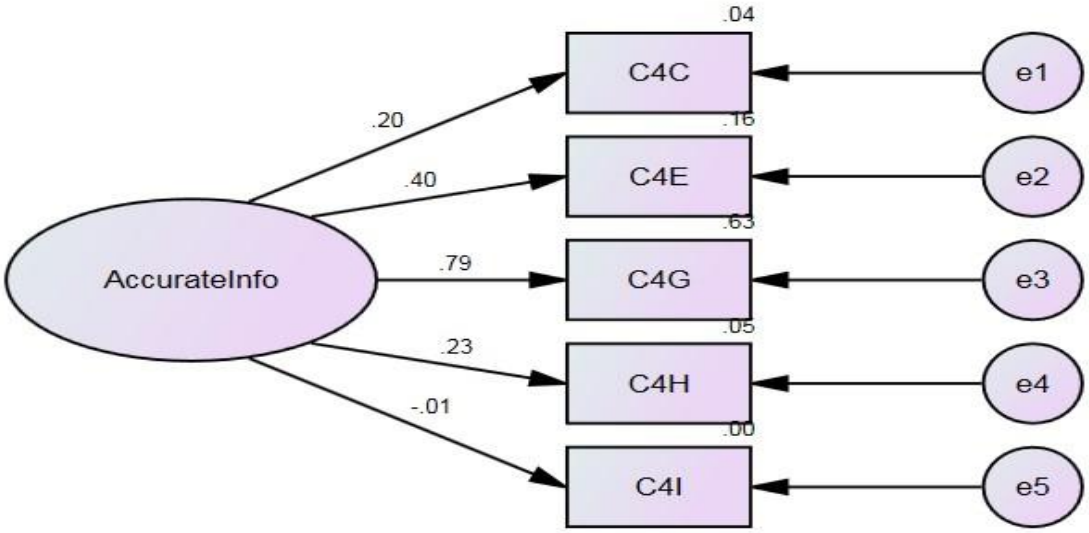

Figure 5.5 Path diagram for *lack of accurate information about project condition*

From the table, the robust CFI and GFI indices were 0.885 and 0.984 respectively. The GFI is very near to the upper limit of 1.00 and therefore good fit. According to Iacobucci (2010), a model is good fit if its CFI or GFI is more than the cut-off figure of 0.95. The RMSEA value is 0.061 which is acceptable. From the table, all the standard errors were below 1.00 and therefore acceptable and reasonable. The Z values were all above the standard value of 1.96 based on the probability level of 0.05. Four of the p-values were below 0.05. This proves that many of the variables were truly significant statistically to the factor. The parameter estimates indicated satisfactory linkages with the factor construct. The R^2 values had moderate and weak levels of predictive accuracy. This indicates a good fitting model for *lack of accurate information about project condition*

factor.

5.7.5.5 ANALYSIS OF *EFFORT DIMENSIONS WHICH ARE NOT VERIFIABLE* FACTOR

The *effort dimensions which are not verifiable* factor was defined by nine (9) variables. After preliminary CFA tests were conducted, three variables were cut off. These variables are C5B, C4F and C4H. They were therefore not included in the further analysis of CFA. The remaining six variables were subjected to detailed CFA tests and analysis. The effects of moral hazard were coded as: A. Cost overruns on budget; C. Reduction of competition; D. Consequences on profitability of project; E. Negative implications on enforceability of contract; G. Dishonesty; and I. Siphoning of funds. This analysis detected the importance of the indicator variables to the factor, significance of variables, factor structure, parameter estimation and model fit.

Table 5.15 Constructs and final items: Effort Dimensions which are not verifiable

Standardized C.R/ SigVariables	**Std. Err**	**R-Square**		
	Coefficient		**Z-Value**	**Value**
C5A: Cost overruns on budget	0.181	0.090	2.020	0.033	0.044
C5C: Reduction of competition	0.391	0.098	4.000	0.153	0.000
C5D: Consequences on profitability of project	0.817	0.159	5.150	0.668	0.000
C5E: Negative implications on enforceability of contract	0.292	0.090	3.230	0.085	0.001
C5G: Dishonesty	-0.200	0.081	-2.480	0.040	0.013
C5I: Siphoning of funds	0.130	0.084	1.540	0.017	0.124

Robust Fit Index: Effort Dimensions which are not Verifiable	**Fit Index Cut-Off Value**	**Estimate**	**Remark**

S-Bχ^2		19.407	
df		9	
Sig	x > 0.05	0.022	
CFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)		
GFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)	0.97	Good Fit
RMSEA	x ≤ 0.08 (Acceptable), x < 0.05 (Good Fit)	0.074	Acceptable
		0.803	

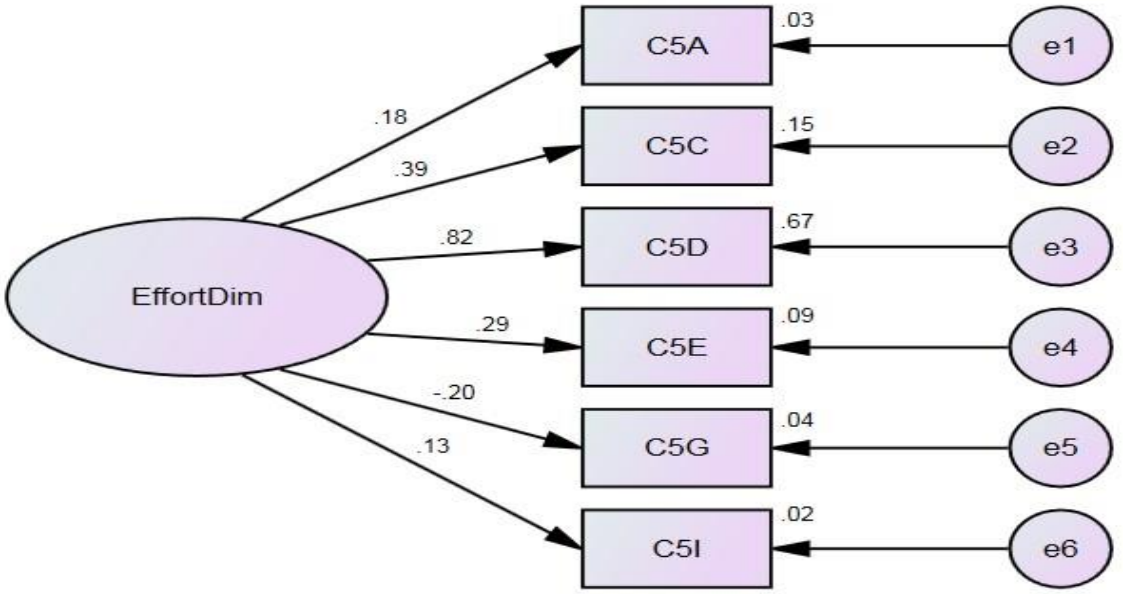

Figure 5.6 Path diagram for *effort dimensions which are not verifiable*

In assessing the goodness of fit, the sample data for *effort dimensions which are not verifiable* factor generated an S– Bχ_2 value of 19.407 with 9 degrees of freedom and complementary probability of 0.022.Additionally, the robust CFI and GFI were 0.803 and 0.97 respectively. The robust RMSEA figure of 0.074 is acceptable conventionally and therefore an unconditional indication of good fit of model to sample. In an ideal situation,

a model that fits should have parameter estimates of significance especially the Z test to help in knowing if the structure factor is feasible. From the table, the values were above the standard of 1.96. The associated p-values were all below 0.05 except for one variable. The R^2 values had moderate and weak levels of predictive accuracy. In summary, the robust fit indices were good fit and parameter estimates were feasible and significant statistically.

5.7.5.6 ANALYSIS OF *REGENERATION OF CONTRACTS* FACTOR

The *regeneration of contracts* factor was defined by nine (9) variables. After preliminary CFA tests were conducted, five variables were cut off. These variables are C6B, C6C, C6D, C6E and C6F. They were therefore not included in the further analysis of CFA. The remaining four variables were subjected to detailed CFA tests and analysis. The effects of moral hazard were coded as: A. Cost overruns on budget; G. Dishonesty; H. Opportunistic behavior and I. Siphoning of funds. In order to know how best the model fits the factor and variables, tests were conducted for the statistical significance at probability level of five percent, fit statistics and standardized residual covariance distribution matrix.

Table 5.16 Constructs and final items: Regeneration of Contracts

Variables	Standardized Coefficient	Std. Err	C.R/ Z-Value	R-Square	Sig-Value
C6A: Cost overruns on budget	0.428	0.077	5.550	0.183	0.000
C6G: Dishonesty	0.384	0.077	5.000	0.148	0.000
C6H: Opportunistic behavior	0.850	0.091	9.300	0.722	0.000
C6I: Siphoning of funds	0.460	0.072	6.430	0.211	0.000

Robust Fit Index: Regeneration of Contracts

Fit Index	Cut-Off Value	Estimate	Remark
S-Bχ^2		1.917	
df		2	Good Fit
Sig	x > 0.05	0.384	
CFI	x ≥ 0.90 (Acceptable), x ≥ 0.95 (Good Fit)	1.000	Good Fit
GFI	x ≥ 0.90 (Acceptable), x ≥ 0.95 (Good Fit)	0.995	Good Fit
RMSEA	x ≤ 0.08 (Acceptable), x ≤ 0.05 (Good Fit)	0.000	Good Fit

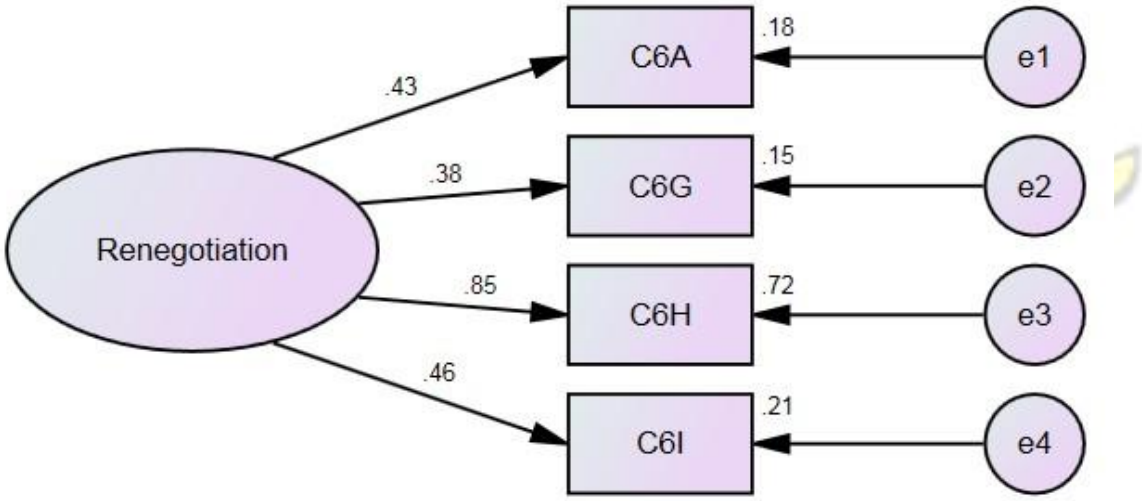

Figure 5.7 Path diagram for *regeneration of contracts*

In assessing the goodness of fit, the sample data for *regeneration of contracts* factor generated an S– Bχ_2 value of 1.917 with 2 degrees of freedom and probability of 0.384.

Furthermore, the robust CFI and GFI were 1.000 and 0.995 correspondingly. The robust RMSEA figure of 0.074 is acceptable standardly and therefore an unconditional indication of good fit of model to sample. In an ideal situation, a model that fits should have parameter estimates of significance especially the Z test to help in knowing if the structure factor is

feasible. From the table, the values were above the conventional value of 1.96. The associated p-values were all 0.00 which is below 0.05. The R^2 values had strong and weak levels of predictive accuracy. The robust fit indices are therefore good fit and parameter estimates are feasible and statistically significant.

5.7.5.7 ANALYSIS OF *LIMITED ABILITY TO COMMIT TO CONTRACTUAL OBLIGATIONS* FACTOR

The *limited ability to commit to contractual obligations* factor was defined by nine (9) variables. After preliminary CFA tests were conducted, five variables were cut off. These variables are C7A, C7C, C7D, C7H and C7I. They were therefore not included in the further analysis of CFA. The remaining four variables were subjected to detailed CFA tests and analysis. The effects of moral hazard were coded as: B. High transaction costs; E. Negative implications on enforceability of contract; F. Corruption and G. Dishonesty. A good and detailed structural equation model should have both fixed and free parameters to be estimated from the data (Bentler, 2005). Their significance, validity, model fit and parameter estimates were found.

Table 5.17 Constructs and final items: Limited Ability to Commit to Contractual Obligations

Variables	Standardized Coefficient	Std. Err	C.R/ Z-Value	R-Square	Sig-Value
C7B: High transaction costs	0.195	0.105	1.850	0.038	0.064
C7E: Negative implications on enforceability of contract	0.295	0.095	3.090	0.087	0.002
C7F: Corruption	0.973	0.277	3.510	0.946	0.000
C7G: Dishonesty	0.297	0.102	2.890	0.088	0.004

Robust Fit Index: Limited Ability to Commit to Contractual Obligations Fit Index

S-Bχ^2		4.780	
df		2.000	
Sig	x > 0.05	0.092	
CFI	x ≥ 0.90 (Acceptable), x ≥ 0.95 (Good Fit)		
GFI	x ≥ 0.90 (Acceptable), x > 0.95 (Good Fit)	0.989	Good Fit
RMSEA	x ≤ 0.08 (Acceptable), x < 0.05 (Good Fit)	0.082	Acceptable

Cut-Off Value Estimate Remark

Good Fit

0.935 Acceptable

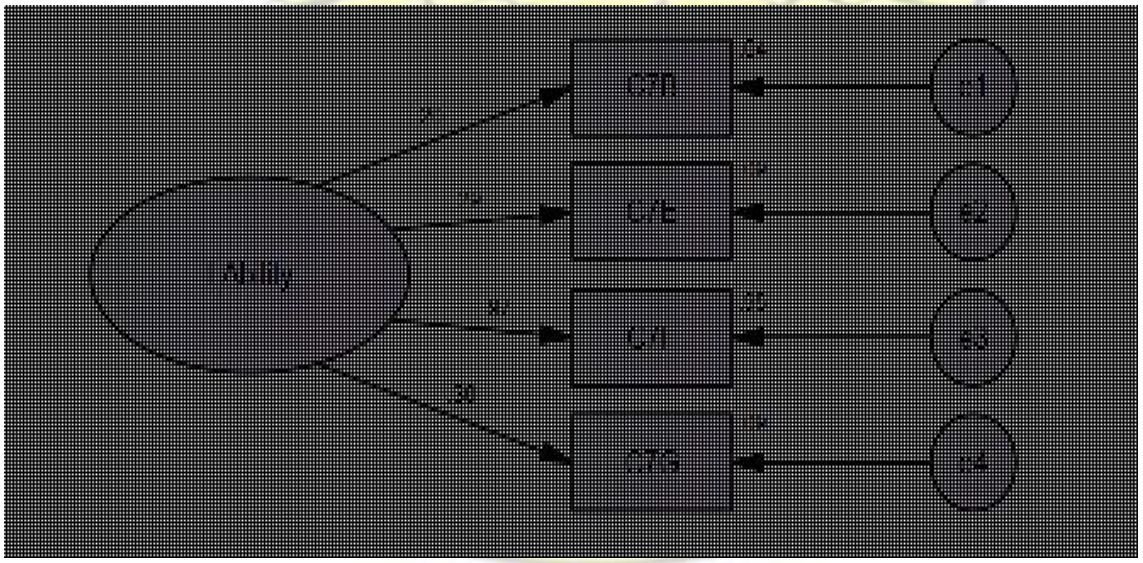

Figure 5.8 Path diagram for *limited ability to commit to contractual obligations*

From the table, the robust CFI and GFI indices were 0.935 and 0.989 respectively. The CFI and GFI are very near to the upper limit of 1.00 and therefore good fit. As indicated by Iacobucci (2010), a model is good fit if its CFI or GFI is more than the cut-off figure of 0.95. The RMSEA value is 0.082 which is acceptable. From the table, all the standard errors were below 1.00 and hence acceptable and reasonable. The Z values except one were all above the standard value of 1.96 based on the probability level of 0.05. Four of the p-values were below 0.05. This proves that many of the variables were truly significant statistically to the factor. The parameter estimates indicated satisfactory linkages with the factor construct. The R^2 values had a mixture of strong and weak levels of predictive accuracy. This indicates a good fitting model for *limited ability to commit to contractual obligations* factor.

5.7.5.8 ANALYSIS OF *INEXPERIENCE* FACTOR

This construct was explained by nine indicator variables (effects). After preliminary CFA analysis was run, two (2) variables were cut off. These variables were C8E and C8H. The remaining seven (7) variables were subjected to detailed CFA tests. The effects of moral hazard were coded as: A. Cost overruns on budget; B. High transaction costs; C. Reduction of competition; D. Consequences on profitability of project; F. Corruption; G. Dishonesty and I. Siphoning of funds. *Inexperience* factor was analyzed with all the 210 responses obtained from the survey. In order to know how best the model fits the factor and variables, tests were conducted for the statistical significance at probability level of five percent, fit statistics and standardized residual covariance distribution matrix.

Table 5.18 Constructs and final items: Inexperience

Variables	Standardized Coefficient	Std. Err	C.R/ Z-Value	R-Square	Sig-Value
C8A: Cost overruns on budget	0.033	0.100	0.330	0.001	0.740
C8B: High transaction costs	0.418	0.078	5.320	0.174	0.000
C8C: Reduction of competition	0.579	0.074	7.790	0.335	0.000
C8D: Consequences on profitability of project	0.598	0.073	8.220	0.357	0.000
C8F: Corruption	0.434	0.080	5.440	0.188	0.000
C8G: Dishonesty	0.450	0.077	5.810	0.202	0.000
C8I: Siphoning of funds	0.278	0.082	3.410	0.077	0.001

Robust Fit Index: Inexperience

Fit Index	Cut-Off Value	Estimate	Remark
S-Bχ^2		18.714	
df		14.000	Good Fit
Sig	x > 0.05	0.176	
		0.955	Acceptable
CFI	x ≥ 0.90 (Acceptable), x ≥ 0.95 (Good Fit)		
GFI	x ≥ 0.90 (Acceptable), x ≥ 0.95 (Good Fit)	0.977	Good Fit
RMSEA	x ≤ 0.08 (Acceptable), x ≤ 0.05 (Good Fit)		
		0.000	Good Fit

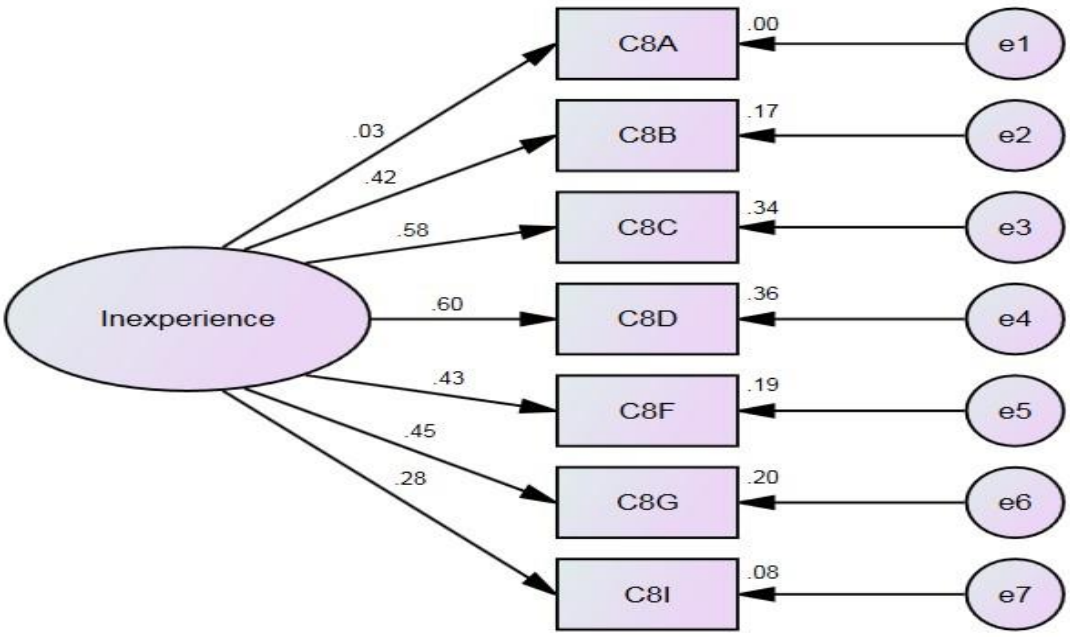

Figure 5.9 Path diagram for *inexperience*

From the table above, S – Bχ_2 value was 18.714 and 14 degrees of freedom (df) with a p-value of 0.176. The CFI value was 0.955 and GFI value was 0.977. This is found to be close to the standard cut-off value of x≥0.90 (acceptable) and x≥0.95 (good fit). It can therefore be observed to be good fit. Furthermore, the RMSEA value was 0.00 which is good fit since cut-off values are x≤0.080 (acceptable) and x≤0.05 (good fit) (Kline, 2010). In addition, the Z-statistic figures except one were above 1.96 and the resultant significant test figures below 0.05 ($p<0.05$). This proves results are statistically significant and acceptable. In conclusion, it can be construed from results of the CFA analysis that, robust fit indices met the prescribed cut-off points and in essence, the model fits the data. The parameter estimates were also significant statistically.

5.8 SUMMARY OF MEASUREMENT MODEL

The table below (Table 5.19) summarizes the relationship between causes and effects of moral hazard and adverse selection of PPP construction projects.

Table 5.19 MEASUREMENT MODEL: RELATIONSHIP BETWEEN CAUSE AND EFFECT

Variables	Standardized Coefficient	Std. Err	C.R/ Z-Value	R-Square	Sig-Value
Low Incentives to Control Costs					
C1B	0.463	0.079	5.880	0.214	0.000
C1C	0.660	0.077	8.570	0.436	0.000
C1D	0.504	0.076	6.650	0.254	0.000
C1H	0.458	0.080	5.760	0.210	0.000
C1I	0.330	0.082	4.010	0.109	0.000
Wrong Party Chosen to Execute Project					
C2A	0.403	0.094	4.280	0.163	0.000
C2B	0.527	0.099	5.340	0.278	0.000
C2C	0.434	0.094	4.620	0.189	0.000
C2D	0.311	0.102	3.050	0.097	0.002
C2E	0.203	0.097	2.080	0.041	0.037
C2H	0.360	0.090	4.010	0.130	0.000
C2I	0.268	0.096	2.800	0.072	0.005
Low Risk Transfer C3A					
	0.387	0.074	5.230	0.150	0.000
C3B	0.518	0.071	7.310	0.268	0.000
C3C	0.614	0.064	9.580	0.378	0.000
C3D	0.500	0.070	7.130	0.250	0.000
C3E	0.646	0.065	9.940	0.417	0.000
C3G	0.382	0.074	5.170	0.146	0.000
Lack of Accurate Information about Project Condition					
C4C	0.198	0.120	1.660	0.039	0.097
C4E	0.403	0.122	3.300	0.162	0.001
C4G	0.794	0.230	3.450	0.630	0.001
C4H	0.229	0.088	2.590	0.052	0.010

C4I	-0.011	0.085	-0.120	0.000	0.901
Effort Dimensions which are not Verifiable					
C5A	0.181	0.090	2.020	0.033	0.044
C5C	0.391	0.098	4.000	0.153	0.000
C5D	0.817	0.159	5.150	0.668	0.000
C5E	0.292	0.090	3.230	0.085	0.001
C5G	-0.200	0.081	-2.480	0.040	0.013
C5I	0.130	0.084	1.540	0.017	0.124
Regeneration of Contracts					
C6A	0.428	0.077	5.550	0.183	0.000
C6G	0.384	0.077	5.000	0.148	0.000
C6H	0.850	0.091	9.300	0.722	0.000
C6I	0.460	0.072	6.430	0.211	0.000
Limited Ability to Commit to Contractual Obligations					
C7B	0.195	0.105	1.850	0.038	0.064
C7E	0.295	0.095	3.090	0.087	0.002
C7F	0.973	0.277	3.510	0.946	0.000
C7G	0.297	0.102	2.890	0.088	0.004
Inexperience					
C8A	0.033	0.100	0.330	0.001	0.740
C8B	0.418	0.078	5.320	0.174	0.000
C8C	0.579	0.074	7.790	0.335	0.000
C8D	0.598	0.073	8.220	0.357	0.000
C8F	0.434	0.080	5.440	0.188	0.000
C8G	0.450	0.077	5.810	0.202	0.000
C8I	0.278	0.082	3.410	0.077	0.001

5.9 DISCUSSION OF RESULTS

From the preceding section of this chapter, a proper and thorough analysis of the Structural Equation Model for causal relationship of moral hazard and adverse selection of PPP construction projects was presented. This section seeks to discuss and assess the implications of the findings to all stakeholders in PPP construction projects.

5.9.1. Low Incentives to Control Costs

The results from the Confirmatory Factor Analysis (CFA) show that this cause as a significant relationship with the effects. When the liability and risk of escalated costs of construction is not borne by the party that is in control of building- like exists in conventional government infrastructure procurement, it leads to moral hazard since there is little motivation to manage costs (Blanc-Brude, 2013).

5.9.2. Wrong Party Chosen to Execute Project

Public-Private-Partnership procurement methods have the likelihood to experience from adverse selection. This occurs when the partner chosen to construct the facility might not be the very excellent one when the issue of controlling costs arises (Loben, 2009).

5.9.3. Low Risk Transfer

In the situation there exist two kinds of private companies which can undertake infrastructural projects. The foremost group is effective and has the capability of lowering costs and managing risks; the remaining group is not and does not have the capability (Blanc-Brude, 2013). The government desires to assign the duty of constructing and managing public facilities but has the challenge of knowing which of the firms to hand over the works to. If the government gives out a contract assigning small or no risk to the

company, as exists for majority of conventional public procurement, the effective companies have an inducement to imitate the ineffective firms at the bidding phase (adverse selection) and make no attempt to lower and manage costs (moral hazard) (BlancBrude, 2013).

In this circumstance, whichever company is engaged, the government has to bear any potential expenditures and evidence confirms that considerable cost overruns are certainly the standard in government works. Simply put, when a suitable incentive format is absent, confidential information about companies' type (whether efficient or otherwise) and actions (management of risk or otherwise) results in escalated procurement charges for taxpayers (BlancBrude, 2013).

5.9.4. Lack of Accurate Information about Project Condition

Due to the extremely long-term scope of Public-Private-Partnership projects, oftentimes three decades and above, specific risk aspects reveal the delicate attributes of PPPs. There exists a deficiency of exact and accurate information concerning the current conditions, the future and the implied social costs of the job. This leads to moral hazard and adverse selection. Moral hazard and adverse selection challenges are even tougher to recognize in this instance (Blanc-Brude, 2013). The competitive tendering process is already a channel of circumventing cost ambiguity. The risk of contracting has been discussed earlier because of the strategic approach of the bidders in the negotiation process. The saying "allocate risks to the stakeholder most able to deal with it" is not always easy to fulfill. There abound countless failed jobs because exposure to hazardous risks exists (Blanc-Brude, 2013).

5.9.5. Effort Dimensions which are not Verifiable

With effort dimensions that are not verifiable, things become problematic. This is the root of the moral-hazard problems. Because providing effort is costly for the firm, but the degree of effort cannot be specified in contracts, a moral-hazard problem arises, as is usual when the source of private information is "endogenous." That is, the firm has an incentive to shirk from exertion of effort during the construction phase in order to maximize returns (Guasch, 2004).

In addition, there can be adverse-selection problems. The firm may well hold some private information, say, about the costs of the activity, from which it can take advantage in its contractual relationship with the government (Guasch, 2004).

5.9.6. Regeneration of Contracts

A particular difficulty in most PPPs leading to moral hazard and adverse selection is that contracts are renegotiated before reaching their agreed termination date. Renegotiation incidents are persistent, though not absolutely in less developed countries. In Caribbean and Latin American nations, a lot of projects were deserted because of the public or private partners' failure to comply with contractual obligations (Guasch, 2004; Iossa and Martimort, 2008).

5.9.7. Limited Ability to Commit to Contractual Obligations

In past research on contract design, instances in which the contractual parties are not able to abide by their obligations have been termed as conditions of restricted commitment. Estache and Wren-Lewis (2008) demonstrate that this label can be utilized to include diverse probable conditions. Primarily, with "limited enforcement," the partner might

renege on the contract for the period of its implementation, even if the public administration does not agree. On the other hand, in a similar instance, also known as

"non-commitment," the government might renege on the contract, even if it is unfavorable for the party. There exists also a third instance, called "renegotiation and commitment," where the stakeholders abide by their responsibilities yet, if they together desire, the contract may be renegotiated at a later time (Iossa and Martimort, 2008).

5.9.8. Inexperience

Inexperience by government and stakeholders who are not familiar with PPP may lead to the problems of moral hazard and adverse selection. Governments targeting at reducing information asymmetry might firstly enter into less complex and complicated PPP contracts (Guasch, 2004; Iossa and Martimort, 2008).

CHAPTER SIX

SUMMARY OF FINDINGS AND RECOMMENDATIONS

6.1 INTRODUCTION

This research which was on investigating the causal relationships and effects of moral hazard and adverse selection on public private partnership construction projects was divided into six independent but interwoven chapters. Chapter one was the general introduction. Chapters two and three were the literature review.Chapter four emphasized the methodology adopted for the research. It detailed out the framework and guiding principles for the conduct of the study correctly and concretely spelling out the research philosophy; sample population; sample size determination; sampling technique; research design; sources of data; data gathering techniques; administration of data and statistical tools for presentations; analysis and testing of the various hypotheses.Chapter five was the analysis and discussion of the responses articulated by the respondents using a combination of both inferential and descriptive statistical methods to present an amalgamation of the findings by the responses from the questionnaires. The analysis concluded in the development of a structural equation model. This chapter concludes the research. It discusses the summary of findings, limitations of research, recommendations, contribution to knowledge and recommendations for further research.

6.2 ATTAINMENT OF RESEARCH OBJECTIVES

The aim of this research was to investigate the causal relationship and effects of moral hazard and adverse selection on Public-Private-Partnership projects. In a bid to accomplish the above stated aim, four specific objectives were lucidly set.

6.2.1 To ascertain the motivating factors for entering into Public-PrivatePartnership construction projects

With background information from literature review conducted, thirteen factors were identified as the motivating factors for the public sector entering into PPP construction projects. Eight factors were identified as the motivating factors for the private sector entering into PPP construction projects. Respondents were asked to rate these variables on a Likert scale. Mean score ranking was used to rank these factors. From the findings, *reduction of public expenditures, faster delivery time of construction projects, achieving improved value for money (VFM), use of innovative materials and technologies* and *increased certainty of projects* were the most significant motivations for the public sector entering into PPP construction projects. Furthermore, *increase in accessible capital, gaining of profits, creation of goodwill for private partner, improvement in private sector's international image* and *sharing of risks* were the most significant motivations for the private sector entering into PPP construction projects. One way ANOVA was used to test the significance of perception among respondents in ranking these motivating factors for the public and private sectors. Out of the thirteen factors for the public sector, only the factor *lesser experience and expertise in project* had significant different perception among the categories of respondents. Contrarily, the remaining 12 factors had no significant difference perception among the categories of respondents. For the eight factors for the private sector, the factors *synergy with public sector* and *obtaining of investment support* had significant different perception among the categories of respondents. The remaining 6 factors had no significant difference perception among the categories of respondents (consulting firm, contracting firm and government agencies).

6.2.2 To identify causes of moral hazard and adverse selection of PPP construction projects

Literature review led to the identification of eight causes of moral hazard and adverse selection of PPP construction projects. These variables were put in a questionnaire for the respondents to rank their importance using a Likert scale. Mean score ranking was used to rank these factors. From the findings, *effort dimensions which are not verifiable, low transfer of risk, lack of accurate information about project conditions, wrong party chosen to execute project* and *renegotiation of contracts* were ranked the most important causes of moral hazard and adverse selection problems in PPP construction projects. One sample t-test was conducted on the causes to establish the relative significance of these variables. All the factors had t-values (the strength of the test) that were positive indicating that their means were above the hypothesized mean of 3.5 except *low incentives to control costs* which had a t-value of -2.610. This is because it had a mean of
3.35 which is below the hypothesized mean of 3.5. All of the factors had a p-value (significance of the test) less than 0.05 and this implies that the means of these variables are not significantly different from the hypothesized mean of 3.5.

6.2.3 To identify effects of moral hazard and adverse selection of PPP construction projects

Utilizing background knowledge from the literature review, nine effects of moral hazard and adverse selection of PPP construction projects were identified. These variables were put in a questionnaire for the respondents to rank their importance using a Likert scale. Mean score ranking was used to rank these factors. *Reduction of competition, high transaction costs, consequences on profitability of project, siphoning of funds* and *negative*

implications on enforceability of contract were the most important effects of moral hazard and adverse selection problems in PPP construction projects. One sample ttest was conducted on the effects to establish the relative significance of these variables. All the factors had t-values (the strength of the test) that were positive indicating that their means were above the hypothesized mean of 3.5. All of the factors had a p-value (significance of the test) less than 0.05 and this implies that the means of these variables are not significantly different from the hypothesized mean of 3.5. Furthermore, the 95% confidence level interval estimated the difference between the population mean weight and the test value (i.e. 3.5).

6.2.4 To investigate causal relationships of moral hazard and adverse selection of PPP construction projects

Structural Equation Modeling (SEM) was used to explore the causal relationships between the causes and effects of moral hazard and adverse selection problems in PPP construction projects. Causes being the independent variables (IV) and effects the dependent variables (DV). A model culminated out of these relationships. The measured model was used to predict, estimate and depict the complex causal relationships i.e. the directionality. It further showed the degree of association and isolation of the unobserved variables on the indicator factors. CFA was used to evaluate the fit of items to latent constructs. Since the fit of each model was good and the item loading adequate, it was assumed that the indicators of the factors were fitting. Diagnostic Fit analysis was conducted using Robust Maximum Likelihood to test statistical significance of parameter estimates. A summary of the measurement model is seen in Table 5.19.

6.3 SIGNIFICANCE AND CONTRIBUTION OF RESEARCH TO KNOWLEDGE

Even though it is known that adding original contribution to research knowledge is a debatable subject within academia especially in masters studies because of the subjective nature of the term originality (Sutrisna, 2004), yet it is without doubt that this research has immensely contributed to knowledge in terms of the causal relationships and effects of moral hazard and adverse selection of PPP construction projects. The findings have confirmed the fact that moral hazard and adverse selection are serious problems faced in PPP construction projects and highlighted fresh areas which require further research. In contemporary times, public private partnership alliances are needful and hence identifying agency theory problems that affect them is essential in their prevention. An empirical outlook was undertaken in this research to identify the motivating factors for entering into PPP construction projects by both the public and private sectors.

Additionally, the research identified the causes and effects of moral hazard and adverse selection on PPP construction projects. In this way, the study has contributed to past studies on the body of PPP and information asymmetry with the limelight on moral hazard and adverse selection. Denzin (2009) posits that a research may add original contribution and significance to knowledge by way of developing novel tools, methodologies and techniques. Within this context, an additional contribution of this research to knowledge is the analytical tools and techniques used. Majority of studies that assess causal relationships mainly use univariate statistical tools like MANOVA, ANOVA or multiple regression modeling to come out with the models. Yet the palpable gap in these models is their failure to bring out the relationships among the dependent variables and independent variables. This arises since those analytical tools condense and relate several independent variables

into one dependent variable. In this research, structural equation modeling (SEM) was utilized. This is due to its robustness and better approach in investigating causal relationships in a model and the direction of influence.

It can be concluded that this is the first study using structural equation modeling to investigate causal relationships and effects of moral hazard and adverse selection on PPP construction projects. Therefore this research provides a valid and practical method to assess causality between numerous dependent and independent variables unlike general assessment of numerous constructs by MANOVA, ANOVA, multiple regression and correlation analytical tools.

6.4 LIMITATIONS OF RESEARCH

The importance of research limitations is to improve upon its recognition and general applying of findings. Limitations should be anticipated when interpreting and generalizing research findings. In this study, the whole research was confined to PPP stakeholders in Ghana. Since professional expertise and experience varies universally, it is plausible to have significant and noteworthy variations in the research findings. In theory, the industries in emerging nations particularly in sub-Sahara Africa are similar. Therefore this limitation stated will not weaken the validity of findings and future application in these emerging nations. In addition, the agreement of the findings with literature goes on to establish credibility and trust in these findings.

Furthermore as posited by Kline (2010), majority of analytical tools are affected by measurement errors, sampling inconsistencies, multicollinearity issues and analytical prejudice which may affect the results and eventual conclusions. Nevertheless, because of

the respondents profile by way of knowledge, expertise and experience on the subject matter; SEM analytical tool used plus the consistency in analysis, it can be said that an amount of realistic reliability and credibility resulted from the research. A case in point is the capability of RML (Robust Maximum Likelihood) estimation method in SEM to deal internally with non-normality. The rigorous method of fit statistics and tests of significances also accentuated trust and reliability in results generated.

6.5 RECOMMENDATIONS

Due to the prevalent nature of the problems of moral hazard and adverse selection on PPP construction projects, it is essential that strategies are undertaken to prevent or altogether avoid them. The following strategies are proposed:

6.5.1 Transfer of risks:

Transfer of risk by way of enforceable contracts curtails extremely moral hazard and adverse selection. If the stakeholder constructing the job is partially or entirely liable for the variance of costs, two circumstances occur: the building team now has great incentives to manage costs and, if enough liabilities transferred, only the builders who are aware they can manage costs well will bid for the projects. Simply put, transfer of construction risk results in projects where only the most qualified builders have to control their own construction liabilities and risks.

6.5.2 Increased incentives to control costs:

The selection of the most qualified construction companies coupled with the incentive to manage costs as a remaining claimant will curtail moral hazard and adverse selection.

6.5.3 Managing of construction risks:

In financing of projects, not excluding Public-Private-Partnerships, construction risks must be controlled by way of a network of contracts and transferred to construction companies which efficiently make available insurance against unanticipated construction costs to the financiers and sponsors of the Special Purpose Entity (SPE).

6.5.4 Benchmarking:

Asymmetries of information on the operating costs can also be reduced through benchmarking and market testing processes (yardstick competition). Elementary parts of the service provided by the contractor can be periodically evaluated against market prices. Prices exceeding the benchmark should be lowered to market prices. The operator will ultimately select new sub-contractors so as to lower costs.

6.5.5 Financial unbundling:

Financial unbundling is an effective way of ensuring transparency in projects by inducing a disclosure of the contract financial main points. A separate funding competition both favours the entrance of new actors, which are susceptible to reinforce the competitive character of the Private Finance Initiative (PFI) market and the partial solving of the issues induced by the asymmetrical information context. The commitment of financial institutions into the contract will allow the assessment of the completion of value for money and will reinforce the monitoring upon the Special Purpose Entity (SPE).

6.5.6 Bond spread:

An inadequate risk transfer to the contractor can be discovered by the reasonability of the bond spread. For instance, if the public partner takes on almost all the demand risk, it can

be, in financial expressions, like providing to the contractor an advance contract for free (Välilä, 2005). The private partner has the guarantee to get an amount of revenue in spite of the real level of demand. This reasoning is similar in the instance of a guarantee of minimum revenue level. The private stakeholder further benefits from a put option for free. If he will not deliver the service, its cash flows will be set at the option strike price. In both instances, a funding competition will expose such contractual disequilibrium. The consequence will be similar in symmetrical situation. If unbearable level of risks is shifted to the private contractor, a separate funding competition will result in an excessive risk premium or unproductive tendering.

6.5.7 External finance:

There are two types of external financiers, outside shareholders and debt creditors. They consider that the financial structure of the contract is not without significance on the private partner incentives. Outside debt or equity might lower incentives to exert effort for the contractor. If the bundling of construction and operating stages in a PPP contract results in proper incentives for the private partner, it looks like that external finance induces the loss of a part of its rent.

External finance brings about a new agency relationship to the contract. It is positive to the public contractor since the interests of external financiers are similar to its objective.

In this way, part of the monitoring expenses can be externalized.

6.5.8 Funding competition:

At the negotiation period of PPP contracts, funding competition helps to raise the public sector's information on the deal. However, the cost of gathering this information should

not override the savings it brings about. In this instance, the size of the deal, and the number of bidders, has a crucial role in the trade-off. Running a debt funding competition is a more attractive option due to the development of the PFI financing market, which tolerates a greater flexibility within the impending funders and causes a reduction in risk premium.

6.5.9 Contain private liabilities to small size:

Private liabilities should be contained to an adequately small size. As well as requiring that the firm not spend so much in the project, in spite of its assets, this necessitates that the firm not depend on debt greatly, even if it has unrestricted access to the credit market. PPP projects are to be effectively run and should not be extremely leveraged. This minimizes moral hazard and adverse selection problems.

6.5.10 Securing contract enforcement:

To be able to induce the firm to fulfill the contract, there should be the requirement of investing a satisfactorily worthy quantity of money in advance, and it should be allowed to recuperate that investment by the passage of time at the execution stage. Since the firm is conscious that disintegration of the partnership will obstruct recuperation of the original investment, it has an incentive to safeguard the partnership with the government. This requires that the private stakeholder should be affluent enough so as to offer huge contribution to induce it to fulfil the contract. To be brought on to partake in the partnerships, private firms should be wealthy to start with. This would discourage the speculative and probable unpredictable investors.

6.5.11 Contract guarantees and technical assistance:

On the whole, the responsibility of a modern development banks or current multilateral banks would involve steps at national and international stages, comprising from fiscal and

risk mitigation features, including the terms of technical guidance. At the national point, the bank will offer state authorities with technical assistance, assisting them compute their comprehension of the country specific factors, which are important for the choosing, expansion, and administration of projects exhibiting the uppermost social returns. Further, it will improve credibility of institutions, synergies, promoting dedication and risk reduction both in the partnerships between public and private sectors and in the association between various governmental levels, relating to how multi-level governance situations are involved.

Internationally, it will offer monetary support, assuring guarantees and giving out the most excellent international actions for project evaluation and risk appraisal, and the best techniques of innovative finance. All these help reduce moral hazard and adverse selection.

6.5.12 Screening

Screening refers to the term for all activities whereby the principal attempts to gain more accurate information on the quality attributes of the agent which are pertinent. These include: references, work probes, certificates, and credit worthiness. A further option to prevent adverse selection is to design the contracts in a manner that only desired contractors will sign them since only they would have the self-interest to render the service under these situations. Examples include guarantees or a likely loss of reputation for the agent. Screening is significant before the signing of contracts. The aim of screening is to gain useful information to the principal in an attempt to be more conversant with the qualifications of the agent.

6.5.13 Monitoring

Monitoring is essential after a contract has been signed. The intent of monitoring is to make certain that the agent is acting in harmony with the contract. This in the long term decreases the problems of information asymmetry: moral hazard and adverse selection.

6.5.14 Signaling

The market party which has more information, e.g. the contractor, signals its type to the client who is the least informed market stakeholder, using some signals. In case of signaling, the initiative goes out from the better informed market participants who send out their signals first and who only then get contracts offered by the worse informed market party. Accordingly, the planner can present his qualities and prove them by way of references or certificates. The benefits of signaling must be higher for desired agents than signaling costs. Simultaneously, the advantages of signaling should be lower for undesired agents than signaling costs. Supposing the client carries out efforts to enquire further about the qualities of the contractor by his own ingenuity, it is referred to as screening. In undertaking public construction projects therefore, VOF processes must be undertaken for the choice of construction services. Private principals too may carry out pre-qualifications.

6.5.15 Cooperation among project participants

Relating to moral hazard, the frequency of the cooperation of the project participants is of foremost importance. If the contractual partners continually cooperate with one another, this can cause a reduction of information asymmetries. The common trust ensuing from long-term cooperation will lead to a reduction of risk costs. Trust takes time to develop between the parties, and it is very fragile, but when developed it surpasses all the other

strategies by way of project control and risk minimization. Formal planning and control systems produce more transparency with respect to the actions of the project participants. The competency of the project management involved plays a crucial role.

6.5.16 Clarifying the need for information in the project

The necessity for information which a project participant requires to accomplish his tasks within a definite period of time is explained according to quality, type and quantity. In this instance, subjective and objective need for information can be distinguished. The former refers to the amount of information that the project participant needs from his subjective point of view on the project while the latter refers to the amount of information that is imperative for achieving the task. To align these amounts of information and to guarantee the optimal supply of all essential information for the project participants, it is vital to define the factors for success of the project. Hence, those factors and parameters are recognized which are of exceptional significance for the respective participant. Particularly in complex and technically challenging projects, this will afford each individual project participant with better understanding of those processes which are the most important ones for the success of the project in an opportunistic way. Within the scope of the project management a special focus should be on the design of information duties of the involved partners. When the project management has developed awareness about possible information imbalances, this can be addressed better when designing the flow of information. Using a proper reporting system causes the transparency within the project to increase. The use of project communication systems may support the project management in the manner of handling the information. The benefits of a project communication system are: responsibilities within the project are transparent for all project participants. The

worker who is responsible in the corresponding case will be informed automatically by e-mail over the tasks and contributions allocated to him. All project contributions are available 24 hours a day and consequently allow an overview over the current state of the project at any time. Information can be recorded, processed and viewed regardless of time. The more and better the communication within the project is organized, the easier it is to prevent information asymmetries.

6.5.17 Information disclosure

The agent delivers information to the client using some special files for client's reference. The client will esteem the agent's reputation as a significant evaluation index when he selects agent, which is because the project implementation needs the agent's strength, experience, credibility, moral qualities among others, and these all constitute private information of the agent.

6.5.18 Well-designed contract

Contract is the most vital instrument that regulates the information between the project owner and contractor. Therefore, a well-designed contract which defines the ways of information transfer is the most effective way to decrease the information asymmetry risk. A well-defined contract aids in reducing risks to the minimum.

6.6.19 Create a clear and transparent process

Routinization and standardization will create a market for PPPs that provides the public and private sector with a clear roadmap for success. This will ultimately lead to a reduction of the agency problems of moral hazard and adverse selection.

6.5.20 Harmonization of interests

A main instrument for reducing the risks of moral hazard is the harmonization of interests, e.g. by profit sharing of the contractor. For the planning participants, contractual incentives must be given so that the targets of the principal may be achieved. Among these incentives are the exact projections of the costs and the meeting of these costs by a corresponding planning performance. A contract that leads to cost optimization without reductions of the quality is highly incentive. If the payment is linked to the overall success, it will no longer be attractive for the individual project participants to pursue only their own interests.

6.6 RECOMMENDATIONS FOR FUTURE RESEARCH

- Further studies should be conducted into determining the impact of moral hazard and adverse selection at the pre-contract, construction and post-construction phases respectively.
- The model developed in this study was not validated. Future studies should validate this model.

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APPENDIX 1

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF ART AND BUILT ENVIRONMENT DEPARTMENT OF BUILDING TECHNOLOGY

SURVEY QUESTIONNAIRE

"INVESTIGATING THE CAUSAL RELATIONSHIPS AND EFFECTS OF MORAL HAZARD AND ADVERSE SELECTION ON PUBLIC-PRIVATEPARTNERSHIP CONSTRUCTION PROJECTS"

I am an MPhil student at Kwame Nkrumah University of Science and Technology, Department of Building Technology. I am presently conducting a study into investigating the causal relationships and effects of moral hazard and adverse selection on PublicPrivate-Partnership construction projects.

As a requirement of the research, I am undertaking a questionnaire survey to look for input from participants within the industry in Ghana. Your knowledge and opinions on the subject are very vital to this research. The research will provide information on the causes of moral hazard and adverse selection, effects of moral hazard and adverse selection and causal relationships of moral hazard and adverse selection on PublicPrivate-Partnership construction projects.

Your responses will be handled as STRICTLY CONFIDENTIAL. This information will be utilized for academic purposes only. Upon your request, a summary of the findings will be made accessible.

I understand that this will take some of your precious time, however, please try and participate, as your input is very important towards the accomplishment of this research. I wish to take this opportunity to express gratitude to you in advance for your involvement.

Yours Sincerely,

Kukah Augustine Senanu
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Project Supervisor
Dr. De-Graft Owusu-Manu
Senior Lecturer
Department of Building Technology
KNUST-Kumasi

PART A: DEMOGRAPHIC BACKGROUND OF RESPONDENTS

Please, kindly respond to the questions by ticking (√) the appropriate box for each item.

1. Which of the following categories do you belong to?

[ ] Government agency

[ ] Consulting firm

[ ] Contracting firm

2. What is your highest educational qualification?

[ ] HND

[ ] BSc

[ ] MSc

[ ] PhD

[ ] Other (please indicate) ..……..

3. How many years of working experience do you have?

[ ] Less than 5 years

[ ] 5-10 years

[ ] 11-15 years

[ ] 16-20 years

[ ] Above 20 years

PART B: MOTIVATIONS FOR ENTERING INTO PUBLIC-PRIVATEPARTNERSHIP CONSTRUCTION PROJECTS

The following are motivations for entering into PPP construction projects. Kindly rank them using the following Likert scale **[1=Not significant; 2=Less significant; 3=Moderately Significant; 4= Significant; 5=Very significant]**. Please tick (√) in the space provided.

MOTIVATIONS	**1**	**2**	**3**	**4**	**5**
Public Sector					
Improved ability to deliver new infrastructure					
Greater efficiency of construction services					
Achieving improved Value for Money (VFM)					
Faster delivery time of construction projects					
Use of innovative materials and technologies					
Reduction of public expenditures					
Access to additional capital					
Minimization of whole life cycle costs					
Increased certainty of projects					
Lesser experience and expertise in project					
Off-balance sheet financing					
Access to broader base of investors					
Reduction in risks					
Any other please state and rank					
Private Sector					
Improving operational environment					
Gaining of profits					
Sharing of risks					
Increase in accessible capital					
Creation of goodwill for private partner					

Improvement in private sector's international image					
Synergy with public sector					
Obtaining of investment support					
Any other please state and rank					

PART C: CAUSES OF MORAL HAZARD AND ADVERSE SELECTION OF PUBLIC-PRIVATE-PARTNERSHIP CONSTRUCTION PROJECTS

The following are causes of moral hazard and adverse selection of PPP construction projects. Kindly rank them using the following Likert scale **[1=Not important; 2=Less important; 3=Moderately Important; 4= Important; 5=Very important]**. Please tick (√) in the space provided.

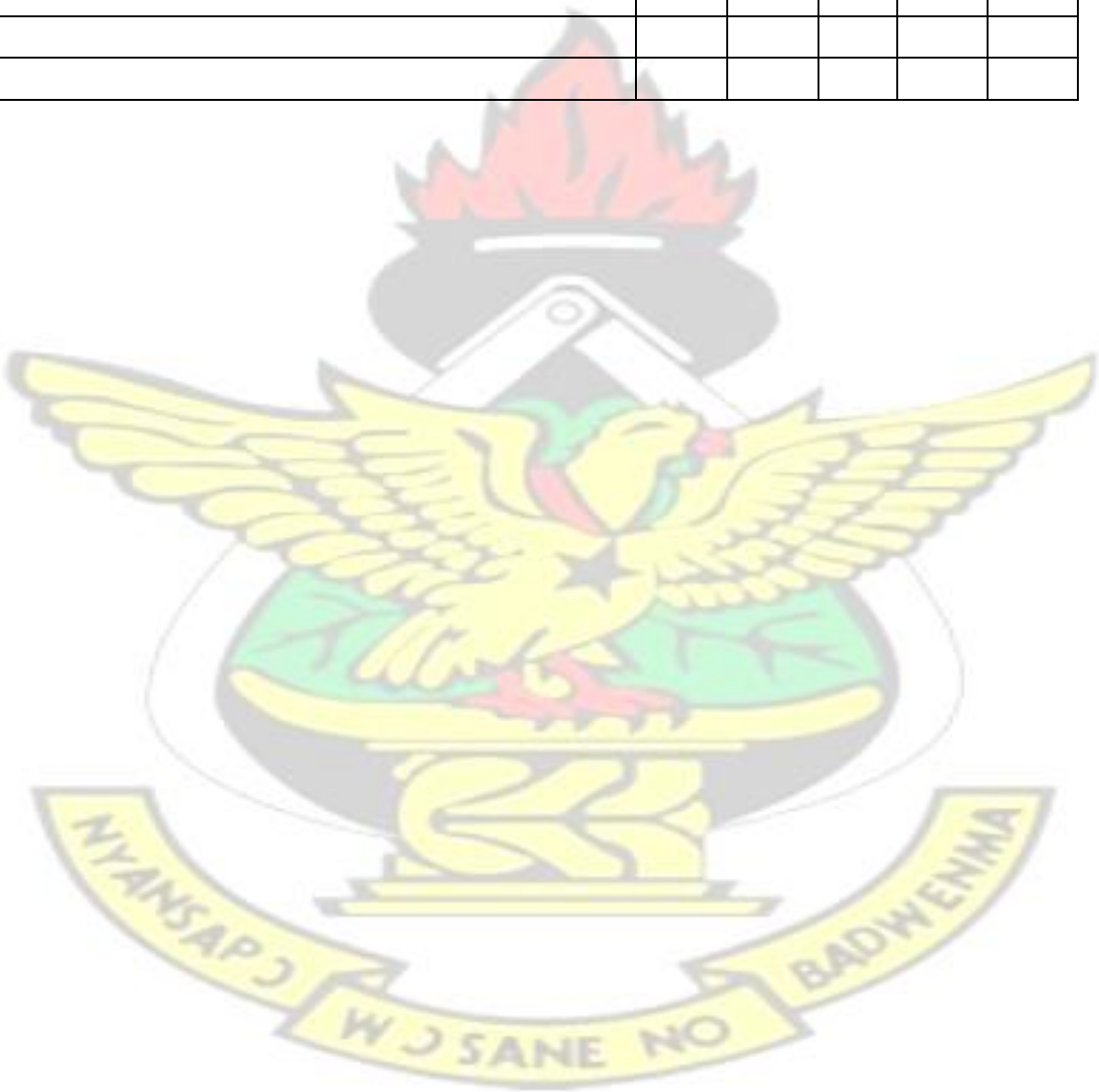
CAUSES	**1**	**2**	**3**	**4**	**5**
Low incentives to control costs					
Wrong party chosen to execute project					
Low transfer of risk					
Lack of accurate information about project conditions					
Effort dimensions which are not verifiable					
Renegotiation of contracts					
Limited ability to commit to contractual obligations					
Inexperience					
Any other please state and rank					

PART D: EFFECTS OF MORAL HAZARD AND ADVERSE SELECTION ON PUBLIC-PRIVATE-PARTNERSHIP CONSTRUCTION PROJECTS

The following are effects of moral hazard and adverse selection on PPP construction projects. Kindly rank them using the following Likert scale **[1=Not severe; 2=Less severe; 3=Moderately Severe; 4= Severe; 5=Very severe]**. Please tick (√) in the space provided.

EFFECTS	**1**	**2**	**3**	**4**	**5**
Cost overruns on budget					
High transaction costs					
Reduction of competition					
Consequences on profitability of project					
Negative implications on enforceability of contract					
Corruption					
Dishonesty					

Opportunistic behavior					
Siphoning of funds					
Any other please state and rank					



PART E: RELATIONSHIP BETWEEN CAUSES AND EFFECTS OF MORAL HAZARD AND ADVERSE SELECTION ON PUBLIC-PRIVATE-PARTNERSHIP CONSTRUCTION PROJECTS

Kindly rank on a scale of 1-5 the relationship between effects and causes of moral hazard and adverse selection.

EFFECTS:

A. Cost overruns on budget **B. High transaction costs**

C. Reduction of competition **D. Consequences on profitability of project**

E. Negative implications on enforceability of contract **F. Corruption G. Dishonesty**

H. Opportunistic behavior **I. Siphoning of funds** The

response scale is as follows:

1=Not significant; 2=Less significant; 3=Moderately Significant; 4= Significant; 5=Very significant

CAUSES	**EFFECTS**								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Low incentives to control costs									
Wrong party chosen to execute project									
Low transfer of risk									
Lack of accurate information about project conditions									
Effort dimensions which are not verifiable									
Renegotiation of contracts									
Limited ability to commit to contractual obligations									
Inexperience									

APPENDIX 2

1. LACK OF ACCURATE INFORMATION ABOUT PROJECT CONDITION

Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
C4C	<---	AccurateInfo	1.000				
C4E	<---	AccurateInfo	2.013	.943	2.136	.033	
C4G	<---	AccurateInfo	3.937	2.469	1.595	.111	
C4H	<---	AccurateInfo	1.135	.633	1.794	.073	
C4I	<---	AccurateInfo	-.044	.355	-.124	.901	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
C4C	<---	AccurateInfo	.198
C4E	<---	AccurateInfo	.403
C4G	<---	AccurateInfo	.794
C4H	<---	AccurateInfo	.229
C4I	<---	AccurateInfo	-.011

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
AccurateInfo	.031	.029	1.069	.285	
e1	.750	.076	9.882	***	
e2	.642	.091	7.044	***	
e3	.280	.252	1.111	.267	
e4	.719	.074	9.706	***	
e5	.538	.053	10.222	***	

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
C4I	.000
C4H	.052
C4G	.630
C4E	.162
C4C	.039

M.I. Par Change

M.I. Par Change

M.I. Par Change

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	2		-.008	9999.000	77.732	0	9999.000
1	e	0	257.736		.654	30.744	20	.871
2	e	0	32.272		.393	28.481	5	.000
3	e	0	393.813		1.187	19.747	1	.790
4	e	0	1525.159		.704	12.396	2	.000
5	e	0	5497.544		.611	11.499	2	.000
6	e	0	95007.689		.457	9.487	1	.961
7	e	0	25339.917		.448	9.284	4	.000
8	e	0	54973.256		.216	9.020	1	1.057
9	e	0	59469.452		.439	8.986	1	.643
10	e	0	229736.531		.137	8.945	1	1.043
11	e	0	216363.968		.216	8.941	1	.761
12	e	0	367565.064		.020	8.940	1	1.002

13	e	0	364424.008		.005	8.940	1	1.001
14	e	0	362055.412		.000	8.940	1	1.000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	10	8.940	5	.111	1.788
Saturated model	15	.000	0		
Independence model	5	44.322	10	.000	4.432

Model	RMR	GFI	AGFI	PGFI
Model	RMR	GFI	AGFI	PGFI
Default model	.035	.984	.953	.328
Saturated model	.000	1.000		
Independence model	.090	.922	.883	.615

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.798	.597	.900	.770	.885
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.500	.399	.443
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	3.940	.000	16.433
Saturated model	.000	.000	.000
Independence model	34.322	17.341	58.844

Model	FMIN	F0	LO 90	HI 90
Default model	.043	.019	.000	.079
Saturated model	.000	.000	.000	.000
Independence model	.212	.164	.083	.282

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.061	.000	.125	.322

Independence model	.128	.091	.168	.001

Model	AIC	BCC	BIC	CAIC
Default model	28.940	29.531	62.411	72.411
Saturated model	30.000	30.887	80.207	95.207
Independence model	54.322	54.618	71.058	76.058

Model	ECVI	LO 90	HI 90	MECVI
Default model	.138	.120	.198	.141
Model	ECVI	LO 90	HI 90	MECVI
Saturated model	.144	.144	.144	.148
Independence model	.260	.179	.377	.261

Model	HOELTER .05	HOELTER .01
Default model	259	353
Independence model	87	110

Minimization:	.000
Miscellaneous:	.203
Bootstrap:	.000
Total:	.203

2. EFFORT DIMENSIONS WHICH ARE NOT VERIFIABLE

Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
C5A	<---	EffortDim	1.000				
C5C	<---	EffortDim	2.041	1.005	2.031	.042	

C5D	<---	EffortDim	4.441	2.456	1.808	.071	
C5E	<---	EffortDim	1.597	.841	1.900	.057	
C5G	<---	EffortDim	-1.130	.685	-1.650	.099	
C5I	<---	EffortDim	.680	.528	1.288	.198	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
C5A	<---	EffortDim	.181
C5C	<---	EffortDim	.391
			Estimate
C5D	<---	EffortDim	.817
C5E	<---	EffortDim	.292
C5G	<---	EffortDim	-.200
C5I	<---	EffortDim	.130

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
EffortDim	.025	.024	1.060	.289	
e1	.741	.074	10.035	***	
e2	.579	.069	8.359	***	
e3	.246	.183	1.345	.178	
e4	.685	.072	9.503	***	
e5	.768	.077	9.979	***	
e6	.679	.067	10.138	***	

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
C5I	.017

C5G	.040
C5E	.085
C5D	.668
C5C	.153
C5A	.033

			M.I.	Par Change
e1	<-->	e4	9.416	.154

M.I. Par Change

			M.I.	Par Change
C5E	<---	C5A	9.019	.199
C5A	<---	C5E	8.375	.200

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	2		-.017	9999.000	99.319	0	9999.000
1	e	1		-.018	.659	49.614	20	.880
2	e	1		-.003	.457	41.678	8	1.041
3	e	0	246.962		.733	32.344	4	.864
4	e	0	350.661		1.099	25.870	2	.000
5	e	0	1577.673		.589	21.985	1	1.164
6	e	0	4503.009		.584	20.689	1	1.208
7	e	0	15263.951		.453	19.978	1	1.278
8	e	0	26423.364		.587	19.732	1	.866
9	e	0	110009.483		.287	19.498	1	1.112
10	e	0	92721.706		.546	19.491	1	.089

11	e	0	356678.891		.119	19.409	1	1.009
12	e	0	394346.686		.116	19.407	1	.974
13	e	0	435530.768		.005	19.407	1	1.001
14	e	0	429781.488		.000	19.407	1	1.000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	12	19.407	9	.022	2.156
Saturated model	21	.000	0		
Independence model	6	67.797	15	.000	4.520

Model	RMR	GFI	AGFI	PGFI
Default model	.047	.970	.930	.416
Saturated model	.000	1.000		
Independence model	.093	.899	.858	.642

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.714	.523	.823	.671	.803
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.600	.428	.482
Saturated model	.000	.000	.000
Model	PRATIO	PNFI	PCFI
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	10.407	1.373	27.145
Saturated model	.000	.000	.000
Independence model	52.797	30.924	82.212

Model	FMIN	F0	LO 90	HI 90
Default model	.093	.050	.007	.130
Saturated model	.000	.000	.000	.000
Independence model	.324	.253	.148	.393

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.074	.027	.120	.165
Independence model	.130	.099	.162	.000

Model	AIC	BCC	BIC	CAIC
Default model	43.407	44.238	83.572	95.572
Saturated model	42.000	43.455	112.289	133.289
Independence model	79.797	80.212	99.879	105.879

Model	ECVI	LO 90	HI 90	MECVI
Default model	.208	.164	.288	.212
Saturated model	.201	.201	.201	.208
Independence model	.382	.277	.523	.384

Model	HOELTER .05	HOELTER .01
Default model	183	234
Independence model	78	95

Minimization:	.002
Miscellaneous:	.266
Bootstrap:	.000
Total:	.268

3. INEXPERIENCE

Variable Summary (Group number 1)

Your model contains the following variables (Group number 1)

Observed, endogenous variables
C8A
C8B C8C
C8D
C8F
C8G
C8I
Unobserved, exogenous variables
Inexperience
e1 e2 e3 e4
e5 e6 e7

Variable counts (Group number 1)

Number of variables in your model:	15
Number of observed variables:	7
Number of unobserved variables:	8
Number of exogenous variables:	8
Number of endogenous variables:	7

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	8	0	0	0	0	8
Labeled	0	0	0	0	0	0
Unlabeled	6	0	8	0	0	14
Total	14	0	8	0	0	22

Number of distinct sample moments:	28
Number of distinct parameters to be estimated:	14
Degrees of freedom (28 - 14):	14

			Estimate	S.E.	C.R.	P	Label
C8A	<---	Inexperience	1.000				
C8B	<---	Inexperience	11.500	30.026	.383	.702	
C8C	<---	Inexperience	17.870	46.595	.384	.701	
C8D	<---	Inexperience	16.656	43.426	.384	.701	
C8F	<---	Inexperience	13.316	34.760	.383	.702	
C8G	<---	Inexperience	12.472	32.550	.383	.702	

C8I	<---	Inexperience	8.966	23.501	.382	.703	

			Estimate
C8A	<---	Inexperience	.033
C8B	<---	Inexperience	.418
C8C	<---	Inexperience	.579
C8D	<---	Inexperience	.598
C8F	<---	Inexperience	.434
C8G	<---	Inexperience	.450
C8I	<---	Inexperience	.278

	Estimate	S.E.	C.R.	P	Label
Inexperience	.001	.005	.192	.848	
e1	.798	.078	10.216	***	
e2	.544	.060	9.027	***	
e3	.551	.075	7.304	***	
e4	.434	.062	7.010	***	
e5	.664	.075	8.906	***	
e6	.533	.061	8.780	***	
e7	.834	.086	9.754	***	

	Estimate
C8I	.077
C8G	.202
C8F	.188

C8D	.357
C8C	.335
C8B	.174
C8A	.001

			M.I.	Par Change
e5	<-->	e6	4.009	.090
e3	<-->	e5	5.646	-.113

M.I. Par Change

M.I. Par Change

C8C <--- C8F 4.289 -.130

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	1		-.252	9999.000	160.867	0	9999.000
1	e	1		-.058	1.382	90.016	25	.497
2	e	0	30.293		.396	61.730	7	.787
3	e	0	271.494		1.155	39.744	1	1.021
4	e	0	1421.247		.790	30.396	1	1.174
5	e	0	6964.341		.799	25.751	1	1.289
6	e	0	23402.579		1.208	24.743	1	.463
7	e	0	181133.413		.791	21.672	1	1.087
8	e	0	178204.964		1.210	21.303	2	.000
9	e	0	1339874.073		.766	20.214	1	1.121
10	e	0	1032538.232		1.337	20.043	2	.000
11	e	0	7994957.127		.764	19.529	1	1.128

12	e	0	4348762.821		1.498	19.469	2	.000
13	e	0	38641428.995		.740	19.171	1	1.107
14	e	0	26083271.525		.867	19.094	3	.000
15	e	0	32876335.491		1.410	19.013	1	1.090
16	e	0	139464380.585		.897	18.931	1	1.275
17	e	0	108237864.405		1.120	18.893	2	.000
18	e	0	274054021.533		1.046	18.848	1	1.343
19	e	0	218885885.029		1.613	18.827	1	.775
20	e	0	1461902170.942		.735	18.791	1	1.169
21	e	0	511856093.677		1.579	18.783	2	.000
22	e	0	3837176024.945		.669	18.759	1	1.137
23	e	0	1042147024.059		1.698	18.757	2	.000
Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
24	e	0	10294853962.480		.572	18.739	1	1.088
25	e	0	4476678352.764		.944	18.734	3	.000
26	e	0	5503172775.459		1.155	18.728	1	1.260
27	e	0	10886986072.583		.917	18.724	1	1.344
28	e	0	8199463479.481		1.259	18.721	1	1.014
29	e	0	33207442797.998		.628	18.719	1	1.241
30	e	0	19208596520.491		.891	18.717	2	.000
31	e	0	39605126869.853		.718	18.716	1	1.330
32	e	0	27729849016.988		1.037	18.715	1	.947
33	e	0	108302307148.729		.434	18.715	1	1.195
34	e	0	70588447247.689		.596	18.714	2	.000
35	e	0	112893783357.382		.516	18.714	1	1.299
36	e	0	129995106328.369		.489	18.714	1	1.227

37	e	0	207424463890.970		.286	18.714	1	1.239
38	e	0	242371878892.274		.224	18.714	1	1.147
39	e	0	296025760102.392		.066	18.714	1	1.083
40	e	0	306936870422.276		.014	18.714	1	1.015
41	e	0	304051849966.329		.000	18.714	1	1.000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	14	18.714	14	.176	1.337
Saturated model	28	.000	0		
Independence model	7	126.080	21	.000	6.004

Model	RMR	GFI	AGFI	PGFI
Default model	.032	.977	.953	.488
Saturated model	.000	1.000		

Model	RMR	GFI	AGFI	PGFI
Independence model	.123	.820	.761	.615

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.852	.777	.958	.933	.955
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.667	.568	.637
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	4.714	.000	20.156
Saturated model	.000	.000	.000
Independence model	105.080	73.394	144.274

Model	FMIN	F0	LO 90	HI 90
Default model	.090	.023	.000	.096
Saturated model	.000	.000	.000	.000
Independence model	.603	.503	.351	.690

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.040	.000	.083	.596
Independence model	.155	.129	.181	.000

Model	AIC	BCC	BIC	CAIC
Default model	46.714	47.828	93.573	107.573
Saturated model	56.000	58.229	149.719	177.719
Independence model	140.080	140.637	163.509	170.509

Model	ECVI	LO 90	HI 90	MECVI
Default model	.224	.201	.297	.229
Saturated model	.268	.268	.268	.279
Independence model	.670	.519	.858	.673

Model	HOELTER .05	HOELTER .01
Default model	265	326
Independence model	55	65

Minimization:	.015
Miscellaneous:	.266
Bootstrap:	.000
Total:	.281

4. LIMITED ABILITY TO COMMIT TO CONTRACTUAL OBLIGATIONS

Variable Summary (Group number 1)

Your model contains the following variables (Group number 1)

Observed, endogenous variables
C7B
C7E
C7F
C7G
Unobserved, exogenous variables
LAbility
e1 e2 e3
e4

Variable counts (Group number 1)

Number of variables in your model:	9
Number of observed variables:	4
Number of unobserved variables:	5
Number of exogenous variables:	5
Number of endogenous variables:	4

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	5	0	0	0	0	5
Labeled	0	0	0	0	0	0
Unlabeled	3	0	5	0	0	8
	Weights	Covariances	Variances	Means	Intercepts	Total
Total	8	0	5	0	0	13

Number of distinct sample moments:	10
Number of distinct parameters to be estimated:	8
Degrees of freedom (10 - 8):	2

			Estimate	S.E.	C.R.	P	Label
C7B	<---	LAbility	1.000				
C7E	<---	LAbility	1.343	.571	2.351	.019	

C7F	<---	LAbility	4.632	2.975	1.557	.119	
C7G	<---	LAbility	1.446	.614	2.356	.018	

			Estimate
C7B	<---	LAbility	.195
C7E	<---	LAbility	.295
C7F	<---	LAbility	.973
C7G	<---	LAbility	.297

	Estimate	S.E.	C.R.	P	Label
LAbility	.031	.028	1.119	.263	
e1	.791	.079	9.976	***	
e2	.594	.066	9.047	***	
e3	.038	.362	.106	.916	
e4	.678	.075	9.018	***	

	Estimate
C7G	.088
C7F	.946
C7E	.087
C7B	.038

M.I. Par Change

M.I. Par Change

M.I. Par Change

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	2		-.006	9999.000	80.258	0	9999.000
1	e	1		-.001	.669	31.836	20	.865
2	e	0	42.158		.556	23.758	7	.963
3	e	0	384.255		1.514	12.566	1	.759
4	e	0	1663.339		.569	6.945	1	1.028
5	e	0	6362.422		.490	5.765	1	1.243
6	e	0	13284.899		.564	5.386	1	.935
7	e	0	67343.983		.336	5.029	1	1.133
8	e	0	62023.061		.391	4.926	2	.000
9	e	0	180094.225		.262	4.838	1	1.244
10	e	0	184686.946		.408	4.813	1	.726
11	e	0	633438.338		.133	4.785	1	1.070
12	e	0	545713.127		.232	4.782	1	.725
13	e	0	1007352.750		.026	4.780	1	1.007
14	e	0	1017846.410		.012	4.780	1	1.002
15	e	0	1021970.690		.000	4.780	1	1.000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	8	4.780	2	.092	2.390
Saturated model	10	.000	0		
Independence model	4	48.515	6	.000	8.086

Model	RMR	GFI	AGFI	PGFI
Default model	.032	.989	.946	.198
Saturated model	.000	1.000		
Independence model	.111	.895	.825	.537

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.901	.704	.940	.804	.935
Saturated model	1.000		1.000		1.000

Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.333	.300	.312
Model	PRATIO	PNFI	PCFI
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	2.780	.000	13.337
Saturated model	.000	.000	.000
Independence model	42.515	23.940	68.564

Model	FMIN	F0	LO 90	HI 90
Default model	.023	.013	.000	.064
Saturated model	.000	.000	.000	.000
Independence model	.232	.203	.115	.328

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.082	.000	.179	.210
Independence model	.184	.138	.234	.000

Model	AIC	BCC	BIC	CAIC
Default model	20.780	21.172	47.557	55.557
Saturated model	20.000	20.490	53.471	63.471
Independence model	56.515	56.711	69.904	73.904

Model	ECVI	LO 90	HI 90	MECVI
Default model	.099	.086	.150	.101
Saturated model	.096	.096	.096	.098
Independence model	.270	.182	.395	.271

Model	HOELTER .05	HOELTER .01
Default model	262	403
Independence model	55	73

Minimization:	.000
Miscellaneous:	.171
Bootstrap:	.000
Total:	.171

5.LOW INCENTIVES TO CONTROL COSTS

Parameter Summary (Group number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	6	0	0	0	0	6
Labeled	0	0	0	0	0	0
Unlabeled	4	0	6	0	0	10
Total	10	0	6	0	0	16

Number of distinct sample moments: 15

Number of distinct parameters to be estimated: 10

Degrees of freedom (15 - 10): 5

			Estimate	S.E.	C.R.	P	Label
C1I	<---	LINCENTIVES	1.000				
C1H	<---	LINCENTIVES	1.585	.494	3.210	.001	
C1D	<---	LINCENTIVES	1.656	.501	3.308	***	
C1C	<---	LINCENTIVES	1.978	.577	3.427	***	

C1B	<---	LINCENTIVES	1.224	.380	3.221	.001	

			Estimate
C1I	<---	LINCENTIVES	.330
C1H	<---	LINCENTIVES	.458
C1D	<---	LINCENTIVES	.504
C1C	<---	LINCENTIVES	.660
C1B	<---	LINCENTIVES	.463

	Estimate	S.E.	C.R.	P	Label
LINCENTIVES	.077	.040	1.938	.053	
e1	.626	.066	9.500	***	
e2	.726	.084	8.609	***	
e6	.618	.076	8.117	***	
e7	.389	.070	5.570	***	
e8	.422	.049	8.562	***	

	Estimate
	Estimate
C1B	.214
C1C	.436
C1D	.254
C1H	.210
C1I	.109

M.I. Par Change

e6 <--> e8 5.013 -.088

M.I. Par Change

M.I. Par Change

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	2		-.106	9999.000	125.146	0	9999.000
1	e	1		-.063	1.047	57.129	21	.570
2	e	0	20.473		.645	27.469	5	.734
3	e	0	100.842		.852	14.024	1	.986
4	e	0	359.995		.493	11.310	1	.789
5	e	0	1114.079		.280	9.642	1	1.047
6	e	0	1937.558		.254	9.505	1	.947
7	e	0	2756.305		.049	9.481	1	1.017
8	e	0	2774.538		.010	9.481	1	1.005
9	e	0	2769.910		.000	9.481	1	1.000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	10	9.481	5	.091	1.896
Saturated model	15	.000	0		
Independence model	5	100.907	10	.000	10.091

Model	RMR	GFI	AGFI	PGFI
Default model	.028	.983	.949	.328
Saturated model	.000	1.000		
Independence model	.146	.808	.711	.538

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.906	.812	.953	.901	.951
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.500	.453	.475

Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	4.481	.000	17.299
Saturated model	.000	.000	.000
Independence model	90.907	62.339	126.937

Model	FMIN	F0	LO 90	HI 90
Default model	.045	.021	.000	.083
Saturated model	.000	.000	.000	.000
Independence model	.483	.435	.298	.607

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.065	.000	.129	.285
Independence model	.209	.173	.246	.000

Model	AIC	BCC	BIC	CAIC
Default model	29.481	30.072	62.952	72.952
Saturated model	30.000	30.887	80.207	95.207
Independence model	110.907	111.202	127.642	132.642

Model	ECVI	LO 90	HI 90	MECVI
Default model	.141	.120	.202	.144
Saturated model	.144	.144	.144	.148
Independence model	.531	.394	.703	.532

Model	HOELTER .05	HOELTER .01
Model	HOELTER .05	HOELTER .01
Default model	245	333
Independence model	38	49

Minimization:	.001
Miscellaneous:	.243
Bootstrap:	.000

Total:	.244

6.REGENERATION OF CONTRACTS

Parameter Summary (Group number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	5	0	0	0	0	5
Labeled	0	0	0	0	0	0
Unlabeled	3	0	5	0	0	8
Total	8	0	5	0	0	13

Number of distinct sample moments: 10

Number of distinct parameters to be estimated: 8

Degrees of freedom (10 - 8): 2

			Estimate	S.E.	C.R.	P	Label
C6A	<---	Renegotiation	1.000				
C6G	<---	Renegotiation	.763	.196	3.889	***	
C6H	<---	Renegotiation	1.776	.449	3.954	***	
C6I	<---	Renegotiation	.989	.228	4.327	***	

			Estimate
C6A	<---	Renegotiation	.428
C6G	<---	Renegotiation	.384
C6H	<---	Renegotiation	.850
C6I	<---	Renegotiation	.460

	Estimate	S.E.	C.R.	P	Label
	Estimate	S.E.	C.R.	P	Label
Renegotiation	.148	.057	2.599	.009	
e1	.662	.073	9.044	***	
e2	.498	.053	9.392	***	

e3	.180	.100	1.805	.071	
e4	.541	.062	8.711	***	

	Estimate
C6I	.211
C6H	.722
C6G	.148
C6A	.183

M.I. Par Change

M.I. Par Change

M.I. Par Change

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	2		-.093	9999.000	116.090	0	9999.000
1	e	0	159.648		.789	39.993	20	.807
2	e	0	14.248		.827	23.649	5	.000
3	e	0	27.258		.394	8.952	2	.000
4	e	0	96.794		.567	3.824	1	1.020
5	e	0	249.946		.240	2.191	1	1.110
6	e	0	440.131		.209	1.953	1	.977
7	e	0	592.339		.043	1.917	1	1.019
8	e	0	607.576		.008	1.917	1	1.004
9	e	0	607.810		.000	1.917	1	1.000

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	8	1.917	2	.384	.958
Saturated model	10	.000	0		

Independence model	4	91.632	6	.000	15.272

Model	RMR	GFI	AGFI	PGFI
Default model	.017	.995	.977	.199
Saturated model	.000	1.000		
Independence model	.151	.802	.669	.481

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.979	.937	1.001	1.003	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.333	.326	.333
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	.000	.000	7.643
Saturated model	.000	.000	.000
Independence model	85.632	58.296	120.410

Model	FMIN	F0	LO 90	HI 90
Default model	.009	.000	.000	.037
Saturated model	.000	.000	.000	.000
Independence model	.438	.410	.279	.576

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.000	.000	.135	.551
Independence model	.261	.216	.310	.000

Model	AIC	BCC	BIC	CAIC
Default model	17.917	18.309	44.694	52.694
Saturated model	20.000	20.490	53.471	63.471
Independence model	99.632	99.828	113.021	117.021

Model	ECVI	LO 90	HI 90	MECVI
Default model	.086	.086	.123	.088
Model	ECVI	LO 90	HI 90	MECVI
Saturated model	.096	.096	.096	.098
Independence model	.477	.346	.643	.478

Model	HOELTER .05	HOELTER .01
Default model	654	1005
Independence model	29	39

Minimization:	.031
Miscellaneous:	.156
Bootstrap:	.000
Total:	.187

7.LOW RISK TRANSFER

Parameter Summary (Group number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	7	0	0	0	0	7
Labeled	0	0	0	0	0	0
Unlabeled	5	0	7	0	0	12
Total	12	0	7	0	0	19

Number of distinct sample moments: 21

Number of distinct parameters to be estimated: 12

Degrees of freedom (21 - 12): 9

			Estimate	S.E.	C.R.	P	Label
C3A	<---	Transferr	1.000				
C3B	<---	Transferr	1.380	.342	4.029	***	
C3C	<---	Transferr	1.536	.360	4.262	***	
C3D	<---	Transferr	1.132	.285	3.973	***	

C3E	<---	Transferr	1.562	.363	4.310	***	
C3G	<---	Transferr	.941	.270	3.486	***	

			Estimate
C3A	<---	Transferr	.387
C3B	<---	Transferr	.518
C3C	<---	Transferr	.614
C3D	<---	Transferr	.500
C3E	<---	Transferr	.646
C3G	<---	Transferr	.382

	Estimate	S.E.	C.R.	P	Label
Transferr	.119	.049	2.424	.015	
e1	.676	.072	9.452	***	
e2	.620	.072	8.603	***	
e3	.464	.062	7.500	***	
e4	.459	.052	8.750	***	
e5	.406	.058	7.015	***	
e6	.617	.065	9.475	***	

	Estimate
C3G	.146
C3E	.417
C3D	.250
C3C	.378
C3B	.268

C3A	.150

			M.I.	Par Change
e4	<-->	e5	6.335	.088
e2	<-->	e5	4.134	-.083

M.I. Par Change

M.I. Par Change

C3E <--- C3D 4.408 .133

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	2		-.219	9999.000	182.529	0	9999.000

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
1	e	0	18.886		.922	81.894	20	.671
2	e	0	193.067		1.037	71.095	3	.000
3	e	1		-.029	1.341	45.839	2	.000
4	e	0	333.411		.211	23.936	5	.948
5	e	0	669.909		.339	16.689	1	1.076
6	e	0	920.604		.094	16.398	1	1.050
7	e	0	1024.975		.023	16.395	1	1.016
8	e	0	995.205		.001	16.395	1	1.001

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	12	16.395	9	.059	1.822
Saturated model	21	.000	0		
Independence model	6	166.761	15	.000	11.117

Model	RMR	GFI	AGFI	PGFI
Default model	.033	.974	.939	.417
Saturated model	.000	1.000		
Independence model	.167	.734	.627	.524

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.902	.836	.953	.919	.951
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Model	PRATIO	PNFI	PCFI
Default model	.600	.541	.571
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model	NCP	LO 90	HI 90
Default model	7.395	.000	22.829
Saturated model	.000	.000	.000
Independence model	151.761	113.910	197.070

Model	FMIN	F0	LO 90	HI 90
Default model	.078	.035	.000	.109
Saturated model	.000	.000	.000	.000
Independence model	.798	.726	.545	.943

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.063	.000	.110	.290
Independence model	.220	.191	.251	.000

Model	AIC	BCC	BIC	CAIC
Default model	40.395	41.227	80.561	92.561
Saturated model	42.000	43.455	112.289	133.289
Independence model	178.761	179.177	198.843	204.843

Model	ECVI	LO 90	HI 90	MECVI
Default model	.193	.158	.267	.197
Saturated model	.201	.201	.201	.208

Independence model	.855	.674	1.072	.857

Model	HOELTER .05	HOELTER .01
Default model	216	277
Independence model	32	39

Minimization:	.000
Miscellaneous:	.203
Bootstrap:	.000
Total:	.203