## Research Report

# Exploring the Contractual Incentivization and Penalization of Professional Consultants' Performance in the Construction Industry


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# Abstract

In the construction industry, professional consultants are appointed in a project to provide professional services to deliver the project successfully. However, in contact practice, project deliverables are repeatedly compromised due to consultants' poor performance. The study is aimed at exploring the use of contractual incentivization and penalization as a remedy and motivation for consultants' performance in the construction industry in South Africa. This is because a penalty is a remedy and an incentive is a motivation that has been found to improve performance.

Using the mixed-method choice, survey questionnaires were used to collect quantitative data and structured interviews were used to collect qualitative data. The professional opinions of 22 professional consultants in South Africa were collected. The study has used descriptive statistics, Relative Importance Index (RII), Bivariate analysis as well as cross-tabulation to analyze quantitative data whereas Thematic analysis and Content analysis were used to analyze qualitative data with the aid of Microsoft Excel computer software for the analysis.

The influence of professional consultants' performance on a project has been subject to scrutiny. Professional consultants' poor performance compromises one or more of the project deliverables and ultimately the project performance. The consultant's poor performance traits that were found to have a negative impact on the project are categorized into inadequate input, variation orders, inconsistent documentation, poor flow of information, design issues and inaccurate estimate. These points out that the consultants' performance is an issue in the South African construction industry despite the standard contracts that govern professional service delivery. Therefore, a penalty-incentive payoff model has been developed to improve the consultants' performance. Each incentive/penalty is used to penalize or incetivize each of the main KPIs, that is the Time/Schedule Incenive is adopted to incentivize or penalize Time KPI, Cost Incentive is adopted to incentivize or penalize Cost KPI, Quality Incentive is adopted to incentivize or penalize the Quality KPI and Design Integrity Incentive is adopted to incentive or penalize Sustainability KPI. The incentive and penalties ought to be built in the Professional Service Contract (PSC) pending the nature of the specific project and Key Performance Indicator (KPI) metrics that are important to the project. Also, the adoption of the scorecard

system that equally penalizes and incentivizes the specific KPIs should be incorporated into the PCS because using one mechanism is one-sided.

The study underlines several areas of improving the professional consultants' performance in the construction industry through the adoption of incentive and penalty mechanisms. Therefore, this study provides a piece of fundamental knowledge and direction for further research to constantly improve the consultants' performance through the implementation of contractual strategies and awareness of the effectiveness of incentives and penalties.

**Keywords:** Incentives, Penalties, Professional Consultants, Performance, Construction Industry, Key Performance Indicators, Construction Contracts

## Declaration

I, Morongoa Sebola, declare that this Research Report entitled Exploring the Contractual Incentivization and Penalization of Professional Consultants' Performance in the Construction Industry in South Africa is my own, unaided work. It is submitted in partial fulfillment of the requirements of the degree of Master of Science in Building in the field of Project Management at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university. All sources used and quoted have been indicated and acknowledged as a complete reference.

Candidate Signature:

Morongoa Sebola: 549535

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***"Tau tša hloka seboka di šitwa ke nare ehlotša"***

# List of Publications

Allen, S., Moabi, M., Ramushu, M., Sebola, M. and Ugulu, R.A. (2016). "The influence of Motivation on Labour productivity on building construction projects in South Africa", *International Journal of Scientific & Engineering Research*, 7(4), 1066-1073

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# List of Abbreviations

*Table A.1: List of Abbreviations*

| Abbreviation | Description |
|---|---|
| AACE | American Association of Cost Engineering |
| BOQ | Bill of Quantity |
| BRICS | Brazil, Russia, India, China and South Africa |
| CESA | Consulting Engineers South Africa |
| CII | Construction Industry Institute |
| CIVETS | Columbia, Indonesia, Vietnam, Egypt, Turkey and South Africa |
| CCT | Certified Cost Technician |
| COVID-19 | Coronavirus disease of 2019 |
| df | Degree of freedom |
| ECC | Engineering and Construction Contract |
| ECSA | Engineering Council of South Africa |
| EPCM | Engineering, Procurement, and Construction Management |
| FIDIC | Fédération Internationale Des Ingénieurs-Conseils (International Federation of Consulting Engineers) |
| JBCC | Joint Building Contracts Committee |
| KPI | Key Performance Indicators |
| NEC3 | New Engineering Contract 3 |
| NCR | Non-Conformance Report |
| *p*-Value | Probability Measure |
| PhD | Doctor of Philosophy |
| PI | Professional Indemnity |
| PROCSA | Professional Consultants Service Agreement |
| PSC | Professional Services Contract |
| QBS | Quality Bases Selection |
| QS | Quantity Surveyor |
| RII | Relative Importance Index |
| ROI | Republic of Ireland |

| | |
|---|---|
| UK | United Kingdom |
| USA | United States of America |

# List of Symbols

*Table B.1: List of Symbols*

| Symbol | Description |
|---|---|
| α | Cronbach's alpha |
| $\bar{X}$ | Mean |
| $X^2$ | Chi-Square |
| σ | Standard Deviation |
| R | Ranking |
| KRT | Kurtosis |
| SKN | Skewness |

# Chapter 1: Introduction to the Study

## 1.1. Background of the study

Professional Services Contract (PSC) is governed by various standard contracts between the contracting parties and because the diversity of the construction service delivery is increasing gradually this has given rise to the expedition for a better-quality and improved contracting strategy that enhances performance (Ogwueleka and Maritz, 2014). These standard contracts entail the background of the contractual obligation of the contracting parties. The standard form of contracts such as FIDIC Client/Consultant, NEC3 PSC and PROCSA are amongst other contracts that have been developed for the construction contract between the client and the consultants. These contracts are often used to appoint professional consultants in South African construction projects.

In the construction context, the client often does not have the expertise concerning construction matters. Therefore, the client employs a variety of professional consultants to perform construction services on his behalf thereby providing input and information concerning the delivery of the project including the project implementation and execution plan, project objectives and how they will be achieved, preparing the scope of work, designing the project and specifications required to meet the project requirements, preparing the bill of quantities (BOQ) and project cost estimates, project schedule and determining the duration of the project, preparing and providing the Health and Safety information, providing environmental and geotechnical data, preparing procurement and construction data and managing the project up until the project delivery stage.

In the construction background, professional consultants mean “the party named in the agreement, who is employed as an independent professional firm by the client to perform services, and legal successor to the consultants and permitted assignees” (FIDIC Client/Consultant, 1998). Their contractual obligation is inclusive of establishing end user’s requirements, project objectives and scope, providing information, administering, managing, monitoring, coordinating and supervising processes and contracts to facilitate the effective completion of the project (PROCSA, 2015). Consequently, the project's success or failure is influenced by the professional consultants' performance. The performance and success of the

project depend on project performance indicators i.e. “time, cost, quality, client satisfaction and safety”, this means that these indicators are used to measure the project performance, consequently, if one or more of these performance indicators are not achieved, then it means that in part, the professional consultants have performed poorly (Meng and Gallagher, 2012; Dadzie, Abdul-Aziz and Kwame, 2012).

The project deliverables “time, cost and quality” are often not achieved due to professional consultants' failure to reasonably perform their contractual obligations and often cost the client. This is the common outcome of the functional input that is inadequate in addition to poorly facilitated project proposals and schedules as well as incorrect and understated timelines. Consequently, these inadequate inputs by the professional consultants turn out to be the contractual baselines that are authorized and mandated. This aligns with the findings from the study conducted in Vietnam which has found that many projects are poorly planned because the importance of the project planning is often disregarded by the consultants. These findings regarding the project planning failure are consistent with the findings from several studies conducted in BRICS countries (Brazil, Russia, India, China and South Africa) and CIVETS countries (Columbia, Indonesia, Vietnam, Egypt, Turkey and South Africa) (Nguyen and Chileshe, 2015). This implies that the construction industry in South Africa is also faced with problems related to project failures resulting from poor input by professional consultants.

Table 1.1 summarizes the factors that were found to be associated with consultants’ poor performance in the construction industry.

*Table 1.1: Consultants Poor Performance deliverables*

| Authors | Consultants’ poor performance factors |
|---|---|
| Enshassi, Mohamed and Abdel-Hadi (2013) | • Lack/limited access to information<br>• Delayed design changes |
| Hasan Baroudi, Elmualim, and Rameezdeen (2018) | • Poor communication<br>• Variation orders<br>• Inadequate and errors in specifications and drawings<br>• Poorly facilitated contract |

| Authors | Consultants' poor performance factors |
|---|---|
| Laryea (2011) | • Poorly arranged data<br>• A late response to the request for information<br>• Poor flow of information<br>• Poorly compiled schedules and inaccurate BOQ<br>• Poorly written specifications and errors in working drawings |
| Odusami and Onwukube (2008) | • Poor flow of information<br>• Poor design<br>• poor relationship between the contracting parties<br>• longer time is taken to make a decision |
| Yap, Low and Wang (2017) | • Poorly compiled tender and contract documents<br>• Poor management amongst designers<br>• Complex designs that are confusing |

### 1.2. Substantiation of the problem

There is consistent scrutiny of professional consultants' performance in ensuring the positive outcome of project performance. There is a common problem in contract practice that is professional consultants' failure to maintain and improve the performance of the project. In Ghana, it has been found that there is a direct relationship between professional consultants' performance and project performance (Dadzie *et al.*, 2012). This implies that how the project performs depends on how the consultants perform their contractual obligations. The factors that were found to be key project performance measures and client' common requirements include but are not limited to "completing the project on time, on the estimated budget, with no defects, fit for purpose and completed right the first time", this means that if one or more of these factors is not met then the consultants are considered to have performed poorly (Dadzie *et al.*, 2012). These findings align with the study conducted by Sunjka and Jacob (2013) which has listed the outcomes that are associated with consultants' poor performance. These outcomes

are “time overrun, budget overrun, poor quality project, bad public relation, litigation, arbitration, disputes and claims as well as the total abandonment of the project” (Sunjka and Jacob, 2013).

Common characteristics that are the predominant source of project poor performance relate to incorrect and understated timelines, underestimated and/or overestimated project cost, inaccurate BOQ, complex designs, schedules that are not sufficiently facilitated with essential practical input, unclear specifications and poorly defined scope of work, frequent changes and postponement in decision making as well as the late response for a request of information (Jyh-Bin and Chien-Chung, 2015; Mulla and Waghmare, 2015). These factors were found to be the extreme errors which the consultants' role is central to and are often undetected for a longer period and ultimately leads to the possibility of the occurrence of construction rework which in turn compromises the project budget and duration (Dadzie *et al.*, 2012; Simpeh, 2012).

The project cost estimate influences the outcome of the project. This is because the cost estimates become a baseline for determining the feasibility of the project, making funding decisions and site budget control. In Nigeria, it has been found that where project costs are underestimated the project duration is often compromised and the overall project gets delayed “while clients seek additional funding and sometimes, projects get deferred if the client does not get additional funding” (Odusami and Onukwube, 2008). These findings align with the results of the study conducted in the Gaza Strip which focused on “factors affecting the accuracy of pre-tender cost estimates”. The study has found that the cost estimates’ level of accuracy determines the success and/or failure of the project. Enshassi *et al*., 2013 have justified this with the reason that onsite, “greater actual expenditure” often occurs as a result of the inaccurate cost estimate (Enshassi *et al.*, 2013). Furthermore, projects frequently get executed with insufficient funds and the client ends up having problems with payment for the cost of overdraft and emergency loans throughout the construction phase as a result of underestimation of cost (Odusami and Onukwube, 2008).

The case study conducted in the United Kingdom (UK) by Laryea (2011) supports the claim that professional consultants’ poor performance is a problem faced in the construction industry globally. The case study was based on “the quality of tender documents” in the construction industry which in detail means “all the relevant information about the proposed contract, terms and condition provided to the contractor which will enable the contractor to price the work as

accurately as possible" (Laryea, 2011). However, in construction contract practice the tender documents are rarely adequate, this means that they are inconsistent and unclear irrespective of the existing standards that are supposed to aid in producing clear tender documents (Laryea, 2011). Furthermore, it has been indicated from the case study that unclear and poor quality "tender documents lead to inaccurate estimates, claims and disputes" (Laryea, 2011). The case study has further revealed that poor quality tender documents are an ongoing problem. These findings back up the claim that professional consultants constantly perform poorly regardless of being appointed to provide adequate information, administration acceptable supervision, and coordination to produce quality tender documents.

Poor administration of tender documents is one of the problems faced in the construction industry in Malaysia. Poor administration of tender documents is a predominant cause of construction reworks. Poor administration of tender documents leads to tender documents that have errors if not discovered in the early phase and ultimately construction reworks which in turn compromises the project cost, schedule, quality as well as resources required to execute the project (Simpeh, 2012; Yap *et al.*, 2017). These Errors that are found in the tender documents are design errors and ambiguous scope of work (Yap *et al.*, 2017; Simpeh, 2012). Design errors have been found to contribute to approximately 79% of total reworks cost (Construction Industry Institute (CII), 1989 as cited by Simpeh, 2012). Likewise, in Malaysia, the cost of construction rework has been found to range between 3.1% to 6% of the project cost (Yap *et al.*, 2017).

The study conducted in the Niger Delta region of Nigeria has determined numerous factors that are related to consultants' poor performance which is the predominant cause of project delays. These factors are poor administration of contracts, complex and errors in designs, late "identification of errors in drawings and specification, inadequate contracting and packaging strategy, late inspection and testing as well as poorly coordinated information" (Simpeh, 2012; Sunjka and Jacob, 2013).

On-site, the project team is faced with the challenges of factors that result from the consultants' poor performance because they find it difficult to interpret and execute the site layout designs as well as the construction works to be performed. The site team further finds it difficult to plan and execute construction activities and phases that overlap. These challenges are caused by the

complex designs, ambiguous specifications and poor flow of information from consultants (Odusami and Onukwube, 2008; Yap *et al*., 2017).

Numerous researchers have been studying incentives and consider incentives a mechanism that improves the professional consultants' performance in a project. For years, Rose and Manley amongst other researchers have been studying the incentives as a mechanism that motivates workers. The abovementioned researchers amongst other researchers have found that incentives encourage performance and ultimately achieve the project objectives (Hughes, Yohannes and Hilig, 2007; Meng and Gallagher, 2012; Ogwueleka and Maritz, 2016; Rose and Manley, 2005; Rose and Manley, 2007; Rose and Manley, 2010; Rose and Manley, 2011). Accordingly, incentives and disincentives (penalty) are mechanisms used in a contract to motivate and remedy performance (Meng and Gallagher, 2012). This statement is justified with the findings from the study conducted by Meng and Gallagher (2012) who found that projects in the UK and Republic of Ireland (ROI) that have used contractual incentives have performed better than non-incentive projects.

Contrary to the findings that incentives and penalties enhance performance, Merrow (2011) has argued that the success of a project is not influenced by the provision of contractual incentives. Merrow has defended this with the argument that the main objective of the project is to save costs and thus providing contractual incentives in a project is an additional cost to the project (Merrow, 2011). This argument is supported by Suprapto, Bakker, and Mooi (2016) who concluded that contractual incentive is not a game-changer, nevertheless, the attitude and the performance of the contracting parties throughout the project lifecycle is what regulates the outcome of the project (Suprapto *et* al., 2016).

Given the impact of professional consultants' performance on the project performance, it is important that their performance and the impact of the consultants' performance has on a project outcome be studied in detail and explore ways that can be incorporated into the PSC to make the consultants improve and optimize their performance.

### 1.3. Problem statement

In practice, professional consultants are appointed by the client to provide input, advice, coordination, supervision, and administration of the contract. However, project deliverables

are constantly compromised due to consultants' poor performance which includes poor facilitation of project proposal and contract, incorrect schedule, design errors, inconsistent and unclear documentation, and ambiguous specification which becomes the contractual baselines that are mandated and as a result, client experiences damages and losses. Therefore, the study seeks to explore contractual strategies that can improve the consultants' performance.

### 1.4. Assumptions

1. Professional consultants' poor performance has a negative influence on the project performance
2. Clients often make a loss due to consultants' poor performance
3. Professional consultants are not adequately incentivized and penalized for their absence of obligation
4. A contractual incentive is a form of motivation that increases consultants' commitment to the project and ultimately improves their performance
5. The penalty is a remedy that is instituted as a consequence of poor performance, thus serving as a deterrent and a driver to ensure the performance of duties

### 1.5. Primary research question

How can appropriate incentives and penalties be built into the Professional Service Contract to ensure high performance of consultants?

### 1.6. Secondary research questions

From the impression of the primary research question, the study further answers the following secondary research questions:

1. What are the roles and responsibilities of professional consultants in a project?
2. What are the project's Key Performance Indicators?
3. What is the impact of professional consultants' poor performance on a project?
4. What professional service agreement is/are used to appoint professional consultants in the construction industry in South Africa?

5. What are the incentives and penalties built into various contracts to ensure the consultants' performance?
6. How effective are the existing PSC penalties and incentive clause in a project?

### 1.7. Research aim

The study is aimed at exploring different incentives and penalty mechanisms that can be incorporated into the Professional Services Contract to improve the professional consultants' performance working in construction projects in South Africa.

### 1.8. Research objectives

The research objectives that have been used to unpack and address the research aim are listed below

1. To determine the roles and responsibilities of professional consultants in a project
2. To determine the project's Key Performance Indicators
3. To determine the impact of consultants' low performance on a project
4. To determine Professional Services Agreement used to appoint professional consultants in the construction industry in South Africa
5. To determine the incentive and penalty Clauses that are built into various contracts that deal with professional consultants' performance
6. To assess the effectiveness of the existing PSC penalties and incentive Clauses and further raise awareness of contract Clauses to clients who do not have experience in construction and contractual matters

### 1.9. Limitations

The factors listed below have limited the emphasis and direction of the study without compromising its meaning, importance, relevance and quality.

1. Lack of studies that made an emphasis on the incentivization and penalization of consultants' performance
2. The respondents' inability to respond to part or all of the questions due to their organization's disclosure terms.

# Chapter 2: Literature Review

## 2.1. Introduction to literature review

Factors that are a predominant source of construction project failure and the remedies have been studied by various researchers in different countries, therefore revisiting similar studies in the context of the South African consultants' performance as a factor that has an impact on the project failure and contractual incentive and penalty as a remedy for performance deserves distinct consideration. This is because the concept of every project starts with the client and the advice and input from the consultants. Thus, the overall implication for this is that the success of the project depends on the performance of the consultants on top of other factors that influence the success of a project. Therefore, the need to review the literature that focuses on the themes and concepts that relate to construction professional consultants' performance and how it impact the project, literature and contract clauses that address the incentives and penalties and the influence they have on performance to the extent that the literature and contracts disclose.

This chapter first addresses the background of professional consultants by outlining the definitions adopted for this study, then the consultants' contractual responsibilities as delineated in the PSC, secondly the impact of consultants performance on a project, the evaluation of incentives and penalty mechanism including the definitions adopted for this study, the benefits of incentives and penalties and discussion of incentive and penalty clauses in the context of construction contracts.

## 2.2. Professional consultants

### *2.2.1. Professional consultants background*

Professional consultants have numerous definitions from different authors. According to PROCSA, (2017) consultants refer to "the contracting party named in the schedule providing the services" (PROCSA, 2017). The professional consultant definition adopted for this study is the construction professional independent party that is contractually appointed and named in the PSC to provide and perform construction professional services on behalf of the client

(FIDIC Client/Consultant, 1998). According to NEC3 PSC (2005), the appointed professional consultant provides unbiased and impartial professional services and holds the client's key interests as established in the scope of services. Moreover, the consultant is a professional party that has realistic communication and leadership skills. Also, professional consultants must be competent to manage clients' requirements as well as project designs and construction processes. Additionally, the appointed professional consultants have the capability to manage the risks involved in their contractual services (Dadzie *et al.*, 2012).

Professional consultants are engaged by the client to monitor and manage the project, that is they manage and support the contractor in order to deliver the project successfully on behalf of the client (Dadzie *et al.*, 2012). In construction contract practice, professional consultants include designers/architects, QS, estimators, planners, project managers, construction managers and engineers in various disciplines such as civil engineering and electrical to name but a few. In general, these professional consultants associate and complement each other to provide required services in order to achieve the project objectives (Appointment of Consultants Policy, 2015). Appointment of Consultants Policy (2015) further states that the legislation that governs the professional services delivery requires that, while the appointed professional consultants perform or provide their obligations they must not be under any PSC that conflicts with their existing contracted responsibility or put them in a situation that will not allow them to perform their contractual obligations.

### *2.2.2. Professional consultants' contractual responsibilities*

The client appoints professional consultants to establish project requirements by defining the project objectives and scope. While undertaking their duties, professional consultants work, consult and complement each other's professional expertise by incorporating each other's advice and input (PROCSA, 2015; Appointment of Consultants Policy, 2015). Their contractual obligations are commonly to provide and take accountability for project designs and specifications and put together the contract documents. Additionally, their obligations cover contract administration, monitoring, coordination, supervision and management of procurement and construction processes. They are also responsible for the operative facilitation of the project from "execution to completion, handover, and operation of the project" (PROCSA, 2015). The PSC requires the professional consultants to exercise their professional expertise with "care, diligence and must comply with rules and regulations governing their

professional services (NEC3 PSC, 2005; FIDIC Client/Consultant, 1998; PROCSA, 2017), they are also required to conform to the Health and Safety guidelines (NEC3 PSC, 2005).

Consultants are appointed to proficiently exercise their professional expertise in order to ensure that the project is delivered on time, within the estimated budget and with the desired quality that is in accordance with the technical specification as well as design standards and less or no defects, and ultimately give the client value for money. Furthermore, professional consultants roles and responsibilities include but are not limited to the following:

The following are typical contractual obligations that professional consultants are appointed to provide:

- To revise and update project specifications and designs as well as supplementary construction documentation (Dadzie *et al.*, 2012)
- To manage the construction works and contractors' operations on site (Dadzie *et al.*, 2012)
- To assess the contractors' program and review progress reports on site (Dadzie *et al.*, 2012)
- Evaluation and authorization of payment certificates (Dadzie *et al.*, 2012)
- Conducting inspection and test of construction works (Dadzie *et al.*, 2012)
- Conducting appraisal report and approval of claims relating to contractor' entitlement to EOT and additional payment (Dadzie *et al.*, 2012)
- They engage, understand and establish the client's preferences and requirements (Dadzie *et al.*, 2012; PROCSA, 2015)
- They provide vital input and information amongst each other as well as other contracting parties (PROCSA, 2015) in order to understand the project requirements and objectives (Dadzie *et al.*, 2012)
- They manage design limitations amongst their varying expertise and services provided and integrate the clients' requirements into the design then develop the impression to complete the project specifications, designs "cost plan and documentation program for the project" (PROCSA, 2015) intending to understand what specification and design is required to deliver a successful project (Dadzie *et al.*, 2012)
- They prepare and exchange the accurate procurement and construction data as well as documents for the operative procurement process and effectively evaluate the tenders (Dadzie *et al.*, 2012; PROCSA, 2015),

- They manage, monitor and administer the contracts, they also prepare and facilitate the procedures of contract documentation compulsory to complete the construction works (PROCSA, 2015), this is done so they understand the project technical requirements and construction procedures (Dadzie *et al.*, 2012)

### *2.2.3. The project's Key Performance Indicators (KPIs)*

In the construction context, performance measures relate to whether the works/services contracted to be performed are executed and completed on time, within the estimated and approved budget and required quality. Unlike misconduct, which is related to the behaviour of humans, performance is associated with the capability of the party to perform the appointed works (Claassen, n.d). In the construction background, performance is associated with the project estimated budget, project completion date, the required quality as well as the risks involved in delivering the project successfully (Hughes *et al.*, 2007).

Table 2.3.3 below shows the parameters that are considered significant performance indicators in a construction project.

*Table 2.3.3:Project Key Performance Indicators*

| Performance parameters | Performance indicator |
|---|---|
| Cost performance | • The effective cashflow arrangement, that is keeping the authorized budget within the limits of a time-based estimate<br>• Completing the project within the estimated cost<br>• Effective control of the cost from execution until project closeout<br>• Appropriate measurement and rectification of construction work from construction stage until handing over the project<br>• Keeping the actual cost on-site within the estimated budget constraints |
| Time performance | • Delivering the project on time |

| Performance parameters | Performance indicator |
|---|---|
| | • Communicating timeously and keeping late responses for information at a minimum<br>• Having less and practical claims related to the extension of time<br>• Having adequate procedure of scheduling works to minimize delays<br>• Having an effective control of changes to the project schedule |
| Quality performance | • Completing the project with acceptable quality and less or no defects<br>• Have a functional quality management plan before executing the construction work<br>• Put in the satisfactory effort to produce acceptable quality work |
| Safety performance | • Have regular safety training and exercise to practice and raise safety awareness<br>• Have safety control measures in place<br>• Reporting and recording of all near misses, incidents, and accidents<br>• Complying and conforming to all safety rules and regulations |

Source: (Ogwueleka and Maritz, 2016)

In Nigeria, the KPIs have been identified in order to model the incentive payoff to incentivize the specific performance in a project. Likewise, in South Africa factors that were found to be performance indicators are:

- Having a project that is sufficient for its use
- Providing services that are acceptable by the client
- Delivering the project with costs that do not exceed the estimated cost
- Putting in extra effort to the works or services provided
- Paying attention to detail while executing the contracted obligations (Claassen, n.d).

## 2.3. The impact of professional consultants' poor performance

The consultants' performance has a direct influence on project performance (Dadzie *et al*., 2012). Professional consultants' poor performance affects the project in different ways and the impact is also different. One of the leading impacts of consultants' poor performance in the construction industry is contractual claims and disputes. The other impact of consultant poor performance on a project is the contingency mark-up increase on the contractors' bid, this results from poorly compiled tender documents (Laryea, 2011). Poor tender documents are ambiguous and complex to read in nature and they also contain errors, ultimately leading to changes, additions, omissions and eventually an extension of time (Dadzie *et al.*, 2012). This is because, in practice, complexities and ambiguities are not straightforward processes thus time is wasted while site supervisors are guessing and interpreting complex and ambiguous tender documents (Laryea, 2011), this ultimately increases the contractors' operational cost on-site. Additionally, tendering cost is another problem that often results from consultant poor performance for the reason that QSs and cost estimators spend tremendous time writing up specifications based on assumptions and guesswork due to insufficiency of information provided to them (Laryea, 2011; Enshassi *et al.*, 2013). As a result of poor performance, one or more of the project deliverables is always compromised i.e. time, cost and quality. This is often due to construction rework (Dadzie *et al.*, 2012), poor project planning (Nguyen and Chileshe, 2015), underestimation and overestimation of project cost (Kolo, Yunusa and Dzikwi, 2011), poor designs (Nguyen and Chileshe, 2015), variation orders, poor flow of information (Odusami and Onukwube, 2008).

### *2.3.1. Poor flow of information*

Consultants' poor performance has a negative impact on the performance of the contracting parties and ultimately affects the overall project delivery (Dadzie *et al*., 2012). During the project setups, the alignment between design and estimating as well as what is required and expected between the design and estimating team is always not well understood due to poor flow of information leading to misaligned timelines. In Nigeria, it was found that poor flow of information is the predominant cause of inaccuracy in the project cost estimates (Odusami and Onukwube, 2008). Still in Nigeria, a similar study has found that during the early stages of the project the cost estimators and QSs are less engaged and are not provided with design

information from the designers/architect, and ultimately they end up producing inaccurate BOQs and cost estimates (Kolo *et al*., 2011).

### *2.3.2. Inaccurate project cost estimates*

Inaccurate project cost estimates are the cost estimates that have been overestimated and/or underestimated. Cost estimates that are overestimated are the main source of "low project feasibility that ultimately restrict the client from executing new projects (Kolo *et al.*, 2011), whereby underestimated costs are the main source of cost increase during construction and cost overrun because they mislead the "planners to high feasibility" and the project ends up being executed with a lower budget (Waziri and Bala, 2011). A similar study conducted in Nigeria also found that inaccuracy in cost estimates has a negative impact for the reason that clients find it difficult to make decisions in awarding the projects (Odusami and Onukwube, 2008).

### *2.3.3. Design-related issues*

The literature reviewed by (Sunjka and Jacob, 2013) has identified design-related issues as one of the predominant factors that cause project delays. Poor designs are considered to be designs with errors and are incomplete. In addition, design-related issues cause project delays because execution is often delayed from time wasted reviewing and revising poor designs several times before they get approved for use. Also, in a case where a design error is found, the works are frequently stopped for temporary up until the time the error is remedied, then ultimately affects the process of selecting the project contractors and suppliers (Sunjka and Jacob, 2013). In Vietnam, a similar study has been conducted and found that design-related issues such as regular design changes result from the consultants' poor performance and ultimately causes project failures (Nguyen and Chileshe, 2015). In Nigeria, it has been found that approximately 50% of the project failure is due to design-related issues such as design errors (Dadzie *et al*., 2012).

In other studies, conducted by Laryea, 2011 and Odusami and Onukwube, 2008, it was found that design-related issues are a source of inaccurate cost estimates (Laryea, 2011; Odusami and Onukwube, 2008). The inaccurate cost estimates in turn lead to poor tender documents as they form part of tender documents and ultimately lead to contractual claims and disputes on a project (Laryea, 2011). Additionally, design-related issues cause construction errors because

onsite, contractors find it difficult to understand the complex designs produced by consultants and end up constructing works with errors (Yap *et al.*, 2017) and eventually causing construction reworks (Dadzie *et al.*, 2012; Yap *et al.*, 2017).

### *2.3.4. Project reworks resulting from consultants' poor performance*

Project duration, cost, and quality are common project deliverables that are often affected by the construction rework. Yap *et al.*, 2017 have indicated in their study that rework is a global problem faced in the construction industry. Construction rework is an effort of redoing the original project objectives that were initially done incorrectly due to non-conformance, creating redundant time and cost of redoing former works (Simpeh, 2012). Rework results from various factors including but not limited to poor administration and inconsistent contract documentation which does not clearly define the scope of work and entail poorly written project specification and also contains poor design with errors (Yap *et al.*, 2017; Laryea, 2011; Simpeh, 2012).

In Ghana, it was found that cost associated with reworks can increase by more than 10% of the project total cost in governments projects (Dadzie *et al.*, 2012), meanwhile, in South Africa it was found that the cost related to construction reworks can increase by up to 6.28% and 4.89% of the total project cost in renovation projects and new projects respectively (Simpeh, 2012). Likewise, the literature reviewed by Yap *et al.*, (2017) has revealed that costs related to construction reworks can increase by up to 20% of the total project cost. The same study has found that the cost associated with reworks in Malaysia ranges between 3.1% to 6% of the total project cost in building projects (Yap *et al.*, 2017). These costs associated with reworks are costs incurred in remedying and redoing defective work and additional works that were not initially incorporated into the project-approved cost estimate.

### *2.3.5. Variation orders*

Like construction reworks, variation orders are also a global problem faced in the construction industry. In practice, construction contracts are hardly implemented and completed without variation orders (Laryea, 2016). A variation order is a written change order or amendments to the contract data such as changes to the specification and designs produced by engineers and designers/architects (Babalola and Idehem, 2011; AACE International CCT Primer, 2011).

Variation order is often initiated to add, omit, substitute, or make changes to the designs, specifications and/or construction works from what was initially approved in the agreement (Babalola and Idehem, 2011). The predominant cause of variation orders is design-related issues such as errors in the initial designs produced by consultants (Simpeh, 2012; Sunjka and Jacob, 2013; Babalola and Idehem, 2011). These errors that are found in the initial designs occur during the pre-feasibility stage and result from poor flow of information, poor management and lack of integration amongst the design team (Simpeh, 2012; Yap *et al.*, 2017).

Variation order affects the project duration and ultimately delays the project because often when the variation order is initiated the project is temporarily stopped (Sunjka and Jacob, 2013). In South Africa, variation order was found to be one of the compensation events that ultimately lead to contractual disputes and entitles the contractor to the extension of time as well as additional payment (Laryea, 2016).

## 2.4. Incentives and Penalties

### *2.4.1. Incentives and penalties background*

#### *Penalty*

Cambridge dictionary defines penalty as "an amount of money that someone is forced to pay for failing to obey a rule, law, etc." (Cambridge Dictionary, n.d). Various researchers such as (Bubshait, 2003; Hughes *et al*., 2007; Sun, Edara, and Mackley, 2012; Meng and Gallagher, 2012; and Paladugu, 2015) refer to the penalty as a disincentive. Penalties are used and are not limited to penalization of a contracting party who is in breach of contract, perform their contractual obligation poorly than "the expected performance from someone in their position is required to perform" and/or completely fail to perform their contracted obligations (Eggleston, 2009). Eggleston has further indicated that penalties must be imposed in all situations that include those that are identified from the start of the contract. Also, where penalties are incorporated into the contract to enhance performance, a party that suffers a loss or damage due to the poor performance of another party should be compensated for the actual damage incurred (Eggleston, 2009).

### *Incentive*

Cambridge dictionary defines incentive as "something that encourages a person to do something" (Cambridge Dictionary, n.d). The incentive is being referred to as monetary reward and bonus (Meng and Gallagher, 2012; Broome, 2002). An incentive is a motivational tool that triggers and puts the behaviour of employees on the right track and ultimately, sustains and achieves the project goal. The incentive is a motivation that satisfies the needs of employees thereby minimizing concerns and eliminating dissatisfaction feeling (Ajang, 2007).

In the construction background, an incentive is a mechanism that is contractually adopted to encourage the contracting parties' behaviour and subsequently their performance (Hughes *et al.*, 2007). Similarly, in contract practice, an incentive is adopted to motivate consultants and contractors to take required actions while performing their duties to advance on the project objectives, manage project cost and schedule to avoid overruns and deliver the project within the suitable confines (Broome, 2002; AACE International CCT Primer, 2011; Paladugu, 2015).

According to Meng and Gallagher (2012) using an incentive contracting strategy is important because it is viewed as a contacting approach that brings into line the objectives of the contracting parties by adopting the performance measures and linking them to performance and project targets. This statement aligns with the statement quoted and cited from Rose and Manley (2005) as cited by Kwawu and Laryea (2013), that "the basic principle of incentive contracting is simply to take advantage of a contractor's general objective to maximize his profits by allowing him to earn a greater profit if he performs the contract efficiently" (Kwawu and Laryea, 2013). Furthermore, Kwawu and Laryea, 2013 have indicated that incentive contracting strategy allows for the financial risk-sharing between the contracting parties, thereby forming a relationship amongst the project team that is active, cooperative and provides the change from the traditional contracting strategy (Paladugu, 2015).

### *Benefits of incentive and penalty*

Paladugu (2015) has reviewed various publications and identified several benefits that result from the use of incentives approach in a contract and the benefits are as follows:

- The flow of information in a project is enhanced

- The project is delivered on time without affecting the quality of the project
- The control, monitoring and management of the contract is improved
- The service provided is enhanced
- The anticipated project outcome is achieved
- The relationship between project cost, quality, and change management requirements is understood
- The alignment and focus of clients' requirements are improved and eventually, the clients' requirements are achieved
- Improvement of the schedule performance

(Paladugu, 2015)

### *2.4.2. Incentive mechanism in construction projects*

Like penalties, incentives are also incorporated into PSC where contracting parties agree to the terms of the contractual incentives. There are several forms of incentive mechanisms that can be adopted to improve the performance of contracting parties. Incentives have been characterized into various categories by different researchers and these incentive categories have been identified and how each incentive mechanism works has been discussed below.

#### ***Types of incentive mechanisms***

I. Time/schedule incentive

This incentive mechanism is provided in a form of a monetary bonus for completing the project early (Rose and Manley, 2011; Meng and Gallagher, 2012). Paladugu has further supported this by deducing that "an amount of money is paid for each day, week, or month (whatever the case may be) of an early completion" (Paladugu, 2015). The study which was focused on "Quantifying the impact of incentives on cost and schedule performance of construction projects in United State" made an emphasis that incorporating incentives into the contract has a positive influence on the project schedule and consequently reduces the project duration by up to 50% of the project duration (Paladugu, 2015).

II. Cost incentive

This type of incentive mechanism is related to financial/monetary incentive (Meng and Gallagher, 2012) which is frequently divided amongst the contracting parties in terms of ratio sharing and it is often included in the contract as a provision for the project in terms of cost-saving (Rose and Manley, 2011).

III. Design Integrity incentive

This type of incentive mechanism is adopted and used for producing designs. Construction works and an overall project that is satisfactory, in accordance with the client's requirements and the anticipated outcome of the project, that is a project with fewer to zero defects (Rose and Manley, 2005; Meng and Gallagher, 2012; Paladugu, 2015).

IV. Safety incentive

This type of incentive mechanism is adopted in a project that is successfully delivered with minimum risks and accidents (Rose and Manley, 2005) and also, where there is a conformance and compliance to safety regulations (Meng and Gallagher, 2012; Paladugu, 2015). The inclusion of safety incentives into the contract is important because it increases the conformance to safety regulations and ultimately minimizes incidents and accidents as well as injuries in construction projects (Paladugu, 2015).

Clients can improve their performance in one or more areas by using either or both contractual incentives to achieve maximum performance (Meng and Gallagher, 2012).

### *2.4.3. Incentive-Penalty alternative contracting strategy*

Contracting parties can receive their contractual incentive only when the condition for entitlement to an incentive has been met, this means that an incentive can only be awarded to a party that has adequately performed their contractual obligation and has completed the project on or before the completion date stated in the contract, within the estimated budget and with fewer to zero defects (Hughes *et al*., 2007). A financial incentive mechanism in a form of a reward or bonus is a contracting strategy that is more advanced to motivate and encourage contracting parties to improve their performance in the construction project (Rose and Manley, 2010; Rose and Manley, 2011). These findings have advanced from the study that has found that incentives are more effective than penalties, which means that an emphasis should be on

financial incentives rather than penalties, although the use and inclusion of both incentives and penalties are also effective. Broome has reasoned that even though the inclusion of penalties into the contract influences performance, there will be a challenge the moment the contracting parties start to shift away from being liable and put the blame on each other (Broome, 2002).

The standard form of contracts that are used on regular basis to appoint professional consultants in the South African construction industry is NEC3 PSC, PROCSA, and FIDIC Client/Consultant. Hence, integrating penalties and incentive terms into the contracting strategy involves a link to the standard form of contract (Kwawu and Laryea, 2013). The existing alternative contracting strategy that makes a provision for reimbursement mechanism for the actual cost of work is the "target cost" strategy. Furthermore, the target cost strategy makes a provision for incorporating risk-sharing and collaboration between contract parties (Laryea and Watermeyer, 2014). This means that this contracting strategy allows for an equal proportion of incentives and penalties for each party in a contract, that is no contracting party will be incentivized nor penalized more than the other.

The abovementioned PSCs make a provision for incentivizing and penalizing contracting parties for their performance. The following are the incentives and penalty provisions extracted from various construction contracts that can be enforced to improve performance.

NEC3 PSC Option X7 and FIDIC Conditions of Contract for Construction Clause 8.7 makes a provision for "delay damages" which is aimed at penalizing the consultants to pay the client for delay damages at "the rate stated in the contract data for each day from the completion date until completion" (NEC3 PSC, 2005; FIDIC Condition of Contract for Construction, 1999)). Likewise, in the client-contractor contract context, the NEC3 ECC Option X17 makes a provision for "Low-performance damages" which is meant to penalize the contractor to pay the client for damages that are caused by a low performance at a rate documented and approved in the contract documents. However, the penalty is applicable only if there is a proven indication that the damage is caused by the contractor's poor performance, that is the contractors' performance is not in accordance with the project KPIs documented and agreed upon in the contract documents (NEC3 ECC, 2005). Similarly, in the client-consultant context, the NEC3 PSC Option X6 and FIDIC Client/Consultant Clause 16.3 make a provision for incentivizing the professional consultants for completing the project on time, this option entitles the consultants to a monetary reward or bonus for early completion of the project.

Besides Option X6 of NEC3 PSC, NEC3 PSC Option C makes a provision for incentive contracting strategy setup which is referred to as “target contract with activity schedule”, this contacting strategy allows each activity of the professional service to be priced based on the lump sum pricing for the services performed (NEC3 PSC, 2005).

It has been mentioned in the literature that having KPIs in a project is a substantial need as they record and monitor the contracting parties’ performance. NEC3 PSC Option X20 makes a provision for project KPIs which complement the abovementioned contract options to measure the consultants' performance in a project to adequately penalize or incentivize their specific performance (NEC3 PSC, 2005). Furthermore, NEC3 PSC Option X20 makes use of incentive schedules to indicate the target of professional consultants' performance. This is achieved by reporting and measuring the consultants’ performance against the project KPIs. This means that in contract practice the consultants submit to the client the proposal that indicates how their performance will be improved to achieve the target when they don’t achieve the target entailed in the incentive schedule. This implies that the client will incentivize the consultants for performance only when the performance has been improved and the target has been achieved, the incentive will then conform to the rate documented in the incentive schedule (NEC3 PSC, 2005).

## 2.5. Key findings of the literature review

NEC3 PSC, FIDIC Client/Consultant and PROCSA are standard contracts used to appoint professional consultants in the construction industry in South Africa. These standard contracts detail the consultants' contractual roles and responsibilities as well as how they should perform their contracted professional services. There is an alignment of professional consultants' roles and responsibilities outlined in the PCS and the publications reviewed. It was found that the typical professional consultants' roles and responsibilities in a project involve providing professional services including, designing, engineering, contract administration, project monitoring, coordination, control and facilitation from the inception phase up until the project closeout phase.

Professional consultants' poor performance is a problem faced in the construction industry globally. In contract practice, the professional consultants' poor performance is measured against the project KPIs that are documented in the contract document. The project KPIs are

usually the time KPI, cost KPI, quality KPI and safety KPI and these are often influenced by the consultants' poor performance in a project. The consultants' performance that is often considered poor includes the poor flow of information, unclear and ambiguous tender documents that entail poor specification and designs with errors. These factors are often left undetected for a longer period and they result in inaccurate project cost estimates and scheduled, reworks and variation orders and ultimately compromise the project execution and delivery.

The review of publications has found that most industries use the incentives and penalty mechanism to enhance good performance and remedy poor performance. It was further found that the incentive and penalty mechanism can be used in conjunction, but with a focus on incentives for the reason that penalties tend to make the contracting parties blame each other to shift away from their liability.

Cost incentives, time incentives, quality incentives as well as safety incentives were found to be the incentive mechanisms that are effective to enhance the consultants' performance and ultimately the performance of the project. These incentive mechanisms are used to incentivize the contracting parties for completing the project within the estimated cost, on or before the completion date stipulated in the contract documents, with fewer or no defects and minimum injuries and accidents.

The incentive mechanism can be coupled with the Options provided by the NEC3 PSC which allows for the incorporation of incentives into the PSC. These Options are:

- Option X6 entitles the professional consultants to an incentive in a form of a monetary reward or bonus for early completion of the project
- Option X7 entitles the client to penalize the consultants for project delay that is due to their poor performance
- Option X20 makes a provision for measuring and specifying the expected and required performance from the consultants before the project execution and incentivizes the consultants for improved performance

# Chapter 3: Research design

## 3.1. Research methodology

Research philosophies, approaches and methodology used for this study have been summarized in Saunders Research Onion in Figure 3.1 below.

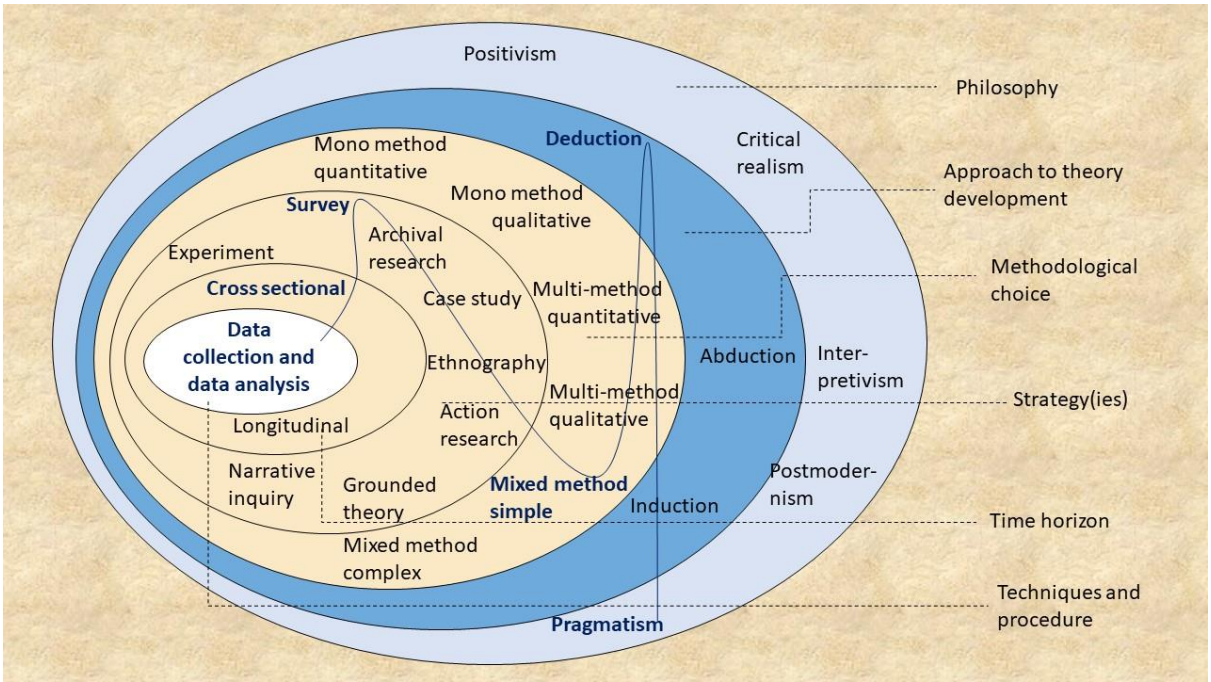


*Figure 3.1: Research philosophy and approach "Saunders Research Onion"*
Source: (Saunders, Lewis and Thornhill, 2016)

### *3.1.1. Research philosophy*

Philosophy of epistemology and ontology have been adopted for the purpose of this study. Epistemology discusses the assumption that is related to procedures of attaining and communicating to others the knowledge that is valid, legitimate, and acceptable, whereas Ontology philosophy denotes the "assumptions about the nature of reality and study the research objects" including but not limited to "organizations, management, and individuals" (Saunders *et* al., 2016). Both of the philosophical assumptions have been adopted for the study for reason that the study involves the individual consultants as well as their organization and has obtained the primary data which has been analyzed together and compared with secondary data and has achieved the aim of attaining the acceptable knowledge which is unbiassed.

The study aims to contractually improve the professional consultants' performance through incorporating the appropriate incentives and penalties into the PSC. It is believed that the use of incentives and penalties has a positive influence on performance and will, consequently, make a difference to the consulting practice. This aligns with the statement made by (Saunders *et al.*, 2016) that pragmatism emphasizes making a change in organizational practice. Additionally, the pragmatism paradigm contemplates results, hypotheses, theories and concepts concerning their practical meanings in an explicit context (Saunders *et al.*, 2016). The pragmatism paradigm has been adopted in this study because the study focuses on the incentive and penalty theories that can be adopted to enhance performance.

### *3.1.2. Research approach*

Deductive reasoning has been adopted as the research approach in order to develop the theory for this study. The reason for adopting deductive reasoning is because "deductive reasoning is used to verify or falsify the existing theory and because the conclusion is grounded on premises that are assumed to be true" (Saunders *et al.*, 2016). Thus, the study is designed to test, that is to verify or falsify existing theories of penalties and incentives. Additionally, the study will substantiate the proposition that incentive can be adopted as a motivational mechanism that can enhance the professional consultants' performance and penalty can be adopted as a remedial tool for professional consultants' low performance.

## 3.2. Research methods

The study is aimed at discussing the professional consultants' low performance and how the low performance affects the performance of the project. The study further explores the theories of contractual penalties and incentives and how they influence the performance of the consultants. To achieve this, the study has adopted deductive reasoning in order to test the theory that the contractual incentives and penalties have a positive influence and assess the influence this theory has on the consultants' performance when used as an incentive mechanism in a PSC.

### *3.2.1. Methodological choice*

This study has adopted and used a survey questionnaire as well the structured interviews to collect data. Survey questionnaires were used to collect quantitative data and structured interviews were used to collect qualitative data in a mixed-method choice. This study has been conducted on professional consultants based in Gauteng province, South Africa, though, they have and/or are involved in projects that are not located in the Gauteng province. The participants have been contacted telephonically, through Email, Teams and Skype for interviews. Data from the survey questionnaire and structured interview has been compared to the literature reviewed to make a conclusion to test whether professional consultants can be incentivized and penalized to improve their performance or not. Research methods that have been used to achieve the aim of the study are demonstrated in Figure 3.2 below.

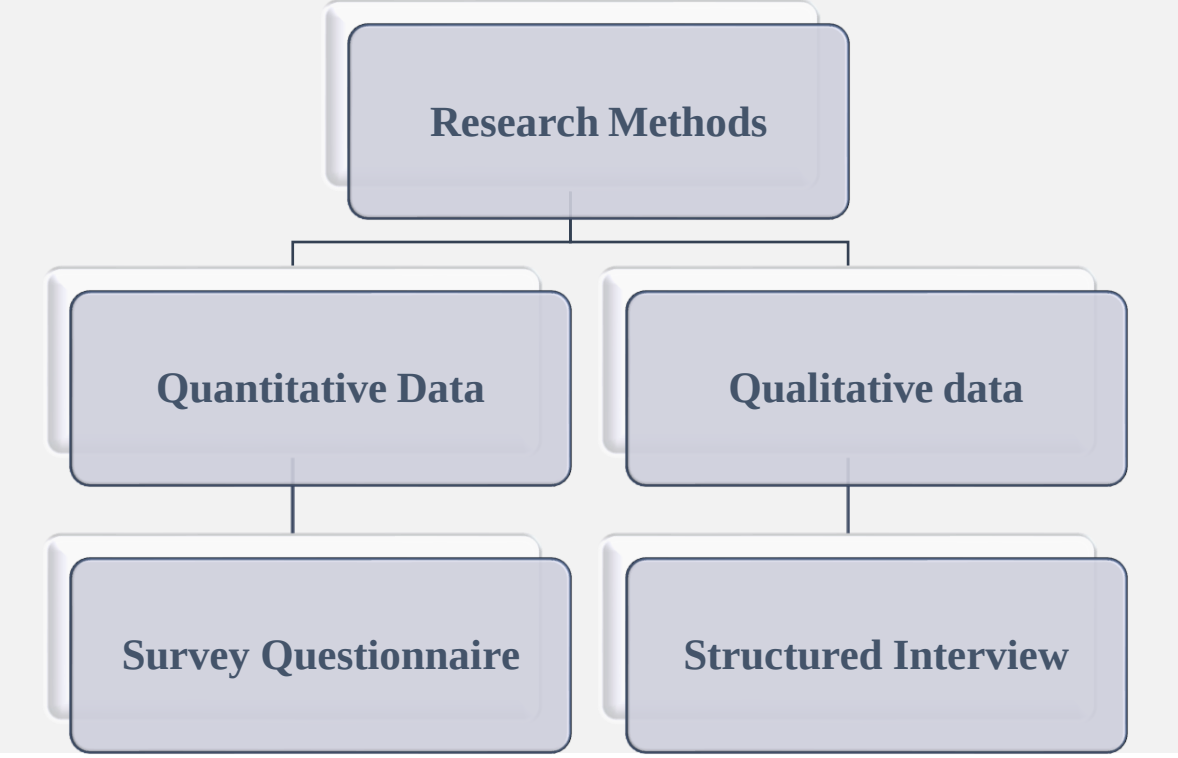


*Figure 3.2: Research Methods*

## 3.3. Population and sampling

The study is focused on penalty and incentive mechanisms that can be incorporated into the PSC with the aim of enhancing professional consultants' performance in a construction project

in South Africa. With that aim, the population that was targeted and participated in this study includes professional consultants in the construction industry involving "project managers, contracts managers, quantity surveyors and engineering managers". The sample of this population was limited to professional consultants located in the Gauteng province, South Africa even though some of the participants have worked on projects outside the Gauteng province. The simple-random sampling method has been adopted for this study for the reason that the probability of the professional consultants located in Gauteng being selected to participate in this study is equal.

## 3.4. Development of the research instruments

The key theories, concepts and themes correlated to the topic of the study have been studied through the review and analysis of the research journal articles. This study has derived and designed structured interview questions and survey questionnaires from the analysis of research journal articles and literature review and these interview questions and survey questionnaires were used as the research instruments that were suitable to answer questions that have arisen from the study concept. These types of research instruments, "structured interviews and survey questionnaires" were adopted for this study because studies with similar concepts to this study have adopted survey questionnaires as well as structured interviews and they are found to be reliable and eventually the studies were published. Furthermore, structured interviews research instruments have helped in achieving all 6 research objectives, while survey questionnaires research instruments have helped in achieving research objectives 2,3, and 6.

## 3.5. Data collection protocol

The data was collected between the month of September 2020 and February 2021. The procedure that was followed to collect the data using a structured interview and survey questionnaires was as follows:

- The targeted sample of the population "construction professional consultants" was given the executive summary of the study that describes the main aim of the study and the detailed problem that is intended to be explored
- The written consent was obtained from the willing participants agreeing to partake in this study, the consent was sent and obtained through E-mails

- Because the study was conducted during the COVID-19 pandemic and the country's lockdown restriction, therefore the structured interviews and survey questionnaires were done using the online mode called "Google Docs" where the participants who gave consent to partake in the study were sent an online link to the survey questionnaires and structured interview

The data collected is presented in Chapter 4 of the study which presents the primary data collected through survey questionnaires and structured interviews. In total, 55 survey questionnaires have been distributed among the randomly selected professional consultants in South Africa. Out of 55, only 22 valid responses have been used for the data analysis with a response rate of 38%. The 38% response rate is accepted for this study because the generally accepted response rate for this kind of study ranges between 15% to 20% (Maritz, 2003 as cited from Hussey and Hussey, 1997). The respondents did not give a specific explanation for incomplete and invalid responses. The general justification given by the respondents who did not complete the survey questionnaire as well as the interview was that they did not have enough time as they were busy with their work and that those who gave the invalid responses did not have a specific reason as to why they gave invalid responses.

## 3.6. Ethical risks and mitigation strategy

- Ethical consent was obtained prior to the collection of data to alleviate from the risk of participants not wanting to partake in the study
- The personal information of the participants was kept confidential and their responses have been used for this study only, this was done to mitigate the risk of participants not revealing all information that is vital for this study
- All information that has been obtained from research journal articles, construction contracts, books, dictionaries and online sources, have been referenced within the text and in the reference list at the end of this study in order to mitigate the risk of plagiarism

## 3.7. Validity and Reliability

The question relating to the validity and reliability of this study has been posed and therefore, the validity and reliability tests that have been adopted in this study are discussed in detail

below. The discussion takes in the description and the reasoning as to why the test has been chosen for this study and discussion of the threats that arise from each test that can pose a problem to this study.

### *3.7.1. Validity test*

The validity test that has been adopted to validate this study is the "external validity". The external validity test relates to the generalization of the findings of the study to the other related groups (Saunders *et al.*, 2016). The general concept concerning this study is the positive influence of incentives and penalties on performance, as such the findings of this study can be generalized across the construction industry. Therefore, This is justified with the questions that were asked before the validity test was adopted, these questions are: "will the same results be found from a different sample, different setting and different time?", This means that: should the same study be conducted in future will the outcome of the results be the same? The answer to the question above was "yes", thus there is a minimum threat that can pose the problem to the study's external validity (Saunders *et al.*, 2016).

### *3.7.2. Reliability test*

The "Parallel-Form Reliability and Cronbach's alpha Test" were adopted reliability tests for this study. The parallel-form reliability test relates to the duplication of the previous study design and attaining similar results, this means that the method used to collect and analyze the data should give consistent findings, then the study conducted is consistent. Therefore, the methods chosen for this study have produced a consistent and quality result (Saunders *et al.*, 2016).

The Cronbach's alpha test has also been chosen for this study to assess the internal consistency of the set of the scale of the findings of this study. This test was adopted for the reason that it is important to achieve an acceptable level of reliability in the study. Table 3.1 was used as a reference to test the reliability and consistency of the results, that is the closest to 1 is the value of Cronbach alpha the more consistent and reliable is the scale used to collect data (Cronbach, 1951).

*Table 3.1: Cronbach's alpha reliability test*

| Cronbach alpha (α) | Internal consistency |
|---|---|
| $\alpha \geq 0.9$ | Excellent |
| $0.9 > \alpha \geq 0.8$ | Good |
| $0.8 > \alpha \geq 0.7$ | Acceptable |
| $0.7 > \alpha \geq 0.6$ | Questionable |
| $0.6 > \alpha \geq 0.5$ | Poor |
| $0.5 > \alpha$ | Unacceptable |

Source: (Cronbach 1951)

## 3.8. Data analysis

Data analysis form part of chapter four of this study. The descriptive statistic, Relative Importance Index (RII), Bivariate analysis as well as cross-tabulation were used to analyze the data collected through survey questionnaires and were further presented and interpreted in chapter four in a form of tables, pie charts and graphs. Thematic and content analysis have been adopted in this study to analyse the data collected through structured interviews. The thematic analysis has been adopted to search for themes and patterns across the data set by coding the data in order to identify patterns and themes that are linked to the existing theories, whereby the content analysis has been adopted in this study to code and categorize the qualitative data in order to present and analyze them quantitatively. These analyses adopted for this study have been used in conjunction with the research questions and objectives of the study in order to derive the themes and pattern and to examine the raw data.

In analyzing the impact of consultant poor performance on a project, The mean ($\bar{X}$) ranking score is interpreted as follows: $\bar{X}>3.5$ is considered to have a high influence, $3.5>\bar{X}>2.5$ is considered to have a neutral influence and $2.5> \bar{X}$ is considered to have a low influence. Kurtosis and Skewness have been used to test for the normality of the distribution of data. For the purpose of this study, the coefficient of Kurtosis value ranging between -3 and +3 and Skewness value ranging between -2 and +2 are considered to have a normal distribution.

The primary data obtained from the survey questionnaire and structured interviews have been analyzed, discussed and used to substantiate the results from previous studies. The study has made an impartial conclusion and recommendation for further study.

# Chapter 4: Data Presentation, Analysis and Results

## 4.1. Introduction

Chapter 4 of this study is structured as follows: section 4.2 of this chapter is the presentation and analysis of respondents' demographic data. Section 4.3 is the presentation and analysis of quantitative results obtained from the survey questionnaire this section is divided into subsections as follows: subsection 4.3.1 determines the impact of consultants poor performance, subsection 4.3.2 determine the cause of project rework and variation orders associated with consultants poor performance, subsection 4.3.3 is the presentation of the importance of having KPIs in a project, subsection 4.3.4 evaluate the incentive as a motivational tool that improves performance, the benefits of incorporating the incentives and penalties into the PSC and the assessment of the likelihood of the existing penalty and incentive Clauses to improve performance.

Section 4.4 is the presentation and analysis of qualitative results obtained from the structured interview. The following themes and patterns have been designed to analyze section 4.4 of this study: Professional consultants' appointment and responsibility, the impact of professional consultants' performance, KPI measures, incentive and penalty mechanism evaluation and consultants' performance damages and performance remedy. The results of the study were presented and analyzed in relation to the research questions and objectives of this study.
Table 4.1 below denotes the correlation between the research objectives, research secondary questions and research theme designed.

*Table 4.1: Correlation between research objectives, secondary questions and themes*

| Research themes | Research objectives | Research secondary questions |
|---|---|---|
| Professional consultants' appointment and responsibility | To determine the roles and responsibilities of professional consultants in a project | What are the roles and responsibilities of professional consultants in a project? |
| Key Performance Indicator measures | To determine the project's Key Performance Indicators | What are the project's Key Performance Indicators? |

| Research themes | Research objectives | Research secondary questions |
|---|---|---|
| | | |
| The impact of professional consultants' performance | To determine the impact of consultants' low performance on a project | What is the impact of professional consultants' poor performance on a project? |
| • Incentive and Penalty Mechanism Evaluation<br>• Incentive-penalty payoff model<br>• Consultants' performance damages and performance remedy | To determine Professional Services Agreement used to appoint professional consultants in the construction industry in South Africa | What professional service agreement is/are used to appoint professional consultants in the construction industry in South Africa? |
| • Incentive and Penalty Mechanism Evaluation<br>• Incentive-penalty payoff model<br>• Consultants' performance damages and | To determine the incentive and penalty Clauses that are built into various contracts that deal with professional consultants' performance | What are the incentives and penalties built into various contracts to ensure the consultants' performance? |

| Research themes | Research objectives | Research secondary questions |
|---|---|---|
| performance remedy | | |
| • Incentive and Penalty Mechanism Evaluation<br>• Incentive-penalty payoff model<br>• Consultants' performance damages and performance remedy | To assess the effectiveness of the existing PSC penalties and incentive Clauses and further raise awareness of contract Clauses to clients who do not have experience in construction and contractual matters | How effective are the existing PSC penalties and incentive clause in a project |

## 4.2. Demographic Data

This section categorizes the demographic data and background of the respondents that have participated in the study. The results of the demographic data that was collected from the randomly selected participants include the organization they work for, their work title, number of years in the construction industry, their core duties, highest qualification as well as their age range and are summarized in Table 4.2 below. The demographic data percentage is the quotient of No. (Number) of occurrence and Total No. (Number ) of participants.

*Table 4.2: Respondents demographic data*

| Demographic Data | No. Occurrence | Total No. of Participants | Percentage |
|---|---|---|---|
| **Organization Category** | | **22** | |
| Consulting companies | 13 | | 59% |

| Demographic Data | No. Occurrence | Total No. of Participants | Percentage |
|---|---|---|---|
| Client representatives | 5 | | 23% |
| Private | 4 | | 18% |
| **Work Title** | | 22 | |
| Project manager | 10 | | 45% |
| Chief engineer contracts | 1 | | 5% |
| Contracts manager | 6 | | 27% |
| Compliance | 1 | | 5% |
| Quantity surveyor | 2 | | 9% |
| Construction project sponsor | 1 | | 5% |
| Design engineer | 1 | | 5% |
| **Number of years in the construction industry** | | **22** | |
| Less than 2 years | 0 | | 0% |
| 2 – 4 years | 1 | | 5% |
| 4 – 6 years | 1 | | 5% |
| 6 – 8 years | 3 | | 14% |
| 8 – 10 years | 4 | | 18% |
| More than 10 years | 13 | | 59% |
| **Highest Qualification** | | **22** | |
| Diploma | 2 | | 9% |
| Bachelor/BTech | 8 | | 36% |
| Honours | 1 | | 5% |
| Masters | 11 | | 50% |
| PhD | 0 | | 0% |
| **Age** | | **22** | |
| 21 to 30 | 1 | | 5% |

| Demographic Data | No. Occurrence | Total No. of Participants | Percentage |
|---|---|---|---|
| 31 to 40 | 6 | | 27% |
| 41 to 50 | 14 | | 64% |
| 51 to 60 | 0 | | 0% |
| 61 to 65 | 1 | | 5% |

### *I. Organization category*

This subsection of the demographic data indicates where the respondents work. As indicated in Table 4.2, it can be noted that 59% of respondents work for the consulting companies as compared to the 23% of respondents coming from the clients' organizations and 18% of respondents did not mention if whether they work for the consulting firms or the client organization. This means that majority of the respondents work at consulting firms.

### *II. Work title.*

This section was designed to represent the current position of respondents at their organization. Table 4.2 indicates that 45% are project managers, 27% works as contracts managers, 9% of the respondents are quantity surveyors, 5% are compliance, another 5% work as chief engineer contracts and 5% work as construction project sponsor.

### *III. No of years in the industry*

This section was designed to indicate the respondent's duration of employment within the construction industry. As indicated in Table 4.2 none of the respondents has less than two years of work experience, 5% of the respondents have working experience ranging between two and four years, whereas another 5% has work experience ranging between 4 and six years, 14% of the respondents have indicated that they have a work experience ranging from six and eight years, and 18% have working experience ranging between eight and ten years and lastly 59% of the respondents have indicated that they have more than ten years of experience.

### *IV. Core duties*

This section aims to give a brief detail of what the respondents' responsibility entails. The respondents' core duties include management of EPCM Projects by liaison with the client from project initiation to handover of the completed project to the client, responsible for engineering

facilitation and management of engineering studies; financial planning, project progressing and tracking; project resourcing and control; specification drafting, site inspections and monitoring; identifying sales opportunities and trends related to the competition, developing new accounts, identifying potential leads, soliciting new business; providing technical information and advice to the client; preparing quotes, commercial and technical accountability.

#### *V. Highest qualification*

This section was designed to show the respondents' level of education. As indicated in Table 4.2 majority of the respondents hold a Master's degree at the frequency of 50% followed by a Bachelor's degree and/or BTech at a percentage of 36%, whereby 9% of the respondents have a Diploma qualification and 5% have an Honours degree and none of the respondents has a Ph.D. qualification.

#### *VI. Age*

The section was designed to indicate the age range of the respondents. Table 4.2 indicates that 64% of the respondents are aged between 41 and 45, 27% are aged between 31 and 40, 5% are aged between 21 and 30 and the remaining 5% are aged between 61 and 65 and none of the respondents are aged between 51 and 60.

## 4.3. Quantitative data analysis

### *4.3.1. The impact of consultants' poor performance*

The study has emphasized poor performance from the consultants that compromises the project deliverable as a research problem. To address this problem, objective one focuses on determining the impact of professional consultants' poor performance on a project. Low-performance traits have been identified from the literature and were adopted for the survey questionnaires.

Table 4.3 shows the results of the overall Cronbach's alpha value of above 0.8 for each low-performance trait, therefore the internal consistency results are considered good. The reliability test for the overall low-performance traits is 0.89, this shows a high level of Cronbach's alpha internal consistency for the scale used in this specific sample.

*Table 4.3: Reliability test results for consultants low-performance traits*

| Low-performance traits | Mean ($\bar{X}$) | Cronbach Alpha (α) | Overall α |
|---|---|---|---|
| | | | **0.89** |
| Inadequate Input | 3.97 | 0.94 | |
| Reworks | 3.53 | 0.86 | |
| Variation/Change orders | 3.47 | 0.90 | |
| Inconsistent documentation | 3.45 | 0.91 | |
| Poor flow of information | 3.39 | 0.92 | |
| Design Related issues | 3.35 | 0.85 | |
| Inaccurate estimates | 3.24 | 0.85 | |

### *I. Impact of inadequate input*

The literature has indicated that inadequate input from the consultants is one of the contributing factors that affect a project negatively. Under this performance trait, the respondents were asked to indicate the likelihood of the inadequate input having an impact on the project. Factors that were found to results from inadequate input were listed and respondents were asked to indicate the likelihood using the 5-point Likert scale of 5 = very likely to 1 = Very unlikely.

Table 4.4 indicates the ranking of low-performance factors that results from inadequate input given by the consultants. Poorly compiled BOQ which will lead to inaccurate estimates was ranked number 1 as a factor that results from inadequate input with a mean rating of 4.50, followed by poor designs and errors in working drawings with a mean rating of 4.45, poor scope definition was ranked in the third place with a mean rating of 4.14. Given that 10 out of 11 factors that result from inadequate input have a mean value of were greater than 3.5, the respondents agree that 10 out of 11 factors listed in the table result from inadequate input by the consultants. The kurtosis and skewness show an acceptable distribution of results except for “poorly compiled BOQ which will lead to inaccurate estimates; poor designs and errors in working drawings; poor scope definition and ambiguous specifications” that have a score of above the acceptable level of +/-3.

*Table 4.4: Impact of inadequate input*

| Impact of inadequate input | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Poorly compiled BOQ which will lead to inaccurate estimates | 4.50 | 0.91 | 10.34 | -2.89 | 1 |
| Poor designs and errors in working drawings | 4.45 | 0.96 | 7.48 | -2.50 | 2 |
| Poor scope definition | 4.14 | 1.04 | 3.33 | -1.70 | 3 |
| Ambiguous Specifications | 4.05 | 0.84 | 7.94 | -2.18 | 4 |
| Incorrect and understated schedule timelines | 4.00 | 1.15 | 0.94 | -1.22 | 5 |
| Lack of coordination between designers | 4.00 | 1.07 | 1.76 | -1.29 | 6 |
| Poor facilitation of project proposal | 3.95 | 1.05 | 1.91 | -1.28 | 7 |
| Frequent and late design changes | 3.82 | 1.22 | -0.26 | -0.83 | 8 |
| Late response to request for information | 3.68 | 1.13 | 0.09 | -0.83 | 9 |
| Changes and/or deferment of decisions | 3.59 | 1.22 | -0.71 | -0.66 | 10 |
| Late or lack of design approval by all stakeholders | 3.50 | 1.34 | -0.91 | -0.40 | 11 |

**($\bar{X}$) = Mean, SD (σ) = Standard deviation, KRT = Kurtosis, SKN = Skewness, R = Ranking**

### *II. Impact of poor flow of information*

This section has explored the respondent's knowledge regarding the poor flow of information. The respondents were asked to rank how often does each of the listed factors occurs as a result of poor flow of information between the consultants using the 5-point Likert scale of 5 = Always to 1 = Never.

Table 4.5*: Impact of poor flow of information*

| Impact of poor flow of information | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Poor contract documentation which leads to a number of addendums during tendering process and construction phase | 3.68 | 0.95 | 2.07 | -1.14 | 1 |
| Misunderstanding of requirements between the design team and estimating team | 3.50 | 0.91 | 1.57 | -0.83 | 2 |

| Impact of poor flow of information | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Poor engagement between QSs and Estimators and late or incomplete provision of design information during early stages resulting in inaccurate estimates | 3.45 | 0.96 | 0.79 | -0.74 | 3 |
| Misaligned timelines | 3.27 | 0.98 | 0.18 | -0.28 | 4 |
| Poor quality feasibility phase outcomes which could halt the client from undertaking project | 3.05 | 1.00 | 0.08 | 0.22 | 5 |

Results from Table 4.5 show that poor flow of information has the highest influence on contract documentation during tendering process and construction phase and thus, the respondents have ranked "poor contract documentation which leads to a number of addendums during tendering process and construction phase" in the first position with mean 3.68, "Misunderstanding of requirement between the design team and estimating team" was ranked second with mean 3.5, followed by "poor engagement between QSs and estimators" and "late or incomplete provision of design information during early stages resulting in inaccurate estimates" which was ranked third with a mean 3.45. The results suggest that the respondents tend to agree that sometimes the poor flow of information does have an impact on the project and the listed factors sometimes occur as a result of poor flow of information since their mean rating is between 2.5 and 3.5. The results show an adequate level of kurtosis and skewness which is within the acceptable range of +/-3 and +/-2 respectively.

### *III. Impact of design-related issues*

Low-performance traits attributed to design-related issues were identified from the literature and were used to design this question. The respondents were asked to rank how often does each factor occur as a result of design-related issues.

*Table 4.6: Impact of design-related issues*

| Impact of design-related issues | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Construction errors and reworks | 3.59 | 1.10 | -0.05 | -0.49 | 1 |
| Inaccurate BOQ and estimates | 3.55 | 1.22 | -0.16 | -0.54 | 2 |
| Construction delays or temporary stoppage of the project | 3.55 | 0.91 | 1.82 | -0.98 | 2 |

| Impact of design-related issues | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Project delays due to time taken reviewing and revising designs | 3.32 | 1.21 | -0.65 | -0.50 | 3 |
| Unclear tender documents that often lead to claims and disputes | 3.23 | 1.11 | -0.19 | -0.49 | 4 |
| Compromised selection process of vendors due to temporary stoppage of the works while design errors are being rectified | 2.86 | 0.94 | 0.03 | 0.29 | 5 |

Table 4.6 indicates the perception of the respondents relative to the design-related issues that influence the project negatively. The "construction errors and reworks" is identified to be the most frequent factor that often occurs as a result of design-related issues and was ranked first with a mean of 3.59, "inaccurate BOQ and estimates" as well as "construction delays or temporary stoppage of the project" were ranked second with mean 3.55. Noticeably, the respondents are in an agreement that the first three factors were predominant outcomes of the design-related issues since their mean rating is above 3.5. "Project delays due to time taken reviewing and revising designs" was ranked third place with mean of 3.32, "unclear tender documents that often lead to claims and disputes" was ranked in fourth place with mean of 3.23 and "compromised selection process of vendors due to temporary stoppage of the works while design errors are being rectified" was ranked in the fifth place with a mean 2.86. It is apparent that the respondents agree that the last three factors sometimes do occur as a result of design-related issues, but not always. The kurtosis and skewness values fall within the acceptable range of +/-3 and +/-2 respectively, therefore the distribution of the result is acceptable.

### *IV. Impact of inaccurate estimates*

*Table 4.7: Impact of inaccurate estimates*

| Impact of inaccurate estimates | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Increase in project cost for measured items during the construction phase | 3.77 | 1.07 | 1.00 | -1.06 | 1 |
| Difficulties to reach decisions regarding project award | 3.36 | 1.05 | -0.11 | -0.28 | 2 |

| Impact of inaccurate estimates | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Project approved for execution with insufficient funding as a result of underestimated cost | 3.27 | 1.24 | -0.78 | -0.24 | 3 |
| Delays and/or abandonment of projects while client seek additional funding and/or does not get additional funding | 2.55 | 1.14 | 0.22 | 0.82 | 4 |

Table 4.7 represents the result of the factors that result from inaccurate project estimates produced by the consultants. By ranking the mean, the results indicate that "increase in project cost for measured items during the construction phase" frequently occurs as a result of the inaccurate estimate, this factor was ranked first with a mean of 3.77, followed by the "difficulty to reach decisions regarding the project awards" with mean 3.36. Furthermore, the table indicates that from time to time "projects get approved for execution with insufficient funding as a result of underestimated cost and some projects are delayed and/or abandoned while client seeks additional funding and/or does not get additional funding, as these two factors have means ranging between 2.5 and 3.5. The kurtosis and skewness values fall within the acceptable range of +/-3 and +/-2 respectively, therefore the distribution of the result is acceptable.

### *V. Impact of variation orders*

The impact of variation orders initiated by the consultants was examined and the findings were revealed in Table 4.8 below.

*Table 4.8: Impact of variation orders*

| Impact of variation orders | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Claims and contractual disputes e.g. extension of time and contractors' additional payment | 3.91 | 1.11 | 0.70 | -0.96 | 1 |
| Delay of the project completion date/ extension of project completion date | 3.82 | 1.14 | 0.29 | -0.88 | 2 |
| Temporary stoppage of the project | 2.68 | 1.21 | -0.07 | 0.68 | 3 |

The impact of variation orders initiated by the consultants has been identified in the literature. The results in Table 4.8 indicate that claims and contractual disputes such as the extension of time and contractors' additional payment is one of the most dominating outcomes of variation orders initiated by the consultants with a mean of 3.91, followed by a delay of the project completion date/extension of project completion date with a mean of 3.82. The results reveal that these two factors were found to be the most factors resulting from the variation orders. The "temporary stoppage of the project" was ranked last with a mean rating of 2.68, the respondents have agreed that these factors seldom occur as a result of variation orders initiated by the consultants. The kurtosis and skewness values fall within the acceptable range of +/-3 and +/-2 respectively, therefore the distribution of the result is acceptable.

### *VI. Impact of inconsistent documentation*

The respondents were asked to indicate the extent to which inconsistent documentation produced by the consultants affects the project.

*Table 4.9: Impact of inconsistent documentation*

| Impact of inconsistent documentation | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Change orders/ variations | 3.73 | 0.94 | 3.05 | -1.70 | 1 |
| Inaccurate estimates | 3.45 | 1.06 | -0.03 | -0.53 | 2 |
| Claims and disputes | 3.41 | 1.01 | 0.33 | -0.34 | 3 |
| Project rework | 3.23 | 1.02 | -0.21 | -0.21 | 4 |

From Table 4.9 it is apparent from the ranking of the results using the mean of responses that "change orders/variation" dominate as a factor that results from inconsistent documentation with a mean of 3.73. The last three factors that result from inconsistent documentation produced by consultants have a mean value of above 2.5 but less than 3.5, this implies that the respondents agree that not all the time but sometimes they do result from inconsistent documentation. The kurtosis and skewness show an acceptable distribution of results except for "change orders/variation" that have a score above the acceptable level of +/-3.

### *VII. Impact of reworks*

The respondents were asked to indicate how often reworks have an impact on the project. The ranking of the impact of the reworks in a project is presented in Table 4.10.

*Table 4.10: Impact of reworks*

| Impact of reworks | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Impact on the schedule of the project | 3.95 | 1.00 | 2.86 | -1.48 | 1 |
| Increased project cost | 3.82 | 1.14 | 0.58 | -1.10 | 2 |
| Compromised quality | 2.82 | 1.10 | -0.53 | -0.08 | 3 |

The results show that the schedule of the project is highly impacted by the reworks and this factor was ranked first with a mean of 3.95, followed by increased project cost as a result of reworks with a mean of 3.82, these results imply that reworks often lead to project delays and increased cost because both their means are above 3.5. The "compromised quality" factor was ranked last with a mean of 2.82, this indicates that the quality is compromised from time to time with a mean less than 3.5. The kurtosis and skewness show an acceptable distribution of results with the score ranging between the acceptable level of +/-3.

### *4.3.2. Rework and variation orders due to consultants' poor performance*

#### *I. Causes of reworks*

Factors that cause reworks were identified from the literature and their results are presented in Table 4.11.

*Table 4.11: Common causes of reworks*

| Causes of reworks | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Errors in design | 17.21 | 38.08 | 14.83 | 3.68 | 1 |
| Poorly defined scope of work | 5.47 | 10.47 | 27.86 | 5.11 | 2 |
| Poorly written specification | 3.91 | 1.11 | 2.94 | -1.65 | 3 |
| Poor administration of contract | 2.86 | 1.17 | -0.50 | 0.09 | 4 |

Respondents were asked to indicate the extent to which they agree that each of the consultant's low-performance factors listed in the table leads to reworks. The ranking of these results is presented in Table 4.11. **"**Errors in design" was ranked first with a mean of 17.21 followed by the poorly defined scope of work with a mean of 5.47 and poorly written specification was ranked third with a mean of 3.91. These results indicate that errors in designs, poorly defined scope of work, as well as poorly written specification, are the predominant cause of reworks.

Poor administration of contract was ranked in fourth place with a mean rating of 2.86. This implies that the respondents don't agree that the poor administration of contract is one of the main sources of rework. The kurtosis and skewness show an impartial distribution of results with errors in design, poorly defined scope of work rating above the acceptable level of +/-3.

### *II. Causes of variation orders*

Variation orders are one of the factors that have a negative impact on the project. From the literature few factors that cause variation orders were identified and used to design this question. Respondents were asked to indicate the extent to which these factors result in variation orders.

*Table 4.12: Common causes of variation orders*

| Causes of variation orders | $\bar{X}$ | SD (σ) | KRT | SKN | R |
|---|---|---|---|---|---|
| Design related issues | 3.73 | 1.03 | 1.24 | -1.11 | 1 |
| Poorly defined scope of work | 3.59 | 1.05 | 0.47 | -0.93 | 2 |
| Conflicting contractual documentation | 3.23 | 1.07 | -0.61 | -0.24 | 3 |
| Poor coordination and integration during pre-feasibility phase | 3.09 | 0.97 | -0.33 | -0.20 | 4 |

After ranking the mean of the responses in Table 4.12, design-related issues were ranked in first place with a mean of 3.73 followed by the poorly defined scope of work in second place with a mean of 3.59. The respondents are in an agreement that these two factors are likely to cause variation orders because all their means are above 3.5. Conflicting contractual documentation was ranked third with a mean of 3.23 and poor coordination and integration during pre-feasibility phase was ranked last with a mean of 3.09. It is impartial that the last two factors could lead to variation orders. The kurtosis and skewness indicate a satisfactory distribution of results with a rating above the acceptable level of +/-3.

## *4.3.3. The importance of Key Performance Indicators (KPI) in a project*

Objective two of the study is focused on determining the professional consultants' KPIs. To achieve this part of the objective, there is a need to assess the importance of having KPIs in a

project. The study has adopted various performance indicators from the literature and was used to design part of the questionnaire survey.

Data collected is analyzed using the Relative Importance Index (RII) and Bivariate analysis. RII has been used by various researchers to determine the relative importance of various variables. The same method has been adopted to analyse the importance of having KPIs in a project. The RII with a value of zero is considered inconclusive and a higher value of close to 100% means that the KPI is of higher importance in a project. The equation used to calculate the RII for each factor is as follows:

$$RII = \frac{\sum W}{(A * N)}$$

*Table 4.13: RII equation symbol*

| RII equation symbols | RII symbol Description |
|---|---|
| RII | Relative Importance Index |
| $W$ | Weighting given |
| $A$ | Highest weight (i.e. 5 in this study) |
| $N$ | Total number of respondents |

Bivariate analysis is used to determine the empirical relationship between the respondents' experience in the construction industry and their opinion regarding the importance of having KPIs in a project. The correlation results will be presented using the Cross Tabulation and Pearson's Chi-Square ($X^2$) tables.

Project KPIs are categorized into cost KPI which is intended to measure the importance of having a cost KPI in a project, time KPI which is intended to measure the importance of KPI measured against project duration and quality KPI which is used to measure the KPI against the quality of the project.

#### *4.3.3.1. Relative Importance Index (RII) analysis*

*Table 4.14: Key Performance Indicator (KPI) ranking*

| Key Performance Indicators (KPI) | RII | $\bar{X}$ | R | α |
|---|---|---|---|---|
| **Cost KPI** | | **4.55** | | **0.75** |

| Key Performance Indicators (KPI) | RII | $\bar{X}$ | R | α |
|---|---|---|---|---|
| Efficient cost control during execution and construction | 95% | 4.73 | 1 | |
| Project completed within the estimated budget | 93% | 4.64 | 2 | |
| Positive project cost outcome, i.e. actual cost not exceeding the estimated budget | 91% | 4.55 | 3 | |
| Efficient change management system ensuring trends are identified early on in the execution stage | 90% | 4.50 | 4 | |
| Efficient cash flow system i.e. keeping the authorized funding within the constraints of a time-based budget | 89% | 4.45 | 5 | |
| Timely Measurement & correction of works during construction until handing over of the project | 89% | 4.45 | 5 | |
| **Time KPI** | | **4.45** | | **0.89** |
| Completing the project on time | 93% | 4.64 | 1 | |
| Changes to the schedule should be effectively managed | 93% | 4.64 | 1 | |
| Minimizing late responses for information by communicating timeously | 90% | 4.50 | 2 | |
| Process of scheduling works should be adequate | 87% | 4.36 | 3 | |
| Having less claims relating to the extension of time during the feasibility stage | 86% | 4.32 | 4 | |
| The mature process to update schedule performance to allow proactive decision making and mitigating actions to be implemented | 86% | 4.32 | 4 | |
| **Quality KPI** | | **4.79** | | **0.67** |
| Project completed with minimum or no defects and acceptable quality of work | 97% | 4.864 | 1 | |
| Having a functional quality management strategy prior to the execution | 95% | 4.727 | 2 | |
| Mature quality control process during the execution of the works | 95% | 4.773 | 2 | |

Results from Table 4.14 indicate that the RII of all factors is close to 100% with a group mean of above 3.5. These results imply that the respondents agree that having KPIs in a project is important as it helps to deliver a project on time, within the allocated budget and without

compromised quality because the higher the value of RII and mean value exceeding 3.5 the more significant of is to have a KPIs in a project.

#### *4.3.3.2. Bivariate analysis*

This analysis is intended to determine the correlation between the respondents' experience and how important it is to have KPIs in a project.

##### *I. Cost KPI cross-tabulation*

The respondents' view on the importance of having KPIs in a project was cross-tabulated with the experience of the respondents. This test was undertaken to establish whether the experience of the respondents and the organization they work for has an impact on how they view the importance of having KPIs in a project. The results of the cross-tabulation are presented in Table 4.15 below.

*Table 4.15: Cost KPI cross-tabulation with experience*

| Experience | Slightly important | Moderately important | Important | Very important |
|---|---|---|---|---|
| 2-4 years | 0% | 0% | 83% | 17% |
| 4-6 years | 0% | 17% | 67% | 17% |
| 6-8 years | 6% | 6% | 33% | 56% |
| 8-10 years | 0% | 13% | 17% | 71% |
| 10 years + | 1% | 1% | 28% | 69% |

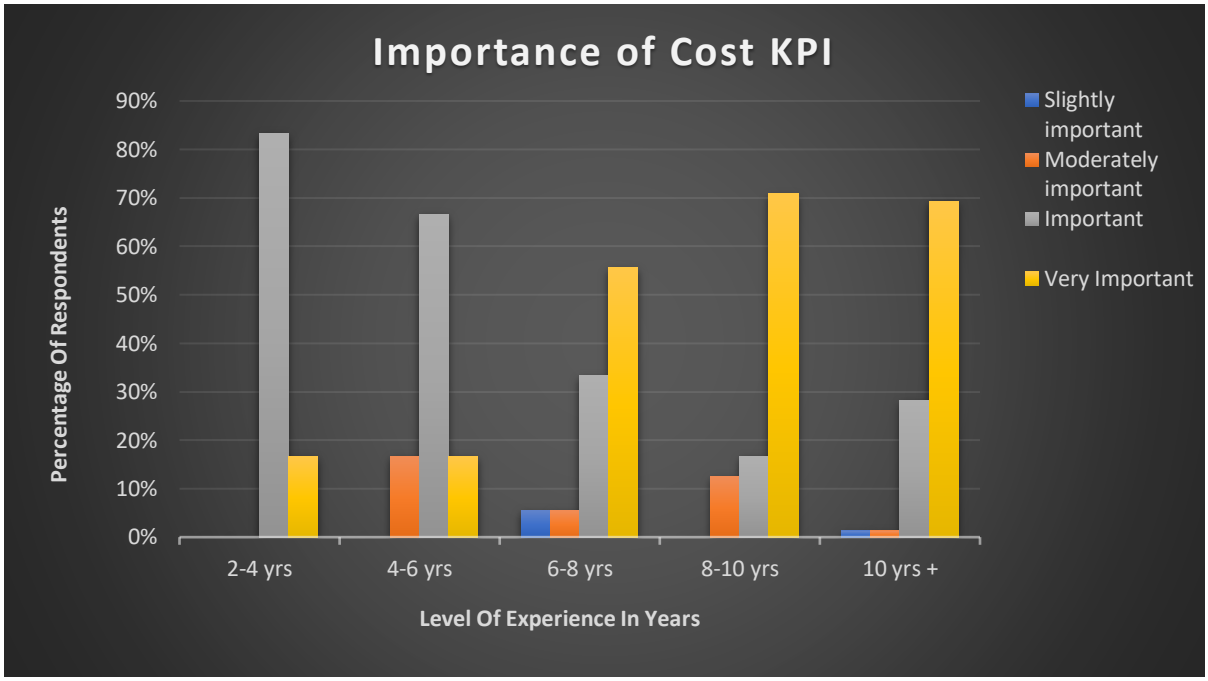


*Figure 4.1.: Importance of cost KPI*

*Table 4.16 Cost KPI Chi Square test*

| Chi-Square Test | | | |
|---|---|---|---|
| | **Value** | **df** | **p-value** |
| Pearson's Chi square | 24.47 | 12 | 0.0175 |

Respondents were asked to rank the importance of having cost KPI in a project. As presented in Figure 4.15. 71% of the respondents with a level of experience between 8-10 years have indicated that having cost KPI in a project is very important while respondents with a level of experience of more than 10 years have indicated that cost KPI is very important, 56% of respondents found having cost KPI in a project very important. 83% and 67% of the respondent with a level of experience between 2-4 years and 4-6 years have found cost KPI in a project important.

A cross-tabulation of respondents' experience with their view on the importance of having cost KPI in a project is represented in Table 4.15. Results presented in Table 4.16 indicate that there is a statistical relationship between the respondents' experience and whether or not, having cost KPI in a project is important. The results of the Chi-Square test in Table 4.16 indicate a correlation of 0.0175 (98.25%). This correlation can be measured through the analysis of data in Table 4.15. As indicated the correlation between the respondents' experience and the

importance of having cost KPI in a project is deemed very important by the respondents with experience of more than 6 years.

### *II. Time KPI cross-tabulation*

*Table 4.17: Time KPI cross-tabulation with experience*

| Experience | Moderately important | Important | Very important |
|---|---|---|---|
| 2-4 years | 0% | 0% | 100% |
| 4-6 years | 17% | 50% | 33% |
| 6-8 years | 17% | 61% | 22% |
| 8-10 years | 0% | 29% | 71% |
| 10 years + | 8% | 38% | 54% |

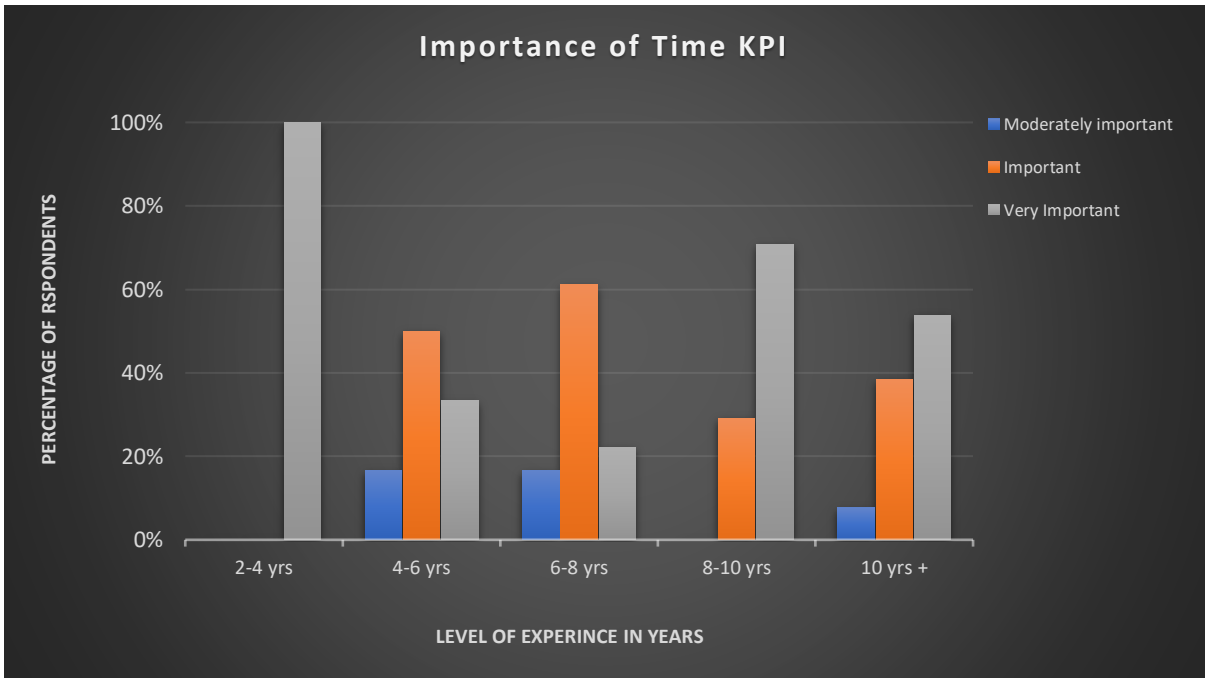


*Figure 4.2: Importance of time KPI*

*Table 4.18: Time KPI Chi-Square test*

| Chi-Square Test | | | |
|---|---|---|---|
| | **Value** | **df** | **p-value** |
| Pearson's Chi square | 17.8 | 8 | 0.0228 |

Respondents were asked to rank the importance of having time KPI in a project. As presented in Table 4.17 and Figure 4.2. 100% of the respondents with a level of experience between 2-4 years have indicated that having time KPI in a project is very important while 71% of respondents with a level of experience between 8-10 years have indicated that time KPI is very important, 54% of respondents with experience of more than 10 years found having time KPI in a project very important.

A cross-tabulation of respondents' experience with their view on the importance of having time KPI in a project is represented in Table 4.17. Results presented in Table 4.18 indicate that there is a statistical relationship between the respondents' experience and whether or not, having time KPI in a project is important. The results of the Chi-Square test in Table 4.18 indicate a correlation of 0.0228 (97.72%). This correlation can be measured through the analysis of data in Table 4.17. As indicated the correlation between the respondents' experience and the importance of having time KPI in a project is deemed very important by the respondents with experience of more than 8 years and important to the respondents with experience between 4 and 8 years.

### *III. Quality KPI cross-tabulation*

*Table 4.19: Quality KPI cross-tabulation with experience*

| Experience | Moderately important | Important | Very important |
|---|---|---|---|
| 2-4 years | 0% | 0% | 100% |
| 4-6 years | 0% | 67% | 33% |
| 6-8 years | 0% | 0% | 100% |
| 8-10 years | 0% | 0% | 100% |
| 10 years + | 3% | 26% | 72% |

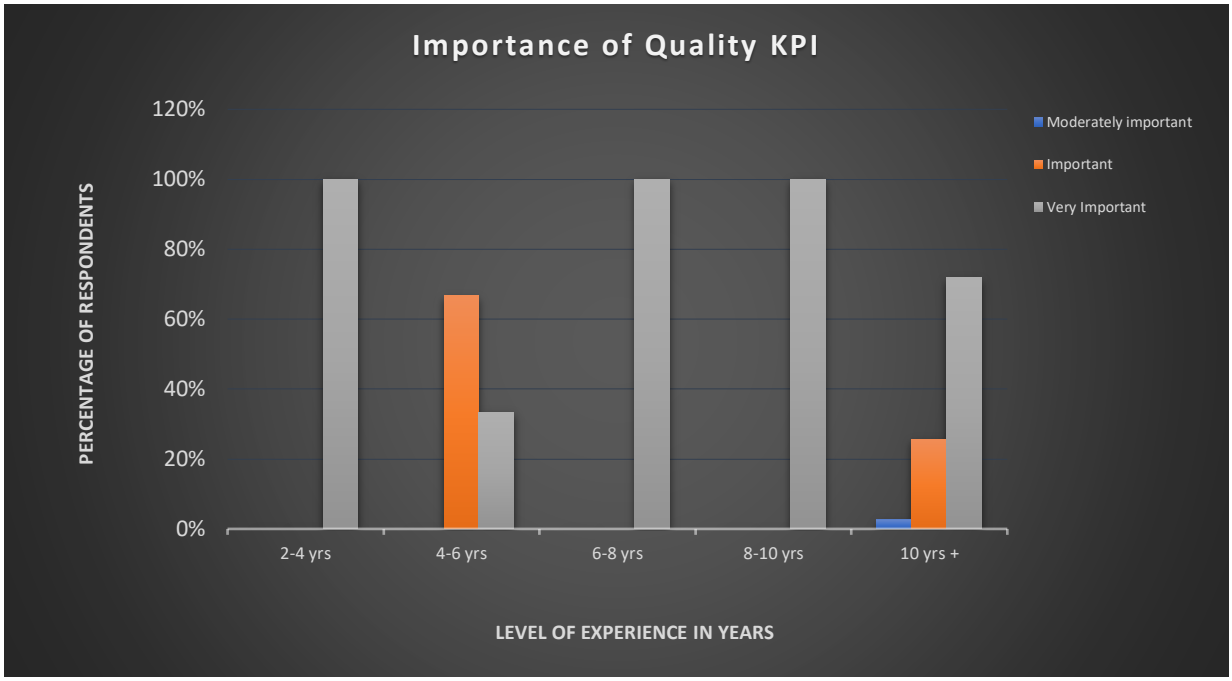


*Figure 4.3: Importance of quality KPI*

*Table 4.20: Quality KPI Chi-Square test*

| **Chi-Square Test** | | | |
|---|---|---|---|
| | **Value** | **df** | **p-value** |
| Pearson's Chi square | 12.46 | 8 | 0.1318 |

Respondents were asked to rank the importance of having quality KPI in a project. As presented in Table 4.19 and Figure 4.3. 100% of the respondents with a level of experience between 2-4 years, 6-8 years and 8-10 years have indicated that having quality KPI in a project is very important, while 72% of respondents with a level of experience of more than 10 years have indicated that quality KPI is very important.

A cross-tabulation of respondents' experience with their view on the importance of having quality KPI in a project is presented in Table 4.19. Results presented in Table 4.20 indicate a correlation of 0.1318 (86.82%) indicates that there is no statistical relationship between the respondents' experience and whether or not, having quality KPI in a project is important because the P-value is more than 0.05.

### *4.3.4. Incentive and Penalty Evaluation*

Objective number 5 of this study is aimed at assessing the effectiveness of the existing penalty and incentive Clauses. To achieve this, a set of three questions was designed, first question was to determine the likelihood of the incentive mechanism to motivate the consultants to perform, the second question was designed to determine the extent to which the use of penalties and incentives in a project can improve the performance of the project and the third question was designed to determine if whether incorporating the existing penalty and incentive Clauses into the PSC will have an impact on the performance of the professional consultants.

The results were further cross-tabulated with the results of the respondents' experience. This was done so to address objective 4 of the study, that is by determining whether or not the respondents are aware of the incentive mechanism as a tool to motivate the consultants' performance and the likelihood of the penalty and incentive Clauses to enhance the consultants' performance and consequently the performance of the project.

#### *I. The incentive as a motivational tool to improve professional consultants' performance*

The respondents were asked to rank the likelihood of each of the incentive mechanisms that motivate the consultants to perform as identified from the literature using a Likert scale of 1 (Very unlikely) to 5 ( Very likely). As it is previously noted, part of the study aims to determine appropriate incentives to improve the consultants' performance. Table 4.21 below presents the RII and mean rating of each of the incentive mechanisms.

*Table 4.21: Incentive mechanism ranking*

| Incentive mechanisms | RII | $\bar{X}$ | R |
|---|---|---|---|
| **Design integrity incentive** - Incentive for producing and maintaining designs that are in line with the client's project outcome expectations and requirements | 86% | 4.32 | 1 |
| **Cost incentive** - Financial incentive provided for cost-saving | 84% | 4.18 | 2 |
| **Time/schedule incentive** - Bonus provided for an early completion | 83% | 4.18 | 3 |
| **Quality incentive** - Incentive for zero or minor defects | 80% | 3.91 | 4 |

| Incentive mechanisms | RII | $\bar{X}$ | R |
|---|---|---|---|
| **Sustainability incentive** - Incentive for development of the design that improves the client's efficiency and operating bottom line | 77% | 3.86 | 5 |

Table 4.21 presents the ranking of incentive mechanisms that when used can enhance the performance of the consultants. The incentive mechanism is ranked in descending order according to their level of likelihood to motivate the consultants from the data as follows: design integrity was ranked 1 with an RII of 86% and mean of 4.32, cost incentive was ranked 2 with an RII of 84% and mean 4.18, in the third-place is the time/schedule incentive with RII of 83% and mean of 4.18, fourth is the quality incentive with an RII of 80% and mean 3.91 and last position is sustainability incentive with an RII of 77% and mean of 3.86. These results indicate that, where these incentive mechanisms are used, they highly tend to improve the performance of the consultants since their RII is close to 100% and their mean is more than 3.5.

The impact of incentive mechanism as a motivational tool to enhance the consultants' performance has been cross-tabulated with the respondents' level of experience in order to determine whether the relationship is prevalent between the respondents' view on the likelihood of incentive mechanism as a motivational tool and their level of experience. The results of the cross-tabulation have been presented in Table 4.22 and Figure 4.4.

*Table 4.22: Incentive mechanism cross-tabulation with experience*

| Experience | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|
| 2-4 years | 40% | 60% | 0% | 0% |
| 4-6 years | 0% | 0% | 40% | 60% |
| 6-8 years | 7% | 7% | 60% | 27% |
| 8-10 years | 0% | 0% | 40% | 60% |
| 10 years + | 3% | 26% | 37% | 34% |

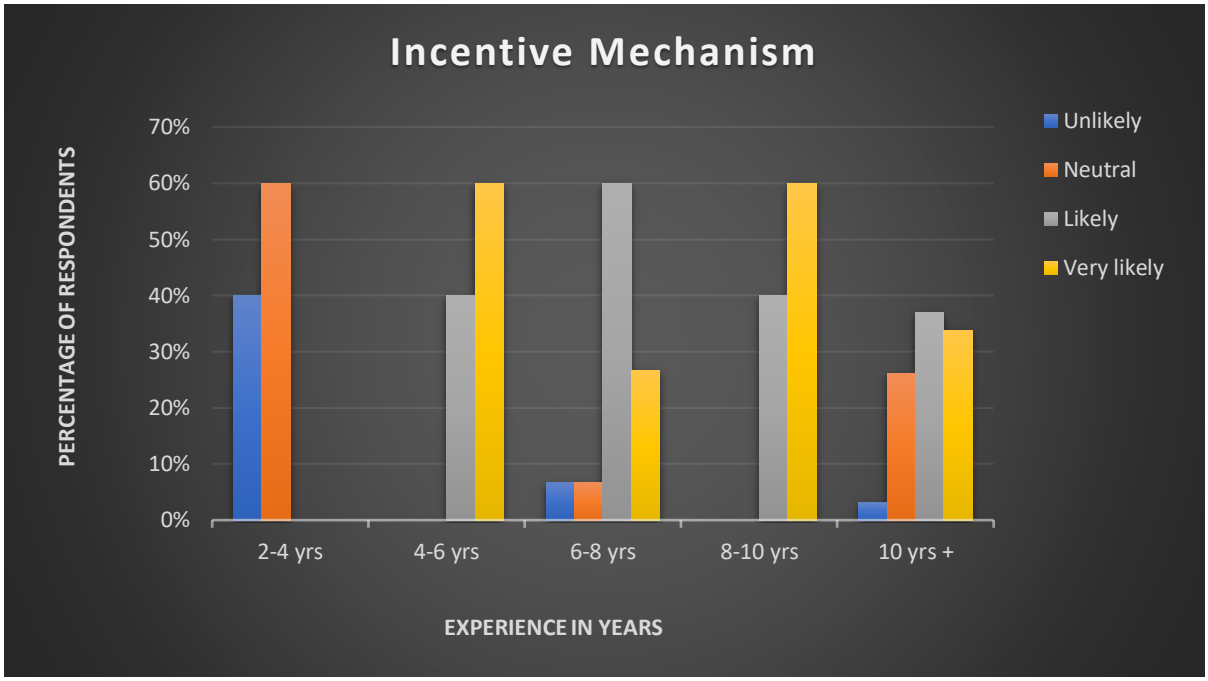


*Figure 4.4: Impact of Incentive Mechanism*

As presented in Figure 4.4. 0% of the respondents with experience between 4-6 years and 8-10 years admitted that the use of incentive mechanism as a motivational tool is very likely to improve the performance of the consultants whilst 60% of the respondents with experience between 6-8 years have admitted that the incentive mechanism is likely to enhance the performance of the consultants and the respondent with the experience between 2-4 years neither admitted nor denied that the incentive mechanism enhances the performance of the consultants.

*Table 4.23: Incentive mechanism Chi-Square test*

| **Chi-Square Test** | | | |
|---|---|---|---|
| | **Value** | **df** | **p-value** |
| Pearson's Chi square | 37.19 | 12 | 0.0002 |

As presented in Table 4.23 there is a statistical relationship between the respondents' experience and incentive mechanism as a motivational tool that enhances the consultants' performance. Results from the Chi-square test presented in Table 4.23 indicate a correlation of 0.0002 (99.98%). The correlation can be assessed through the analysis of Table 4.22. As indicated the correlation suggests that the incentive mechanism is considered to be more effective by the respondents with experience between 4-10 years.

### *II. Benefits of incorporating incentives and penalties into Professional Service Contract (PSC)*

The respondents were asked to indicate the extent to which they agree that the use of incentives and penalties has positive benefits. This question was designed in order to determine the benefits of incorporating incentives and penalties into the PSC.

*Table 4.24: Benefits of incentives and penalties ranking*

| Incentive and Penalty Benefits | RII | $\bar{X}$ | R |
|---|---|---|---|
| Project schedule performance is improved | 84% | 4.18 | 1 |
| The desired project outcome is achieved | 82% | 4.09 | 2 |
| Client satisfaction is improved through the alignment and focus of the client's requirements | 81% | 4.05 | 3 |
| Project is delivered on time without compromising quality | 81% | 4.05 | 3 |
| The level of service provided is increased | 80% | 4.00 | 4 |
| Monitoring, control and management of the contract is improved | 76% | 3.82 | 5 |
| The relationship between cost, quality and management of changes is fully understood | 75% | 3.73 | 6 |
| Control of information in a project is improved | 74% | 3.68 | 7 |

Table 4.24 shows the extent to which the respondents agree that the use of incentives and penalties leads to various benefits. The results show that the factor “project schedule is improved” was ranked first with RII 84% and mean 4.18, followed by “the desired project outcome is achieved” which ranked second with RII 82% and mean 4.09, “client satisfaction is improved through the alignment and focus of the client's requirements” as well as the “project is delivered on time without compromising quality” was ranked third with RII 81% and mean 4.05. These results imply that the respondents agree that incorporating incentives and penalties into PSC could result in all of the factors listed in Table 4.24 because the RII of all the factors are close to 100% and their means are above the value of 3.5.

*Table 4.25: Benefits of incentives and penalties cross-tabulation with organization*

| Organization | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|
| Client | 0% | 6% | 64% | 30% |

| Organization | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|
| Consulting | 14% | 24% | 41% | 21% |
| Private | 0% | 16% | 69% | 16% |

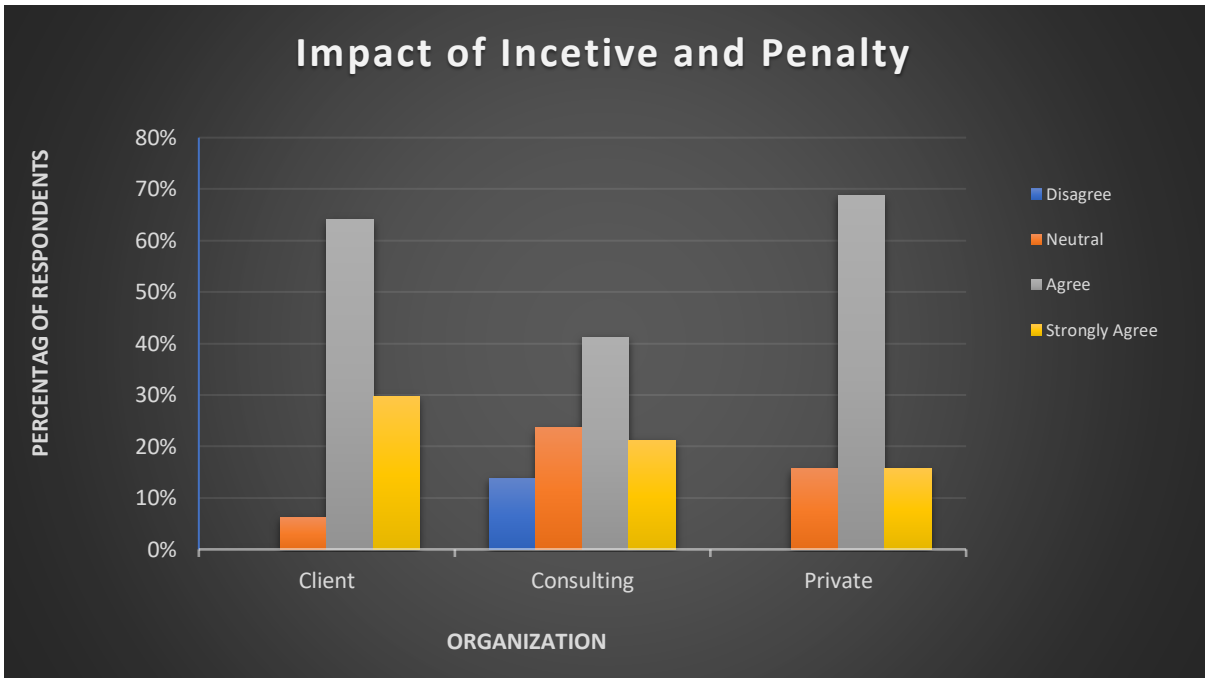


*Figure 4.5: Benefits of incentives and penalties*

The results of the benefits of incorporating incentives and penalties into the PSC were cross-tabulated with the respondents' organization category. This is intended to establish if incentives and penalties benefit both consultants and clients equally or not. The results of the cross-tabulation are presented in Table 4.25 and Figure 4.5 above. Findings are presented in Figure 4.24. indicate that 64% of the respondents working at the client organization agree that incorporating incentives and penalties into the PSC is beneficial in a project while 41% of the respondents working at the consulting organization agree and 14% disagree that incorporating incentives and penalties into the PSC is beneficial. 69% of the respondents who did not mention whether they work at the client or consulting organization agree that incorporating incentives and penalties into the PSC is beneficial.

*Table 4.26: Benefits of incentives and penalties Chi-Square test*

| Chi-Square Test | | | |
|---|---|---|---|
| | **Value** | **df** | **p-value** |
| Pearson's Chi square | 26.96 | 6 | 0.0001 |

The Chi-square test presents a correlation of 0.0001 (99.99%). The correlation can be evaluated through the analysis of data presented in Table 4.26 above. As indicated the correlation suggests that incorporating incentives and penalties into the PSC is most likely to benefit the client organization than the consulting organization. It must be noted that these findings are based on the percentage of respondents and do not imply that the use of incentives and penalties does not benefit the consulting organization.

### *III. Incentive and Penalty Clauses*

The incentive and penalty Clauses listed in Table 4.27. have been identified in the commonly used SUITES of contract in South Africa "FIDIC and NEC". The respondents were asked to indicate the likelihood of the incentive and penalty Clauses to enhance the performance of the consultants where they are incorporated into the PSC and enforced.

*Table 4.27: Incentive and penalty Clauses ranking*

| Clauses | RII | $\bar{X}$ | R |
|---|---|---|---|
| NEC3 PSC Option X6: Bonus for early completion | 83% | 4.14 | 1 |
| FIDIC Client/Consultant Clause 16.3: Compensation | 81% | 4.05 | 2 |
| FIDIC Conditions of Contract for Construction Clause 8.7: Delay damages | 80% | 4.00 | 3 |
| NEC3 ECC Option X17: Low performance damages | 80% | 4.00 | 3 |
| NEC3 PSC Option X20: Key Performance Indicator | 79% | 3.95 | 4 |
| NEC3 PSC Option X7: Delay damages | 79% | 3.95 | 4 |

The results in Table 4.27 shows that "NEC3 PSC Option X6 Bonus for early completion" has the highest probability of enhancing consultants' performance with an RII of 83% and mean of 4.14, followed by "FIDIC Client/Consultant Clause 16.3 Compensation" with RII of 81% and mean of 4.05. These findings indicate that the respondents agreed that all the Clauses listed

in Table 4.27 have a high influence on consultants' performance because all their RIIs are close to 100% and their mean is more than 3.5.

*Table 4.28: Incentives and penalties Clauses cross-tabulation with organization*

| Organization | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|
| Client | 4% | 17% | 58% | 21% |
| Consulting | 5% | 25% | 52% | 18% |
| Private | 0% | 0% | 42% | 58% |

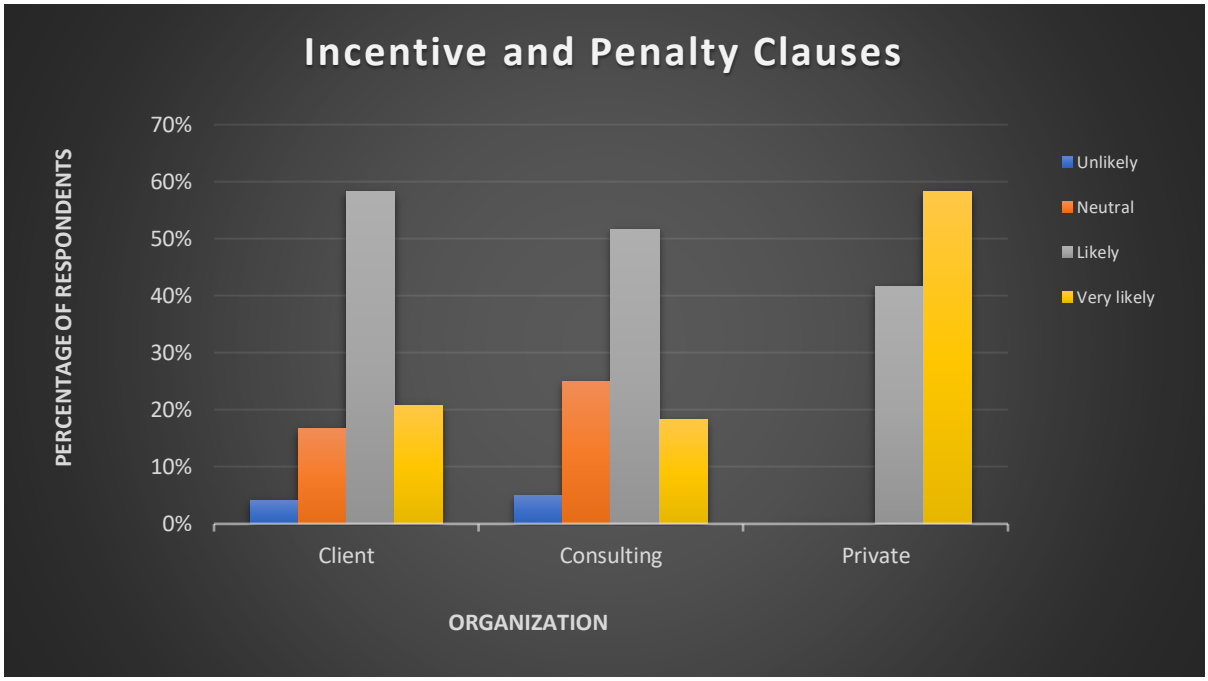


*Figure 4.6: Incentive and Penalty Clauses*

A cross-tabulation of respondents' organization with their view on the likelihood of the influence of incentive and penalty Clauses on consultants' performance is presented in Table 4.28 and Figure 4.6. This is intended to determine the effectiveness of the penalty and incentive Clauses in each organization. The results show that 58% of the respondent from client organizations found the penalty and incentive Clauses to be likely effective, while 52% of the respondents working at the consulting organization found the incentive and penalty Clauses to be likely effective and those who did not mention the organization they work for found the Clauses to be very likely effective.

*Table 4.29: Incentive and penalty Chi-Square test*

| Chi-Square Test | | | |
|---|---|---|---|
| | **Value** | **df** | **p-value** |
| Pearson's Chi square | 19.45 | 6 | 0.0035 |

Table 4.29 indicates that there is a statistical relationship between the respondents' organization and the likelihood of the penalty and incentive Clauses to influence the performance of the consultants. The Chi-square test indicates an association of 0.0035 (99.65%). This correlation can be measured through the analysis of data in Table 4.28. As indicated the correlation between the respondents' organization and the effectiveness of penalty and incentive Clauses is deemed very likely by the respondents who did not mention their organization and likely by both the respondents from the client organization and consulting organization.

## 4.4. Qualitative Data Analysis

The preceding section 4.3 presented the quantitative data analysis. This section presents the results and analysis of a series of interviews conducted on construction professionals in South Africa. This is focused on gaining a deeper understanding of the influence of consultants' performance on a project and the incentives and penalty mechanism practices and how these are used to improve the performance. This section defines the structure of the interview as well as the techniques and procedures used in this study.

In analyzing the qualitative data, the responses were coded and grouped into themes and sub-themes. The themes and sub-themes are linked to the existing theories discussed in chapter 2 of this study. This was done so to minimize and eliminate unrelated answers to the research problem and provide acceptable responses to the research question. The themes and sub-themes were derived using the research questions and objectives of this study and are grouped as follows: the form of contract used to appoint professional consultants; consultants contractual responsibilities; KPIs measures; the impact of professional consultants performance; incentive and penalty mechanism as a motivational tool for poor performance.

### *4.4.1. Professional consultants' appointment and responsibilities*

There is a need to establish a common understating of the professional agreement used to appoint consultants and the responsibility they carry in a project. The respondents were asked to determine how consultants are appointed as well as the type of contract used to appoint them and what responsibilities the appointed consultants carry in a project. These questions were designed to answer research questions 1 and 7 and to further assist in addressing objective 1 of the study by understanding the professional consultants' contractual obligations before determining the impact of their performance.

#### *I. Standard contracts used to appoint professional consultants*

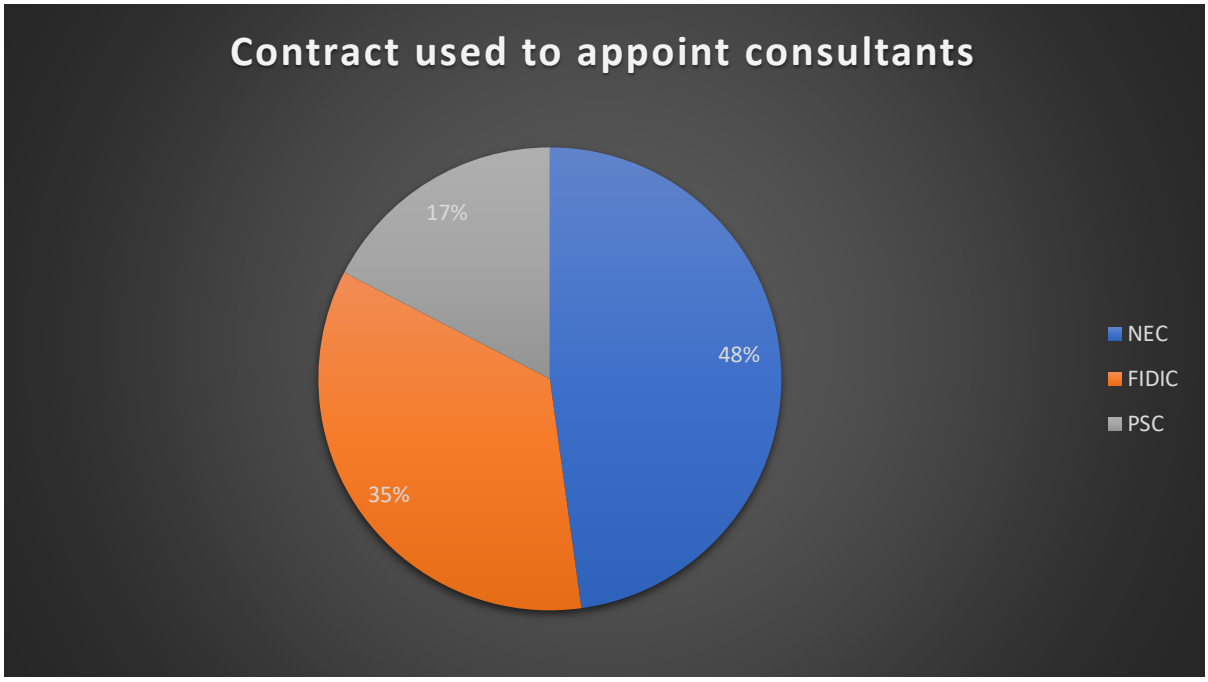


*Figure 4.7: Contract used to appoint consultants*

Figure 4.7 above illustrates the types of contracts commonly used to appoint consultants. The results from the interviews show that mostly 48% of the consultants are appointed under the NEC PSC contract, while 35% are appointed under the FIDIC Client/Consultant contract while 17% of the respondent did not specify which form of PSC is used to appoint the consultants. This implies that consultants are often appointed through a competitive bidding process under the NEC and FIDIC Professional Services Contract and also guided by the ECSA guidelines governed by the Government Gazette.

### *II. Professional consultants' responsibilities*

Professional consultants are appointed to mainly perform core duties in a project such as designing, engineering, construction project management and contract procurement. Their responsibility while performing these duties is to ensure that during inception stage, concept and viability stage, design development stage as well as documentation and procurement stage, the pre-design and detailed designs, facilitation of project proposals, schedules and other related project documentation, engineering and engineering management, project implementation and supervision, and generic financial project management are done according to the client's requirements and project objectives.

## *4.4.2. The impact of professional consultants' performance*

To address objective 1 of the study and to assess the impact of consultants' performance in a project in order to determine incentive and penalty mechanisms that can be adopted to motivate the consultants to improve their performance, the respondents were asked to determine the impact the consultants' performance (good or poor) have on a project. The respondents have made both positive and negative remarks regarding the outcome of consultants' performance in a project. The results from the interview have indicated that poor performance from the consultants affects the project negatively while good performance affects the project positively. The respondents have indicated that where consultants' performance is good, the project objectives are met as a result of the flow of information and contract management.

Below is a summary of how poor performance compromises the project deliverables and ultimately the performance of the project:

- The project suffers the consequences including decision making as well as poor or impractical decisions as a result of the poor performance of the appointed site engineer
- The project constructed based on the poor design never works, redesigning and design changes delay the execution of the project and increase the cost related to design and lead to late completion of the project respectively
- Consultants' performance affects the project in many ways and affects the project's deliverables namely time, cost, and quality. This results from design errors and poor technical documentation from engineering services provided by the consultants, poorly

defined and implemented procurement processes and procedures affect the project timeline, commercial agreement and contract management

- Project stakeholders tend to not understand the workflow and end up making incorrect decisions and in turn compromises the project deliverables as a result of consultants' performance

### *4.4.3. Key Performance Indicators measures*

KPIs represent the measures of performance in a project and for this study, the respondents were asked to indicate the KPIs that are often put in place to measure the consultants' performance. The question is designed to address objective 2 of the study and to model a typical incentive and penalty payoffs that can be adopted to penalize and/or incentivize the specific performance.

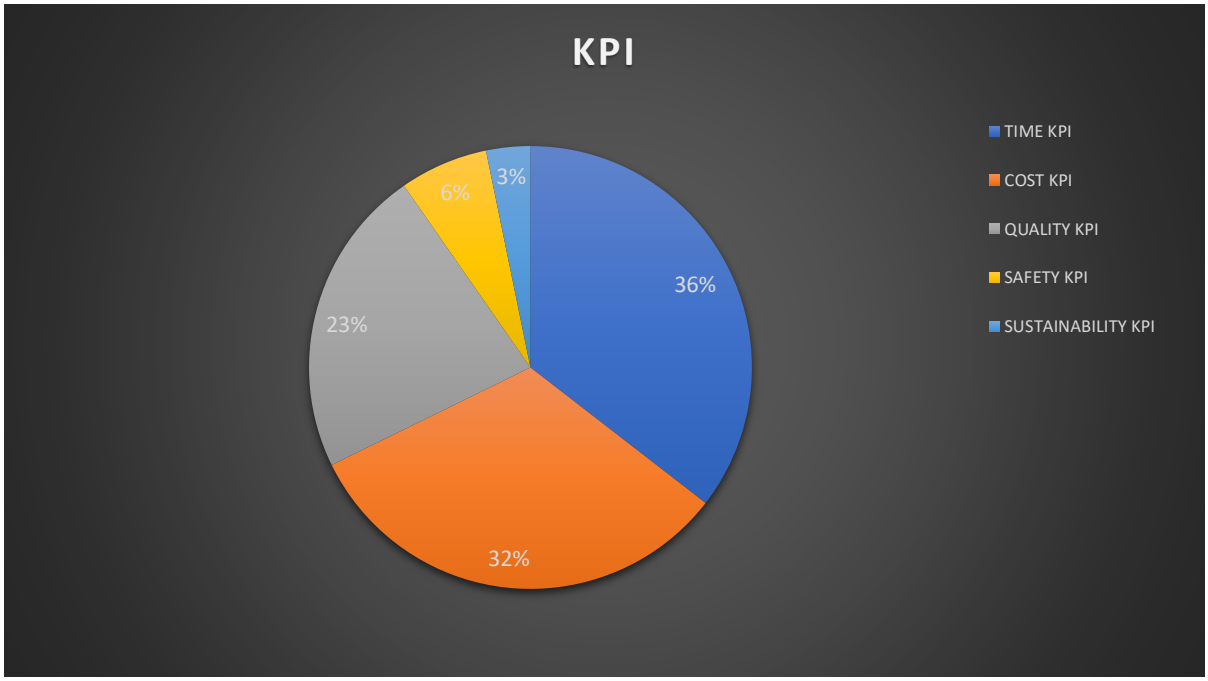


*Figure 4.8: Key Performance Indicators*

Figure 4.8. illustrates the number of occurrences each performance indicator has been mentioned from the interview. The results from the interview indicate that "time KPI" followed by the "cost KPI" are the most performance indicators used to measure the performance of the consultant and consequently the project performance. This implies that there is more emphasis on time and cost performance followed by quality performance. Safety and sustainable

performance are considered as the least performance indicators used. The results from the interview are in conjunction with the results obtained from the quantitative analysis indicating that cost KPI, time KPI and quality KPI are the most important performance indicators in a project that aid in modelling the performance parameters.

### *4.4.4. Incentive and Penalty Mechanism Evaluation*

To address objectives 3 and 5 and to answer secondary research questions 4, 5 and 6 of the study, the respondents were asked to indicate the incentives as well as penalties built into the contract to ensure consultants performance and were further asked to indicate the incentives and penalties other construction parties such as client-contractor carry when they do not perform their contractual obligations. And lastly, the respondents were asked to indicate how can these incentives and penalties be appropriately incorporated into the PSC. These questions were designed to determine the incentives and penalties built into various contracts to motivate consultants to improve their performance and further assess their effectiveness.

Results from the interview revealed that even though incentives exist they are hardly built into the contract, however, continuity of the business between the client and the consultants is taken as an incentive. Where they are built into the contract, they are built in into a special clause, that is bonus and recognition rewards clause for early completion of the project. Results further revealed that penalties rather than incentives are used to enhance consultants' performance.

As mentioned above penalties are often used as a motivational tool to remedy consultants' performance. The respondents have further indicated that “delay damages, performance bonds and guarantees, Professional Indemnity, surety as well as retention money” are often included in the agreement as penalty Clauses that remedies the consultants' poor performance. The respondents further indicated that these penalty Clauses are used where the project is delivered late, with over budget and with defects resulting from the consultants' low performance.

Similarly, to the client-consultants contract, delay damages are the commonly used penalty to remedy the parties’ performance in the client-contractor contract. This type of penalty is followed by the low-performance damage clause. The findings also reveal that often in a client-contractor contract, the contractor pays for the damages through the use of performance bonds and regularly is liable for the reperformance of the works. Furthermore, where the client is at

fault, the client is liable to grant the contractor an extension of time and pay for the additional funds due to late payments as well as late decision making.

The respondents have mentioned various incentives and penalties that are often used to deal with performance and they have further given their opinion on how these penalties and incentives can appropriately be built into the PSC to achieve high performance.

The findings have indicated that both the incentives and penalties should be coupled together in the contract because using one mechanism is one-sided. This can be achieved in an instance where the consultant has full control and the risk is apportioned to the consultants, that is the consultant should not be penalized nor incentivized where he does not have control.
Incentives and penalties can be incorporated into the PSC pending the nature of the specific project and what KPI metrics are important in the project. For example, it would be irrational to have incentives for early completion in a project that is solely cost, or quality driven with timeline not being important. Thus, the penalty and incentive Clauses should be simplified further to suit the KPIs of a specific project and what the consultants are working on, that is, it should clearly be stated what is to be penalized and what is to be incentivized.

### *4.4.5. Consultants performance damages and remedy*

In addition to determining the impact of consultants' low performance on a project, it was important to determine how it is often proven that the impact of the damage is caused by the consultants' poor performance, and ultimately the measure often put in place to remedy the damages and when it is decided to terminate the consultants' services due to poor performance.

The results from the interview have revealed that consequential damages such as poor decision making, delays, poor designs and incorrect site levels are recorded, checked, and proven to results from the consultants' low performance. Early warnings, KPI's such as milestone date, budget, etc. and risk register are used to measure, evaluate and prove damages resulting from consultants' poor performance. In addition, during proposals, manhours are allocated to each discipline of consultants and therefore poor performance can easily be monitored where each discipline exceeds their allocated hours before completing their tasks and also reworks initiated by the consultants indicate poor performance. Furthermore, proof of loss of income in addition to time and cost is usually the measure to substantiate claims related to consequential damages.

Respondents have advised on various ways of contractually remedying consequential damages after being proven that they were caused by the consultants' low performance. Additionally, they revealed ways of dealing with the consequential losses as a result of consultants' low performance and further specified applicable liquidated damages for cases where the project has failed in terms of time, cost, and quality performance due to consultants' poor performance or failure to perform. The findings from the interview have revealed that in dealing with the consultants' low performance contractually, communication is always the first port of call, then the reperformance of the works at the consultants own cost and are allowed to the reperformance of the works of up to 10% of the contract value, and thereafter one would be reliant on the contractual terms available for claims related to consequential damages. These contractual terms include the use of liquidated damages, retention bonds, delay damages, performance bonds, sureties, cash retention, bonus/penalty schemes as well as recovering or deducting money from the consultants' professional indemnity insurance. In some cases, consequential losses are excluded from the consultants' responsibilities and are covered by project contingencies. Extreme measures are by reporting them to the Professional Body and/or National Treasury and recommend that they must not bid within the department for a period of five years of which they must report their action to correct their poor performance or permanent de-registration of the consulting firm (in a case where the client is a government organization).

The findings have revealed that where the consultant has failed dismally, termination is often the last resort to deal with poor performance, however, the decision to terminate the consultants comes with experience, the knowledge of when to sense that a consultant will not be able to produce, often after several engagements and continuous failure to rectify and correct their works and actions to improve their performance resulting in increased consequential losses. In a case where termination is the last solution to poor performance, the decision is taken quickly and before the negative impact on the project is too excessive.

# Chapter 5: Discussion of Results

## 5.1. Discussion of results

This section discusses the results from the survey questionnaires and interviews conducted for the purpose of this study. The results of the study cover the professional consultants' contractual responsibility, the impact of consultants' poor performance on a project, KPIs that are put in place to measure the performance, the effectiveness of incentives and penalties as a motivation and a remedy for consultants' performance.

### *5.1.1. Professional consultants' contractual responsibility in a project*

In practice, professional consultants are appointed to perform their professional duties on behalf of the client. They are appointed under various professional service contracts for various duties. The findings of the study align with the literature and that within the South African context the professional consultants are mainly appointed under the NEC PSC and FIDIC Client/Consultant to perform their contractual obligation to successfully deliver the project.

Findings of the study have revealed that consultants' responsibilities include but are not limited to as quoted from the respondents who gave consent to be quoted but be kept anonymous in the study

- "Evaluating and approving the contractors' payment certificates" (Respondents 1)
- "Assessing, authorizing and issuing contract variations or additional work and determining the value of any variations or additional work to be executed" (Respondents 2)
- "Evaluating and determining any requests for extensions of time" (Respondents 3)
- "Assessing the compliance of materials and workmanship with the quality specified in the contract" (Respondents 4)
- "Measuring the progress that is being made with the completion of the works and give guidance to the contractor as to the state of completion of the works required to certify practical completion" (Respondents 5)
- "Certifying practical completion of the works and issuing a works completion list to the contractor within a specified time of the certification of practical completion" (Respondents 6)

- “Evaluating the status of completion of any work included in the works completion list and as soon as the work has satisfactorily been completed by the contractor issue a certificate of works completion” (Respondents 7)
- “Inspect the works and issue a certificate of final completion at the end of the defect’s liability period” (Respondents 8)
- “Compiling the final account and closeout report and issue it to the client and contractor” (Respondents 9)

These findings align with the consultants' roles stated in the FIDIC contract as cited by (Dadzie *et al*.,2012). This means that the consultants' contractual obligations have an extreme influence on the successful delivery of the project.

### *5.1.2. The cause of reworks and variation orders*

The literature reviewed in this study has indicated that the common source of reworks and variation orders can be categorized into several groups such as design-related issues, poorly defined scope of work, conflicting contractual documentation, poor coordination and integration during the pre-feasibility phase, poorly written specification and poor administration of the contract. Therefore, the source of construction reworks and variation orders were studied based on the abovementioned categories.

The results from the study have indicated that design-related issues such as errors in designs and frequent changes to the designs and poorly defined scope of work were found to be consultants' poor performance factors causing reworks and variation orders in a project. The study conducted by Babalola and Idehem (2011) has found that design-related issues such as design changes, “inadequate drawings details as well as complex design by the consultants were some of the factors that cause variation in a project. The claim is further supported by the study conducted by Yap *et al*., (2017) and Dadzie *et al*., (2012) who found that poor design is a source of reworks because contractors often use poorly designed drawings which will ultimately lead to construction errors and there will be a need for variation orders and reworks. This means that most consultants do not integrate all of the project objectives and client requirements into the design and scope of work, hence the need for variation orders and to redo the works that were incorrectly done to cater for the project objectives that were not catered for

initially, and ultimately compromise one or more of the project deliverables. This aligns with the statement made by Simpeh (2012) that construction rework due to non-conformance creates a redundant time and cost of redoing the former work. Furthermore, project costs associated with reworks can increase to up to 20% (Yap *et al.*, 2017) and more than 10% (Dadzie *et al.*, 2012). Therefore, Babalola and Idehem (2011) suggest that problems associated with reworks can be eliminated by having an adequate plan at an early stage of the project.

### *5.1.3. The impact of consultants' poor performance*

To address the aim of the study which is focused on determining the appropriate incentive and penalties and study how they can be incorporated into the professional service contract, it was vital to first study the impact of consultants' low performance in a project.

Challenges resulting from the consultants' low performance listed by various researchers from different countries were found to be similar challenges faced by the South African construction industry, even though the studies were conducted several years ago and in different countries. These challenges faced in the construction project of which the professional consultants are central to results from inadequate input by the professional consultants, poor flow of information between consultants and contracting parties, design-related issues, inaccurate estimates and inconsistent documents produced by the consultants, reworks, variation and change orders initiated by the consultants. These low-performance traits were found to have a negative impact on the delivery of construction projects in South Africa and they align with the findings of the studies conducted by Enshassi *et al.*, (2013); Odusami and Onwukube (2008); Laryea (2011); Yap *et al.*, (2017); Construction Industry Institute (CII) (1989) cited by Simpeh (2012); Waziri and Bala (2011); Kolo *et al.*, (2011); Dadzie *et al.*, (2012); and Babalola and Idehem (2011).

The table listing negative factors that result from the consultants' low performance is listed in Table 5.1.3 below. These factors align with factors that were found to have a negative impact on the project by various researchers.

*Table 5.1: The impact of consultants low performance on a Project*

| Impact of consultants' low performance | RII | $\bar{X}$ | R |
|---|---|---|---|
| Poorly compiled BOQ which will lead to inaccurate estimates | 90.00% | 4.50 | 1 |
| Poor designs and errors in working drawings | 89.09% | 4.45 | 2 |
| Poor scope definition | 82.73% | 4.14 | 3 |
| Ambiguous specifications | 80.91% | 4.05 | 4 |
| Incorrect and understated schedule timelines | 80.00% | 4.00 | 4 |
| Lack of coordination between designers | 80.00% | 4.00 | 4 |
| Poor facilitation of project proposal | 79.09% | 3.95 | 5 |
| Impact on the schedule of the project | 79.09% | 3.95 | 5 |
| Claims and contractual disputes e.g. extension of time and contractors' additional payment | 78.18% | 3.91 | 6 |
| Frequent and late design changes | 76.36% | 3.82 | 7 |
| Delay of the project completion date/ extension of the project completion date | 76.36% | 3.82 | 7 |
| Increased project cost | 76.36% | 3.82 | 7 |
| Increase in project cost for measured items during the construction phase | 75.45% | 3.77 | 8 |
| Change orders/ variations | 74.55% | 3.73 | 9 |
| Late response to request for information | 73.64% | 3.68 | 10 |
| Poor contract documentation which leads to a number of addendums during tendering process and construction phase | 73.64% | 3.68 | 10 |
| Changes and/or deferment of decisions | 71.82% | 3.59 | 11 |
| Construction errors and reworks | 71.82% | 3.59 | 11 |
| Inaccurate BOQ and estimates | 70.91% | 3.55 | 12 |
| Construction delays or temporary stoppage of the project | 70.91% | 3.55 | 12 |
| Late or lack of design approval by all stakeholders | 70.00% | 3.50 | 13 |
| Misunderstanding of requirements between the design team and estimating team | 70.00% | 3.50 | 13 |
| Poor engagement between QSs and estimators and late or incomplete provision of design information during early stages resulting in inaccurate estimates | 69.09% | 3.45 | 14 |

| Impact of consultants' low performance | RII | $\bar{X}$ | R |
|---|---|---|---|
| Inaccurate estimates | 69.09% | 3.45 | 14 |
| Claims and disputes | 68.18% | 3.41 | 15 |
| Difficulties to reach decisions regarding project award | 67.27% | 3.36 | 16 |
| Project delays due to time taken reviewing and revising designs | 66.36% | 3.32 | 17 |
| Misaligned timelines | 65.45% | 3.27 | 18 |
| Project approved for execution with insufficient funding as a result of underestimated cost | 65.45% | 3.27 | 18 |
| Unclear tender documents that often lead to claims and disputes | 64.55% | 3.23 | 19 |
| Project rework | 64.55% | 3.23 | 19 |
| Poor quality feasibility phase outcomes which could halt the client from undertaking project | 60.91% | 3.05 | 20 |
| Compromised selection process of vendors due to temporary stoppage of the works while design errors are being rectified | 57.27% | 2.86 | 21 |
| Compromised quality | 56.36% | 2.82 | 22 |
| Temporary stoppage of the project | 53.64% | 2.68 | 23 |
| Delays and/or abandonment of projects while client seek additional funding and/or does not get additional funding | 50.91% | 2.55 | 24 |

It can be noted from Table 5.1 that the professional consultants' low performance has an extreme impact on a project because 22 out of the 36 factors listed have a mean of more than 3.5 and therefore this means that there is a 61% chance that consultants low performance will have an influence on the outcome of the project. Therefore, there is a need to determine and measure these impacts in a project to penalize and/or incentivize the consultants and ultimately improve their performance and achieve the project objectives.

The factors listed and ranked in Table 4.4 in chapter 4 were found to be the inadequate input often provided by the consultants and in turn, affect the project performance negatively. From the analysis of the results, it is apparent that it is very likely in a project for the consultants to perform poorly and give an input that compromises the project deliverables. This means that there is a correlation between the consultants' performance and project performance.

One of the factors that were found to be associated with the consultants' low performance is the poor flow of information. This factor was found to have multiple negative impacts on the project including poorly prepared contract documentation and misunderstanding of project requirements by the project team such as the design team and estimating team. These impacts that result from poor flow of information further have a negative impact on the project including inaccurate estimates, project claims and disputes (Laryea, 2011), "frequent design changes" which in turn affect the project budget (Memon, Rahman and Aziz, 2012). This implies that good communication amongst consultants is crucial because it enables them to establish and define the clients' requirements and project scope, consult with each other to complement and incorporate each other's input to achieve the project objectives.

It was indicated in the literature that project documents produced by consultants are not always consistent and clear in practice (Laryea, 2011) and they affect the project performance in various ways. Findings from the study strongly suggest that inconsistent project documentation often leads to variation orders. This factor was found to be the predominant source of contractual disputes and claims, and ultimately delay the project and increase the project cost because it involves stopping the project temporarily and altering the original scope of work (Sunjka and Jacob, 2013). Variation order was also found to be one of the compensation events in the case study conducted in South Africa because where a variation order is issued it entitles the contractor to the extension of time and additional payment (Laryea, 2016) affecting the project duration and budget.

The inconsistency and unclear project documentation produced by the consultants also includes poor and complex designs produced by the consultants. Poor and complex designs were found to be the predominant cause of inaccurate BOQs and project cost estimates and ultimately increases project cost and delay the project. This implies that the QSs and estimators spend time analyzing and making assumptions on the poorly designed drawings and end up producing inaccurate BOQs and cost estimates (Laryea, 2011) which has a negative impact on the decisions regarding the project awards (Odusami and Onukwube, 2008). The inaccurate estimate also results in low feasibility that restricts the client from executing new projects and misleads the construction project developers to high feasibility resulting in additional cost during the construction phase (Waziri and Bala, 2011). This means that project cost estimates cannot be more accurate than the poor designs produced by the consultants. The findings suggest that the accuracy of the estimate is an important factor during the feasibility stage of

the construction project because it helps in predicting the cost of delivering the project and making adequate decisions regarding the budget allocation (Waziri and Bala, 2011).

Furthermore, findings from the study have revealed that poor and complex designs produced by the consultants, delay the project, increase cost, cause construction errors and eventually rework. This implies that project execution is delayed due to the time taken to modify, review and accept the designs for construction works (Sunjka and Jacob, 2013). In addition, contractors and the site team misunderstand the poor and complex designs and end up constructing a project with errors and ultimately the need to rework in order to ratify the work errors (Odusami and Onukwube, 2008; Yap *et al*., 2017). Moreover, poor designs are frequently modified delaying the project and affecting the budget linked with the required type and volume of project resources (materials, equipment and labour) associated with the design modified (Memon *et al*., 2012). This implies that poor design delays the project due to the time taken to modify and revise the designs to meet the project objectives.

The findings associated with the impact of the consultants' poor performance align with the problem statement that in practice project deliverables are often compromised due to consultants' low performance. This is in agreement with the study conducted by (Memon *et* al., 2012) which revealed that there is a correlation between consultants' low-performance factors that compromises project cost and inadequate project control, monitoring and management. Therefore, the importance of penalizing the consultants for poor communication and producing inconsistent documentation is important for the reason that it enables all parties to a project to understand the workflow and make correct decisions and in turn improve the overall performance of the project. Hence the performance indicators have been identified and studied in order to model incentive and penalty mechanisms. The performance indicators are discussed in detail below.

### *5.1.4. Key Performance Indicator measures*

From the literature, it was indicated that KPIs are used to keep records and measure the consultants' performance. Objective two of this study was to determine professional consultants' KPIs. This objective is aimed at determining the metrics for measuring the incentives and/or penalty payoff against the performance. Time KPI, cost KPI, and quality KPI was found to be the most dominating KPIs in the construction industry in South Africa. These

KPIs are used to measure the performance in a project. In addition to these key KPIs, three key Incentive mechanisms were identified from the literature and were categorized into time/schedule incentive, cost incentive, design integrity incentive and safety incentive. Therefore, these key incentive mechanisms can be used as the mechanism to incentivize or penalize the KPIs in a project for the reason that the incentives improve the performance (Meng and Gallagher, 2012). Therefore, these key incentive mechanisms can be adopted to incentivize or penalize the KPIs in a project. With that being said the following incentive model can be adopted to incentivize or penalize the consultants' performance determined from the KPIs illustrated in Figure 5.1.

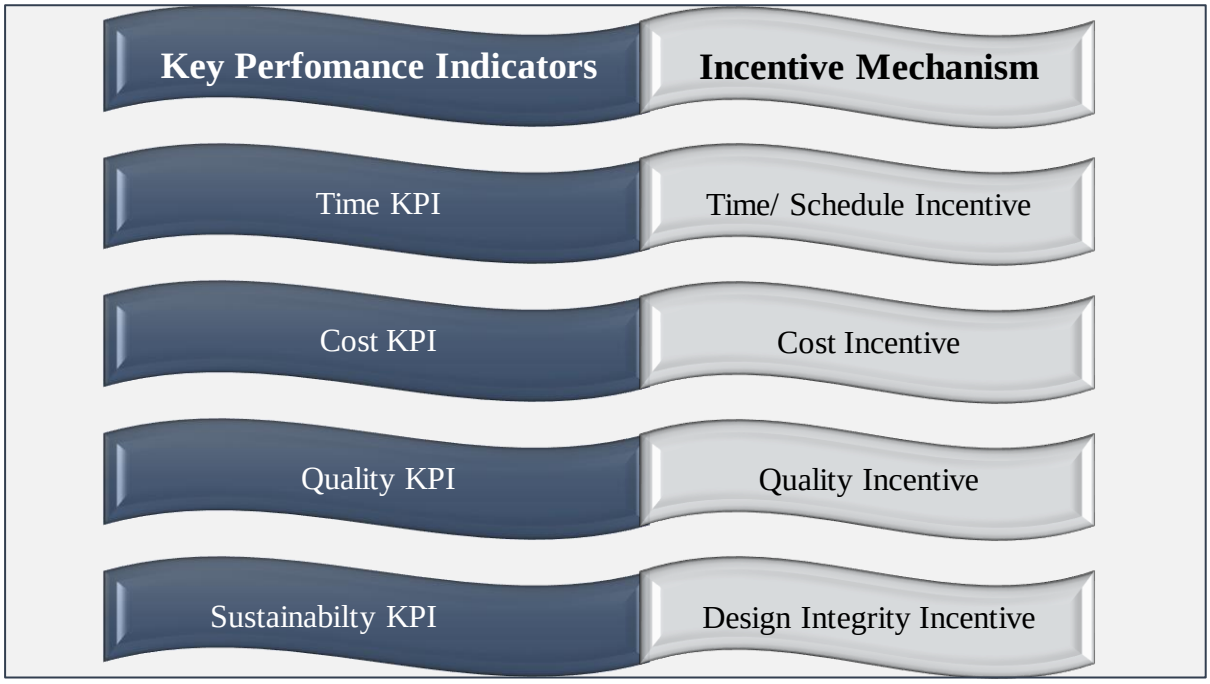


*Figure 5.1: Penalty-incentive payoff model for performance*

Findings of the study have further indicated that consultants can appropriately be penalized or incentivized against the specific performance, that is good or poor performance. Therefore, the penalty-incentive model illustrated in Figure 5.1 indicates how each of the incentive mechanisms can be adopted to penalize or incentivize each one of the main KPIs in a project.

The penalty-incentive model means that time/schedule incentive which refers to a bonus or reward can be adopted to penalize or incentivize the time KPI associated with completing the project on time, effectively managing the project schedule and having fewer or no claims associated with the extension of time. These findings align with the study conducted in the

USA by Paladugu (2015) which emphasized that including schedule incentives in the contract will reduce the project completion time by 50%. Cost incentive mechanism can be adopted to incentivize the professional consultants' performance related to effective cost control and save cost in a project, that is completing the project within the estimated budget. This claim is supported by the study conducted by (Meng and Gallagher, 2012) who found that the financial incentives mechanism supports the project in terms of cost-saving. The quality incentive can be adopted to incentivize the professional consultants for delivering the project with minor to zero defects without compromising the desired quality. This incentive motivates the consultants to deliver the project with good quality that achieves project objectives (Meng and Gallagher, 2012; Paladugu, 2015). Design integrity incentives can be adopted to improve and maintain designs that are in line with the client's expectations and requirements in terms of safety and sustainability.

The penalty-incentive payoff model results align with the study conducted by Ogwueleka and Maritz, (2016) in South Africa and Nigeria. The study has modelled a similar incentive payoff for the construction organization in both South Africa and Nigeria. The study has found that in South Africa the cost incentive can be used in a case where project target cost has been met, time incentive can be used to incentives "timely completion", quality incentive can be used to incentivize "conformance with quality", safety/health incentive can be used to incentivize low incident rate, whereas in Nigeria it was found that cost incentive can be used to incentivize "measurement and correction of works", time incentive can be used in a case where the project has been completed with the reasonable claims of extension of time, quality incentive can be used in a case where the project is completed with minimum or zero defects and safety/health incentive can be used to incentivize parties for effectively responding to incident (Ogwueleka and Maritz, 2016). This alignment of the results of the study conducted in Nigeria and South Africa implies that it is vital in a project to have KPIs so that it will be easy to incentivize or penalize the consultant for their specific performance.

### *5.1.5. Incentive and Penalty mechanism*

From the literature, it was revealed that penalties and incentives can be used to remedy poor performance and motivate consultants to improve the performance and ultimately improve the performance of the project. Therefore, it is important to determine the benefits of incentives

and penalties mechanisms and assess their likelihood to motivate the consultants' performance and ultimately achieve the project objectives.

The literature has revealed that the use of incentives and penalties in a project gives several benefits. The results from the study have further indicated that most of the time the contracts uses penalties alone to promote performance, however, this does not seem to be effective as it is one form of motivation, therefore positive incentives in a form of monitory rewards and accolades tend to motivate the individuals to put in an extra effort. Therefore, it was suggested that both penalties and bonuses be incorporated into the existing PSC to promote and remedy the performance of the consultants.

The findings further revealed that where incentives and penalties are used in a project, the price schedule is improved, and the desired outcomes are achieved. The respondents further indicated that the project deliverables are rarely compromised, and the level of service provided by the consultants is increased. These findings are supported by the study conducted by Paladugu (2015) that some of the benefits that are achieved through incentivization include early delivery of the project without compromising the quality, the desired outcome of the project is achieved and end user's satisfaction is improved, schedule performance is improved (Paladugu, 2015). This implies that incentivization and penalization of the consultants' performance are beneficial in delivering the project without compromising the project deliverables and achieving the project objectives.

In addition to the benefits of using incentives and penalties in a project, the study has identified incentives and penalty Clauses that are commonly used in construction contracts. These Clauses were identified to further determine their likelihood to improve performance and to address objective 5 of this study which is the assessment of the effectiveness of the existing PSC penalty and incentive Clauses. The Clauses identified from construction contracts are categorized into incentive Clauses and penalty Clauses as follows: NEC3 PSC Option X6 "Bonus for early completion"; and NEC3 PSC Option X20 "Key Performance Indicator"; NEC3 PSC Option X7 "Delay Damages"; FIDIC Conditions of Contract for Construction Clause 8.7 "Delay Damages Clause"; NEC3 ECC Option X17 "Low-Performance Damages"; and FIDIC Client/Consultant Clause 16.3 "Compensation Clause" (NEC3 PSC, 2005; FIDIC Conditions of Contract for Construction, 1999; NEC3 ECC, 2005; FIDIC Client/Consultant, 1998).

Findings from the study have indicated that delay damages, as well as low-performance damages Clauses, were ranked high as the penalty Clauses that can enhance consultants' performance. Likewise, bonuses for early completion as well as compensation Clauses were found to be the most effective Clauses that can motivate the consultants to improve their performance when incorporated into the PSC. These findings align with the results from the interview which revealed that bonuses and rewards for early completion are built in the PSC as special incentive Clauses. Furthermore, the respondents have indicated from the interview that delay damages and low-performance Clauses are often used as penalty Clauses to penalize the consultants for low performance, that delivering the project late, over the budget and with poor quality or defects. These findings imply that delay damages and low-performance damages Clauses are the most effective penalty Clauses that are likely to improve performance. This statement is supported by the finding from the interview where respondents were asked to indicate penalties other parties such as Client-Contractor carry when they do not perform.

# Chapter 6: Conclusion and Recommendations

## 6.1. Conclusion

This study reports on the impact of consultants' poor performance, the exploration of contractual incentive and penalty mechanisms that can be used to motivate and remedy consultants' performance in the construction industry in South Africa. The study has extensively reviewed the literature themes, topics and patterns that are related to the impact of consultants' low performance on a project, existing penalty and incentive mechanisms in order to assess their effectiveness when used to enhance performance. Descriptive analysis, RII and bivariate analysis were used to analyze the findings from the survey questionnaires and content analysis, as well as thematic analysis, were used to analyze results from the structured interviews. The findings of the study were supported by theoretical evidence from previous studies.

The study aimed to determine appropriate incentives and penalties and how they can be incorporated into the PSC to enhance the professional consultants' performance in the construction industry in South Africa. This aim has been achieved successfully through the assessment of the primary objectives. Furthermore, the study has satisfactorily answered the research question by answering the research secondary questions. From the responses derived from the study, it was anticipated that there would be a better understanding of how professional consultants' poor performance negatively impact the project and how the poor performance can contractually be improved through the use of penalties and incentives

In specific relation to objective 1 of the study which was aimed at "determining the impact of the consultants' low performance on a construction project in South Africa", it was found that in practice, the impact of consultants low performance aligns closely with the impact of low performance by construction parties determined in the literature, however, the level of the effect differs significantly as indicated in chapter 5 Table 5.1.3 which indicated that the professional consultants' low performance often affect 61% of the project negatively. The outcome of consultants low-performance factors listed in Table 5.1.3 are commonly caused by inadequate input from professional consultants, poor flow of information between consultants and contracting parties, design-related issues such as ambiguous and complex designs as well

as design errors, inaccurate estimates and inconsistent documents produced by the consultants, reworks, variation and change orders initiated by the consultants. These poor performances are the predominant cause of project failures in South Africa because they compromise one or more of the project deliverables.

In specific to objective 2 of the study, it was important to determine the KPIs of the project in order to model the penalty-incentive payoff for the specific performance, that is good or poor. This objective was important for the reason that having KPIs in a project helps in keeping the record of consultants' performance so that it will be easier to penalize or incentive the specific performance. The KPIs put in place to measure the consultants' performance is the time frame, expenditure cost and quality and they should be in line with the physical progress on-site. These KPIs are similar to the KPIs determined from the literature, that is time, cost, quality and design KPIs and they are important because they determine the project outcome. From these KPIs, the study has modelled the penalty-incentive payoff that can be adopted to penalize or incentivize the specific performance that is recorded and measured against the project-specific KPIs.

In addition to the penalty-incentive payoff model that can be adopted to penalize or incentivize specific performance, the study has further achieved objective 3 of the study which was aimed at determining the incentive and penalty Clauses built into various contracts that deal with professional consultants' performance. NEC3 PSC, NEC3 ECC, FIDIC Conditions of Contract for Construction and FIDIC Client/Consultant contracts have been used to determine the Clauses related to penalties and Incentives, i.e. NEC3 PSC Option X6 "Bonus for early completion"; NEC3 PSC Option X20 that addresses "Key Performance Indicator" in a project; NEC3 PSC Option X7 and FIDIC Condition of Contract for Construction Clause 8.7 which both addresses the "Delay Damages" in a project"; NEC3 ECC Option X17 which addresses "Low-Performance damages" caused by the contracting parties and FIDIC Client/Consultant Clause 16.3 which addresses "Compensation" to the contracting party in a case one party has failed to perform their contracted obligation. All these Clauses have been found to have a high influence on performance and therefore can be incorporated into the PSC to improve consultants' performance. However, delay damages and low-performance damages Clauses are the most dominating penalty Clauses that enhance consultants performance and examples of these penalties are delay damages, performance bonds and guarantee, professional indemnity, sureties and retention, liquidated damages, whereas bonuses and rewards which are "special Clauses" for early completion of works are the most dominating incentive Clauses that

motivate the consultants to improve the performance. Where these penalties and incentives fail to improve the consultants' performance, termination of the contract is used as the mechanism to deal with poor performance and the consulting firm is barred from bidding for work for five years in a case where the client is the government organization. These penalty-incentive Clauses were found to be similar penalty-incentive Clauses that are effective in the client-contractor contract.

In specific to objective 4 of the study which was aimed at raising awareness of contract Clauses to clients who do not have experience in construction and contractual matters. From the Bivariate analysis of the study, the client respondents seemed to have an understanding of the impact of incentives and penalties on performance, however, there is little empirical evidence that indicates whether or not the client representatives are aware of the benefits and effectiveness of incorporating the incentives and penalties into the professional services contract. Therefore, a further study needs to be conducted regarding raising the awareness of the effectiveness of incentives and penalties for the construction parties who do not have experience in contractual matters.

The fifth objective of the study was to assess the effectiveness of the existing PSC penalties and incentive Clauses. Contractual incentives and penalties are effective because the respondents have agreed that the use of incentives and penalties in a contract gives positive benefits. Likewise, incentives and penalties are effective because they give one of the following positive outcomes when they ate incorporated into the PSC:

- Improvement of the project schedule and ultimately the project performance
- The achievement of the project desired outcome
- Improvement of the alignment and focus of the requirements and ultimately the client satisfaction improvement
- Improved level of service provided and ultimate early delivery of the project without compromised quality
- Improvement of monitoring, control and management of the contract
- Improvement of control of information and ultimate full understanding of the relationship between cost, quality and change management

Penalties can be used together with incentives; this is effective in a case where the control and risk are apportioned to the appointed consultant. However, penalties are more effective than incentives.

## 6.2. Recommendation

From the results of this study, the following areas are recommended for further study:

1. The study has developed a penalty-incentive payoff model. There is a need to further establish the effectiveness of the developed incentive penalty payoff model.

2. There is a lack of empirical evidence indicating a successful case where professional consultants have been contractually incentivized and/or penalized. Most studies about incentives were focused on incentivizing contractors to improve their performance and the general application of incentives on employees. Therefore, there is a need to determine whether professional consultants are adequately incentivized and penalized for their performance.

3. The participants have indicated some knowledge regarding the existing incentives and penalty clauses. However, there is a need to establish if they are aware of the benefits of incorporating incentives and penalties into the contracting strategies. Furthermore, determine ways that can raise awareness to the clients that are not experts in construction contract matters regarding the use of incentives and penalties to improve consultants' performance.

## 6.3. Closing Remarks

Chapter 6 of this study provides a summary of the findings of the study and recommendations for further study. It can be noted that the study has validated the context of the themes and concepts designed for this study and has achieved the anticipated objectives.

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# Annexures

## 1. Annexure A: Consent Form

### Consent Form to participate in the study

**Title of the Study:** "Exploring the Contractual Incentivization and Penalization of Professional Consultants' Performance in the Construction industry"

**Researcher:** Miss. Morongoa Sebola

**Supervisor:** Prof. Samuel Laryea

I, _____, the undersigned, agree to participate in this research study. I further confirm that:

Please tick yes/no

| | | Yes | No |
|---|---|---|---|
| 1. | I have read and understand the purpose of the study as indicated in the information sheet | | |
| 2. | My participation in the study is voluntarily and I can withdraw from participating at any given time | | |
| 3. | Any issues regarding confidentiality have been explained to me | | |
| 4. | The use of my response in the study has been clearly explained to me | | |
| 5. | I agree to participate in the study i.e. Fill in the questionnaires and answer the interview questions | | |
| 6. | I would like my identity to be kept confidential and anonymous | | |
| 7. | I agree that the researcher may quote and use my responses to the interview questions in the research report | | |

Signature: _____

Date: _____

## 2. Annexure B : Research instruments: Survey Questionnaire

*Section A: Demographic Information*

1. Name of the Organization: _____
2. State your work title in the organization? _____
3. How long have you been working in the construction industry?

| | | | | | |
|---|---|---|---|---|---|
| Less than 2 years | 2 – 4 years | 4 – 6 years | 6 – 8 years | 8 – 10 years | More than 10 years |

4. Please state your core duties: _____
5. State your highest qualification: _____
6. Age:

| | | | | |
|---|---|---|---|---|
| 21 - 30 | 31 - 40 | 41 - 50 | 51 - 60 | 61 - 65 |

*Section B: The Evaluation of the impact of Professional Consultant's poor Performance on project performance*

1. What is the likelihood of the following by the consultants' inadequate input/poor performance traits to have a negative impact on the project?

| Inadequate Input | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| Poor facilitation of project proposal | 1 | 2 | 3 | 4 | 5 |
| Incorrect and understated schedule timelines | 1 | 2 | 3 | 4 | 5 |
| Poorly compiled BOQ which will lead to inaccurate estimates | 1 | 2 | 3 | 4 | 5 |
| Poor designs and errors in working drawings | 1 | 2 | 3 | 4 | 5 |
| Ambiguous Specifications | 1 | 2 | 3 | 4 | 5 |
| Late or lack of design approval by all stakeholders | 1 | 2 | 3 | 4 | 5 |
| Poor scope definition | 1 | 2 | 3 | 4 | 5 |

| Inadequate Input | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| Frequent and late design changes | 1 | 2 | 3 | 4 | 5 |
| Changes and/or deferment of decisions | 1 | 2 | 3 | 4 | 5 |
| Late response to request for information | 1 | 2 | 3 | 4 | 5 |
| Lack of coordination between designers | 1 | 2 | 3 | 4 | 5 |

2. How often does each of the following occur as a result of the poor flow of information?

| Poor flow of information | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Misaligned timelines | 1 | 2 | 3 | 4 | 5 |
| Misunderstanding of requirement between the design team and estimating team | 1 | 2 | 3 | 4 | 5 |
| Poor engagement between QSs and Estimators and late or incomplete provision of design information during early stages resulting in inaccurate estimates | 1 | 2 | 3 | 4 | 5 |
| Poor quality feasibility phase outcomes which could halt the client from undertaking project | 1 | 2 | 3 | 4 | 5 |
| Poor contract documentation which leads to a number of addendums during tendering process and construction phase | 1 | 2 | 3 | 4 | 5 |

3. How often does each of the following occur as a result of Design related issues?

| Design Related issues | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Project delays due to time taken reviewing and revising designs | 1 | 2 | 3 | 4 | 5 |
| Inaccurate BOQ and estimates | 1 | 2 | 3 | 4 | 5 |
| Construction errors and reworks | 1 | 2 | 3 | 4 | 5 |
| Unclear tender documents that often lead to claims and disputes | 1 | 2 | 3 | 4 | 5 |

| Design Related issues | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Construction delays or temporary stoppage of the project | 1 | 2 | 3 | 4 | 5 |
| Compromised selection process of vendors due to temporary stoppage of the works while design errors are being rectified | 1 | 2 | 3 | 4 | 5 |

4. How often does each of the following occur as a result of Inaccurate estimates?

| Inaccurate estimates | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Increase in project cost for measured items during the construction phase | 1 | 2 | 3 | 4 | 5 |
| Difficulties to reach decisions regarding project award | 1 | 2 | 3 | 4 | 5 |
| Delays and/or abandonment of projects while client seek additional funding and/or does not get additional funding | 1 | 2 | 3 | 4 | 5 |
| Project approved for execution with insufficient funding as a result of underestimated cost | 1 | 2 | 3 | 4 | 5 |

5. How often does each of the following factors lead to the variations or change orders and eventually compromise the success of the project?

| Variation/Change orders | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Poorly defined scope of work | 1 | 2 | 3 | 4 | 5 |
| Design related issues | 1 | 2 | 3 | 4 | 5 |
| Conflicting contractual documentation | 1 | 2 | 3 | 4 | 5 |
| Poor coordination and integration during pre-feasibility phase | 1 | 2 | 3 | 4 | 5 |

6. How often does each of the following factors occur as a result of the Variation order initiated by consultants?

| Variation/Change orders | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Temporary stoppage of the project | 1 | 2 | 3 | 4 | 5 |
| Delay of the project completion date/ extension of project completion date | 1 | 2 | 3 | 4 | 5 |
| Claims and contractual disputes e.g extension of time and contractor's additional payment | 1 | 2 | 3 | 4 | 5 |

7. How often does each of the following factors occur as a result of inconsistent documentation produced by consultants?

| Inconsistent documentation | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Inaccurate estimates | 1 | 2 | 3 | 4 | 5 |
| Claims and disputes | 1 | 2 | 3 | 4 | 5 |
| Project rework | 1 | 2 | 3 | 4 | 5 |
| Change orders/ variations | 1 | 2 | 3 | 4 | 5 |

8. How often does each of the following occur as a result of Reworks?

| Reworks | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Compromised quality | 1 | 2 | 3 | 4 | 5 |
| Increased project cost | 1 | 2 | 3 | 4 | 5 |
| Impact on the schedule of the project | 1 | 2 | 3 | 4 | 5 |

9. The factors listed below were found to be the common causes of reworks. What is the likelihood of each of the following to result in reworks?

| Reworks | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| Poor administration of contract | 1 | 2 | 3 | 4 | 5 |
| Poorly defined scope of work | 1 | 2 | 3 | 4 | 5 |
| Poorly written specification | 1 | 2 | 3 | 4 | 5 |
| Errors in design | 1 | 2 | 3 | 4 | 5 |

*Section C: Key Performance Indicator (KPI)*

In the construction context, performance indicators relate to contract completion date, cost, quality requirements and risks involved in the delivery of a successful project (Hughes *et al.*, 2007).

Rank the following performance indicators in their level of importance for each of the following performance parameters

| **Key Performance Indicators (KPI)** | **Not important** | **Slightly important** | **Moderately important** | **Important** | **Very Important** |
|---|---|---|---|---|---|
| **Cost KPI** | | | | | |
| Efficient cash flow system i.e. keeping the authorized funding within the constraints of a time-based budget | 1 | 2 | 3 | 4 | 5 |
| Project completed within the estimated budget | 1 | 2 | 3 | 4 | 5 |
| Efficient cost control during execution and construction | 1 | 2 | 3 | 4 | 5 |
| Timely measurement & correction of works during construction until handing over of the project | 1 | 2 | 3 | 4 | 5 |
| Efficient change management system ensuring trends are identified early on in the execution stage | 1 | 2 | 3 | 4 | 5 |
| Positive project cost outcome, i.e. actual cost not exceeding the estimated budget | 1 | 2 | 3 | 4 | 5 |
| **Time KPI** | | | | | |
| Completing the project on time | 1 | 2 | 3 | 4 | 5 |
| Minimizing late responses for information by communicating timeously | 1 | 2 | 3 | 4 | 5 |

| Key Performance Indicators (KPI) | Not important | Slightly important | Moderately important | Important | Very Important |
|---|---|---|---|---|---|
| Having less claims relating to the extension of time during the feasibility stage | 1 | 2 | 3 | 4 | 5 |
| Process of scheduling works should be adequate | 1 | 2 | 3 | 4 | 5 |
| The mature process to update schedule performance to allow proactive decision making and mitigating actions to be implemented | 1 | 2 | 3 | 4 | 5 |
| Changes to the schedule should be effectively managed | 1 | 2 | 3 | 4 | 5 |
| **Quality KPI** | 1 | 2 | 3 | 4 | 5 |
| Project completed with minimum or no defects and acceptable quality of work | 1 | 2 | 3 | 4 | 5 |
| Having a functional quality management strategy prior to the execution | 1 | 2 | 3 | 4 | 5 |
| Mature quality control process during the execution of the works | 1 | 2 | 3 | 4 | 5 |

*Section D: Incentive and Penalty evaluation*

***1. Incentive Mechanism***

What is the likelihood of each of the following incentive mechanisms to motivate consultants to perform?

| Incentive Mechanisms | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| **Time /Schedule Incentive** – Bonus provided for an early completion | 1 | 2 | 3 | 4 | 5 |
| **Cost Incentive** – Financial incentive provided for cost-saving | 1 | 2 | 3 | 4 | 5 |
| **Design Integrity Incentive** – Incentive for producing and maintaining designs | 1 | 2 | 3 | 4 | 5 |

| Incentive Mechanisms | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| that are in line with the Client's project outcome expectations and requirements | | | | | |
| **Quality Incentive** – Incentive for zero or minor defects | 1 | 2 | 3 | 4 | 5 |
| **Sustainability Incentive** – Incentive for development of the design that improves the client's efficiency and operating bottom line | 1 | 2 | 3 | 4 | 5 |

2. ***Benefits of incorporating Incentives and Penalties into Professional Service Contract (PSC)***

Indicate the extent to which you agree that the use of incentives and penalties leads to each of the factors below

| Incentive and Penalty Benefits | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| Control of information in a project is improved | 1 | 2 | 3 | 4 | 5 |
| Project is delivered on time without compromising quality | 1 | 2 | 3 | 4 | 5 |
| Monitoring, control and management of the contract is improved | 1 | 2 | 3 | 4 | 5 |
| The level of service provided is increased | 1 | 2 | 3 | 4 | 5 |
| The desired project outcome is achieved | 1 | 2 | 3 | 4 | 5 |
| The relationship between cost, quality and management of changes is fully understood | 1 | 2 | 3 | 4 | 5 |

| Incentive and Penalty Benefits | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| Client satisfaction is improved through the alignment and focus of the client's requirements | 1 | 2 | 3 | 4 | 5 |
| Project schedule performance is improved | 1 | 2 | 3 | 4 | 5 |

### *3. Incentive and Penalty Clauses*

The following incentive and penalty Clauses have been identified in the commonly used SUITES of contract in South Africa "FIDIC and NEC".

Indicate the likelihood of each of the following Clauses to enhance the performance of the consultants where they are incorporated into the PSC and enforced

| Clauses | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| NEC3 PSC Option X6 Bonus for early completion | 1 | 2 | 3 | 4 | 5 |
| NEC3 PSC Option X20 Key Performance Indicator | 1 | 2 | 3 | 4 | 5 |
| NEC3 PSC Option X7 Delay Damages | 1 | 2 | 3 | 4 | 5 |
| FIDIC Conditions of Contract for Construction Clause 8.7 Delay Damages | 1 | 2 | 3 | 4 | 5 |
| NEC3 ECC Option X17 Low Performance Damages | 1 | 2 | 3 | 4 | 5 |
| FIDIC Client/Consultant Clause 16.3 Compensation | 1 | 2 | 3 | 4 | 5 |

*Thank you for your participation.*

## 3. Annexure C: Research instruments: Structured Interview Questions

### *Section A: Demographic Information*

1. Name of the Organization: _____
2. State your work title in the organization? _____
3. How long have you been working in the construction industry?

| | | | | | |
|---|---|---|---|---|---|
| Less than 2 years | 2 – 4 years | 4 – 6 years | 6 – 8 years | 8 – 10 years | More than 10 years |

4. Please state your core duties: _____
5. State your highest qualification: _____

6. Age:

| | | | | |
|---|---|---|---|---|
| 21 - 30 | 31 - 40 | 41 - 50 | 51 - 60 | 61 - 65 |

### *Section B1: Interview questions*

1. How are consultants appointed, under what form of contract?
2. What responsibilities do they carry?
3. What Key Performance Indicators are put in place to measure the consultants' performance?
4. What impact does the consultant's performance (good or poor) have on the project?
5. What incentives are built into various contracts to ensure the performance of consultants' roles and responsibilities?
6. What penalties are built into contracts to deal with instances where consultants fail to perform or perform poorly?
7. What penalties do other parties such as Client and Contactors carry when they do not perform their obligations? Why has this not traditionally applied to the consultants' contract?
8. How can appropriate incentives and penalties be built into professional services contracts to ensure high performance?

*Section B2: Interview questions*

1. What measures are put in place to monitor and prove consequential damages caused by the consultants' poor performance
2. How do you deal with claims relating to consequential damages resulting from the consultants' poor performance on a project?
3. How do you contractually deal with Consultants who perform poorly?
4. What are the applicable liquidated damages for cases where the project has failed in terms of Time, Cost and Quality performance due to consultants' poor performance or failure to perform?
5. What penalties do you apply for non-performance, use of performance bond, or making good concept to apply at the consultants' own cost
6. When do you decide on termination of the contract where the consultant has failed to perform?
7. How do you deal with consequential loss as a result of consultants' poor performance?

*Thank you for your participation.*

## 4. Annexure D: Ethical Clearance Certificate

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**SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT RESEARCH ETHICS COMMITTEE**

| | |
|---|---|
| **CLEARANCE CERTIFICATE** | **PROTOCOL NUMBER CEM/20/1/MS1** |
| **PROJECT TITLE** | Exploring the Contractual Incentivization and Penalization of Professional Consultants' Performance in the Construction industry |
| **INVESTIGATOR** | Morongoa Sebola: 549535 |
| **SCHOOL/DEPARTMENT** | **SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT** |
| **DATE CONSIDERED** | 05/08/2020 |
| **DECISION OF THE COMMITTEE** | Approved conditionally with respect to the declaration and detailed feedback |
| **EXPIRY DATE** | 31st September 2021 |
| **DATE** 5/8/2020 | **CHAIRPERSON** Dr. Kola Ijasan |

cc: Supervisor: : **Prof. Samuel Laryea**

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**DECLARATION OF INVESTIGATOR (S)**

To be completed in duplicate and **ONE COPY** returned to the Secretary Mrs. M. Sithole at the CEM reception desk.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to the completion of a yearly progress report.**

**Signature** **Date** **__01____/__09_____/___2020____**