

**DELAYS AND DISRUPTIONS ON CONSTRUCTION PROJECTS
WITHIN THE PUBLIC SECTOR: INTEGRATED PROJECT
DELIVERY SYSTEM AS AN ALTERNATIVE**

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PREFACE

The research contained in this dissertation was completed by the candidate while based in the Discipline of Property Development, School of Engineering of the College of Agriculture, Engineering and Science, University of KwaZulu-Natal, Howard Campus, South Africa. The research was financially supported by the University of KwaZulu-Natal.

The contents of this work have not been submitted in any form to another university and, except where the work of others is acknowledged in the text, the results reported are due to investigations by the candidate. As the candidate's Supervisor I agree to the submission of this dissertation.



Prof. Theo C. Haupt

December, 2017

DECLARATION 1 - PLAGIARISM

I, Thamini Moodley declare that

1. The research reported in this thesis, except where otherwise indicated, is my original research.
2. This thesis has not been submitted for any degree or examination at any other university.
3. This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
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 - a. Their words have been re-written but the general information attributed to them has been referenced
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Signed

.....

Thamini Moodley

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ABSTRACT

The South African construction industry has earned a reputation for poor project delivery, particularly within the public sector. Successful project delivery has been identified as attaining the project objectives with regards to time, cost, quality and scope within the constraints as outlined by the client. Research and statistical data has highlighted key causes for project delivery failure, with delays and disruptions being identified as a primary reason. The consequences of these delays and disruptions are severe and frequently and if not always, lead to cost overruns. The reasons for these delays vary on projects and circumstances. Constructability on projects has been found to be lacking. The sequence of processes on a project is known as the constructability or more commonly, buildability. There is a significant lack of consideration of constructability on projects which results in variations, cost overruns, poor communication and ultimately delaying the project.

This study aimed to examine the existing procurement methods which determine the processes, sequence of operations and communication channels within the public sector and investigated whether an alternative procurement method, namely Integrated Project Delivery System (IPDS), could serve as a potential solution to the existing issues. The research was conducted on key project professionals who have great influence on the procurement methods implemented on public sector projects. The processes, sequence of operations and communication channels on a project are determined by the procurement method implemented. The selected procurement method provides a framework for the project and the project team. The current options available within the public sector are structured according to guidelines provided by legislative framework, the Construction Industry Development Board and The National Treasury. The guidelines are aligned with the specific requirement of the country. The findings revealed that the Traditional Procurement method is implemented by default or due to familiarity and is therefore not always the appropriate system. The research found that the Traditional Procurement system possesses adversarial relations and the industry is in agreement that a more relational system could harness greater results. In additions, the TPS unfortunately restricts contractor involvement during the implementation stages which is potentially to the detriment of the project. The findings further suggested that the contractor has valuable input which should be considered during the design stages in order to improve the ease of construction and possible reduce construction time and effectively diminish delays and disruptions. The research revealed that the consequential impact of this change will be significant. The study recommends that the South African construction industry within the public sector should display greater versatility when considering the implementation of alternate procurement systems such as

Integrated Project Delivery as opposed to adopting the default conventional method which fosters adversarial relations.

Keywords: Procurement, public sector, Integrated Project Delivery System

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Procurement method selection has been identified as a key factor contributing to successful project delivery within the construction industry (Mathonsi & Thwala, 2013). The use of traditional procurement methods by the construction industry has become notorious for failing to integrate construction with design (Trigunarsyah, 2004). As a consequence, the relationships between parties involved in the design stage and those involved in the construction phase are adversarial and counterproductive to achieving overall project success and achievement of project goals. It is essential that organizational structures such as professional teams are formed as a result of the project parameters and the project delivery success or failure be measured against these parameters. Procurement systems are the combined contributions of design, management and installation of the organizational structure. (Rwelamila and Ngowi, 1996).

According to Lupton, Cox and Clamp (2007) 'Procurement' often describes the flow of relationships, both interactive and contractual, between the client and the construction teams and consultants within a construction project. The elected method is dependent on the nature and scope of the work to be performed. It is also reliant on the manner in which the work is to be carried out, the risks that it involves and the price basis on which the contract is awarded. The procurement method is often chosen prior to the commencement of the project based on previous projects of similar nature. Mosey (2009) argues that the traditional method of procurement which involves the contractor and subcontractors being appointed based on the lowest price tendered when the construction is ready to commence is a reflection of an established trend rather than a solution that addresses the specific needs of the client. While it is further argued that early project processes should not be governed by traditional contracts when the design and procurement involving the pricing of the design thereof are agreed upon, the need for a contract is pertinent to identify the parameters of a contractor's early involvement and the associated obligations and risks.

Rwelamila and Hall (1994) identify the Traditional Procurement System (TPS) as being an outdated method, displaying inefficiency and failing to effectively illustrate the appropriate client-contractor relationship. The TPS has been the default procurement method selected by consultants while neglecting consideration of its appropriateness for the given circumstances.

According to Matthews and Howell (2005) there are four systemic issues which arise when utilising the existing traditional procurement methods, namely:

- Innovative ideas being held back due to competitive bidding processes;
- Difficulty experienced in innovating across trade boundaries due to contract stipulations;
- Absence of formal efforts being made to link planning systems of the subcontractors involved in the process; and
- Subcontractors constantly struggling to optimize individual performance.

Mosey (2009) identifies the following possible factors as a result of a procurement method which fails to consider the input of contractors during the planning phases, namely:

- Increase of risk to the project;
- Poor communication among the parties to the contract
- Project delays;
- Inaccurate information being relayed resulting in claims; and
- Inaccurate information being relayed resulting in disputes.

Kong and Gray (2006) lists and explores four primary shortcomings of the traditional procurement method as:

- The time-consuming nature of the development processes involved;
- The consequence of uncertain costs;
- The impact on buildability; and
- The fragmentation of the parties to the contract.

Arguably, the consequences of these issues are schedule delays and increased construction costs as a direct result of designers not considering buildability/constructability within their designs with many amendments having to be made to the working drawings once the construction team has given their input. Many of these changes are driven by issues of buildability or constructability (Arditi., Elhassan and Toklu, 2002). The drawings of designers usually convey the quality they intend for the building once completed, often with little concern of how this objective is to be achieved. Typically, the assembly of the building and its associated components reside within the jurisdiction of the contractor. When these designs are of a complex or unusual nature the contractor draws the attention of the design team to the implications of these designs on the actual construction process. Frequently this action results in

variations to the working drawings. The lack of consideration for the manner in which builders or contractors and their teams will apply the design to the construction process often results in project delays in the form of cost increases and schedule delays (Ibid). Smith and Love (2001) identify that despite time and cost overruns on building projects, procurement strategies have not evolved sufficiently in recent years.

The issues of fragmentation and separation of the design and construction phases have been identified in various reports dating back to early 1960 (Mosey, 2009). Traditionally there is a separation between the design and construction phases of a project due to the traditional procurement approach which is widely used in the construction industry in KwaZulu-Natal and elsewhere. This separation deprives contractors of the opportunity to provide input into the design informed by their experience, often resulting in designs that lack buildability or structural integrity. By neglecting the concept of constructability projects are not being carried out in the most efficient manner (Motsa., Oladapo and Othman, 2008). Research conducted by Rwelamila., Talukhaba and Ngowi (1999) suggest that the key reason for the lack of ‘Ubuntu’ (African group solidarity) among Southern African Development Community (SADC) member states within the public sector building industry is inappropriate organizational structures. The inefficient overall project management systems result from the TPS being the default method selected. The need for a more comprehensive procurement method becomes increasingly apparent as numerous projects continue failing to meet delivery requirements. “Maximising value and minimising waste at the project level is difficult when the contractual structure inhibits coordination, stifles cooperation and innovation, and rewards individual contractors for both reserving good ideas, and optimising their performance at the expense of others” (Matthews and Howell, 2005: 47).

1.2 Problem Statement

The problem statement may be described as follows:

Successful and efficient project delivery without the currently pervasive delays and disruptions on public sector construction projects is severely hindered by the lack of innovation, existing industry fragmentation, separation of design from construction, lack of effective communication and inequitable distribution of risk between, and adversarial relationships of participants within the construction process as a result of the current procurement routes used by the public sector which exclude integrated project delivery approaches with their associated benefits.

1.3 Hypothesis

The hypotheses of this study are as follows:

- 1.3.1 Delays and disruptions on public sector construction projects result from the existing traditional procurement methods
- 1.3.2 The traditional procurement system, which is the primarily selected procurement method on public sector projects, fosters adversarial relationships between stakeholders in the construction process
- 1.3.3 The input of the contracting team during the planning and design phases of projects minimizes the risk of delays and disruptions
- 1.3.4 The separation of design from construction contributes to a number of negative impacts on construction projects
- 1.3.5 A procurement method which encourages integration of the design and construction team will contribute to successful project delivery
- 1.3.6 A form of contract which supports and encourages partnering and collaborating on construction projects will minimize project delays and disruptions

1.4 Objectives

- 1.4.1 To determine the nature and causes of delays and disruptions on public sector construction projects
- 1.4.2 To establish the types and pervasiveness of procurement systems used by the public sector on their projects
- 1.4.3 To determine the level of contractor involvement during the planning and design phase and its impact on project delays and disruptions.
- 1.4.4 To establish the extent to which the separation of design from construction on public sector projects results in lack of innovation, existing industry fragmentation, separation of design

from construction, lack of effective communication and inequitable distribution of risk between, and adversarial relationships of participants.

1.4.5 To determine the level of acceptance of and willingness to implement alternate forms of procurement and contracts that allow for integration of design and construction and encourages partnering and collaboration on public sector construction projects in relation to project delivery success.

1.4.6 To determine if the existing forms of contract provide a barrier to implementing alternative procurement methods.

1.5 Research Methodology

The methodology for the study is as follows:

- A literature review which will detail the studies conducted on the discussion topics. This will provide a basis for the study and will assist in identifying key issues.
- The research methodology will be a mixed method of quantitative and qualitative in nature to form a greater understanding of the research problem. A questionnaire will be compiled in order to establish opinions and experiences which will assist in determining a conclusion for this study. Convenience sampling which includes participants within the Durban and surrounding areas will be adopted due to time constraints.
- The data analysis and interpretation will include gathering the qualitative data and constructing a means of quantitative analysis to determine a statistical outcome which relates to the study. The aim of the analysis is to enable the researcher to draw conclusions based on the findings of the data analysis. Recommendations on how the procurement system implemented is related to project delays will be made.

1.6 Limitations

The following limitations apply to the study:

- The study will be restricted to a sample of Public Sector construction projects within the Kwa Zulu-Natal province of South Africa.

- Only parties to a contract within the KwaZulu-Natal region will be considered. These parties to the contract will include the Principal Agent, Quantity Surveyor and main contractor or subcontractor where relevant.
- The study is constrained by time as it is being conducted during January 2017 to October 2017.

1.7 Assumptions

The study will be subject to the following assumptions, namely

- The sample will remain unbiased and provide accurate information.
- The sample has the necessary experience and understanding of the processes in order to provide information that is accurate.

1.8 Significance of the study

Public sector projects regularly experience delays and disruptions resulting in increased costs and dissatisfied clients. Very few studies have been done to examine holistically and thoroughly the systemic and other causes of these phenomena critically in order to understand them and their causes so that appropriate preventive interventions can be developed and implemented.

The timely delivery of public sector projects is important as a national priority. This project makes a contribution to addressing the problem using an evidence-based approach.

This study aims to examine the most commonly used procurement approaches and routes in the public sector of South Africa and to explore the potential impact of using the Integrated Project Delivery System on public sector projects in KZN. The findings of this study may provide opportunities for increased efficiency and waste reduction by optimising resource allocation. The findings will potentially also highlight barriers that inhibit the effective implementation of this form of procurement system within South Africa.

1.9 Ethical Considerations

- The information provided for the purposes of this study must be provided of the participants own accord, free of an undue influence.
- Participation in the research is voluntary and will not have negative consequences on the participants' reputation/employment.

- The participant is expected to act and provide information without remuneration or the expectation thereof. Should the participant wish to remain anonymous to protect their confidentiality, they may do so.
- The participant may withdraw from the study should they wish to at any time. Failing to participate in this study will in no way harm or disadvantage the reputation of the participant.
- The information provided is to be used strictly for research purposes and will be disposed of accordingly by the University of KwaZulu-Natal within a relevant time period after completion of the dissertation

1.10 Structure of the Study

Chapter 1: Introduction- The background of the research is discussed within this chapter and the problem statement, hypotheses and related objectives derived are defined. The background study will explore key issues and identify the fundamental motives for the study. The hypotheses and objectives will then be developed based on the background study.

Chapter 2: Literature Review- This chapter contains a comprehensive review of relevant literature and previous studies on the research topic. The research and findings of relevant literature as outlined in the background study is obtained and analysed to develop a supportive framework for the study. Key influencing factors and relationships will then be identified. This identification will assist with compiling and conducting the methodology in the chapters to follow.

Chapter 3: Research Methodology- This chapter will outline the method of research to be adopted. The method(s) will provide the necessary tools to enable the researcher to gather the data effectively within the constraints of the study.

Chapter 4: Data Collection and Analysis- In this chapter the data collected will be analysed and presented by means of triangulation mixed methods approach. The data will be presented in a statistical manner in order to illustrate the results in relation to the research objectives.

Chapter 5: Conclusion- In this chapter the data analyzed will provide a basis for the researcher to draw conclusions from the emerging results and make recommendations accordingly. The conclusion of the research will ascertain if the researcher has met the objectives as outlined in background study in an effort to significantly improve the problems identified.

CHAPTER 2

LITERATURE REVIEW

2.1 Project Delivery

A construction project may be defined as temporary endeavor which has an allocated time and cost, in order to create a product, service or result (The Constructor, 2017). Turner (1993: 3) defined a project as “An endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives.” Rwelamila and Ngowi (1996) identify cost, time, quality and utility as the most dominant objectives and parameters of their projects by clients.

“Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it is rarely happens that a project is completed within the specified time” (Assaf and Al-Hejji, 2006: 349). According to The Constructor (2017) construction projects may be complex in nature and may require intricate coordination of permissions, people, equipment and material. A project can commence in spite of numerous uncertainties which frequently results in delays.

2.2 Delays and Disruptions

The manifestation of projects exceeding the stipulated time and lagging in schedule is considered a frequent occurrence in construction. Delays in construction have been defined as the time which has lapsed beyond a specified completion date outlined in a contract or beyond a date for which project delivery has been agreed upon. These delays have various impacts on the parties to a contract. The client or owner suffers a loss of income through lack of leasable space or lack of productivity due to absence of facilities. A contractor may suffer increased overhead expenses and unanticipated inflation rates due to extended time spent on the project (Assaf and Al-Hejji, 2006).

Construction delays result in increased costs which makes project completion within the scheduled time advantageous to all parties to avoid these additional costs. It therefore becomes vital that the causes of

delays are identified in an effort to mitigate the risk of this occurrence and the costly consequences (Al Hammadi and Nawab, 2016).

2.2.1 Types of Delays

The Constructor (2017) categorizes delays as, for example,

- Critical or non-critical delays

A critical delay directly impacts on the project duration while a non-critical delay will not affect the project duration but will affect the timeous completion of scheduled activities.

- Excusable or non-excusable delays

An excusable delay where the contractor is entitled to an extension of time is where the contractor has no control over the delayed activity. A non-excusable delay is where the contractor is responsible and in full control of the delayed activity which impacts on the project duration. The contractor will be held liable for the financial repercussions.

- Concurrent delays

A concurrent delay is when the contractor may experience delays which affect many activities at the same time and as a consequence, impacts on the project duration. The cause of the delay/s will determine liability and compensation.

- Compensable or non-compensable delays

A compensable delay is one which the contractor is liable for the extension of time and cost compensation due to an excusable delay. Should the contractor be at fault the delay is non-compensable.

2.2.2 Causes of Delays

Advancing technology and client changes have been identified as key factors contributing to the schedule delays on a project. External factors such as the physical, financial and economic environment have also been identified. (The Constructor, 2017)

El-Razek *et al* (2008) analyze the groups of delay causes and rank their index accordingly in Table 2-1, identifying contractual relationships in the top three.

Table 2-1: Causes of Delays and its Ranking Index

Rank	Group of delay causes	Group importance index
------	-----------------------	------------------------

1	Financing	64.33
2	Materials	53.67
3	Contractual relationships	52.38
4	Changes	47.47
5	Rules & regulations	45.00
6	Manpower	44.83
7	Scheduling & control	43.39
8	Equipment	40.00
9	Environment	30.33

Sambasivan and Soon (2007) emphasize the relationship between the cause and effect of delays in order to prevent delays in the future. The causes of delays have been categorized as:

Client related: this pertains to financial and payment aspects, interference from the client, delayed decisions, impractical time lines

Contractor related: delays caused by the contracting team including subcontractors, site management, unsuitable construction methods and planning, errors on site, insufficient experience

Consultant related: management of the contract documents, design and drawings approvals, quality assurance, inspection and testing lead time

Material related: quality and supply of materials

Labour related: supply and productivity of labour force, availability of equipment, failure of equipment

Contract related: discrepancies within the contract documents

Contract-relationship related: disputes, negotiation, lack of appropriate organizational structure, lack of communication between the parties

External: inclement site conditions, changes to regulation, issues with surrounding areas

2.2.3 Effects of Delays



Effects of delay in construction projects

Figure 2-1 (Adapted from The Constructor. 2017)

The consequences of delays have been identified by Sambasivan and Soon, (2007) as

- **Time overrun:** client and contractor related factor impact on the timing of a project. Insufficient planning, poor site management, lack of experience are key factors on the contractors part. Delayed payments have a direct impact on the project scheduled completion.
 - **Cost overrun:** Contract related factors predominantly caused by errors and discrepancies in the contract data, changes in scope and variations. These factors have a negative impact on time. There exists a significant correlation between time and cost.
- Dispute:** Client, contract, contract-relationship and external related factors all impact on disputes. There primary issues from which disputes arise are payment delays, client interference, change in

scope, poor flow of communication amongst the parties, inclement site conditions. These disputes can result in arbitration or litigation if no resolution is met.

- **Arbitration:** Client and contractor related disputes can result in arbitration should there be a lack of resolution. An appointed arbitrator can facilitate the process without the dispute going to court.
- **Litigation:** Client, labour, contract, contract-relationship related and external factors can give rise to a dispute resulting in litigation. Litigation is the final resort of resolution.
- **Total abandonment:** this could be a result of client, consultant, labour, contract-related and external factors. The predominant factor is finances and economic difficulty.

Other effects of delays also include the following, namely:

2.2.4 Variations

Variations on construction projects occur frequently and have proven to contribute significantly to the cost and time overruns on projects. The impact of these variations is independent of the scale of the project. These variations can arise from changes in the owner's financial contributions or status, a change in the owner's requirements of the project, errors within the design of the project and lack of sufficient time allocated to prepare contract documents accurately (Oladapo, 2007). The delayed recognition of variations during the design process is often a result of the sequential flow of communication, fragmentation of the team and poor team coordination (Love, Edwards and Smith, 2005). A study conducted by Simpeh (2012) found that the absence of integration among members of the design team resulted in significant design changes which had an impact on the changes on site and the contracting parties. The study further identified lack of communication between the principal contractor and subcontractors resulted in setting out errors on site.

2.2.5 Rework on Projects

Research on rework revealed that changes which were implemented under the instruction of the client and the design team had a significant impact on rework. The trade foremen's lack of experience and ability to sufficiently interpret structural drawings resulted in rework. Rework on construction projects caused conflict among the organizations resulting in a reduction of the supervision on site which left the workers feel less than motivated. Rework requires extension of time on site in addition to increased project costs. It was concluded that the involvement of the subcontractors, suppliers and designers during the design stage is essential to reduce the risk of rework (Simpeh, 2012).

El-Razek., Bassioni and Mobarak (2008) identify the top ten causes of delays and the corresponding overall effect on the project in table 2-2

Table 2-2: Causes and Effects of Delays on Projects

Client/ Owner	Consultant	Contractor	Effect on project
Financing by contractor during construction	Financing by contractor during construction	Design changes by owner or his agent during construction	Financing by contractor during construction
Non-utilization of professional construction/ contractual management	Non-utilization of professional construction/ contractual management	Delays in contractor's payment by owner	Delays in contractor's payment by owner
Obtaining permits from municipality	Delays in contractor's payment by owner	Financing by contractor during construction	Design changes by owner or his agent during construction
Lack of database in estimating activity duration and resources	Preparation of shop drawings and material samples	Partial payments during construction	Partial payments during construction
Preparation of shop drawings and material samples	Difficulty of coordination between various parties contractor, subcontractor, owner, consultant working on the project	Slow delivery of materials	Non-utilization of professional construction/ contractual management
Difficulty of coordination between various parties contractor, subcontractor, owner, consultant working on the project	Partial payments during construction	Slowness of the owner decision making process	Slow delivery of materials
Excessive bureaucracy in project owner operation	Design changes by owner or his agent during construction	Changes in materials types and specifications during construction	Difficulty of coordination between various parties contractor, subcontractor, owner, consultant working on the project
Delays in contractor's payment by owner	Controlling subcontractors by main contractor in the execution of work	Shortage in construction materials	Slowness of the owner decision making process
Unexpected foundation conditions encountered in the field	The relationship between different subcontractors' schedules	The relationship between different subcontractors' schedules	The relationship between different subcontractors' schedules
Controlling subcontractors by main contractor in the execution of work	Slow delivery of materials	Difficulty of coordination between various parties contractor, subcontractor, owner, consultant working on the project	Preparation of shop drawings and material samples

A client briefing process coupled with the correct procurement system selection contributes significantly in attaining the clients' objectives for a project (Bowen, Pearl and Edwards, 1999).

2.3 Procurement

Procurement provides a framework which outlines the roles and responsibilities for parties to a contract. Its contribution has been identified as a key element in determining the success of a project and client satisfaction. Selecting an appropriate procurement method is therefore crucial to both the professional team and the client (Love, Skitmore and Earl, 1998). Clients within the construction industry each have their own objectives for a project which lead to vital decisions which must be made regarding the project in an effort to ensure that those objectives are met. Design procurement includes the design responsibility, risk allocation and involvement of the contractor (Cooke and Williams, 2004).

Turner and Muller (2003) elaborate further by identifying key features shared by projects as shown in Table 2-3.

Table 2-3: Shared features of projects

Project Aim	Features of Project	Project Pressures	Project Management Processes
Beneficial Change	Unique: each project is different	Uncertainty: we cannot be sure if the intended outcome will be achieved	Flexible: to accommodate the uniqueness of the project; not routine operations
	Novel Processes: each project adopts different approaches	Integration: calls for integration of resources to carry out the work; between different aspects of the project and from the project into business	Goal Orientated: to achieve the beneficial change
	Transient: each project has a beginning and an end	Transience: project delivery within the time constraints	Staged

Adapted from Turner and Muller (2003)

The construction life cycle may be viewed in terms of three defining processes, namely design, construction and use. The design involves the inception stages of the project and comprises of planning, securing funding, conceptual, structural and architectural designs and compiling contract documents. These tasks are necessary to establish feasibility and lead up to the construction phase. The construction

phase involves the implementation of the technical design concepts under management to produce the end product. The final process involves the handing over of the project. This process greatly influences the client's opinion on project delivery success (Rowlinson and McDermott, 1999).

2.3.1 Procurement methods

2.3.1.1 Traditional Procurement (TPS)

The consultants are appointed to carry out the design, control costs of the project and undertake the contract administration. It is the responsibility of the contractor to carry out the works as outlined in the scope of works, which is inclusive of sub-contractors, suppliers and workmanship and of materials. There are instances where the client may appoint sub-contractors directly and decide if the contractor is to assume full responsibility for this nominated/ selected sub-contractor or if there is a limit to that responsibility (Lupton *et al.*, 2007).

In the traditional approach, the contractor is awarded via a competitive tendering process based on documents provided which will provide all the required information pertaining to the project. The contractor may be appointed at an earlier stage via negotiation or based on the information available. This variant of the traditional system is frequently referred to as the 'Accelerated Traditional method' and entails utilizing a two stage tendering process or a negotiated tender process. This allows the design and construction to run concurrently within the parameters of the project. The variant will provide for the contractor to start the works on site at an early stage however it carries increased risks of cost uncertainty (Ibid).

Due to the fragmentation of design and construction the Traditional Procurement System, adversarial relationships between the project team can be easily adopted. Other results such as lack of innovation and increased cost and time implications have been highlighted. These key issues indicate that the TPS may not always provide the project with the best value for money. (Trauner Consulting Services (TCS), 2007)

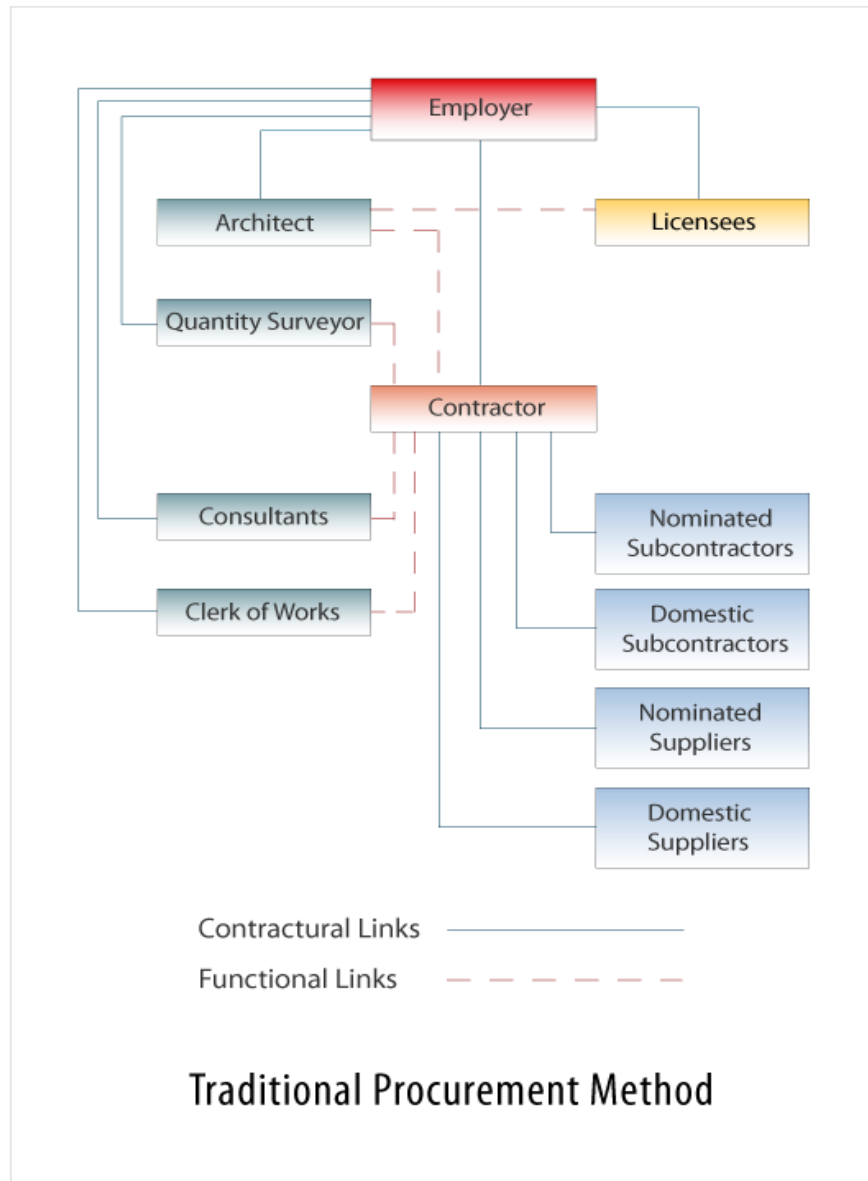


Figure 2-2: Traditional Procurement Method.

Source: Seamus Cooley Quantity Surveyors 2017

A study conducted by Thwala and Mathonsi (2012) revealed that the traditional method of procurement needs improvement to address the current industry demands.

Traditional based procurement strategies foster characteristics which are synonymous with the segregation of the design element and the construction of the project. If the true value of the process is to be optimal, these characteristics require rectification. The contribution of the contractors and specialist

subcontractors are invaluable but often only considered post design when all the parameters of the project including the cost have been allocated. (Morledge and Smith, 2013)

2.3.1.2 Design Build

The Design Build Procurement method may be defined as “Design and Construct procurement (sometimes referred to as ‘Design and Build’) can be described as using a single contractor to act as the sole point of responsibility to a public sector client for the design, management and delivery of a construction project on time, within budget (taking account of whole-life costs) and in accordance with a pre-defined output specification using reasonable skill and care” (Miller *et al.*, 2009).

Consultants may be appointed if guidance on design and costs are required by the client and these facilities are not available internally. The contractor accepts the design responsibility to a great extent as well as the completion of the works. Consultants may be appointed by the contractor depending on the scope of work and information provided and the mandate from the client. The client may issue a mandate for complete design and construction or for the design development and construction within the scope outlined by the client appointed consultants (Lupton *et al.*, 2007).

In the case of partial design responsibility, the contract should explicitly outlay the scope and terms of liability in the case that the contractor is partially responsible for the design. Where no provision has been made for partial design responsibility, the contractor is deemed to assume absolute responsibility. The necessary indemnity insurances are to be in place in order to render the contractors’ liability valid (Miller *et al.*, 2009).

Occasionally the contract may limit the liability of the contractor in terms of design liability and therefore requires additional consultants that possess adequate indemnity insurances. The consultants must be identified prior to the acceptance of a tender (Miller *et al.*, 2009). It is common for the client to request that the contractor be responsible for appointing the consultants by a process referred to as consultant switch or novation. The multilateral agreement is complex in nature and frameworks for the conditions of contract are outlined by the Royal Institute of British Architects (RIBA) (Lupton *et al.*, 2007).

A competitive tender process or a negotiated tender process can be implemented to appoint the contractor. ‘Single Direct Design and Build’ refers to an agreement where a single contractor is approached and the design and build contract is negotiated with that contractor. ‘Competitive Design and Build’ refers to an agreement where multiple contractors are approached. The competitive design and build process can be

more time consuming and can entail a two-stage tendering process however the process has shown to yield increased design development and cost and time certainty (Ibid).

The detail of information provided to the contractor varies depending on the project and objectives. The recommendation is to rather supply the contractor with specification of performance requirements instead of detailing specification to allow the design liability to rest resolutely with the contractor. Contrary to the accelerated traditional method, Design and Build offers increased cost certainty. This is due to the contractor possessing the authority to integrate design and construction advantageously and utilizing the market effectively in order to offer the client the most cost-effective results (Miller *et al.*, 2009).

The design and build method allows for the contractor to commence on site earlier than usual and as a result of the design and construction being integrated, can increase construction programming certainty. Compiling the contract documents and adjudicating the competitive tender results can prove to be a time-consuming process. Variations by the client to the original scheme can result in excess costs (Ibid).

Miller *et al* (2009) identify primary features of the design build procurement system as:

- There exists a single source of liability in the contractor; awarding the client the advantage of liaising with a single organization should a disagreement or problem arise. While this is supposedly the case, practically the liability extends to the contractors' involvement on design and liability thereof.
- The client has little or no influence on the details of the design other than the scheme or purpose of the development. The system could be implemented on projects which are not defined by detail but rather by the overall scheme.
- The system enables the contractor to commence early on the construction since the design details can continue concurrently.
- Programming responsibility rests with the contractor. The risk of delay claims arising from requests for information are diminished since it is the obligation of the contractor to ensure that information is delivered timeously and effectively.
- Offers increased cost certainty however changes to the client's scheme can dramatically affect the cost.

- The contractors appointed consultants, in-house or external, must be verified to possess the necessary professional indemnity insurances.
- It is recommended that the client appoint consultants to compile or advise on the project requirements. Adequate time must be allowed for this extensive task.
- The requirements may include specification details or provisional sums but it is recommended that the performance conditions be described instead to allocate the design responsibility to the contractor.
- The contractors design duties are deemed to be absolute (in relation to the form of contract) if no provision has been made otherwise.
- Tenderers should be made aware if pricing or cost is the key objective to be adjudicated. Adjudication criteria should be outlined in order to evaluate tenders competitively.
- The contractor's attentiveness to the market and realistic lead times offers many benefits to the project.

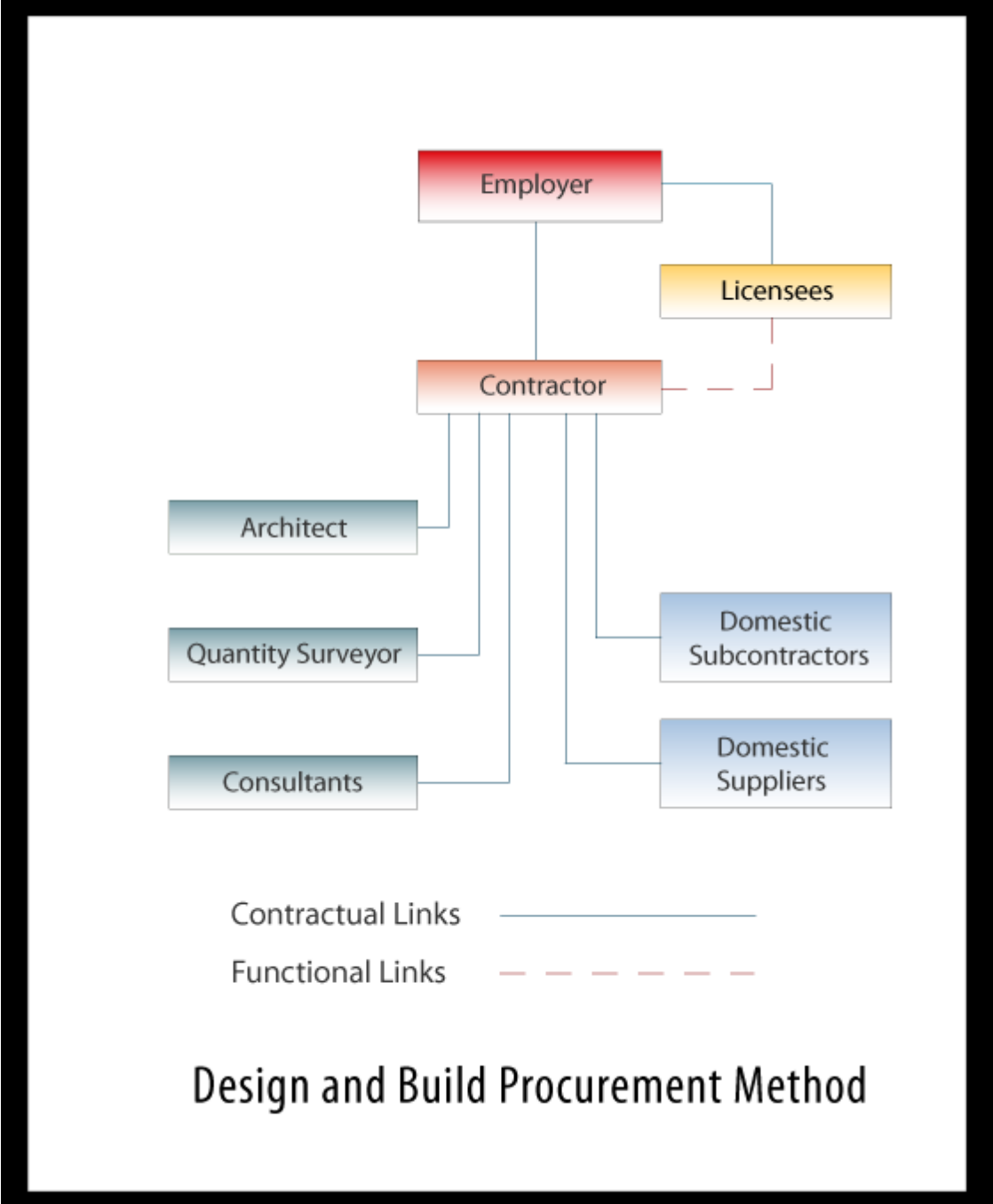


Figure 2-3: Design-Build Procurement Method.

Source: Seamus Cooley Quantity Surveyors 2017

2.3.1.3 Management Procurement

Variations of management procurement have been identified, namely management contracting, construction management and design and manage.

Management Contracting allows the client to appoint a management contractor in addition to the professional team. This team acts as advisors during the pre-construction stages and is responsible for execution of the works once at construction stage under direct works contract. Early site commencement is attainable with this method due to its flexible characteristics which allow the client to make changes during construction and the drawings adjusted accordingly. It is recommended that the contractor be appointed at the early design stages on lead times and design and construction programming. The management contractor will usually be appointed after proposing a fee structure and undergoing interviews with the client and design team. This fee includes the services rendered for management of the project which is calculated at a percentage of total project costs as well as services rendered at pre-construction stages in the event that the project not advance. The contractor will be provided with a cost plan, drawings and the specifications of the project. The risk is allocated to the client due to cost and time uncertainty. Tenders for works packages are competitive and lump sum amounts with bills of quantities. (Miller *et al.*, 2009)

2.3.1.3 Collaborative

2.3.1.3.1 Partnering and Alliancing

The key features of partnering are cooperation and co-commitment between the team. Partnering provides for close collaboration while still allowing for individual team risk and reward allocations. This feature however, can result in the team(s) suffering the consequences of unfortunate circumstance (Walker, Hampson and Peters, 2000).

“Alliances provide a tool for creating agility in response to the diversity in skills, work culture and business practices that characterizes customers.” (Walker, *et al.*, 2000: 8) Team members of an alliancing arrangement share the risk and reward schemes according to the project success level rather than individual team performance. The probability of a shared commitment is therefore higher in alliancing than partnering.

The circumstances under which alliancing is best suited are identified by TCS (2007) as

- Projects which are of a complex nature
- Projects which have been identified as high risk
- Where the risks of the project are unpredictable
- Due to the nature of the project as opposed to insufficient planning or time management and
- Projects which are best managed collectively

According to TCS (2007) it is essential that the project benefits substantially from the involvement of owner and non-owner participants. Figures 2-4 and 2-5 describe the benefits and disadvantages of Alliancing

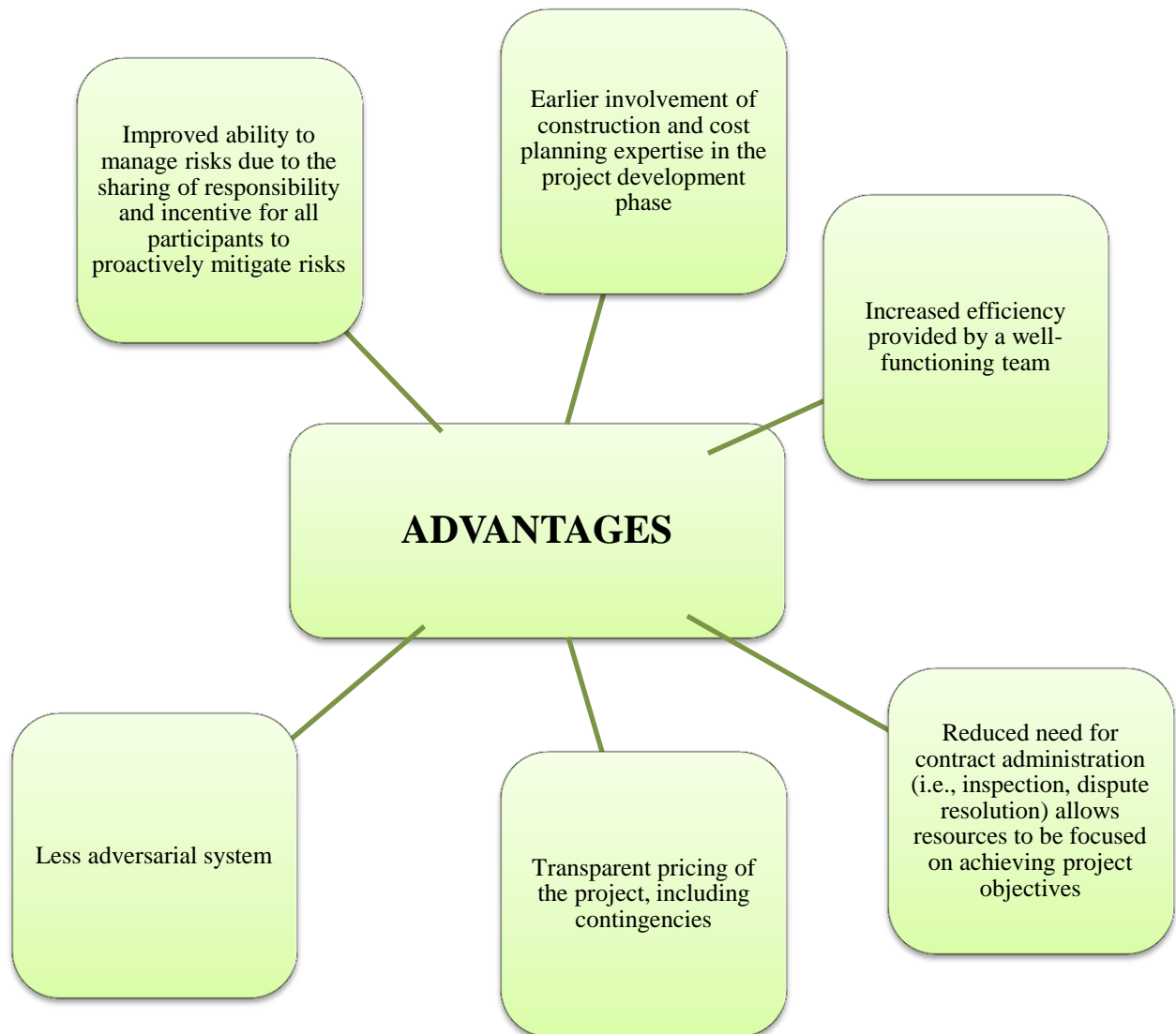


Figure 2-4: Advantages of Alliancing on Projects.

Adapted from TCS (2007)

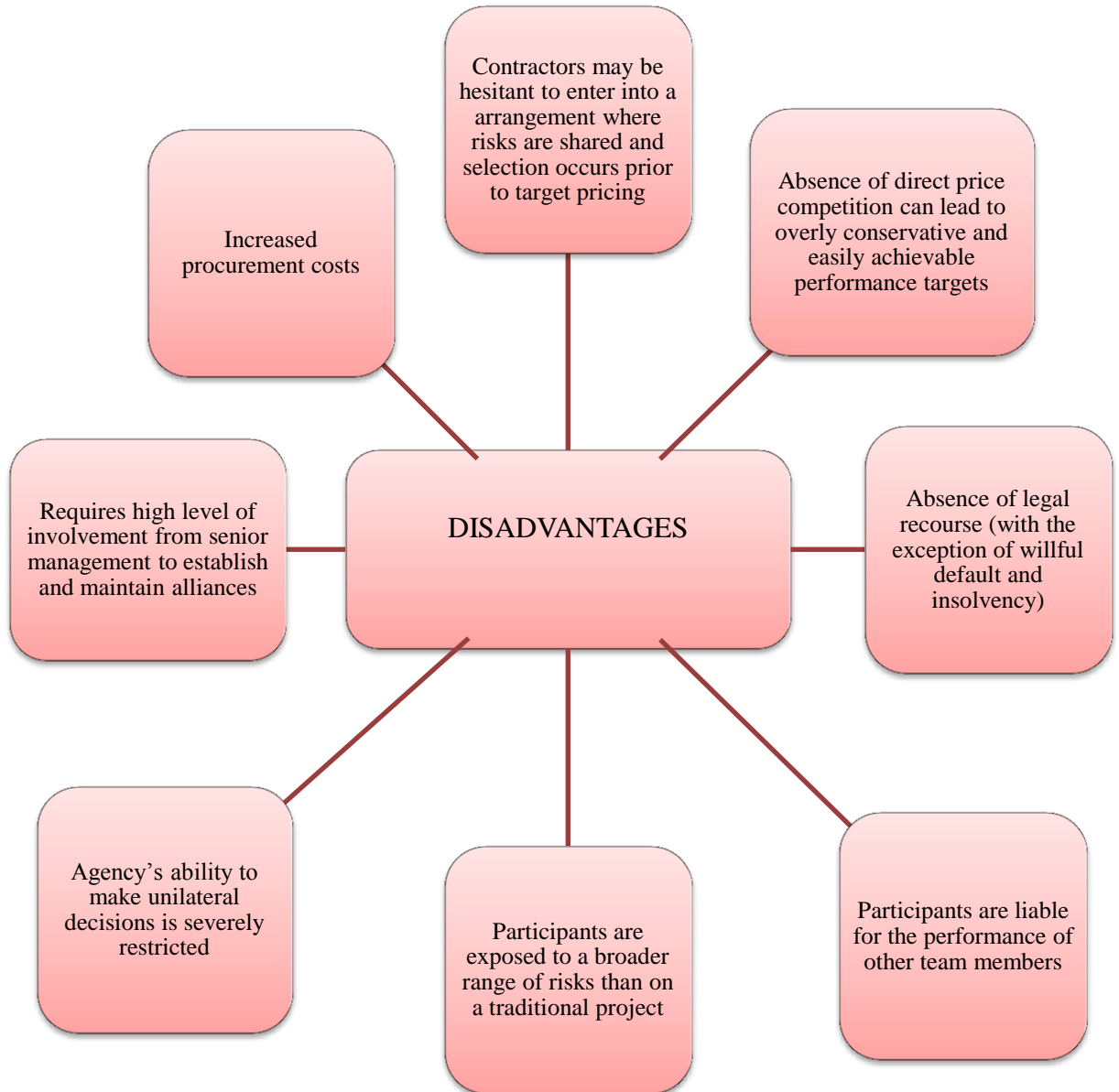


Figure 2-5: Disadvantages of Alliancing on Projects.

Adapted from TCS (2007)

2.3.1.4 IPDS

Integrated Project Delivery may be defined as:

“Integrated Project Delivery (IPD) is a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction. IPD principles can be

applied to a variety of contractual arrangements and IPD teams can include members well beyond the basic triad of owner, architect, and contractor. In all cases, integrated projects are uniquely distinguished by highly effective collaboration among the owner, the prime designer, and the prime constructor, commencing at early design and continuing through to project handover.” (AIA CA Council, 2007: 1)

Matthews and Howell (2005) identified key issues with TPS.

Key Issue 1:

It was found that subcontractors were introduced into the project only when the design was complete and required a price. While the design team may have been in consultation with the subcontractors during design, there was neither exclusivity nor commitment from either party. This was owing to the competitive pricing element. This resulted in the subcontractors reserving potential innovations in order to obtain a competitive advantage during the tender process. The process for the design team to accommodate these innovations post design proved to be a timeous task if at all possible, resulting in potential delays.

Key Issue 2:

The contractual relationship between the principal contractor and subcontractors provide some difficulty pertaining to innovation. The principal contractor holds the contracts for the trade subcontractors and is the communication link between them and the consulting team. The details of the contracts stipulate what is expected of the subcontractor to provide and by default what is not expected, compensation details, scheduling requirements, remedy clauses and penalty clauses. Provision for innovation among the interrelated trades appeared to be nonexistent and therefore it very rarely occurs on these contracts.

Key Issue 3:

While there have been efforts to encourage partnering among the contracting team, there remains a significant lack of coordination. Mutual planning and expectations are not aligned in order to optimize efficiency. The principal contractor assumes dictatorship type role and the subcontractors act respond independently despite the interdependent nature of the trades.

Key Issue 4:

Subcontractors assume a defensive role in an effort to optimize efficiency and improve or maintain performance in their specific trade. This is a result of the contract which is in place coupled with the lack of coordination of trades on site. The subcontractor protects the trade under the contract even at the expense of the project and fellow subcontractors at times.

In an effort to approach a solution, an ideology was formed:

“What if every member of the design-build team shared completely the responsibility for the entire project and set about correcting deficiencies or problems wherever they popped up without regard to who caused the problem or who is going to pay for it? What if all the construction members were friends looking out for the interest of the client and each other, applauding the successes of each other and sharing the pain of each other’s failures? What if all of the design and construction entities on a project could be organized in such a way that they all functioned as if they truly were a single company with a single goal with no competition amongst themselves for profit or recognition?” (Mathews and Howell, 2005: 48).

The solution leans toward the alignment of goals and objectives on a project. Two types of contracts were identified and categorized in figure 2-6 as transactional and relational.

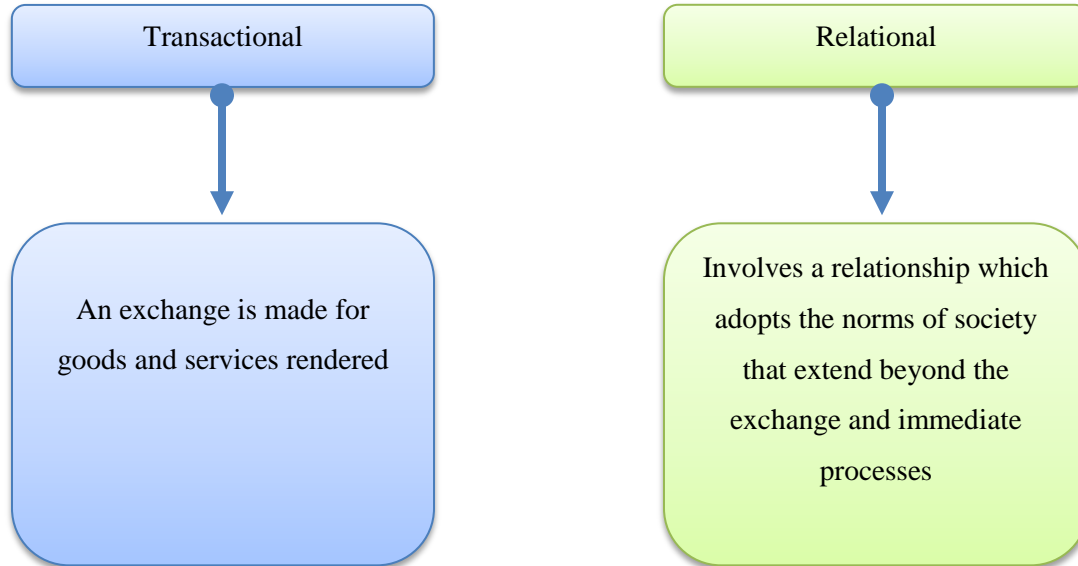


Figure 2-6: Types of Contracts

Adapted from Mathews and Howell (2005)

Primary team members (PTM's) are identified as the Architect, consultants, principal contractor and necessary subcontractors. The relationship among the client, PTM's and the prime contract may be defined in Figure 2-7:

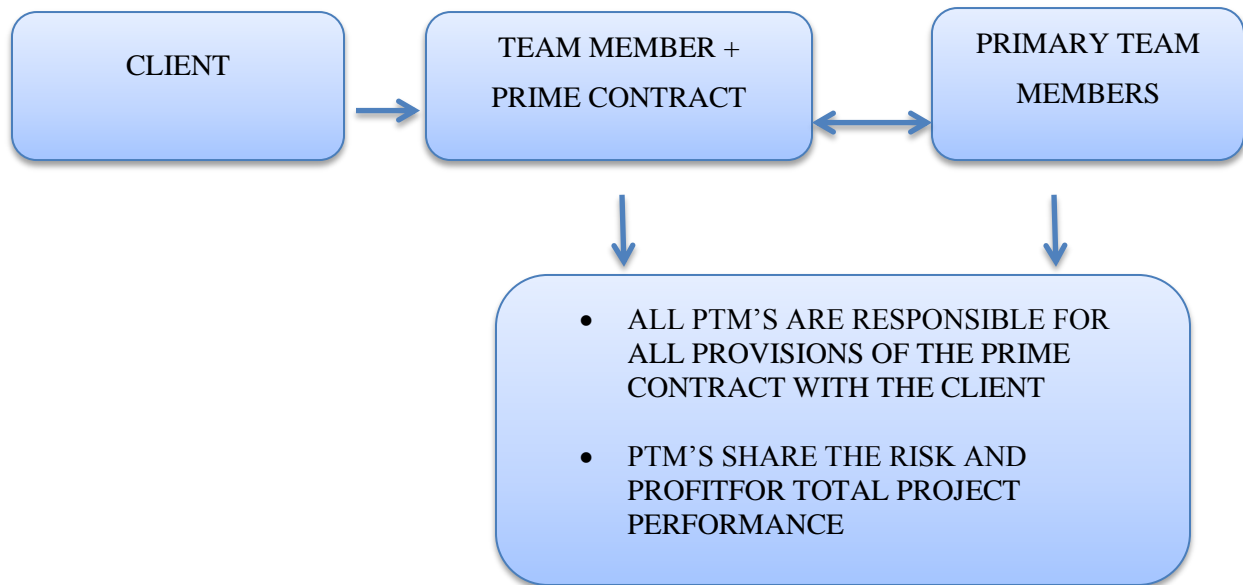


Figure 2-7. Principles governing the team relationship

(adapted from Matthews and Howell (2005))

2.3.1.4.1 Features of IPD

The features of Integrated Project Delivery include:

- **Multi-party Agreement:** a single contract is entered into between the owner/ client and the primary stakeholders in the project. IPD aims to expose collaboration and coordination of the project and its participants to its fullest and the contract facilitates this attainment of goals mitigating the complication of various contracts which could foster individual outcome based goals.
- **Shared risk and reward:** IPD identifies the success of the team and the project as opposed to recognizing individual members of the team for contributions. Risk and rewards of the team members are combined and their collaboration is incentivized to attain the common goal. The

goals vary according to the determinants of success for that particular project. An example of this could be allocating each entity's overhead and profit to cover cost overruns and should the inverse occur where the project is under the budgeted costs, the team may enjoy an incentivized bonus. The methods for this allocation have been identified as:

- Based on Value- a bonus offering to the project team which is associated with adding value to the project
- Incentive Pool- a predetermined amount of the project team fees is reserved and this amount is subject to increases or decreases based on criteria stipulated in the contract
- Innovation and Outstanding Performance- the team is rewarded for showing dedication and creativity
- Performance Bonus- rewards which is based on quality of work
- Profit Sharing- the profit is determined collectively as opposed to individually

Early involvement of all participants: a vital differentiating factor of IPD is the engagement of all parties at the early stages of the design phase. This collaboration can significantly alleviate the problem of fragmentation between design and construction teams. This process has the ability optimize efficiency and avoid variations resulting in delays and cost overruns. There is no specific type of technological tools required, however information technology synonymous with Building Information Modelling (BIM) has been found to improve the effectiveness of the process in all phases of the project (Becerik-Gerber and Kent, 2010).

“The purpose of IPD as a project delivery method is to align the incentives for all project participants to reach overall project objectives. Traditional construction delivery methods tend to create differing incentives for each party to maximize their own goals, sometimes to the detriment of the project as a whole” (Leone *et al.*, 2016: 1).

2.3.2 Public Sector Procurement

Procurement in the public sector within South Africa has been implemented as a policy tool as a result of the practices during the Apartheid era (Corporate Counsel Association of South Africa, 2016).

A procurement system is not limited to just procurement processes, it also includes (National Treasury, 2012):

- rules and guidelines governing procedures and methods;

- procurement documents inclusive of terms, conditions, procedures and requirements;
- risk / quality oversight (governance and performance) controls; and
- organisational policies which address issues such as:
 - the usage and application of particular procurement procedures;
 - the requirements for recording, reporting and risk management;
 - the procedures when handling specific procurement issues;
 - utilising procurement to promote social and developmental objectives; and
 - the allocation of responsibilities for the performance of activities.

In order for a public procurement system in South Africa to be developed around the constitutional requirements it must meet certain objectives (National Treasury, 2012). The objectives are identified by Watermeyer (2011) as:

Primary objectives: Procurement system is to be fair, equitable, transparent, competitive and cost effective as identified by Section 217 (1) of the constitution.

Secondary objectives: Procurement policy may provide for categories of preference in the allocation of contracts; and the protection or advancement of persons, or categories of persons, disadvantaged by unfair discrimination as per Section 217 (2) of the constitution.

The Construction Industry Development Board (CIDB) has developed standards and best practice guidelines around the objectives. These standards provide procedures and methods which are legal requirements that must be applied to specific key procurement processes and have been adopted into ISO 10845 standards for construction procurement.

The development of these standards around the objectives entrenched in the Constitution of the Republic of South Africa (Act 108 of 1996) have been described as (National Treasury, 2012):

- Fair: the process of offer and acceptance is conducted impartially without bias and provides participating parties simultaneous and timely access to the same information.
- Equitable: the only grounds for not awarding a contract to a tenderer who complies with all requirements are restrictions from doing business with the organization, lack of capability or capacity, legal impediments and conflicts of interest.

- **Transparent:** the procurement process and criteria upon which decisions are to be made shall be publicized and made publicly available with reasons for those decisions, and with the possibility of verifying that criteria were applied.
- **Competitive:** the system provides for appropriate levels of competition to ensure cost-effective and best value outcomes.
- **Cost-effective:** the processes, procedures and methods are standardized with sufficient flexibility to attain best value outcomes in respect of quality, timing and price, and the least resources to effectively manage and control procurement processes.
- **Promotion of other objectives:** the system may incorporate measures to promote objectives associated with a secondary procurement policy subject to qualified tenderers not being excluded and deliverables or evaluation criteria being measurable, quantifiable and monitored for compliance.

Subsequent to 1994, established contractors who undertook projects on a large scale had been given preference in public sector procurement, resulting in barriers to entry for new contractors. Fragmentation and lack of supportive structures existed due to inconsistent policy application. Several reforms were introduced to address the issues arising from the unfair policies. Preferential Procurement Policy Framework Act (PPPFA) Act No 5 of 2000 was implemented by the National Treasury in response to socioeconomic issues. This system gave rise to the supply chain management (SCM) system to be used as a policy tool. The SCM was embraced in 2003 in an effort to promote procurement best practice. This system has been accepted under constitutional status and is utilized in an attempt to rectify the discrimination policies which were born from Apartheid. The process is guided by a framework of legislature as described in Figure 2-8 (Corporate Counsel Association of South Africa, 2016).

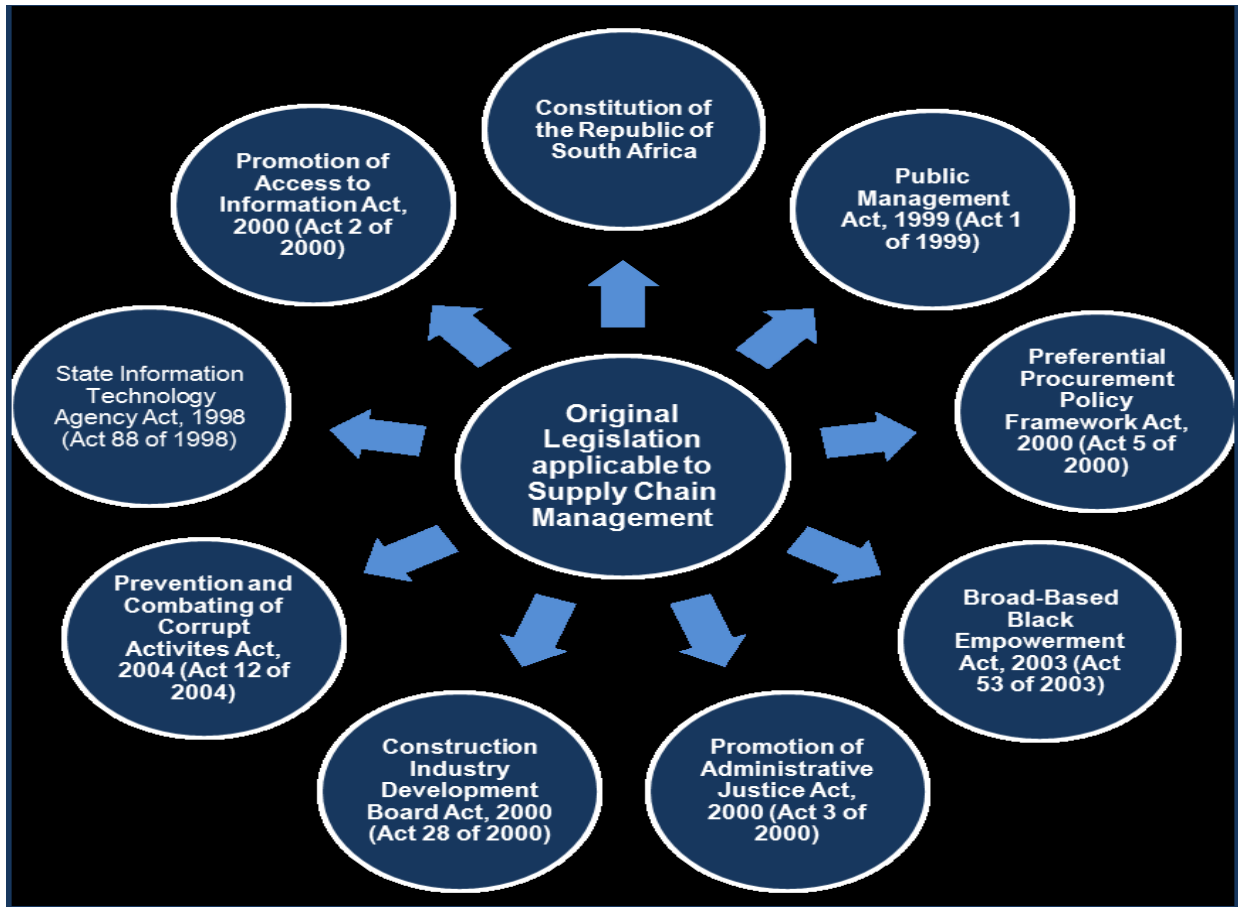


Figure 2-8: The laws which influence public sector procurement in South Africa (Corporate Counsel Association of South Africa, 2016)

These influential laws relative to procurement are elaborated further by Watermeyer (2011) as:

Public Finance Management Act (Act 1 of 1999): this act provides a regulatory framework for SCM inclusive of procurement within national and provincial departments and state owned enterprises.

Promotion of Administrative Justice Act (Act 3 of 2000): Determines fair administrative procedures and permits those who have been affected by unjust administrative action to request reasons for such. In addition, the act requests that administrators must respond to such requests. (Administrative actions are presumed to be have been taken without good cause where an administrator fails to respond within the prescribed period.) The Act makes provision for procedures for the judicial review of administrative actions and remedies in proceedings for judicial review, including the prohibition of an administrator:

- from acting in a particular manner,
- setting aside the administrative action,

- correcting the defective action and
- the ordering of the administrator to pay compensation.

The Promotion of Equality and the Prevention of Unfair Discrimination Act, 2000 (Act 4 of 2000): This act forbids the state or any person from unfairly discriminating against a person on the grounds of race or gender through denying them right of access to contractual opportunities for the rendering of services or by failure to provide the necessary provision which will accommodate the needs of such person.

Preferential Procurement Policy Framework Act, 2000 (Act No 5 of 2000): This act forms the manner in which preferential procurement policies are implemented

Construction Industry Development Board Act, 2000 (Act 38 of 2000): This act establishes a code of conduct for the parties engaged in construction procurement and the means by which the Board can promote and implement policies, programs and projects, inclusive of those focused at procurement reform, standardisation and uniformity in procurement documentation, practices and procedures within the framework of the procurement policy of government, through the establishment of:

- a national register of contractors (and if required, consultants and suppliers) to manage public sector procurement risk and facilitate public procurement;
- a register of projects above a financial value with data relating to contracts awarded and completed and a best practice project assessment scheme;
- best practices

Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003): Enforces a code of good practice to inform the:

- development of qualification criteria for the issuing of licenses or concessions, the sale of state owned enterprises and for entering into partnerships with the private sector; and
- Development and implementation of a preferential procurement policy.

Local Government: Municipal Finance Management Act, 2003 (Act No 56 of 2003): Establishes a regulatory framework for SCM which includes procurement within municipalities and municipal entities.

Prevention and Combatting of Corrupt Activities Act, 2004. (Act No. 12 of 2004): Established corruption and related activities as an offence. This act enforces a register in an attempt to impose restrictions on any

person or enterprise convicted of these activities in relation to tenders and contracts. The act also places an obligation on a person who is in an authoritative position to report transactions of a corrupt nature.

The South African public sector still faces issues with the current procurement process despite the reform process initiatives. These issues include (CCASA, 2016):

- non-compliance with procurement and SCM-related legislation and policies;
- tender irregularities;
- Corruption, incompetence and negligence by public

The TPS has been greatly criticized for failing to accommodate the advancing technology and increasing complexity on construction projects (Rwelamila and Hall, 1994). “Classical (i.e., traditional) contractual arrangements call for clear and definitive allocations of risks (and responsibilities and liabilities) among stakeholders. But all possible risks/uncertainties are not foreseeable and quantifiable at the outset. Even the foreseeable risks may change in importance and may influence some other risks, requiring considerable adjustments during project execution. Classically “complete” contractual arrangements are therefore not suitable for proper risk management. The objective of risk management should be to minimize the total cost of risks to a project, not the cost to any parties separately.” (O’Connor, 2009: 3).

The argument as presented by Rwelamila and Hall (1994) is that the fault lies within the management of the system and perhaps not the system itself. “Traditional contracts rigidly delineate responsibilities with much elaboration on the consequences of failure. These contracting approaches reinforce self-protective behavior and instill mistrust.” (O’Connor, 2009: 1)

Figure 2-9 provides a comparison of the TPS vs IPDS

Traditional Project Delivery

Integrated Project Delivery

Linear, distinct, segregated; knowledge gathered “just-as needed”; information hoarded; silos of knowledge and expertise

Concurrent and multi-level; early contributions of knowledge and expertise; information openly shared; stakeholder trust and respect

Process

Fragmented, assembled on “just-as needed” or “minimum-necessary” basis, strongly hierarchical, controlled

An integrated team entity composed key project stakeholders, assembled early in the process, open, and collaborative

Teams

Individually managed, transferred to the greatest extent possible

Collectively managed, appropriately shared

Risk

Individually pursued; minimum effort for maximum return; (usually) first cost based

Team success tied to project success; value-based

Compensation/ reward

Paper-based, 2 dimensional; analog

Digitally based, virtual; Building Information Modeling (3, 4 and 5 dimensional)

Communications / technology

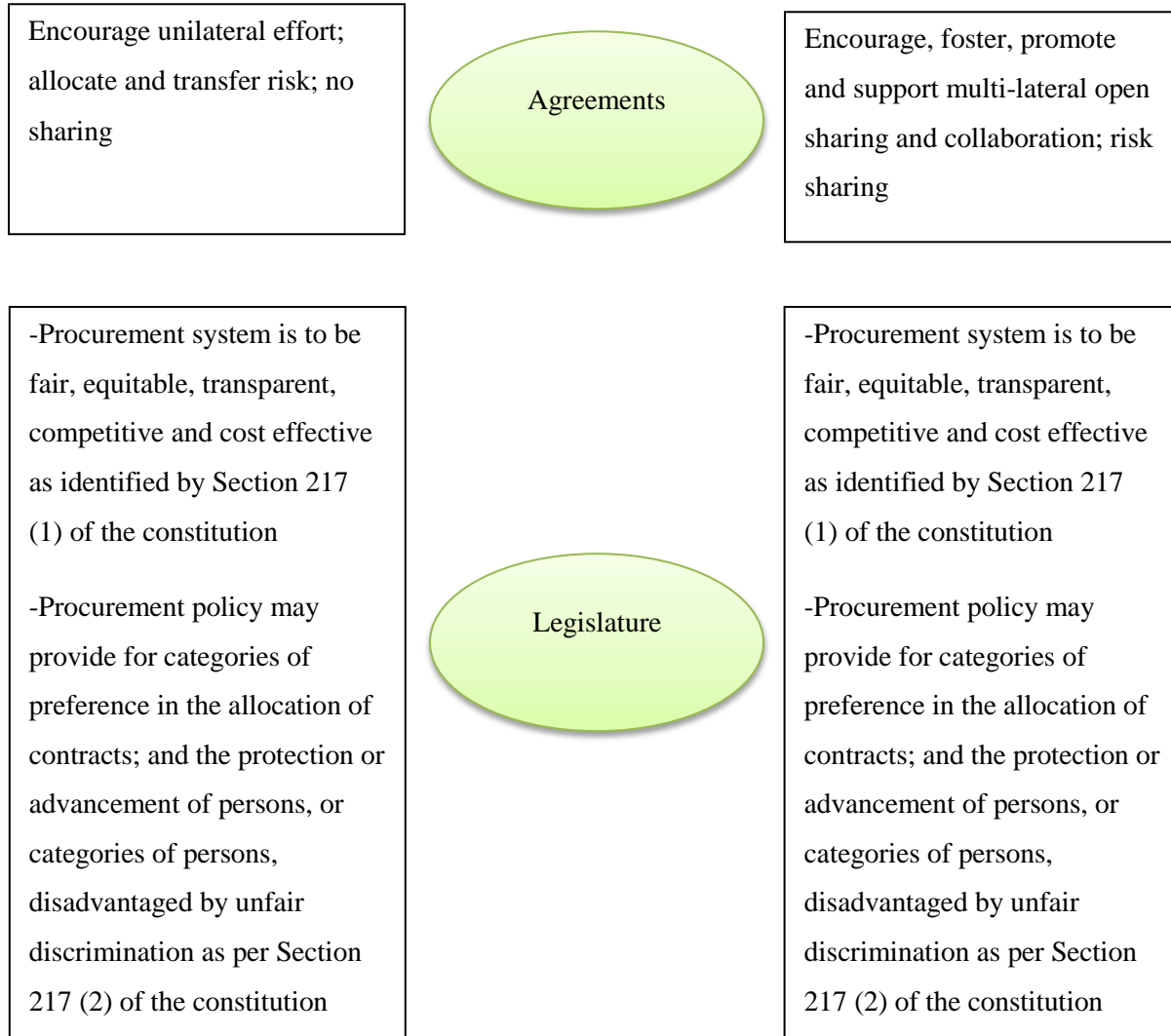


Figure 2-9: Traditional Delivery vs Integrated Delivery

Adapted from the AIA 2007 and National Treasury 2012.

2.3.3 Factors Influencing Procurement Selection

Majority of private sector clients lack experience in procurement method selection and rely on the Architect to advise them accordingly (Miller *et al.*, 2009). Architects tend to recommend TPS as a result of the higher fee advantage for pre and post contract provision. This may be the motive to select TPS by default despite the experience gained from various projects which would allow the advisor to recommend an appropriate method (Sarif and Morledge, 1997). Franks (1984); Nahapiet and Nahapiet (1985) and Morledge *et al* (2007) suggest that TPS is selected by default due to the advisors' lack of knowledge and skills required to suggest otherwise. Bowen *et al* (1997) shares those sentiments by suggesting that professionals lack a comprehensive understanding between the assortments of methods available and are

therefore unable to suggest project specific, appropriate procurement methods. The variety of methods available is a reflection of the complex nature of the selection itself. Clients can only select the most appropriate system once they are fully informed of the various systems available and its features (Sarif and Morledge, 1997).

The procurement method selection may have been pre-assigned on certain projects prior to the appointment of an Architect due to: policy of a company or authority; limited choices due to project constraints or simply as a result of the client’s decision which is guided by the Principal consultant other than the Architect (Lupton *et al.*, 2007).

According to Lupton *et al* (2007), the selection of procurement method is dependent on:

- The scope of work intended
- The risk distribution
- Design responsibility
- Coordination of the outlined work and;
- The extent of which the price affects the contract being awarded

Walker *et al* (2000) summarize the challenges faced by facilities in selecting procurement methods in Table 2-4

Table 2-4: Procurement Method Selection

<u>CHALLENGES</u>	<u>POTENTIAL SOLUTIONS</u>
The 'cheapest' initial capital price is seldom the most economic long-term solution	Procure projects on the basis of 'best value' not 'cheapest initial price'
Negative conflict-ridden approaches result in a litigious atmosphere in which win-lose mentality prevails locking out many creative solutions and win-win possibilities.	Use an agreed problem-solving approach and dispute resolution mechanism that recognizes the validity of diversity of opinion and approaches providing a greater pool of solution possibilities.
Stakeholder-value generating possibilities are seldom revealed through a short-term profit gain or capital cost-reduction focus. This approach constrains solutions to a win-lose outcome and is not conducive to encouraging win-win outcomes.	Focus on satisfying the real needs of stakeholders. A focus on developing and maintaining long term relationships often releases creative energies and synergies that reduces wasted energy and increases wider knowledge and experience for all project parties involved.

Project participants and their supporting communities often experience detrimental quality-of-life impact through an unhealthy focus on profit maximization or initial cost reduction. Often supporting communities pay a high indirect cost for projects.	Business needs to recognize that its <i>raison d'être</i> is to increase community value rather than simply maximize its own wealth. Businesses survive and are sustained by supporting communities, which generates market demand and creates prosperity.
The environment is often degraded when the cheapest initial cost and bottom-line profits are relentlessly pursued. The consequences of waste generation are often borne by the community rather than those who have generated it.	The TQM approach in its fullest sense should be adopted. Each project must not degrade the external environment or the supporting social system for which the project is intended to serve.
Project stakeholders include a diverse group of individuals including project team participants and others who will be ultimately affected by the project.	Recognize that performance criteria extend beyond low initial cost or profit margins. A more balanced scorecard of project success should prevail that satisfies a wider scope of project stakeholder.

There exists evidence of the public sector experimenting with alternative procurement methods in an effort to improve project delivery efficiency. The alternative systems gravitate toward a more integrated project delivery approach which has been embraced by the private sector (TCS, 2007) yet the controversy around the evident lack of ‘Ubuntu’ (African group solidarity) among project stakeholders within the Southern Africa Development Community public building sector has been highlighted (Rwelamila *et al.*, 1999).

2.4 Legislative Framework

Form of Contracts in relation to procurement and delays

2.4.1 Joint Building Contracts Committee

The objectives for developing the Joint Building Contracts Committee (JBCC) were to develop a standardized set of contractual documents to compliment an effective building process. A Principal Agent is appointed to administer the contract on behalf of the client. The Principal Agent is usually the Architect, Quantity Surveyor or Engineer depending on the specific circumstances of the project. The Principal Agent assumes the responsibility of consulting with the professional team and the contracting team. The project has a single point of communication. The professionals, the contractors and the

subcontractors and specialists each are appointed individually under standardized contract documents (CIDB, 2005).

2.4.2 General Conditions of Contract

The General Conditions of Contract for Construction Works, frequently referred to as GCC 2004, is a form of contract which is applicable to all bids, contracts and orders including bids for functional and professional services, sales, hiring, letting and the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents (National Treasury, 2010).

An Engineer is appointed as an agent of the Employer as a requirement of the GCC. The agent is employed to administer the contract. It is the responsibility of the agent to consult with the employer and the contractor where there is a requirement to make a decision on issues pertaining to interpretation of the contract or price establishment. This consultation serves to reach an agreement between the parties however if this is not unanimous, the agent is required to issue a ruling which is fair in light of the fact, circumstances and contract.. The contract data establishes specific instances where Employer approval is essential (CIDB, 2008).

2.4.3 FIDIC

FIDIC (French Acronym for the International Federation of Consulting Engineers) is an internationally recognized standard form of contract for civil engineering construction and mechanical and electrical plant. There are four forms of contracts which have been added to the FIDIC domain, these are:

- Conditions of Contract for Construction (Red Book)
- Conditions of Contract for Plant and Design-Build (Yellow Book)
- Conditions of Contract for EPC/Turnkey Projects (Silver Book)
- Short Form of Contract (Green Book)

These forms of contract are best suited to projects where tender are invited. The Silver book has been designed in response to market requirements where a client's objectives are cost and time certainty. The project final price and completion date determine success in terms of the client's objectives and the client is willing to allocate a premium contribution towards ensuring this is met. The contractors under this contract assume a broader range of responsibility and risk than in the other forms of contract under the FIDIC umbrella (CIDB, 2010).

2.4.4 Summary of Forms of Contract

The forms of contract primarily utilized within the public sector in South Africa align specifically with features of the traditional procurement methods. These features support the fragmentation of the project participants and stifle the opportunity for participant integration (CIDB, 2005; 2008; 2010; National Treasury, 2010). According to the CIDB (2005), Table 2-5 provides a summary of the key features of the recommended forms of contract.

Table 2-5: Forms of Contracts Summary

ASPECT	GCC	FIDIC	JBCC
Application	Suitable for both building and construction works contracts.	The obligations by the parties, rather than the nature of the work, determine which contract is to be used. FIDIC recommends that the use of the books as follows: Red Building and Civil Engineering contracts Yellow Mechanical & Electrical process plant contracts Silver International major turnkey projects. For projects only and typically designed and managed by independent engineering consultants.	Suitable for the building sector of the construction industry where the works are designed and administered by agents of the employer who are coordinated by a principal agent.
Provision for different contracting strategies	Although it is focused on the design by employer contracting strategy, it may be used in design and build contracts.	Separate contracts for three main strategies: Red Construction: Building and Engineering works designed mainly by the employer. Yellow Plant Design & Build for works designed mainly by the contractor. Silver Engineer-Procure-Construct Turnkey projects with all work (engineering, procurement and construction) by the contractor.	Only suitable for design by employer contracting strategy.
“Tender” vs “contract”	“Tender” and “Contract” separated	“Tender” included as part of the “Contract”	“Tender” included as part of the “Contract”.
Structure	Series comprises only one form of contract.	Separate documents with many common clauses repeated in each document. (Documents are structured around 20 similar clauses, which are adapted as required by each contract.)	Separate documents with many common clauses repeated in each document.
Design by either party	Intended to be by the employer but contract provides for design by the contractor to the extent specified in the contract.	Red Intended to be by the employer but contract provides for design by the contractor to the extent specified in the contract. Parts designed by contractor to be fit for purpose. Yellow Design (fit for purpose) by contractor to Employer’s Requirements. Silver Fit for purpose design by the contractor who shall also be responsible for the accuracy and completeness of the Employer's Requirements, with some limited exceptions.	Contractor is not responsible for the design of the permanent works. However nominated and selected subcontractors do carry design responsibility which is ceded by the contractor to the employer
Limitation of liability	To be addressed as an additional	Capped at amount stated or contract sum if not stated, with	To be addressed as an additional

<p>Loss of revenue, loss of profit, indirect and consequential Other direct losses during the contract period Loss and damage to employer's surrounding property Latent defects</p>	<p>condition. Unlimited for defects to the extent which contractor is responsible, uncertain for others. Contractor liable for making good physical loss and to repair damage from whatever cause save for "excepted risks". Liable for latent defects for a period of ten years after the completion of the contract.</p>	<p>exceptions. This cap applies to the contractor only. Unlimited for defects to the extent which contractor is responsible, uncertain for others. Contractor liable, including for consequential loss, arising from breach of contract, negligence, or other legally actionable wrong. The contract is silent, hence covered by the law of the contract in which the site is situated.</p>	<p>condition. Unlimited for defects to the extent which contractor is responsible, uncertain for others. Contractor liable for making good physical loss and to repair damage from whatever cause. Liability limited to the amount of the contract works insurance provided for in the contract. Liable for latent defects for a period of five years after the completion of the contract.</p>
<p>Financial risk allocation</p>	<p>The risk allocation is fixed based on the principle that the risk carried by the party best suited to deal with it.</p>	<p>Each main contract has its own independent (but fixed) risk allocation strategy typical of the sector the contract is designed to target. Red Employer carries quite a few risks Yellow Contractor carries most risk, but employer still carries some. Silver Contractor carries virtually all risk. Time and cost effect dealt with differently depending on the risk event. Some events do not allow for contractor's profit. Engineer / Employer to determine (extra time & cost) by consultation in an endeavour to reach agreement. Alternatively, engineer can determine.</p>	<p>The risk allocation is fixed based on the principle that the risk carried by the party best suited to deal with it.</p>
<p>Role of the Employer and his agents</p>	<p>The Engineer administers the Contract as agent of the employer in accordance with the provisions of the Contract</p>	<p>Red and Yellow books refer to employer and the engineer (a person who may not necessarily be an engineer). Engineer is the employer's agent but may be restricted by the employer. Silver refers to employer only but may delegate actions to a representative. All contracts make reference to Employer's Personnel. All may delegate their duties. Engineer (or Employer in the Silver Book) is required to determine any matter by consultation with the parties and if agreement is not reached, to determine the matter by making a fair determination in accordance with the contract, accounting for the circumstances.</p>	<p>The principal agent is given full authority and obligation to act in terms of the contract and may as such bind the employer. Principal agent is required to determine any matter by consultation with the parties and if agreement is not reached, to determine the matter by making a fair determination in accordance with the contract, accounting for the circumstances.</p>
<p>Subcontracting</p>	<p>Contractor is liable as if he had not subcontracted. Provision is made for the appointment of subcontractors in</p>	<p>Contractor is liable as if he had not subcontracted. Provision for Nominated Subcontracts. No back-to-back conditions of subcontract are provided.</p>	<p>Provision is made for nominated subcontractors and selected subcontractors i.e subcontractors appointed by the</p>

	consultation with the employer.		principal agent in consultation with the contractor. The contractor is liable as if he had not subcontracted where the subcontractor is selected. The contractor is not liable in certain respects where the subcontractor is nominated. Back to back forms of subcontract are provided to facilitate the appointment of contractors.
Claims procedures	If Contractor considers himself entitled to make any claim for extension of time or additional payment, he shall notify the Engineer within 28 days of the circumstances giving rise to the claim, after which the Employer has no further liability. This is a strict / full time bar.	If Contractor considers himself entitled to make any claim for extension of time or additional payment, he shall notify the Engineer within 28 days of the circumstances giving rise to the claim, after which the Employer has no further liability. This is a strict / full time bar.	Provision made for the adjustment of the contract value and the date for practical completion under prescribed circumstances. Claims for such adjustments must be made within the stated period of becoming aware of the circumstances giving rise to a claim, failing which no compensation will be made.
Dispute management	All disputes referred to and settled by either a mediator or adjudicator, failing which arbitration or litigation, as provided for in the contract	Disputes first referred to a Dispute Adjudication Board (single person or three person board) for settlement. If no notice of dissatisfaction is received it becomes final and binding. General Conditions of Dispute Adjudication Agreement included as an Appendix in each main contract document. If dissatisfied, a party notifies the other and amicable settlement is attempted. If still no agreement, proceed to international arbitration by three arbitrators under ICC rules, unless otherwise agreed by the parties	In “state” contracts disputes are submitted to litigation. Institution of the action must be commenced and the process served within 1 year from the date of the existence of the dispute, failing which the dispute shall lapse. In “non-state” contracts, disputes are referred to arbitration or mediation.
Application	Suitable for both building and construction works contracts.	The obligations by the parties, rather than the nature of the work, determine which contract is to be used. FIDIC recommends that the use of the books as follows: Red Building and Civil Engineering contracts Yellow Mechanical & Electrical process plant contracts Silver International major turnkey projects. For projects only and typically designed and managed by independent engineering consultants.	Suitable for the building sector of the construction industry where the works are designed and administered by agents of the employer who are coordinated by a principal agent.

2.4.5 Factors affecting selection of form of contract

Criteria to consider when selecting an appropriate form of contract as described by the CIDB (2005) are:

- The level of complexity of the work
The minor works contracts are applicable when the works are direct or repetitive and the duration is minimal; there are no requirements for advanced management methods; the level of risk on the procuring and contracting party is low and the design is near completion once construction commences.
- The capability and capacity of the management team
- Specific requirements such as:
 - Construction management;
 - Employers design;
 - Management contract;
 - Design and build
 - Develop and construct
 - Activity schedules
 - Bills of quantities
 - Reimbursable costs
 - Target costing
 - Partnering
- Consideration to how well suited the administrative procedures of the contract is to the organization's administrative processes and procedures.
- Requirements relating to:
 - Risk allocation and management
 - Consecutive contracts for the appointment of all subcontractors
 - Managing cost and time overruns
- The willingness of the client's representative to accommodate use of different admin procedures for building (JBCC) and civil engineering contracts (FIDIC)

- Training requirements
- The requirement for a standard document with the capability to manage multiple discipline strategies in relation to building and civil engineering works including all necessary procurement of professional services, team services and supplies in a sequence of documents which are all based on a shared set of goals, terminology and management strategy.

The selection of an appropriate form of contract has been summarized by the CIDB (2005) in Figure 2-10

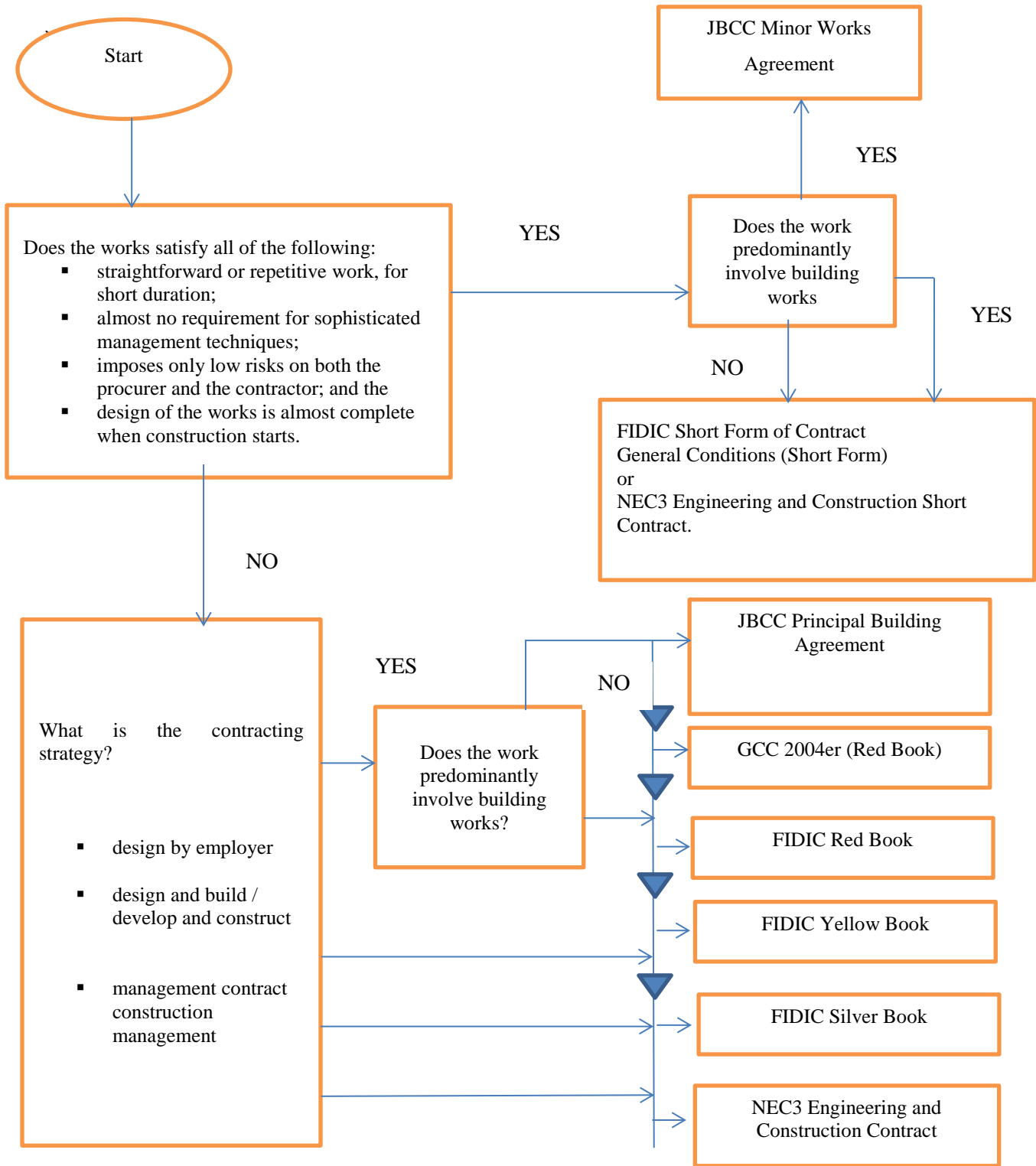


Figure 2-10 The selection of an appropriate form of contract for engineering and construction works (CIDB 2005)

2.4.6 IPDS: The Prime Contract

IPD diminishes the hierarchy of project participants that is synonymous with the traditional methods. There exists a single binding contract between the team and the client. This contract can be adapted to any existing form of contract which stipulates the scope of the project, the costs and planning schedules. The contract will be signed by the team as a single entity. The Multiparty Integrated Project Delivery Agreement, also identified as ConsensusDocs 300 (CD300), provides for a form of contract for IPDS. This agreement addresses key issues such as a multiparty agreement between owner, designers, and constructors, cost reimbursable payments, and risk sharing amongst relevant participants. The structures of management, business terms and the construction process have been added into the CD300 in recent years. Lean Construction techniques in the planning of the project, design as well as construction have been incorporated into the CD300. IPD was developed in an effort to eliminate the effect of different objectives amongst the participants to a contract, which is inherent in Traditional methods. The inclusion of the Lean Construction techniques into the CD300 facilitates the process of aligning all aspects of the construction process throughout. In an effort to diminish inefficiencies, Lean Construction process focus on improved planning, greater collaborative initiatives between the owners, the designers and the construction team and creating incentives which are project based as opposed to individually based outcomes. The CD300 creates an obligation for the project participants to function as a team to attain the common goal via the structure provided. (Leone and Vornehm, 2016)

2.5 Chapter Summary

It becomes evident, through the literature explored, that the Traditional Procurement Method has been adopted on public sector projects by default. While proving advantageous on projects, TPS has been criticized for its features which appear to foster adversarial relationships among the project participants. These adversarial effects manifest in the breakdown of communication and fragmentation within the professional team from the inception phase through to the completion of a project. These effects can have a devastating impact on successful project delivery as a result of project delays among other consequences. The need for a comprehensive method which compliments the relational nature of construction becomes increasingly apparent. IPDS presents a form of procurement which compliments the relational nature of the construction process and seeks to eliminate the shortcomings experienced by TPS.

CHAPTER 3

3. RESEARCH METHODOLOGY

3.1 Introduction

“All progress is born of inquiry. Doubt is often better than overconfidence, for it leads to inquiry, and inquiry leads to invention” (Maxim Hudson cited in Kothari, 2004:5). Research is not just simply gathering information but also refers to the specific manner in which the information is collected. The process entails a systematic and detailed investigation conducted (Oliver, 2010). Research may be referred to as a search of knowledge, a scientific and systematic examination of vital topics and an art of investigative nature. Research in the academic aspect can be summarized as new contributions to existing knowledge in an effort towards advancing the area of study (Kothari, 2004).

3.2 Research design

The result of discovery on the ‘voyage of discovery’ which research is frequently referred to as is dependent of a number of factors, namely:

- Questions which the research addresses
- Patterns and techniques of research
- Location and subject material being investigated
- The analysis conducted
- The reflection by the researcher on the analyses within the context of the theory and the literature review and the methodology being implemented (Fellows and Liu, 1997).

The driving force behind research appears to the questions asked and problems addressed within the research. The research design methods selected to conduct the research must address the problems and questions in a manner which is valid, accurate and reliable (Fellows and Liu, 1997).

The research design is significant as it maps out a framework of how to effectively conduct the research to directly obtain the objectives of the study (Creswell., Plano Clark., Gutmann., & Hanson, 2003).

3.3 Research approaches

Kothari (2004) outlines the basic types of research as:

- Descriptive vs Analytical

Descriptive research entails a variety of fact finding enquiries including surveys. The aim of descriptive research is to describe the status quo. The term '*Ex post facto research*' is frequently used in descriptive research. The primary feature of this type of research is that the researcher has no control over the variables and simply reports on the happenings. Descriptive research is used to measure items or to establish the causes of an effect when the variables not within control. Descriptive research makes use of various survey methods inclusive of comparative and correlational methods. Analytical research entails the researcher making use of information which is readily available and performing an analysis of the data in order to critically evaluate the information.

- Applied vs Fundamental

Applied research aims at addressing an immediate problem faced by society, an industrial organization or business. Examples of applied research are research which identify social, political or economic trends that may have a direct effect on an institution or the copy, marketing or evaluation research. Fundamental research on the other hand, is primarily involved with generalizations and formulation of theories. Fundamental research is also referred to as basic or pure research. Examples of fundamental research are research which is involved with a natural phenomenon or in relation to pure mathematics. In addition, studies regarding human behaviour with the intention of making generalizations about human behaviour are an example of fundamental research. Applied research aims to discover solutions whereas fundamental research aims discover information which has a diverse application base which adds to an existing body of knowledge.

- Quantitative vs Qualitative

Quantitative research is concerned with the measurement of quantity and is applicable to occurrences which can be expressed in terms of quantity or amounts. Qualitative research is concerned with occurrences dealing with quality or kind. Examples of qualitative methods are motivation research which utilizes an in-depth interview process to analyze motives and desires, attitude or opinion research which analyzes how people feel. Techniques include work association tests, sentence completion tests, story completion tests and the likes.

- Conceptual vs Empirical

Conceptual research is concerned with an abstract idea or theory. Philosophers and thinkers utilize this type of research to either reinterpret an existing concept or to develop a new concept.

Empirical research is based on experience or observation, disregarding system or theory. The research is data-based, allowing the researcher to arrive at conclusions which are verifiable by observation or experiment. We can refer to this type of research as experimental research. The researcher develops hypotheses and conducts the study to prove or disprove the hypotheses. Experimental designs which will manipulate the material in order to achieve the desired result are required. The research is therefore dependent on the researchers control over the variables and the intentional manipulation of one variable to study the resulting effect. Empirical research is best suited to research which seeks to prove that specific variables have an effect on the other variables. This type of study is considered to be the most significant support possible for a provided hypothesis.

The basic research methods, despite the techniques utilized can be classified as either quantitative or qualitative research (Ibid).

The differences between the basic types of research are outlined by Flick (2011) in Table 3-1

Table 3-1: Research Design: Quantitative vs Qualitative Research

QUANTITATIVE RESEARCH	QUALITATIVE RESEARCH
Objective	Subjective
Research Questions: How many?	Research Questions: What? Why?
“Hard” science	“Soft” science
Test theory	Develops theory
Facts are value-free and unbiased	Facts are value-laden and biased
Measurable	Interpretive
Report: statistical analysis	Report: rich narrative, individual interpretation
Reasoning is logistic and deductive	Reasoning is dialectic and inductive
Processes are: <ul style="list-style-type: none"> • Planned • Linear • Sequence of steps • Standardized process 	Processes are: <ul style="list-style-type: none"> • Less linear in comparison • Steps may be closely interdependent • Steps located at different stages • Non-standardized process

Adapted from Flick (2011) and Anderson (2006)

3.3.1 Quantitative

The Centre for Innovation in Research and Teaching (2017) outlines the four primary types of quantitative research designs as:

Descriptive Design: this type of design aims to describe the current status of a variable or occurrence. The hypothesis is developed post data collection. The type of data collection is predominantly observational.

Correlational Design: entails the exploration of the relationship between the variables making use of statistical analyses. This method is also predominantly observation in its data collection since it does not seek to identify the cause and effect.

Quasi-experimental: this type of design aims to identify the cause and effect relationship between variables. There are neither groups allocated nor manipulation between variables by the researcher. Control groups are established and exposed to the variables. The results are compared with the results of groups which haven’t been exposed to the variables. This design is also referred to as casual-comparative.

Experimental: this design utilizes scientific methods to identify the cause and effect relationship among variables within the study. The researcher makes a concerted effort to control all variables apart from the independent variable being manipulated. The effects on the independent and dependant variable are collected and the data analysed to detect a relationship.

Data can be collected via the following methods:

Questionnaires: this usually involves emailing or hand delivering a carefully constructed questionnaire for the participants to respond to within a stipulated time frame. This method has proved, through its extensive implementation, to be highly effective in retrieving information (Kothari, 2004).

Surveys: survey research designs provide flexibility and can be presented in various forms similar to questionnaires. They can be administered electronically or personally.

3.3.2 Qualitative

3.3.2.1 Focus groups:

This method is best suited when seeking to extract data on the cultural median of a particular group regarding an issue or issues which pertain to that group (Creswell, 2009).

3.3.2.2 Observation:

In order for scientific observation to be conducted, it is required to serve a formulated research purpose, methodically planned and recorded and subjected to controls on validity and reliability. The primary features of this method are that the information is gathered by the observer without consent of participants required, the data is current and not influenced by past or future effects and finally the method is unaffected by the willingness of participants since it does not require active participation. This method can prove to be a costly exercise, frequently with limited information available (Kothari, 2004).

3.3.2.3 Case Study

The case study method is applied to research experimental theories using predetermined procedures. The procedures usually comprise of various methods of data collection such as interviews and documenting evidence to investigate an occurrence (Fellows and Liu, 2003).

3.3.2.3.1 Advantages:

- This type of research method allows us to understand completely the behavioural patterns of the unit of study
- The researcher is able to capture the emotions of the unit of study
- It aids in developing relevant hypotheses
- An intense study of social units is facilitated by this method
- Appropriate questions for surveys or questionnaires can be developed from case study research
- Several methods may be implemented under the case study method, such as in depth interviews, questionnaires, documents, study reports of individuals
- Aids in discovering the nature of the population to be studied
- Allows the researcher to understand social changes
- Provide great value in decision making regarding management issues

3.3.2.3.2 Limitations:

- The information gathered is difficult if at all possible to compare to other data collected similarly
- Since the data can be viewed as subjective, often the data is not regarded as significant scientific data
- The risk of false generalization is identified due to the study being conducted on a few units and the data gathered in a manner which does not impose rules on how to collect this data
- The process is time consuming
- The participant may respond in a biased manner
- Case study method applies to a limited sphere
- The researcher needs to remain unbiased when reporting the data (Kothari, 2004).

3.3.2.4 Interviews

Personal interviews: this entails face-to-face structured or unstructured interview between the interviewer and the participant. In a structured interview, predetermined questions are compiled and a rigid procedure is put in place. In an unstructured interview, the interviewer is allowed more flexibility to rearrange the sequence of questions or to ask additional questions and to omit questions at the discretion of the researcher. This however proves difficult when analyzing and comparing interviews since there is no distinct pattern. Unstructured interviews are best suited to exploratory or formulated research while structured interviews are appropriate for descriptive studies. Personal interviews can prove to be costly,

time consuming and access to certain participants can be problematic among other disadvantages (Kothari, 2004).

Telephonic interviews: this method of data collection provides flexibility, and efficiency with a higher response rate as opposed to a written document. Telephone interview are generally more cost effective than personal interviews and provides an interface for the interviewee when physical access is limited. The key disadvantages of this method are that the interviews are generally very time limited, can prove more bias than a personal interview and are not suited to intensive interviews (Kothari, 2004).

The advantages and disadvantages of telephonic and personal interviews are outlined in table 3-2

Table 3-2: Interviews, the advantages and disadvantages

Personal Interviews	Telephonic Interviews
Advantages	
Large amount of detailed information can be obtained	Allows for greater flexibility in comparison to mailing methods
The interviewer may overcome any resistance displayed by the respondent	It is a faster more effective way to obtain information
This method allows for more flexibility since the opportunity to restructure questions is present	Telephonic interviews are more cost effective than personal interviews
The observation method can be applied to recordings of verbal answers	Recalling is relatively simple
Personal information is more attainable	Provides for a higher response rate than the mailing methods
The sample can be controlled effectively, diminishing the possibility of non-responses	Responses can be recorded without causing any embarrassment to the participant
The interviewer has control over who responds as this is clearly visible	The requirements can be explained with ease
Spontaneous reactions can be captured	Access is more attainable than a personal interview
Misinterpretations due to language barriers or lack of understanding can be reduced	The need for field staff is diminished
Additional information regarding the participants environment and personal characteristics can be collected	A wider sample distribution is possible
Disadvantages	
Depending on the geographical sample this method can prove to be costly	There is a time limitation on responses
The element of a bias interviewer and respondent is always a possibility	This method is limited to participants who have access to phones.
Access to the participant may prove difficult and certain respondents may be unapproachable	Extensive geographical samples may be restricted due to cost factors

This method can be time consuming where there is a larger sample and recalls may be necessary	This method is not suited to intensive interviews where comprehensive answers are required
The pressure of the interview process may result in spontaneous responses not being factual	Increased possibility of interviewer bias
The organisation required for selecting, training and supervising the field-staff is more complex	Questions must be short and direct
Interviewing may introduce systematic errors	
The need for free and frank responses can prove to be a difficult requirement	

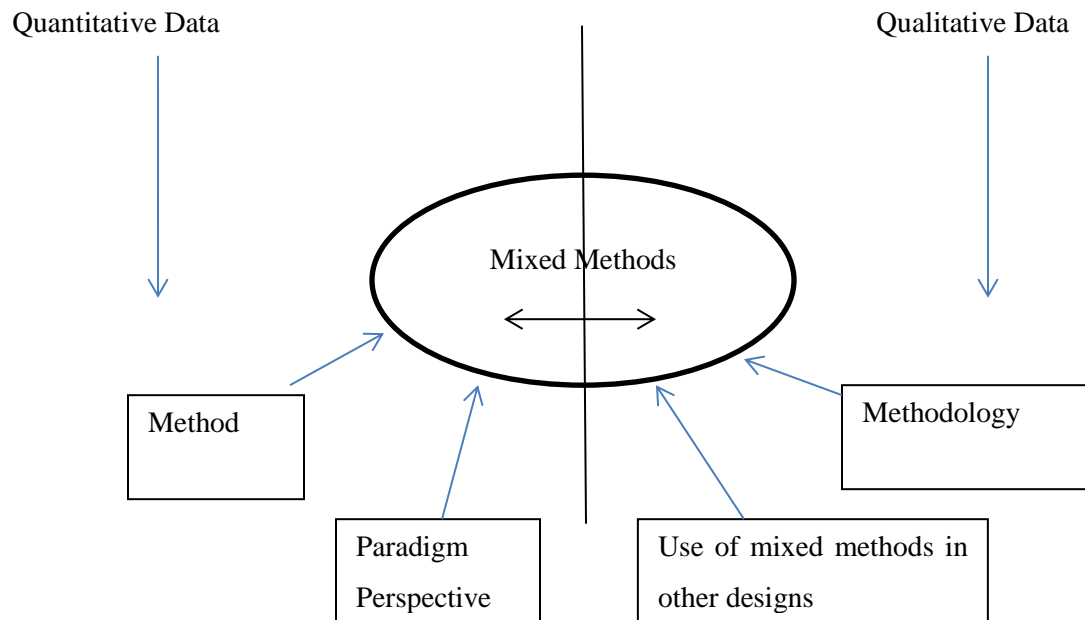
Adapted from Kothari, 2004

3.3.3 Mixed Methods

Mixed method research is the combination of both qualitative and quantitative research being conducted within a single study to provide a greater understanding of the research problem than each method would present individually (Creswell, 2008). In order to gain an improved understanding the following may occur in mixed method research:

- The results between quantitative and qualitative data may be compared
- Qualitative research may be used to explain findings from quantitative data
- To develop an instrument where there is lack of availability of a comprehensive instrument
- To present an argument with qualitative data and
- Using qualitative research to explore and then to generalize finding to a large population by making use of quantitative methods (Ibid)

Figure 3-1 Framework for viewing perspectives on Mixed Methods



Source: Creswell, 2008

3.4 Population

A universe or population is a set of clearly defined objectives to be studied. This universe may be finite in which the number of items is certain or the universe may be infinite in which case the number of items is unknown and infinite. Examples of finite universes are the population of a particular place or the workforce of a town. Examples of infinite universes are the stars in the sky or throwing of a dice (Kothari, 2004).

3.5 Sampling

Samples can be either probability or non-probability samples. Probability samples possess elements which have a known probability of being included within the sample as opposed to non-probability sample which prohibit the researcher from determining this probability (Kothari, 2004). Probability sampling has been established as the best way to ensure an unbiased sample (Muijs, 2004).

3.5.1 Types of sampling

- Probability Sampling:

- Simple random sampling: This type of sampling gives each item within a population an equal chance of being included in the sample. Simple random sampling is also known as chance sampling due to its nature (Kothari, 2004)
- Systematic sampling: this method involves selecting a random unit, usually off a list, to start with and then proceeding to select units at evenly based intervals, or every nth unit until the desired number of units are reached (Ibid).
- Stratified sampling: this technique is implemented to obtain a representative sample if a homogeneous group from which to draw a sample cannot be established. The population is classified into subpopulations which do not overlap and sample items are selected from each layer or strata (Ibid).
- Non-Probability Sampling:
 - Convenience sampling: this method entails selecting units based on ease of access from a population to include in a sample (Kothari, 2004).
 - Judgement sampling: this involves utilizing the features, in the opinion of the researcher, of the selected population to compile a sample (Creswell, 2009). Judgement sample is often associated with qualitative research methods (Kothari, 2004).

3.5.2 Sample size

The sample size is the number of items selected from the population to represent the sample. The sample size should be neither excessive nor minimal. An appropriate sample size should meet the requirements of efficiency, representativeness, reliability and flexibility. Accuracy and level of confidence are considerations when evaluating the sample size (Ibid). For the purpose of this study, a sample of 10 participants was used to partake in the interview. The participants were selected based on the level of involvement on projects within the case study. The participants consisted of Project/ Construction Managers and Principal Quantity Surveyors who played a high level of involvement on projects during the procurement phases. A sample of 20 participants was selected for the survey schedule. The sample consisted of five Quantity Surveyors, 5 Project Managers, 5 Construction Managers and 5 Architects. The survey was compiled in an effort to establish the lines of communication which exist on projects within the public sector and to determine what the participant's ideal flow of communication would be in order to validate the research and compare them with the findings concluded from the interviews.

3.5.3 Sample selection bias

Incorrect inference from the data collected can be caused by systematic bias and sampling error.

Systematic bias is a result of errors in the sampling procedures and cannot be decreased or diminished by an increase in the sample size. Systematic bias is frequently a result of one or more of the following:

- Inappropriate sampling frame: a bias representation of the population will give rise to a systematic bias
- Defective measuring advice: if the instrument itself is bias then the data collected and subsequent measuring will prove to be bias ie if questionnaires or interviewers are bias then the data collected will be bias.
- Non-respondents: if all the participants within the initial sample are not able to be included this may result in systematic bias.
- Indeterminacy principal: the participant may behave differently owing to knowledge of being observed as opposed to natural behaviour when not being under observation. This may result in systematic bias.
- Natural bias in the reporting of data: the risk of participants providing responses which is the 'correct response' as opposed to their own opinions or facts could cause systematic bias (Kothari, 2004).

3.6 Instrument administration

3.6.1 Survey

A survey was designed and developed for project participants to populate based on their experience on projects within the public sector. Every effort was made to ensure that the survey was designed to allow the participants to understand the instrument with ease and to indicate responses effectively (Kothari, 2004).

The survey consisted of 2 scenarios with identical pages as illustrated in Fig 3-2:


- The first scenario required the respondent to connect various project participants/ stakeholders based on flow of communication which currently exists on public sector construction projects. They were provided options of single flow communication or two way flow of communication and were advised to comment if necessary.
- The second scenario required the respondent to connect various project participants/ stakeholders based on a desired flow of communication on public sector construction projects. They were provided options of single flow communication or two-way flow of communication and were advised to comment if necessary.


The surveys were emailed or hand delivered to the respondents where possible. They were advised on how to indicate the flow of communication and it was requested that they return the survey upon

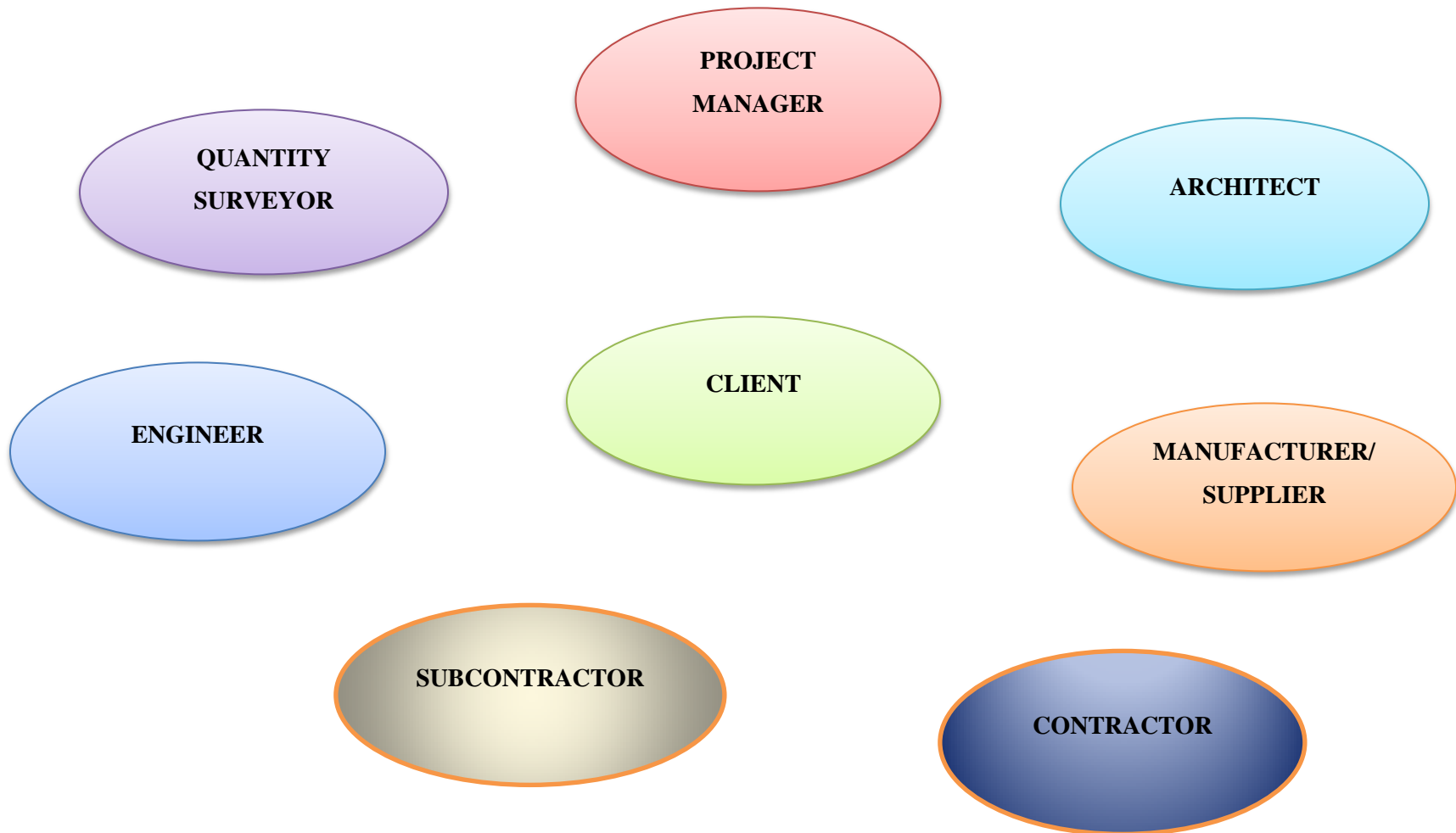
completion. The respondents were allowed a maximum of 2 weeks to complete the survey and follow up telephone calls and emails were sent out as a reminder to complete the survey.

Fig 3-2: Current flow of communication on public sector projects

Respondents were requested by means of directional arrows on a diagram to indicate the flow of communication which currently existed on public sector construction projects and then to indicate the **desired flow of communication** on a separate sheet

One way communication flow 

Two way communication flow 



3.6.2. Case Study

Ten case studies on projects within the public sector were identified and interviews based on those cases were conducted. The participants were selected via convenience sampling. The cases were identified based on construction projects within the public sector which were complete and had experienced delays in order to analyze the details of the delays. The semi-structured interviews were conducted over a period of two weeks and each interview took approximately 30 minutes depending on the level of interaction. The 15 questions were designed to be open-ended and emphasis was placed on the sequence of questions in order to create a comfortable environment for the respondents.

3.7 Response rate

In order to conduct research, scholars are dependent on the willingness of participants to respond to their instruments. A 100 percent response rate is highly unlikely unless the instrument is administered in a coercive manner to the target sample. A larger response rate is less likely when participation is voluntary. Higher response rates result in larger data samples and yield improved credibility however it has been argued that response representativeness is more crucial than response rate. Primary reasons for non-responses have been identified as a failure to deliver the instrument successfully to the target population and the reluctance to respond (Baruch & Holtom, 2008).

3.8 Chapter summary

This chapter provided a framework for the research methodology which was implemented. The research instruments, processes and methods which were implemented were described. The findings from the information gathered will be analyzed and presented in the next chapter.

CHAPTER 4

4. DATA ANALYSIS

4.1 Introduction

This chapter provides an analysis of the data collected. The data was analyzed using Microsoft Excel 2010 in the form of tables as part of a qualitative analysis approach.

4.2 Qualitative Analysis

Due to the study being qualitative in nature a pretest of the interview schedule was done to establish its reliability with two colleagues. There were no corrections needed to be made in the schedule items as they were clear and unambiguous.





The survey data of the responses to the current and desired relationships between project stakeholders involved in procurement were analyzed and all marked up relationships between stakeholders were tabulated. The existing relationships between stakeholders on public sector projects and the desired relationships were examined. The findings were then compared and the changes were noted.

On the other hand, the interview recordings were transcribed and then captured using Excel spreadsheets. Once the tables were populated, emerging themes were noted. Using content analysis techniques, the responses of participants were analyzed into common emerging themes. The themes were summated for ease of reporting commonalities and differences. The summarized findings of each theme were presented and discussed.

4.3 Survey Analysis

Table 4-1 illustrates the findings from the survey which was conducted on various project stakeholders in order to assess the relationships and flow of communication which exists on projects within the public sector and the desired changes to optimize efficiency on these projects.



Table 4-1 Current vs Desired flow of communication

Project Participants Relationship	CURRENT			DESIRED		
	One Way communication flow 	Two Way communication flow 	No Relationship Indicated	One Way communication flow 	Two Way communication flow 	No Relationship Indicated
Client – Project Manager	1	17	2	1	19	
Client – Architect		13	7	1	13	6
Client – Quantity Surveyor		3	17		12	8
Client – Engineer	1	3	16		12	8
Client – Contractor		4	16	1	6	13
Client Subcontractor			20	1	2	17
Client Manufacturer			20		1	19
Project Manager Architect	2	17	1	5	15	
Project Manager Quantity Surveyor	1	17	2	2	17	1
Project Manager Engineer		12	8	1	14	5
Project Manager Contractor	5	6	9		12	8

Project Manager Subcontractor			20	2	1	17
Project Manager Manufacturer			20	2	5	13
Architect Quantity Surveyor	1	4	15		9	11
Architect Engineer	1	6	13		8	12
Architect Contractor	3	6	11	1	11	8
Architect Subcontractor			20		2	18
Architect Manufacturer	2	4	14	3	10	7
Quantity Surveyor - Engineer	1	9	10	1	10	9
Quantity Surveyor - Contractor	6	4	10	5	3	12
Quantity Surveyor - Subcontractor		1	19	2	1	17
Quantity Surveyor - Manufacturer			20		4	16
Engineer Contractor	2	3	15		7	13
Engineer Subcontractor	1	2	17		5	15
Engineer Manufacturer			20		1	19

Contractor Subcontractor	-4	16			20	
Contractor Manufacturer	-7	13		1	18	1
Subcontractor Manufacturer	-	5	15	1	6	13

Table 4-2: Communication and Relationship Change Analysis

Project Stakeholders	<div style="border: 1px solid black; padding: 5px; display: inline-block;">Unilateral Relationship</div> 	<div style="border: 1px solid black; padding: 5px; display: inline-block;">Bilateral Relationship</div> 	No Relationship Indicated
Client – Project Manager	0	-2	2
Client – Architect	-1	0	1
Client – Quantity Surveyor	0	12	8
Client – Engineer	1	-9	8
Client – Contractor	-1	-2	3
Client – Subcontractor	-1	-2	3
Client – Manufacturer	0	-1	1
Project Manager – Architect	-3	2	1
Project Manager – Quantity Surveyor	-1	0	1
Project Manager – Engineer	-1	-2	3
Project Manager – Contractor	5	-6	1
Project Manager – Subcontractor	-2	-1	3
Project Manager – Manufacturer	-2	-5	7
Architect – Quantity Surveyor	1	-5	4
Architect – Engineer	1	-2	1
Architect – Contractor	2	-5	3

Architect Subcontractor	-	0	-2	2
Architect Manufacturer	-	-1	-6	7
Quantity Surveyor – Engineer		0	-1	1
Quantity Surveyor – Contractor		1	1	-2
Quantity Surveyor – Subcontractor		-2	0	2
Quantity Surveyor – Manufacturer		0	-4	4
Engineer Contractor	-	2	-4	2
Engineer Subcontractor	-	1	-3	2
Engineer Manufacturer	-	0	-1	1
Contractor Subcontractor	-	4	-4	0
Contractor Manufacturer	-	6	-5	-1
Subcontractor Manufacturer	-	-1	-1	2
Total number of changes = 204				

The findings in Table 4-2 suggest the following:

4.3.1 Client Relationship Analysis

Client-Project Manager: the respondents desired a bilateral flow of communication between the client and the project manager.

Client-Architect: respondents selected preferred a unilateral relationship as their desired model.

Client- Quantity Surveyor: no change was indicated in the unilateral relationship. However, significant changes were noted in the bilateral relationship with stakeholders clearly indicating a desired increase in the bilateral relationship between the client and QS.

Client-Engineer: a significant increase in the need for bilateral communication is preferred.

Client- Contractor: a slight increase in the need for bilateral relationships between the client and contractor is preferred.

Client- Subcontractor: several respondents indicated that a unilateral or bilateral relational would be preferred as opposed to the existing model in which there is no relationship.

Client- Manufacturer: one respondent illustrated the need for a bilateral relationship between the client and manufacturer as part of the desired model.

It is evident that there is a general desire by most respondents for an increase in the relationship between the client and all project stakeholders within the public sector model.

4.3.2 Project Manager Relationship Analysis

Project Manager- Architect: a slight increase in the need for unilateral relationships and a decrease in bilateral relationships was noted. No respondents indicated that a lack of relationship would be beneficial in the desired model.

Project Manager- Quantity Surveyor: respondents showed no change in the unilateral relationship which was a dominant number. A slight change from no relationship in the existing model to a preferred unilateral desired relationship was shown.

Project Manager- Engineer: More respondents indicated a desired increase in unilateral and bilateral relationships than indicating no relationship necessary.

Project Manager- Contractor: the number from existing to desired bilateral relationships doubled and the requirement for a unilateral relationship was diminished.

Project Manager- Subcontractor: a few respondents indicated that a relationship between the project manager and subcontractor would be desired as opposed to the nonexistent relationship in the existing model.

Project Manager- Manufacturer: a few respondents indicated that a relationship would be desired as opposed to the nonexistent relationship in the existing model. Majority of the respondents maintained that there is no need for a relationship between the project manager and the manufacturer.

The respondents appear to find the lack of relationships between the project manager and the rest of the team undesirable. Many have indicated a preference of either unilateral or bilateral relationships rather than a nonexistent relationship

4.3.3 Architect Relationship Analysis

Architect- Quantity Surveyor: respondents indicated that an increase in the bilateral relationship between the architect and Quantity Surveyor would be more desirable than the existing model. They also indicated a decrease in the lack of a relationship between the project participants.

Architect- Engineer: the findings revealed a slight increase in the need for bilateral relationships between the project participants but maintained the numbers on the lack of a relationship.

Architect- Contractor: a significant increase was noted in the desire for bilateral relationships between the contractor and architect with the corresponding decrease in the lack of relationships.

Architect- Subcontractor: a slight increase in the need for bilateral relationships was noted.

Architect- Manufacturer: a significant shift from a complete lack of relationship to both unilateral and bilateral desired relationships was indicated.

The respondents indicated that relationships between the architect and the contractor, subcontractor and manufacturer are desired in order to improve project within the public sector. The desired increase for these relationships is higher for the architect than the other professionals which could indicate that this involves design stages.

4.3.4 Quantity Surveyor Relationship Analysis

Quantity Surveyor- Engineer: one respondent indicated an increase in the bilateral relationship between the QS and Engineer however half the respondents find that a relationship is not necessary.

Quantity Surveyor- Contractor: more than half the respondents indicated that there shouldn't be a relationship between the QS and the contractor.

Quantity Surveyor- Subcontractor: a slight increase in the need for a unilateral relationship between the QS and subcontractor was indicated while most respondents maintained that this relationship is not essential.

Quantity Surveyor- Manufacturer: a relationship between the QS and manufacturer does not exist as per the respondents view on current methods however a few respondents opted for a bilateral relationship on the desired model.

The respondents continue the evident trend of increasing the bilateral flow of communication amongst the project participants.

4.3.5 Engineer Relationship Analysis

Engineer- Contractor: a significant increase in the need for bilateral relationship between the engineer and contractor was indicated with a slight decrease in the lack of a relationship.

Engineer- Subcontractor: A slight increase in the need for a bilateral relationship was noted within the desired model while most respondents maintained that this relationship is not essential.

Engineer- Manufacturer: one respondent indicated a need for a bilateral relationship while all other respondents maintained that this relationship is not a necessity.

The respondents continue the evident trend of increasing the bilateral flow of communication amongst the project participants. The relationship between the engineer and the contractor, subcontractor and manufacturer appear to be a non-essential one.

4.3.6 Contractor Relationship Analysis

Contractor- Subcontractor: by indicating a significant increase, all respondents illustrated that a bilateral relationship is necessary.

Contractor- Manufacturer: a noticeable increase in the need for bilateral relationships was indicated by the respondents

The respondents share the consensus that increased two way communication is a necessity between the subcontractor, manufacturers and contractors.

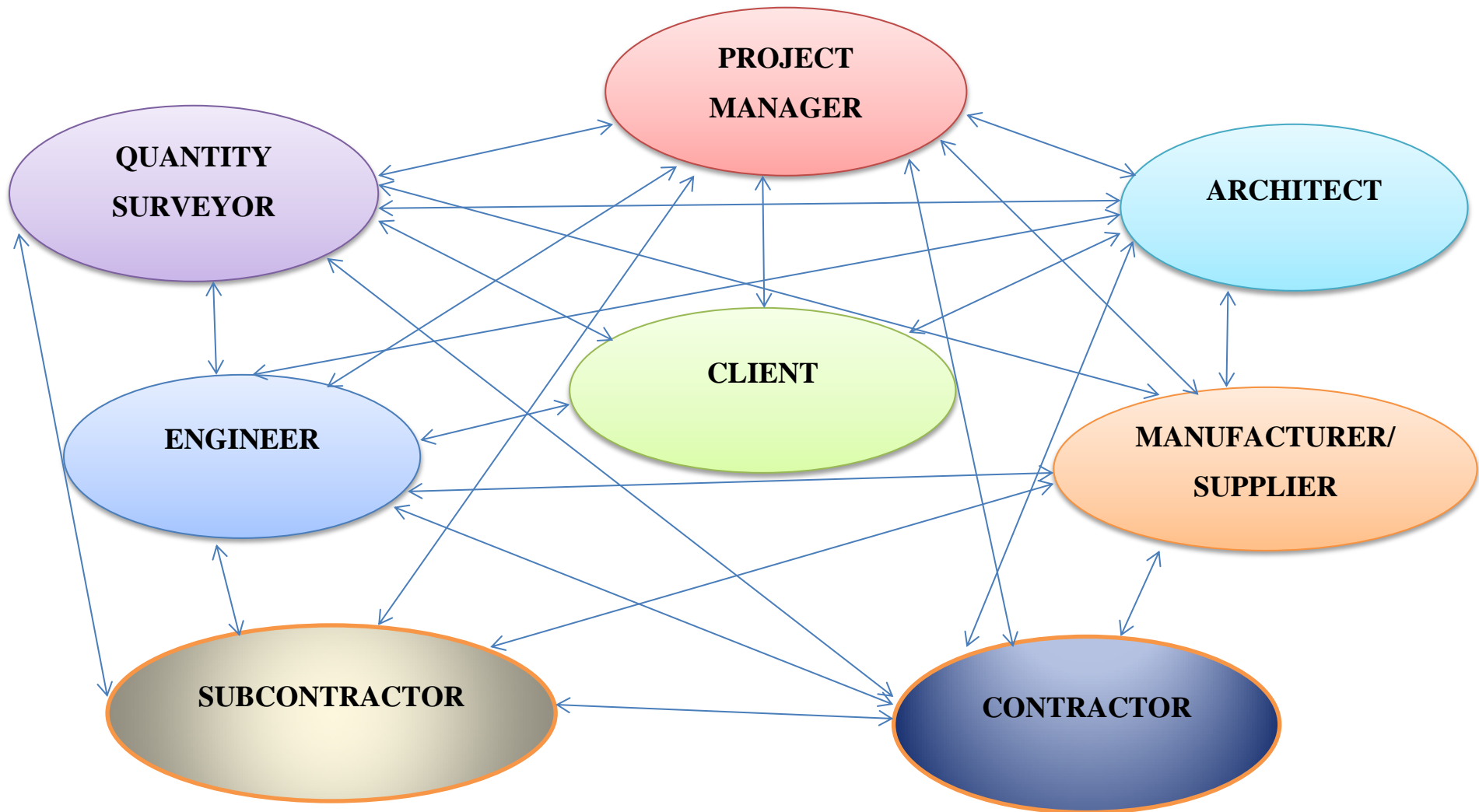
4.3.7 Subcontractor Relationship Analysis

Subcontractor- Manufacturer: an increase in the need for unilateral and bilateral relationships within the desired model was indicated.

It becomes evident from the survey findings as depicted in Figure 4-1 that there were 204 added or altered directional lines of communication between the existing procurement model that was predominantly used in the public sector and the desired flow of communication as part of procurement arrangements. Clearly, the project participants prefer a procurement model and contractual arrangement that allows for more interaction and communication between all the various

stakeholders. The significant increase in desired relationships and corresponding decrease in lack of relationships hints at the preference for a system which is more relational that could potentially yield improved results when compared against current practices.

Figure 4-1 Desired Communication Model



4.4 Interview Analysis

Table 4-3: Case Study Profiles

CASE	SECTOR	ESTIMATED DURATION	ACTUAL DURATION	TENDER VALUE	COMPLETION VALUE	PRIMARY CAUSES OF DELAY
1	Education	15 months	27 months	R10 million	R12 million	Contractor defaulting on works completion due to misunderstanding scope of works
2	Education	6 months	60 months (ongoing)	R25 million	not yet determined	Payment delays
3	Education	18 months	26 months	R35 million	R44 million	Inefficient contractual administrative processes. Consequential delays. Inefficiency of programs manager
4	Housing	6 months	12 months	R34 million	R34 million	Inefficient tender process
5	Sports and Recreation	22 months	22 months	R2,6 billion	R3,6 billion	Internal program had to be accelerated due to lack of understanding and coordination of trades
6	Transport and Infrastructure	12 months	13 months	R25 million	R28 million	Political issues within tender process
7	Health	6 months	13 months	R2,8 billion	R3,9 billion	Inefficient approval processes; lack of funding; inaccurate bill of quantity
8	Education	6 months	10 months	R2,4 million	R3 million	Poor planning; client insufficiently equipped to plan
9	State Facility	18 months	39 months	R40 million	R40 million	Inefficient approval processes; inefficient tender processes; contractor defaulting due to incorrect appointment
10	Housing	7 months	15 months	R30 million	R30 million	

The interviews were conducted with key individuals who are involved with procurement on public sector projects and have influence on the procurement selection and administration. Each of the persons interviewed possess extensive knowledge and experience with public sector procurement in specific. The interviews were conducted at the various offices of individuals, although participation was in their personal capacity, independent of the organization they worked for. The duration of the interviews ranged from 16 to 90 minutes in duration.

Table 4-4: Reasons for Project Delivery Failure within Public Sector (n=10)

Primary Reasons for Project Failure	
Delays	70%
Budget	40%
Other	40%

All respondents claimed that most projects in the public sector did not satisfy the usually required project objectives, listing the primary causes for project delivery failure as delays (70%) and budget overruns (40%) as shown in Table 4-4.

A participant responded with the following statement

"the capacity to understand the objectives and then carry out the work to meet those objectives is lacking and requires development."

Another participant stated

"the public sector has a greater data base of specialists whereas the private sector is streamlining to a strategic market. This creates room for error within the public domain."

Table 4-5: Project Delivery Success Rate (n=10)

Percentage of projects which attained complete project delivery success	
0%	30%
0-10%	30%
50%	30%
>50%	10%

It is evident that most respondents (90%) reported a success rate of less than 50% on public sector projects. A participant stated

"All decisions boils down to estimates and the choices made at that stage. This is specific to the public sector. Private sector is a lot more fluid."

Table 4-6: Reasons for project failures (n=10)

Reasons for failed projects	
Poor project briefing and scope definition	50%
Delayed decision-making and processes	50%
Limited stakeholder experience	50%
Poor communication	40%
Political interference	30%
Lack of planning	30%
Poor project document and procurement process alignment	20%
Budgetary constraints	10%

It is evident from Table 4-6 that project briefing and defining the scope; delayed decision making; limited stakeholder experience and poor communication appear to be the dominant issues contributing to project failures. A respondent reported,

"The planning processes are poorly conducted. The complete scope needs to be understood including the end user requirements. If a school needs to be built, the occupation date needs to be relative to the needs of the students. The core deliverable of what the department wants to achieve displays great inefficiencies."

Table 4-7: Procurement route primarily selected on public sector projects (n=10)

Procurement Route	
Traditional Method	100%
Design-Build	10%
Collaborative Methods	0%
Management Orientated	0%

All respondents identified the Traditional Procurement method as the primarily selected route within the public sector. When the option of procurement routes selected was given, a participant's response was,

"the government has one method available which is the open tendering system ie the Traditional Procurement Method."

Table 4-8: Reasons for the selection of procurement route (n=10)

Reason for selection	
Default Approach	90%
Legislative Framework	60%
Habit/ Familiarity	30%
Client's Decision	20%

According to Table 4-8, the majority of respondents (90%) concur that the selection of the procurement method is by default followed by 60% in agreement that the legislative framework is also a contributing factor. Some of the comments regarding the reasons for the selection were:

"Traditional Procurement Method. This is the way it has been done and the legislative framework makes the most provision for this. This has been entrenched in us as professionals."

"The Traditional Procurement Method with public tender is always selected by default."

"The Traditional Procurement Method is selected in order to ensure transparency and afford the competition a fair opportunity amongst contractors. We are governed by the PPPFA."

Table 4-9: Criteria for this selection of procurement method (n=10)

Criteria for the selection of procurement method	
Legislature	80%
CIDB	50%
Project Specific	40%
Client	10%

From Table 4-9 It is apparent that the legislative framework of the country is a determining factor when assessing the criteria for the selection of the procurement method. A respondent made the following supporting statement,

" • *Transparency*

• *Accountability*

• *Value for money*

• *Supply Chain Management (SCM)*

- *Preferential Procurement Policy Framework Act (PPPFA)*
- *Open tendering basis*

These variables lead us to the traditional method. The method is easily adaptable."

Table 4-10: Criteria for appropriate procurement method (n=10)

Does the criteria result in the appropriate method being selected	
Yes	30%
No	30%
Sometimes	40%

There are varying opinions on where the criteria for the selection of procurement methods result in the appropriate method being implemented. A respondent who disagreed that the criteria results in the appropriate method selected stated,

" It does not always contribute to the most effective method being selected however it is up to the project team with emphasis on the professional team to ensure that the selected method works to the advantage of the project."

Another added, *"It does not always contribute to the most effective method being selected however it is up to the project team with emphasis on the professional team to ensure that the selected method works to the advantage of the project."*

Table 4-11: The role of a Principal Agent in relation to responsibility of attaining project delivery success (n=10)

Is the role of the Principal Agent advantageous in relation to the project delivery success?	
Yes	100%
Yes if it an independent professional such as the Project Manager	90%
Sometimes	10%
No	0%

Table 4-11 confirms that there was a consensus among the respondents that the role of the Principal Agent is advantageous to the project and achieving the objectives. However, it is also evident that the selection of who should fulfill this role is debatable. The following comments were noted:

"The role of a Principal Agent should be a project manager and not the architect as it has been done. The PM is an isolated role and this is advantageous to the project in terms of being a single point of contact and accepts responsibility for his role only and not a dual role."

"In many cases the Principal Agent is the Architect under the misconception that since they manage the design they can manage the team. I do not share that opinion. I think that greater efficiencies can be achieved if a Project Manager is appointed as the PA since it is distinct from the design process."

"The Architect or QS is usually appointed and the dual role poses issues since each professional is primarily concerned with the task of their respective trade. An effective PA needs to assess complete functionality of a project and not just in terms of design or cost implications."

Table 4-12: Contributions of Principal Agent towards project objectives (n=10)

Contributions of the Principal Agent role	
Planning and Coordination	60%
Single point of contact	50%
Conflict Resolution	20%

Table 4-12 suggests that the primary contribution of the Principal Agent (PA) on a project appears to be planning and coordination (60%) which aligns with the project objectives. The consensus among the respondents is that this role needs to be fulfilled by a competent individual in order for it to be advantageous and to contribute significantly. The following comments were noted:

"It is imperative to have a single head and point of contact for the team to be successful."

"The role of a Principal Agent is advantageous. A single liaison for the client is essential as opposed to many people. It contributes positively to the project by ensuring the project goals are attained."

"The role of a Principal Agent should be a project manager and not the architect as it has been done. The PM is an isolated role and this is advantageous to the project in terms of being a single point of contact and accepts responsibility for his role only and not a dual role. Coordination is vital and the PA assumes this responsibility. The role is only advantageous if he has the correct skill set."

The participants were asked whether a relationship between the method of procurement and successful project delivery existed. Table 4-13 summarizes the responses

Table 4-13: The relationship between the method of procurement on a project and successful project delivery (n=10)

Yes	80%
Sometimes	20%
No	0%

From Table 4-13 it is evident that 80% of respondents associate the method of procurement with project delivery success while 20% attribute the association between the method of procurement and project delivery success to the complexity and size of the project.

A participant responded,

The relationship is directly proportional. Your method selected will determine project success."
 Another stated, *"There exists a strong correlation between the two on larger projects. I do not think it is as significant on smaller simpler projects."*

The participants were asked whether the option of using alternative procurement routes had been explored. Table 4-14 lists the responses

Table 4-14: Use of alternative relational and non-adversarial procurement routes (n=10)

Yes	90%
No	10%
Positive outcome on projects which used alternative procurement methods	90%

In Table 4-14, the respondents indicated that they have explored implementation of alternative procurement methods which resulted in a positive outcome in all instances. When questioned on the circumstances of this implementation, a response was,

"We have approached specialist subcontractors and requested pricing within a predetermined budget. This alternative method offered price certainty and high quality of workmanship due to us approaching selected specialists."

When the outcome was discussed, a respondent proclaimed,

" I am working on a project where is has been set aside for a Contractor Development Program (EPWP) and the appointment is done by the National Treasury and Public Works. The environment is more relational since they appoint consultants and sub-consultants to ensure flow of communication is effective. It assists the focus of the project. When dealing with traditional methods, the contractors are afraid to put forward their ideas and seek a medium who is higher up on the food chain due to the hierarchy in traditional methods."

Table 4-15: Most common causes of delays, disruptions and cost overruns (n=10)

Most frequent causes of delays, disruptions and cost overruns	
Lack of skilled resources	80%
Client	60%
Inefficient departmental processes	50%
Political	30%
Poor planning	30%
Design	20%
Poor communication	20%

Table 4-15 suggests that the lack of skilled resources and client's interference and indecisiveness appear to be the prevalent causes of delays, disruptions and cost overruns. A participant had the following response:

"Capability of contractors is not guaranteed. The CIDB provides for grading and upskilling but not capability. The fact that they have past experience still does not guarantee the capability or the quality of the work."

Another stated, "The client puts the professional team under tremendous pressure to deliver a tender without a detailed scope or design. This gives rise to delays and budget overruns."

Table 4-16: Assessing extent of knowledge of Integrated Project Delivery System (IPDS) (n=10)

Preference for the Integrated Project Delivery System	
Yes	90%
No	10%

Table 4-16 suggests that majority of participants (90%) were familiar with IPDS or features of this relational procurement method. The responses align with these participant's statements:

"I am familiar with the concept but the term is new."

"My knowledge is moderate; I have read about it and experienced a variation of it on projects."

Table 4-17: Willingness to implement IPDS (n=10)

Consideration of IPDS implementation	
Yes	60%
Uncertain	30%
No	10%

While majority of the participants (60%) indicated from Table 4-17 that the method would be a welcomed alternative, 30% displayed hesitance to implement this approach. A participant responded:

"Methods such as Turnkey have worked within the private sector and could similarly work in the public sector however transparency is essential and must be maintained."

Another responded:

"I would be hesitant to implement it. With our legislative framework, I am uncertain how one would prove an unbiased appointment of contractor."

Another response was: "I think that the systems are rather rigid but it is the best system for right now within this developing economy, considering lack of resources; skill shortage; mal-administration; rampant corruption, gate keeping etc. I agree that a system like IPD is necessary but implementation will have to wait until we have the capacity."

Table 4-18: Potential barriers to implementation (n=10)

Identify barriers to implementation	
Transparency issues	40%
Contractor appointment criteria	40%
Trust among Primary Team Members	30%
Nothing	20%
Client	10%

It is evident from Table 4-18 that transparency and the criteria to appoint contractors appear to be the prevailing barriers to implementation. The respondent's displayed increased curiosity and questioned the adaptability of this approach to our legislative requirements regarding transparency. Some of the questions were:

" • *The selection process involved with appointing the contractor would be complicated*

• *Transparency issues*"

"What about the privity of contract law which is the law of our country? You cannot impose another's liability onto a third party"

"• How would the contractor be selected? Due to the open market this would prove difficult

• *How would emerging contractors be involved"*

Table 4-19: Assessing the impact of implementing IPDS (n=10)

Potential Impact of Implementing IPDS	
Positive collaboration	60%
Improved planning and coordination	60%
Time Saving	30%
Price Alignment	30%
Improved innovation	20%

From Table 4-19 it appears that the collaborative features and improved coordination appealed to the participants with a favourable 60% indicating so. A participant who had no previous experience with alternative methods within the public sector provided the following response:

"I cannot say completely since I have not dealt with alternative procurement methods within the public sector but I do see the efforts of collaboration as a positive attribute and it would ensure that flow of communication is improved."

Another participant who has explored alternative methods noted the following points:

"• *Solutions would be arrived at with greater ease.*

• *Managing the expectations of the client and community by early involvement would be simpler*

• *Collaborative attitude would be adopted*

- *An improved project delivery would be possible due to innovation and collaboration"*

A critical observation was relayed by another respondent:

"If you impose collective responsibility on a team you achieve much more efficiencies on your design and constructability. You should not isolate the professional team from the contracting team. If you work together you remove a critical barrier to success which is an 'us and them' attitude. The contractor is an equal member of the team and his ideas are not to be disregarded. The fact that the turnkey approach allows more responsibility to him is the primary reason it is so successful. This would ideally work on private sector projects. The public sector and its entities, over time, will improve and evolve. It is very likely that the IPDS approaches will be adopted."

All respondents agreed that if implemented, the IPDS approach would have a positive impact on the failed case study projects.

Table 4-20: Circumstances affecting implementing IPDS (n=10)

Potential benefits of IPDS	
Collaboration	60%
Complex and specialized projects	50%
Time constraints	40%
Price alignment and improved value	30%

Table 4-20 suggests that the potential improved collaboration which arises from the IPDS approach appears to be evident to most of the participants (60%).

There was a consensus among the participants that training would be required:

"If I were to implement it, this would be on a complex project and where there is an adequate skill level within the project team. The only way to reach the skill level is to undergo the training."

"Training is required to 'unlearn' the norms that we know."

The participants were asked whether other public sector project parameters required as part of the PPPFA in South Africa would affect the use of alternative procurement routes. The responses are listed in Table 4-21

Table 4-21: The Preferential Procurement Policy Framework Act (PPPFA) and alternative procurement methods (n=10)

Yes	60%
No	40%

It is evident from Table 4-21 that a majority of respondents (60%) held that the PPPFA demands and compliance would affect implementing alternative procurement routes within the public sector.

A respondent who did not identify the PPPFA as a barrier stated:

"I do not see them affecting the framework in any way unless they are contradictory to the legislature of the country" while another who disagreed had the following response, " Public municipal finance act has a built in requirement for a competitive process, value for money and equal competition. What is the basis of the team's appointment? Imposing team members on each other may contradict some of our legislature. I think some elements of this approach will not comply with our regulations and in order to reach compliance, you will lose some of the effect of IPDS."

4.5 Chapter Summary

The purpose of this chapter was to present the findings from the data collected. Qualitative research was used to gather data. The findings suggest that while the Traditional method is primarily selected on public sector projects, it may not always provide for the most appropriate method. The stakeholders indicated that the Traditional Procurement route is synonymous with segregation of project participants. The findings suggest that this fragmentation can be associated with one of the primary causes for delays, disruptions and cost overruns on projects. When an alternate route which fosters relational features as opposed to being adversarial in nature was introduced, the participants revealed interest in implementation.

The stakeholders identified key feature within IPDS which would assist in reducing delays, disruptions and the consequential cost implications on projects. Potential barriers to implementation within the public sector were highlighted.

The study found the South African legislative framework appears to have a great impact on the implementation of alternative procurement methods. Any alternate route explored would need to be adaptable to the existing framework in order to be considered as a viable option.

While the stakeholders have highlighted barriers to implementation, the benefits of IPDS appeal to them.

CHAPTER 5

5. CONCLUSION

5.1 Introduction

This chapter provides a summary of the study. The hypotheses of the study are tested and future recommendations are made based on the findings.

5.2 The Problem Statement

The problem statement may be described as follows:

Successful and efficient project delivery without the currently pervasive delays and disruptions on public sector construction projects is severely hindered by the lack of innovation, existing industry fragmentation, separation of design from construction, lack of effective communication and inequitable distribution of risk between, and adversarial relationships of participants within the construction process as a result of the current procurement routes used by the public sector which exclude integrated project delivery approaches with their associated benefits.

5.3 Hypotheses

The hypotheses to be tested in this study are as follows:

H1: Delays and disruptions on public sector construction projects result from the existing traditional procurement methods

H2: The traditional procurement system, which is the primarily selected procurement method on public sector projects, fosters adversarial relationships between stakeholders in the construction process

H3: The input of the contracting team during the planning and design phases of projects minimizes the risk of delays and disruptions

H4: The separation of design from construction contributes to a number of negative impacts on construction projects

H5: A procurement method which encourages integration of the design and construction team will contribute to successful project delivery

H6: A form of contract which supports and encourages partnering and collaborating on construction projects will minimize project delays and disruptions

5.4 Objectives

The study objectives were:

- 5.4.1 To determine the nature and causes of delays and disruptions on public sector construction projects
- 5.4.2 To establish the types and pervasiveness of procurement systems used by the public sector on their projects
- 5.4.3 To determine the level of contractor involvement during the planning and design phase and its impact on project delays and disruptions.
- 5.4.4 To establish the extent to which the separation of design from construction on public sector projects results in lack of innovation, existing industry fragmentation, separation of design from construction, lack of effective communication and inequitable distribution of risk between, and adversarial relationships of participants.
- 5.4.5 To determine the level of acceptance of and willingness to implement alternate forms of procurement and contracts that allow for integration of design and construction and encourages partnering and collaboration on public sector construction projects in relation to project delivery success.
- 5.4.6 To determine if the existing forms of contract provide a barrier to implementing alternative procurement methods.

5.5 Hypothesis Testing

- **H1: Delays and disruptions on public sector construction projects result from the existing traditional procurement methods**

Procurement has been identified as the flow of contractual relationships between the project participants on a construction projects. The procurement method depends on the nature and scope of work and the manner in which the work is to be carried out. The selected method of procurement provides a framework for the project and outlines the project parameter and is therefore closely associated with the outcome of the project (Lupton, Cox and Clamp, 2007).

The research findings suggest that the procurement method selected is directly proportional to project delivery success. Project participants have identified the Traditional Procurement Method as the primarily selected procurement route within the public sector. The findings further provide

evidence that majority of projects carried out in the public sector have experienced project delivery failure due to delays and disruptions.

Therefore the hypothesis that delays and disruptions on public sector construction projects result from the existing traditional procurement methods cannot be rejected.

- **H2: The traditional procurement system, which is the primarily selected procurement method on public sector projects, fosters adversarial relationships between stakeholders in the construction process**

The Traditional Procurement method is notorious for its lack of effective communication among project participants, poor planning involving contractors and subcontractors and increased fragmentation of the project participants (Matthews and Howell, 2005; Kong and Gray, 2006; Mosey, 2009).

The findings of the research suggest that the currently implemented procurement route, which is the Traditional Procurement method, provides for less interaction between relevant stakeholders than what is desired to optimize efficiencies. A significant 204 changes were indicated on the desired relationship matrix. When discussed during the interviews, the respondents associated the TPS with a fragmented process which encourages a hierarchy among the project participants, unidirectional communication through a predetermined intermediary, and delays in obtaining necessary or critical information for effective project execution and delivery.

Therefore the hypothesis that the traditional procurement system, which is the primarily selected procurement method on public sector projects, fosters adversarial relationships between stakeholders in the construction process cannot be rejected.

- **H3: The input of the contracting team during the planning and design phases of projects minimizes the risk of delays and disruptions**

The engagement of the contracting team at the planning and design stages has a critical effect on the outcome of the project. The collaborative efforts have been found to reduce the issue of fragmentation evident in more conventional methods. The occurrences of variations on projects are avoided and the consequential cost overrun is diminished (Becerik-Gerber and Kent, 2010).

The need for increased contractor involvement is evident from the significant changes shown on the desired relationship matrix. The interview respondents provided more insight on the time

saving consequences of a more collaborative approach which encourages early contractor involvement during the vital planning stages. The innovation which the contractor can provide at design stages should not be disregarded. An improved understanding of the scope which is a benefit of early contractor involvement, often results in a smoother construction process with effective communication.

Therefore the hypothesis that the input of the contracting team during the planning and design phases of projects minimizes the risk of delays and disruptions cannot be rejected.

- **H4: The separation of design from construction contributes to a number of negative impacts on construction projects**

Conventional methods traditionally display a lack of consideration to the buildability of a design due to the disconnect between the design and construction stages. This fragmented process results in the contractors innovation being disregarded, inhibited or it is simply too late in the process to implement into the design. Efficiencies are wasted due to the projects lacking constructability, often manifesting in delays and cost implications (Mosey, 2009; Motsa *et al*, 2008).

The study provided evidence that the hierarchy between the professional team and the contracting team, which is prevalent within the traditional procurement system, serves as a barrier to innovation and solidarity. The contracting team is appointed only once the design is complete so the opportunity to provide useful insight on practicality is lost. The poor understanding of the scope is a direct implication of delayed involvement of the contractor frequently resulting in delays and disruptions. The ‘us and them’ attitude is adopted on projects and the constructability benefits that the contracting team can offer is lost.

Therefore the hypothesis that the separation of design from construction contributes to a number of negative impacts on construction projects cannot be rejected.

- **H5: A procurement method which encourages integration of the design and construction team will contribute to successful project delivery**

The fragmentation of processes and participants has become synonymous with the Traditional Procurement system. Contractual relations and changes have been listed in the top five causes of delays on projects (El-Razek *et al*, 2008). The need for a system which at its core is integration of the project participants and therefore the processes is evident. Systems which encourage

collaboration have displayed a higher success rate than those which align with fragmented processes (Matthews and Howell, 2005).

The majority of the participants responded positively to an alternative method of procurement which encouraged integration of the pervasively fragmented processes. The benefits of this integration were identified as improved communication and better understanding of the project scope. The benefits were significantly increased when considering projects which were complex in nature. When asked if the integrated system would change the outcome of previously delayed projects the respondents were highly optimistic. The survey analysis further provided evidence that there is a demand for the contracting team and the professional team to improve communication between them bilaterally to have a more desirable effect on projects.

Therefore the hypothesis that a procurement method which encourages integration of the design and construction team will contribute to successful project delivery cannot be rejected.

H6: A form of contract which supports and encourages partnering and collaborating on construction projects will minimize project delays and disruptions

According to the National Treasury (2012), procurement systems in South Africa need to be developed in line with the constitutional requirements and therefore must adhere to the primary objectives of the constitution namely to be fair, equitable, competitive and cost effective and the secondary objectives which provide for categories of preference in the allocation of contracts; and the protection or advancement of persons, or categories of persons, disadvantaged by unfair discrimination. Best practice guidelines have been developed by the Construction Industry Development Board (CIDB) which are legal requirements to be applied to specific key procurement processes. These processes have been adopted into ISO 10845 standards for construction procurement.

The findings of this study identify that the existing forms of contract which are implemented on projects are defined by the regulations set out by National Treasury and the CIDB and align with the rigidity of the conventional methods. The privity of contract law was of concern to a few parties. However the American Institute of Architects has provided great insight into addressing these concerns by developing new forms of contract to accommodate them. Evidence from the study shows that there is a realization that contractual arrangements need to be adapted in order for challenges such as privity to be addressed. Such a suite of contracts targeted at South African public sector construction which currently does not exist when developed will support the introduction and implementation of alternative relational forms of procurement in the sector easing the concerns about

complying with legislative and regulatory requirements as they exist at present and reducing project delays and disruptions as a consequence.

Therefore the hypothesis that a form of contract which supports and encourages partnering and collaborating on construction projects will minimize project delays and disruptions cannot be rejected.

5.6 Conclusions

The selection of the appropriate procurement system is a vital contributing factor to project delivery success (Love, Skitmore and Earl, 1998; Bowen, Pearl and Edwards, 1999). The study investigated the existing procurement systems being implemented on construction projects within the public sector in South Africa. The findings revealed that the Traditional Procurement System was the primarily selected method implemented by default. The findings suggested that the Traditional Procurement method fosters adversarial relationships. These findings concurred with those of Rwelamila *et al.*, (1999) and Thwala and Mathonsi (2012). The research concluded that the TPS provides a rigid framework which encourages a hierarchy within the project team and creates a negative distinction between the professional team and the professional team. The lack of innovation and understanding of scope among the team is a direct result of the fragmentation of the TPS (Trauner Consulting Services, 2007). The procurement methods are developed in alignment with the legislative framework of the country as outlined by the Construction Industry Development Board and National Treasury (Watermeyer, 2011). The study revealed that the legal framework dictates this rigid system and will affect the implementation of an alternative procurement method which is more relational in nature.

The study provides evidence that a change in the methods is desperately needed. There exists a resistance to change among a few professionals due to the risk associated with exploring an option which is unfamiliar however the industry is evolving and it is essential that South Africa keeps up in order to improve project delivery success and the industry as a whole.

5.7 Recommendations for Future Study

Based on the findings of this research, the following recommendations are proposed for future research endeavors:

- The study was confined to research within the KwaZulu-Natal region. It would be beneficial to analyse similar information within the other regions in order to determine if they are faced with similar shortcomings or to ascertain if issues are regional specific.

- To investigate if potentially implementing an alternate approach to procurement on a project from the inception stages would affect the outcome and to analyse if this benefits of this outcome will outweigh the risk involved.
- The legislative and regulatory framework has been proven to be rigid and the forms of contract which are developed follow suit in terms of their rigidity and inability to adopt features of more relational approaches. An analysis of how this influences the development of procurement systems and its contribution to an appropriate method being implemented would be useful in creating greater efficiencies on projects.
- To analyse the extent of involvement and risk each stakeholder has on a public sector project in order to determine the effect this has on their overall outcome and performance.

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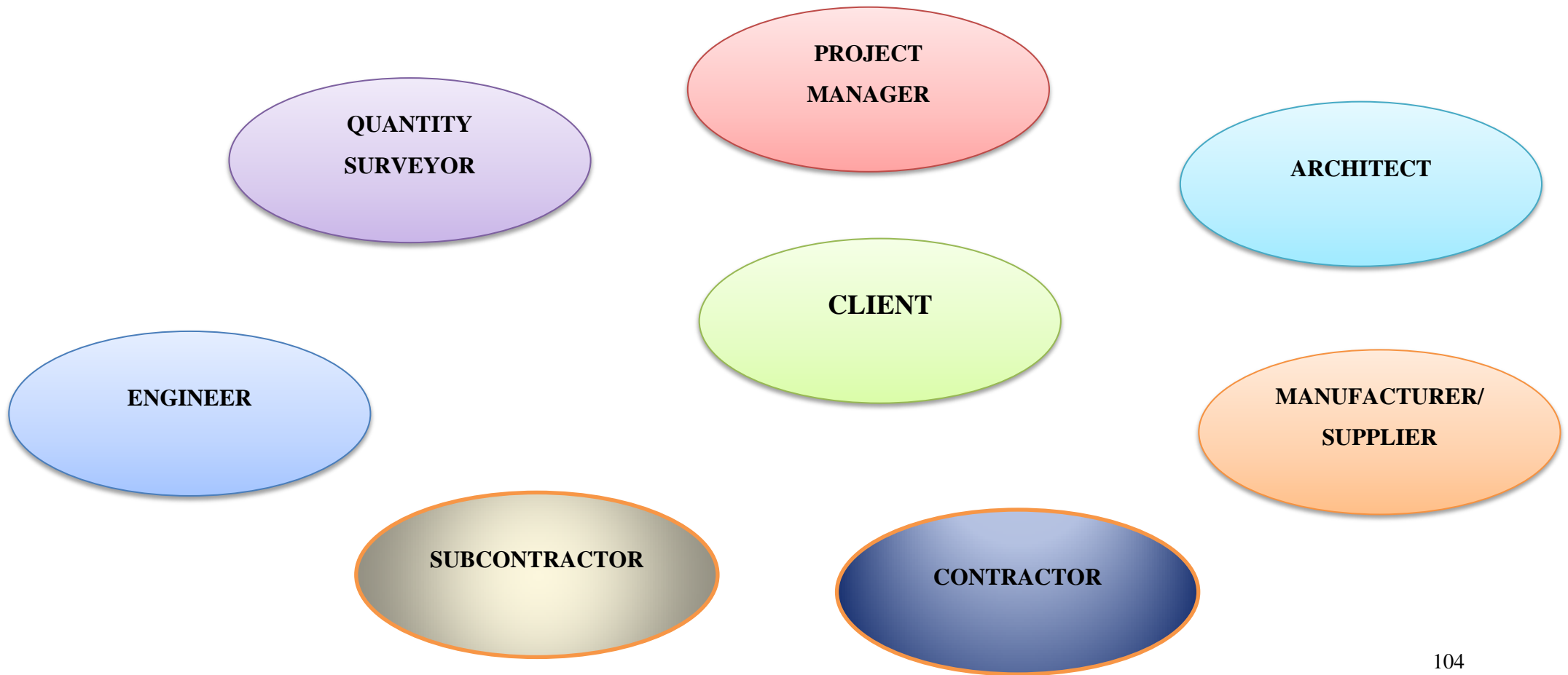
APPENDICES

Appendix A: Survey


Making use of directional arrows, indicate the flow of communication **which currently exists** on public sector construction projects


One way communication flow 

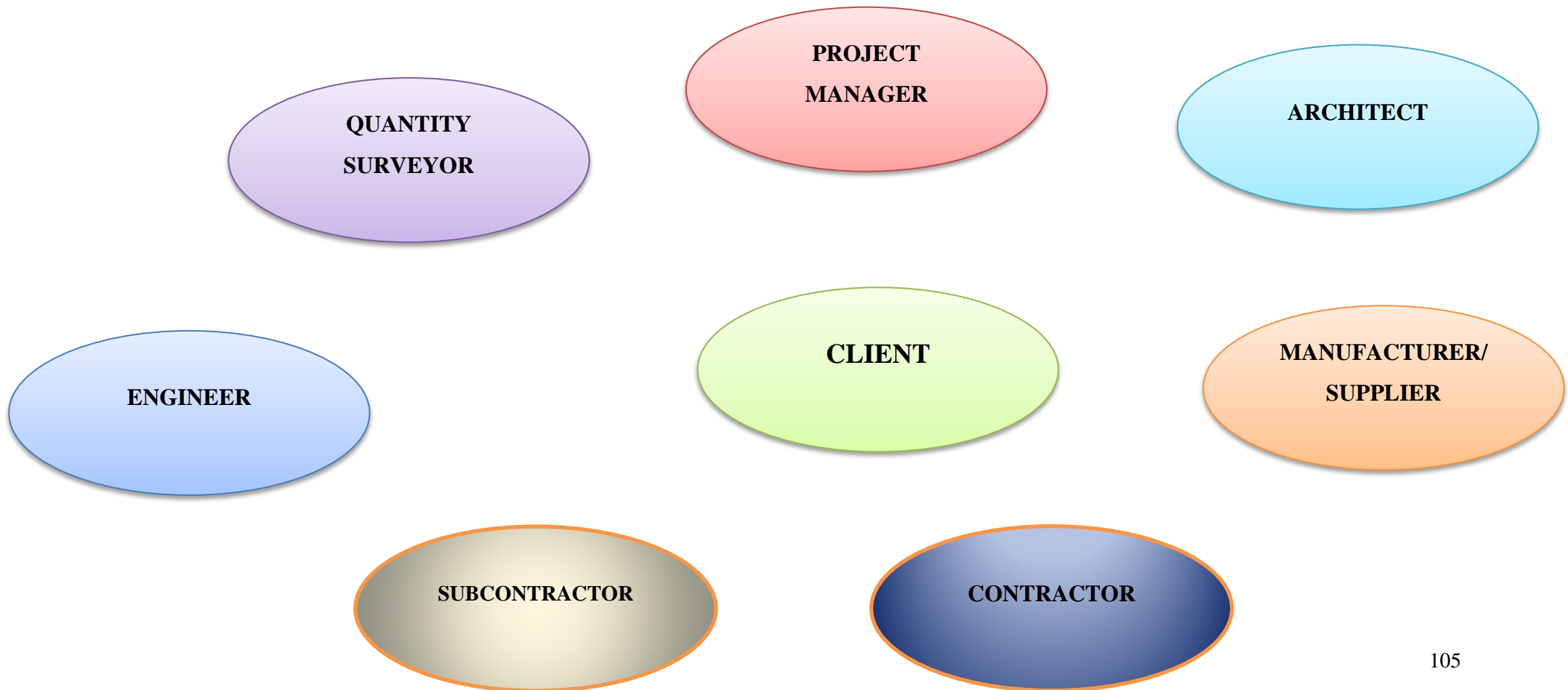
Two way communication flow 



Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow 

Two way communication flow 



Appendix B: Interview Schedule

Delays and disruptions in Construction Projects within the Public Sector: IPDS as an alternative

This study aims to examine the most commonly used construction procurement approaches utilised within the public sector of South Africa and to explore the potential impact of using the Integrated Project System on these types of projects. This study will contribute to improvement in delivery of projects with increased efficiency and waste reduction by optimising resource allocation. The study will potentially highlight barriers that inhibit the effective implementation of this form of procurement in South Africa and provide insight on how to overcome these barriers in an effort to enhance the development of the construction industry.

This study contributes to the body of knowledge of public sector procurement routes and proposes an Integrated Project Delivery approach given its benefits to all parties involved in the project delivery process.

1. While the public sector has experienced successful project delivery to some degree, most projects do not satisfy the required project objectives.

What are your thoughts on this statement?

2. Successful project delivery in construction may be described as attaining the predetermined objectives of a project with relation to time, cost, quality and scope and other project parameters.

Based on construction projects carried out within the public sector during the past three years, what percentage of projects, in your opinion, has attained complete project delivery success? Discuss the reasons that projects fail.

3. Based on construction projects carried out within the public sector during the past three years that you have been involved with, which are the procurement methods primarily selected and experienced and why? (eg traditional; design-bid-build etc.)

4. What are the criteria for this selection of procurement method? Describe why these criteria are used and whether they in reality contribute to the appropriate method being selected.

5. It is typical of currently used procurement systems to appoint a principal agent on a project. Briefly discuss the advantages/ disadvantages of this role in relation to responsibility of attaining project delivery success. How does this appoint contribute to achieving the project goals and objectives?

6. Discuss the relationship between the method of procurement on a project and successful project delivery. Comment on whether there is in fact such a relationship.

7. Have you ever explored options of using alternative procurement routes which are relational and non-adversarial? If not why not? If so describe the procurement route and how it affected the project outcomes.

8. What in your opinion are the greatest or most common causes of delays, disruptions and cost overruns on projects you have been involved with?

The fragmentation of the processes and parties involved on a project has been established as a shortcoming of commonly utilised procurement methods. Integrated Project Delivery (IPD) System seeks to align the objective of various parties thereby providing a system which is more comprehensive. The IPD system has been described as one where "Team members are united together under the prime contract. The team has one price, and that is the price to the client. The team has one scope, and that is the project scope as defined in the prime contract. There is no accounting among Primary Team members for who is over or who is under budget. Holding everyone solely accountable for their own scope and price would drive the project back down the road to local optimization and inhibit innovation. IPD was formed to avoid these problems." (Matthews and Howell., 2005; 49)

9. How much do you know about this procurement approach? Is the Integrated Project Delivery System a term/method which the public sector/ you are familiar with and would consider using?

10. In your opinion what would prevent you from using this approach?

11. In your opinion, what impact would implementing the IPDS approach have on public sector projects (on the project in particular)?

12. By implementing IPDS, would successful project delivery have been possible on previous failed projects? Explain your answer?

13. If you were able to implement IPDS on public sector projects why would this be? Would you be willing to undergo specific training to implement the approach?

14. Would other public sector project parameters required as part of the PPPFA affect the use of alternative procurement routes? In which ways if they do?

15. What other comments do you have about public sector procurement?

Information Sheet and Consent to Participate in Research

**Delays and disruptions on Construction Projects within the Public Sector:
Integrated Project Delivery System as an Alternative**

To whom it may concern:

I, Thamini Moodley, am currently registered at the University of KwaZulu Natal for MSc in Construction Management. To be awarded my Master's degree, I am required to submit a dissertation on an approved research topic. My research topic is Delays and disruptions on Construction Projects within the Public Sector: IPDS as an alternative.

Successful and efficient project delivery without the currently pervasive delays and disruptions on public sector construction projects is severely hindered by the lack of innovation, existing industry fragmentation, separation of design from construction, lack of effective communication and inequitable distribution of risk between, and adversarial relationships of participants within the construction process as a result of the current procurement routes used by the public sector which exclude integrated project delivery approaches with their associated benefits.

This study aims to examine the most commonly used procurement approaches and routes in the public sector of South Africa and to explore the potential impact of using the Integrated Project Delivery System on public sector projects in KZN. The findings of this study may provide opportunities for increased efficiency and waste reduction by optimizing resource allocation. The findings will potentially also highlight barriers that inhibit the effective implementation of this form of procurement system within South Africa.

Public sector projects regularly experience delays and disruptions resulting in increased costs and dissatisfied clients. Very few studies have been done to examine holistically and thoroughly the systemic and other causes of these phenomena critically in order to understand them and their causes so that appropriate preventive interventions can be developed and

implemented. The timely delivery of public sector projects is important as a national priority. This project makes a contribution to addressing the problem using an evidence-based approach

You are being invited to consider participating in this study. The study is expected to enrol 40 participants utilizing a convenience sampling method. It will involve a survey which should take approximately 10 minutes long to complete.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number HSS/1910/017M).

In the event of any problems or concerns/questions you may contact the researcher at tammyl.moodley@gmail.com or on 0636872546 or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

Please note that only a summary of the data collected will be included in the study and that your name will not be included. Your anonymity and confidentiality is of utmost importance. Data will be securely stored on a central server at UKZN for duration of 5 years after which

the records will be deleted. Your participation in this study is completely voluntary and will not involve reimbursement for participation.

This study is being conducted in my personal capacity as a student. Should you need to contact me regarding any aspect of this research, you can do so by email on:

tammy1.moodley@gmail.com

My academic supervisor is Prof. Theo C Haupt, based in the School of Engineering on the Howard campus of the University of KwaZulu Natal. He can be contacted by email at: haupt@ukzn.ac.za or telephonically at: 031 260 2712.

Your participation is greatly appreciated and it will have a significant impact towards the study.

Kind Regards,

Thamini Moodley (Student no. 207523082)

Supervisor Prof Theo Haupt

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CONSENT

I _____ have been informed about the study entitled Delays and Disruptions on Construction Projects within the Public Sector: IPDS as an alternative by Thamini Moodley.

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed about any available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at tammy1.moodley@gmail.com or on 0636872546.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

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4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557 - Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

Signature of Participant

Date

Signature of Witness

Date

(Where applicable)

Signature of Translator

Date

(Where

applicable)

Appendix C: Declaration of Consent (Interview)

Information Sheet and Consent to Participate in Research

Delays and disruptions on Construction Projects within the Public Sector: Integrated Project Delivery System as an Alternative

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I, Thamini Moodley, am currently registered at the University of KwaZulu-Natal for MSc in Construction Management. To be awarded my Master's degree, I am required to submit a dissertation on an approved research topic. My research topic is Delays and disruptions in Construction Projects within the Public Sector: IPDS as an alternative.

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them and their causes so that appropriate preventive interventions can be developed and implemented. The timely delivery of public sector projects is important as a national priority. This project makes a contribution to addressing the problem using an evidence-based approach

You are being invited to consider participating in this study. The study is expected to enrol 10-15 participants utilizing a simple random sampling method. It will involve a structured interview which is approximately 15-20 minutes long.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number HSS/1910/017M).

In the event of any problems or concerns/questions you may contact the researcher at tammy1.moodley@gmail.com or on 0636872546 or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

Please note that only a summary of the data collected will be included in the study and that your name will not be included. Your anonymity and confidentiality is of utmost importance. Data will be securely stored on a central server at UKZN for duration of 5 years after which

the records will be deleted. Your participation in this study is completely voluntary and will not involve reimbursement for participation.

This study is being conducted in my personal capacity as a student. Should you need to contact me regarding any aspect of this research, you can do so by email on:

tammy1.moodley@gmail.com

My academic supervisor is Prof. Theo C Haupt, based in the School of Engineering on the Howard campus of the University of KwaZulu Natal. He can be contacted by email at: haupt@ukzn.ac.za or telephonically at: 031 260 2712.

Your participation is greatly appreciated and it will have a significant impact towards the study.

Kind Regards,

Thamini Moodley (Student no. 207523082)

Supervisor Prof Theo Haupt

--

CONSENT

I _____ have been informed about the study entitled Delays and disruptions in Construction Projects within the Public Sector: IPDS as an alternative by Thamini Moodley.

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed about any available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at tammy1.moodley@gmail.com or on 0636872546.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557 - Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

Additional consent

I hereby provide consent to:

Audio-record my interview YES / NO

Signature of Participant

Date

Signature of Witness

Date

(Where applicable)

Signature of Translator

Date

(Where applicable)

Appendix D: Ethical Clearance



10 November 2017

Ms Thami Moodley 207523082
School of Engineering
Howard College Campus

Dear Ms Moodley

Protocol reference number: HSS/1916/017M

Project title: Delays and disruptions in Construction Projects within the Public Sector: IPDS as an alternative

Full Approval – Expedited Application

In response to your application received 9 October 2017, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted FULL APPROVAL.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Dr Shamila Naidoo (Deputy Chair)
Humanities & Social Sciences Research Ethics Committee

/pm

cc Supervisor: Prof TC Haupt
cc Academic Leader Research: Professor Christina Trevis
cc School Administrator: Ms N Ndamini

Humanities & Social Sciences Research Ethics Committee

Dr Shenika Singh (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag 334001, Durban 4000

Telephone: +27 (0) 31 260 3687/32504657 Facsimile: +27 (0) 31 260 4800 Email: singh@ukzn.ac.za / shenika@ukzn.ac.za / mtchupp@ukzn.ac.za

Website: www.ukzn.ac.za



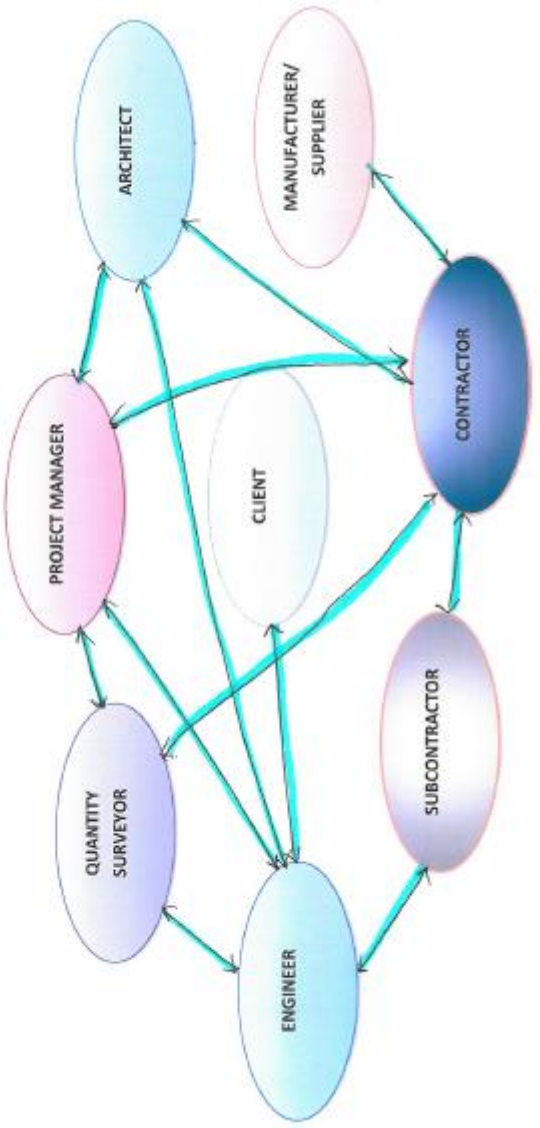
100 YEARS OF ACADEMIC EXCELLENCE

Focusing Centres: Edgewood Howard College Medical School Pietermaritzburg Westville

Appendix E: Survey Responses

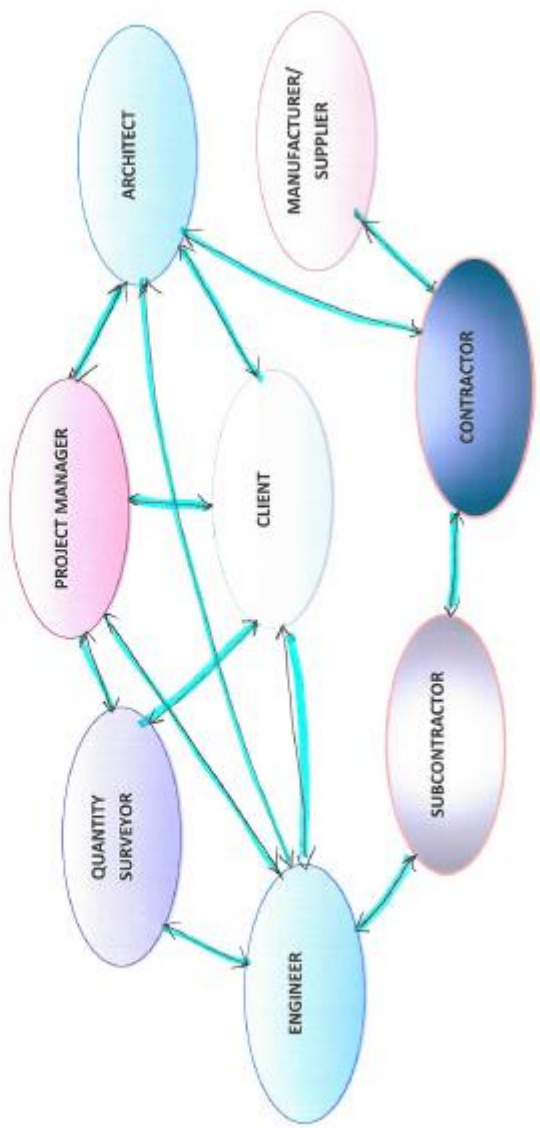
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
Two way communication flow ↔



Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

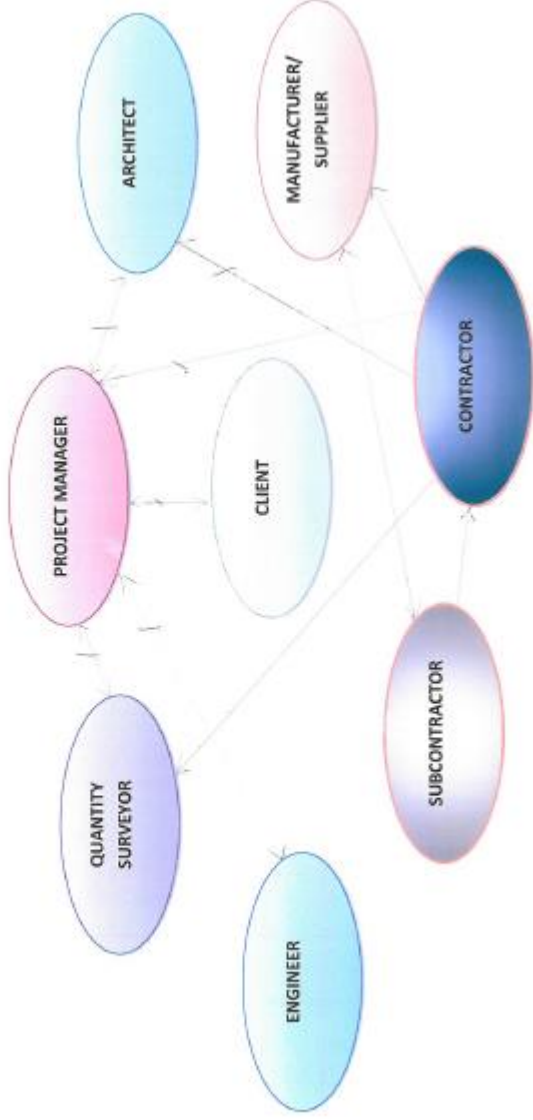
One way communication flow →
Two way communication flow ↔



Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects ✓

One way communication flow →

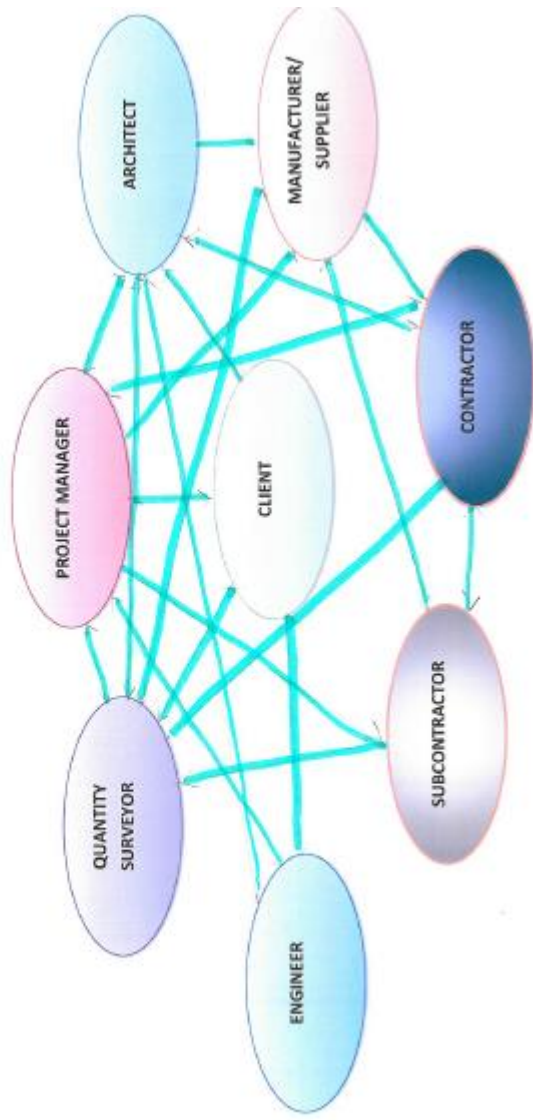
Two way communication flow ↔



Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

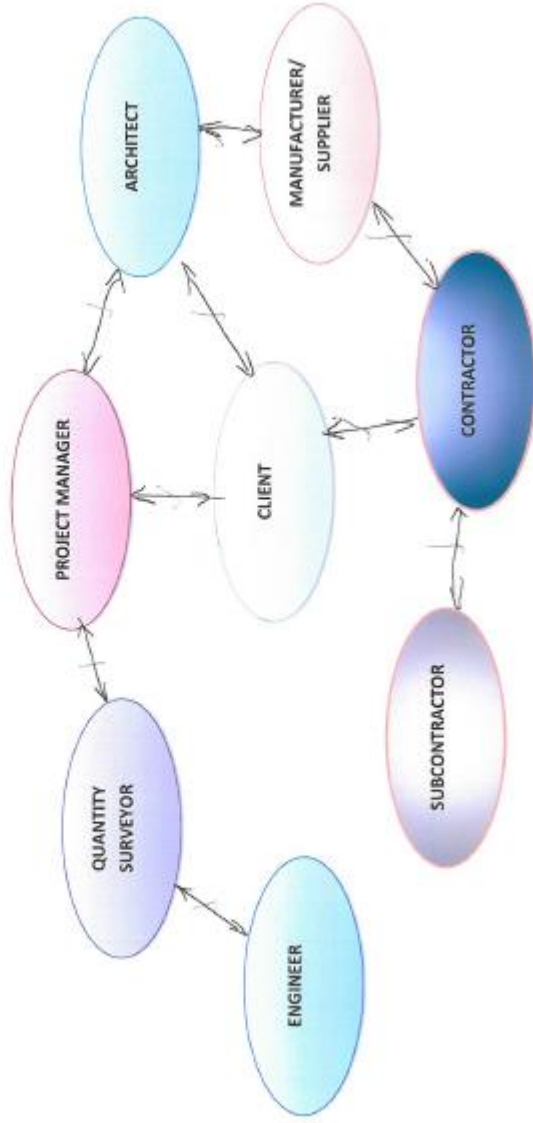
One way communication flow →

Two way communication flow ↔



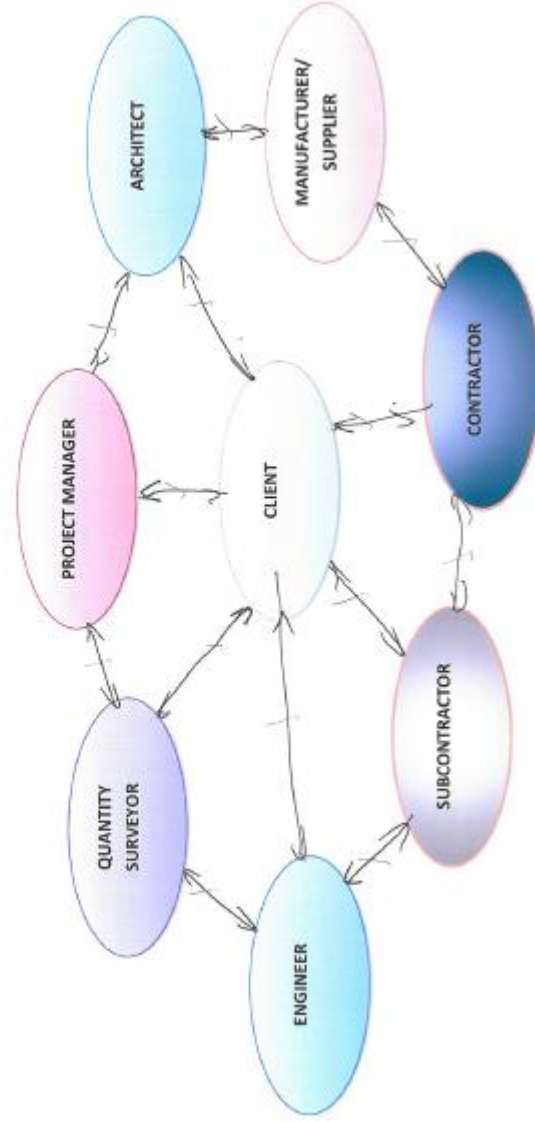
Making use of directional arrows, indicate the flow of communication **which currently exists** on public sector construction projects

One way communication flow →
Two way communication flow ↔



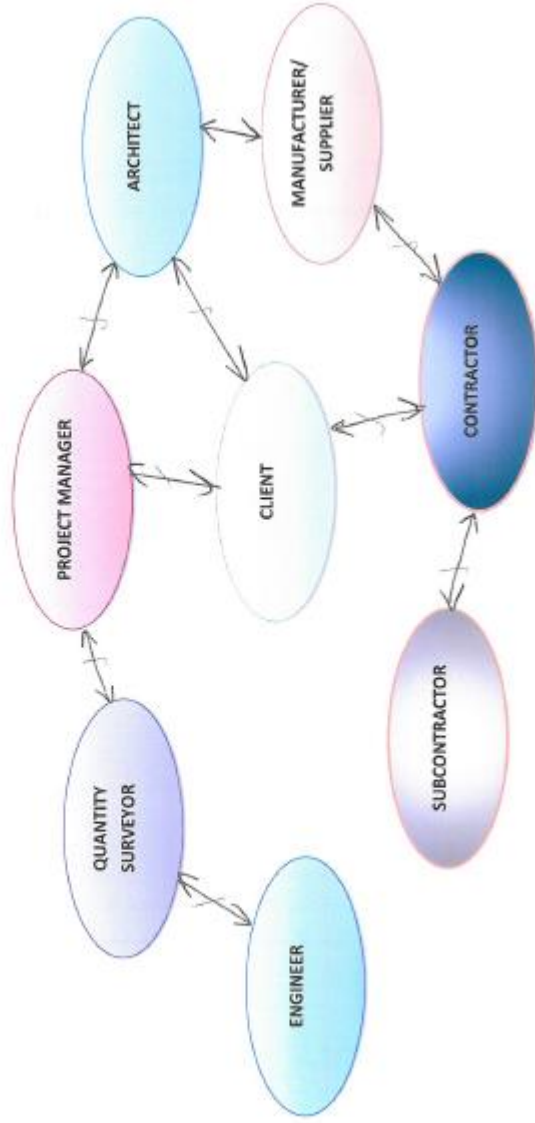
Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



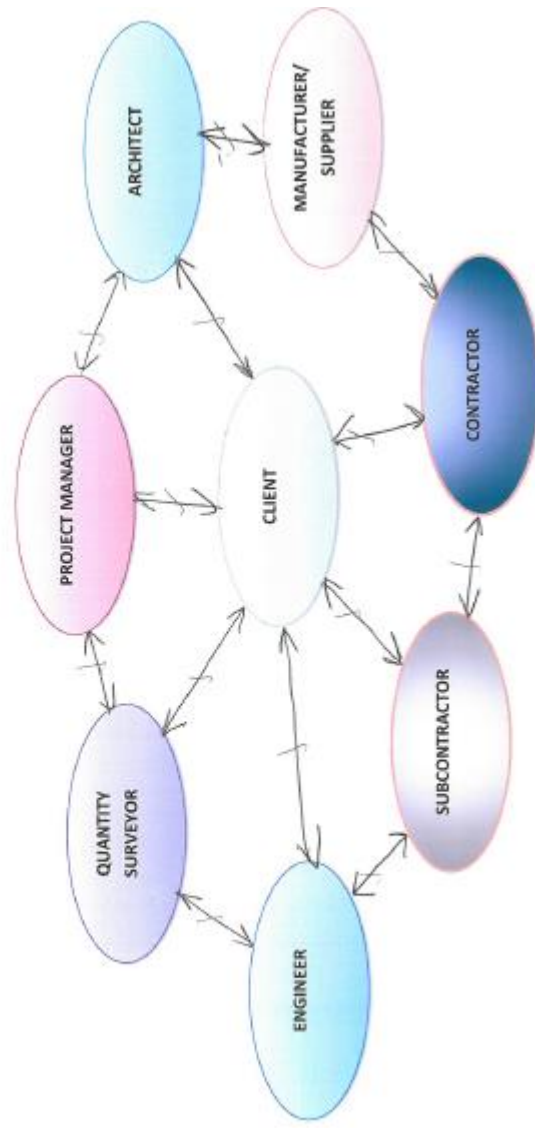
Making use of directional arrows, indicate the flow of communication which **currently exists** on public sector construction projects

One way communication flow →
 Two way communication flow ↔



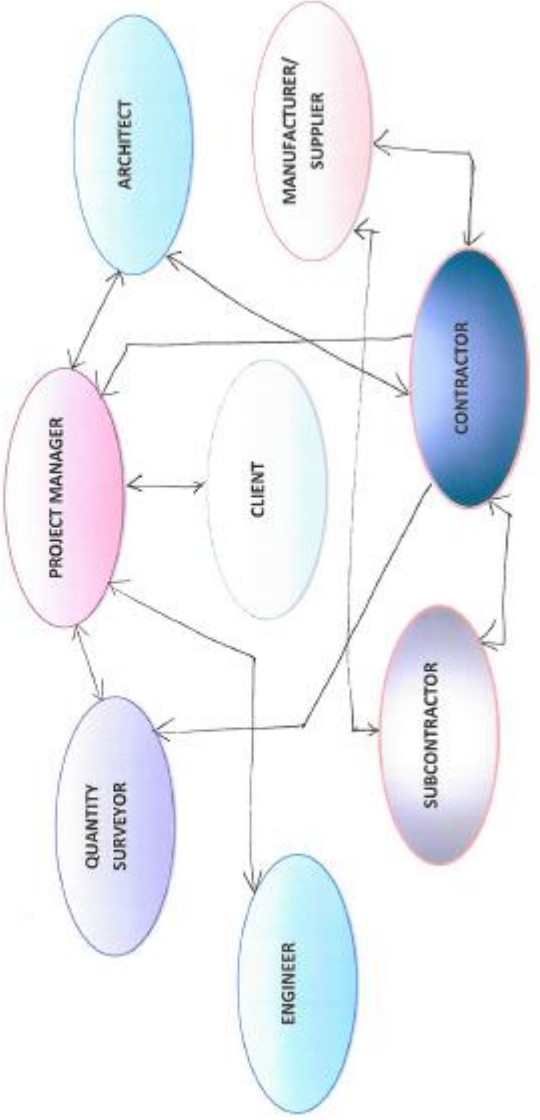
Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



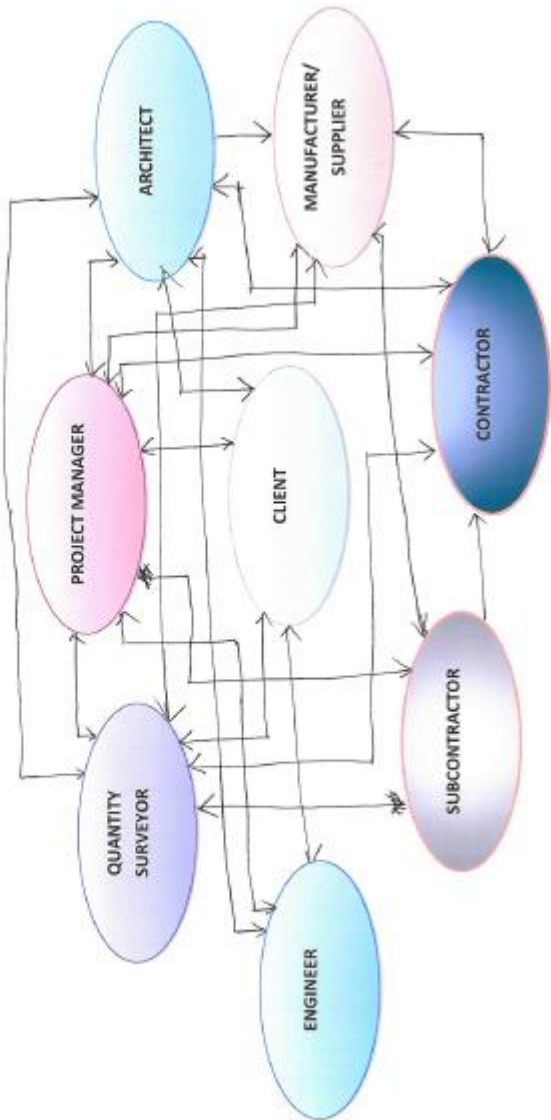
Making use of directional arrows, indicate the flow of communication which **currently exists** on public sector construction projects

One way communication flow →
 Two way communication flow ↔



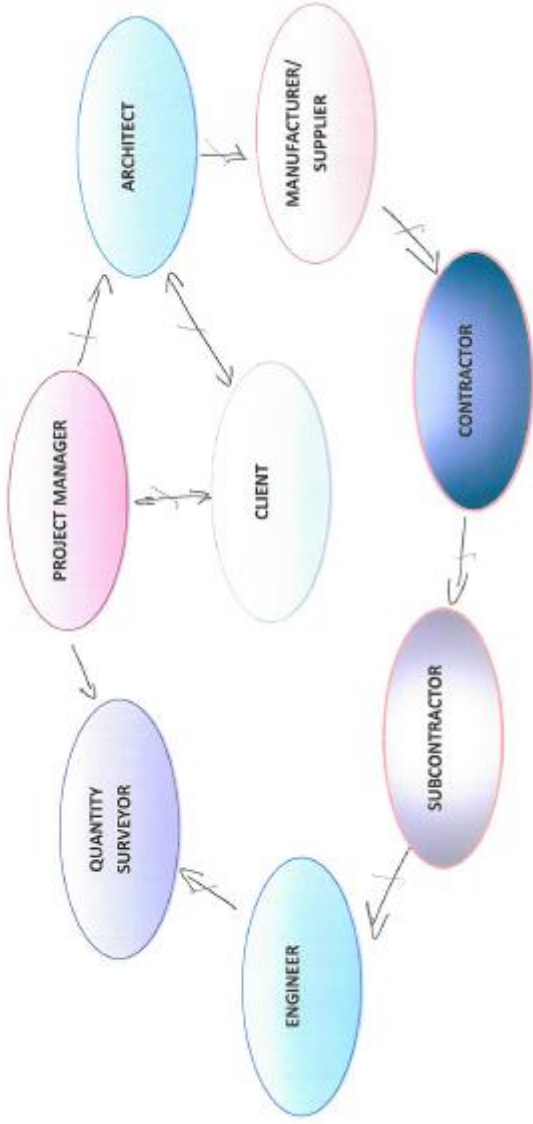
Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



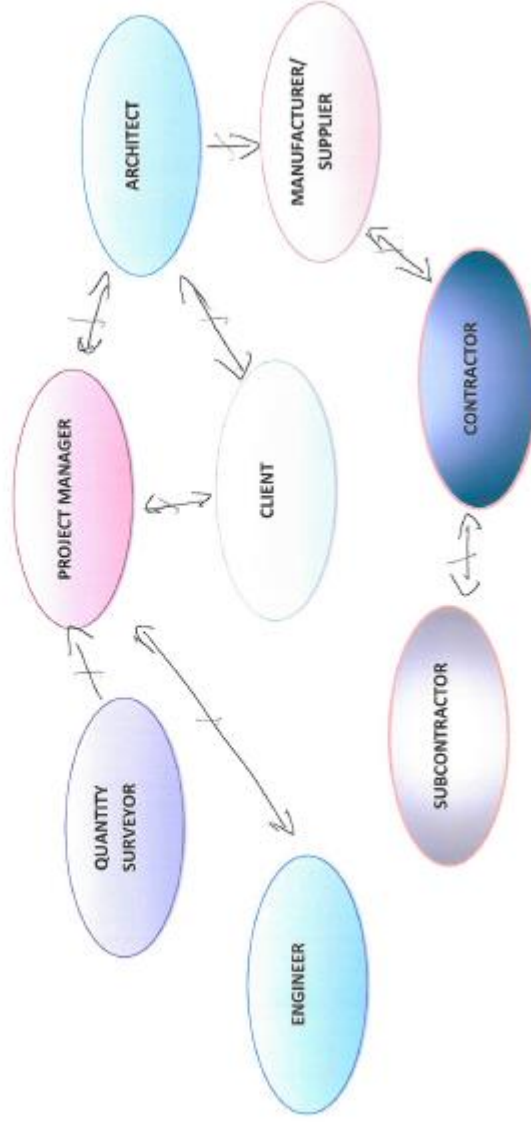
Making use of directional arrows, indicate the flow of communication **which currently exists** on public sector construction projects

One way communication flow \rightarrow
 Two way communication flow \leftrightarrow



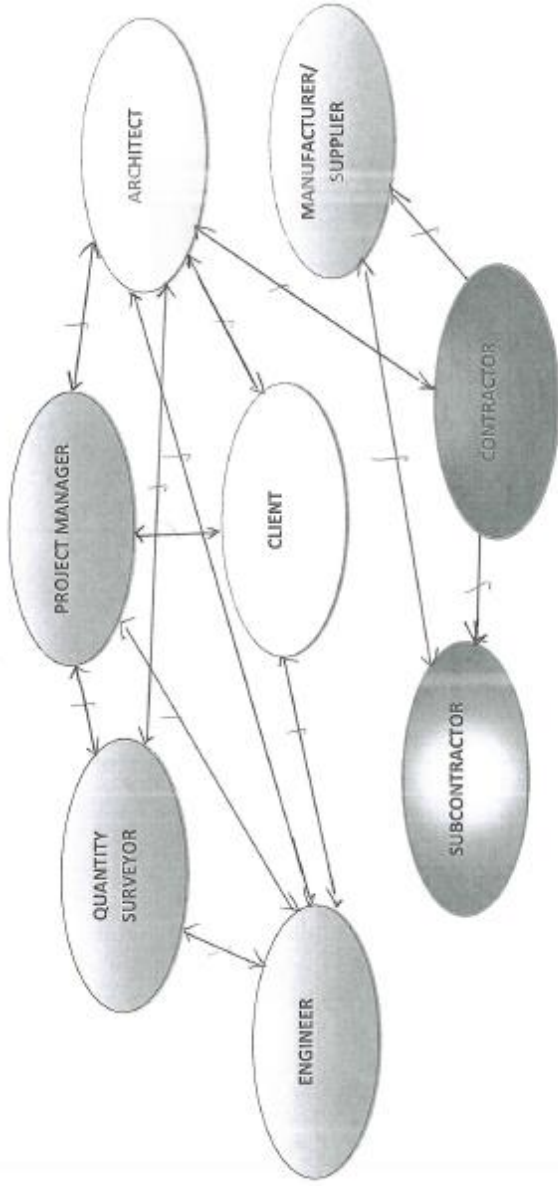
Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow \rightarrow
 Two way communication flow \leftrightarrow



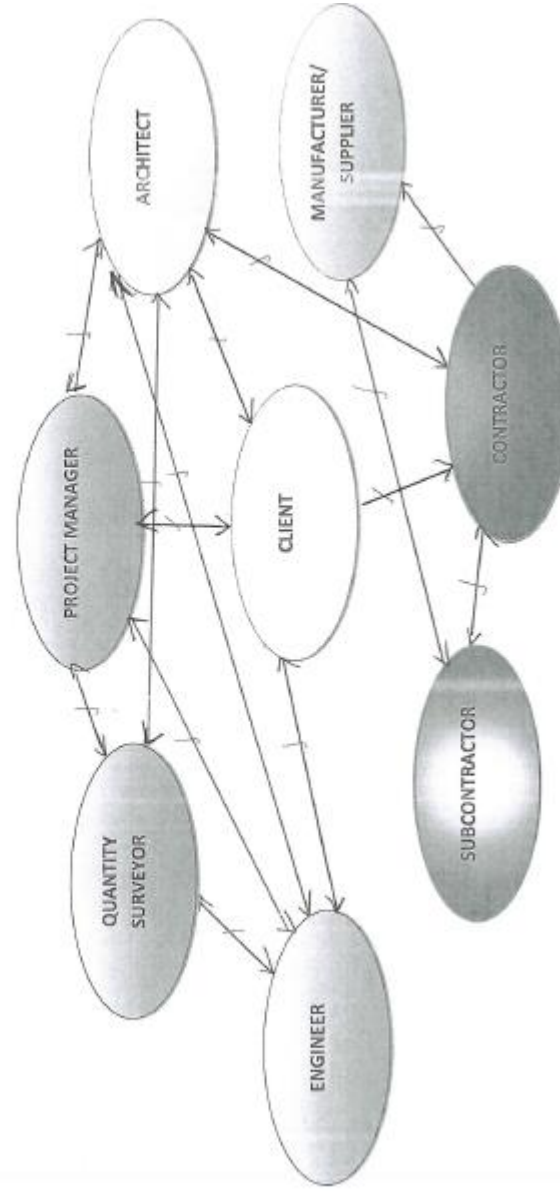
✓
 Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
 Two way communication flow ↔



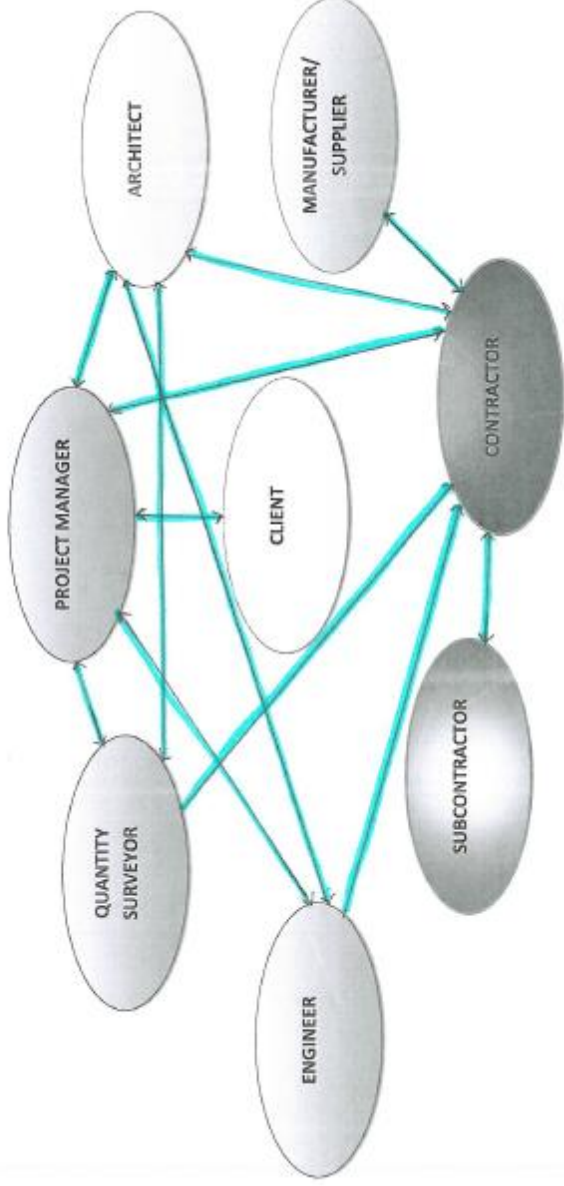
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



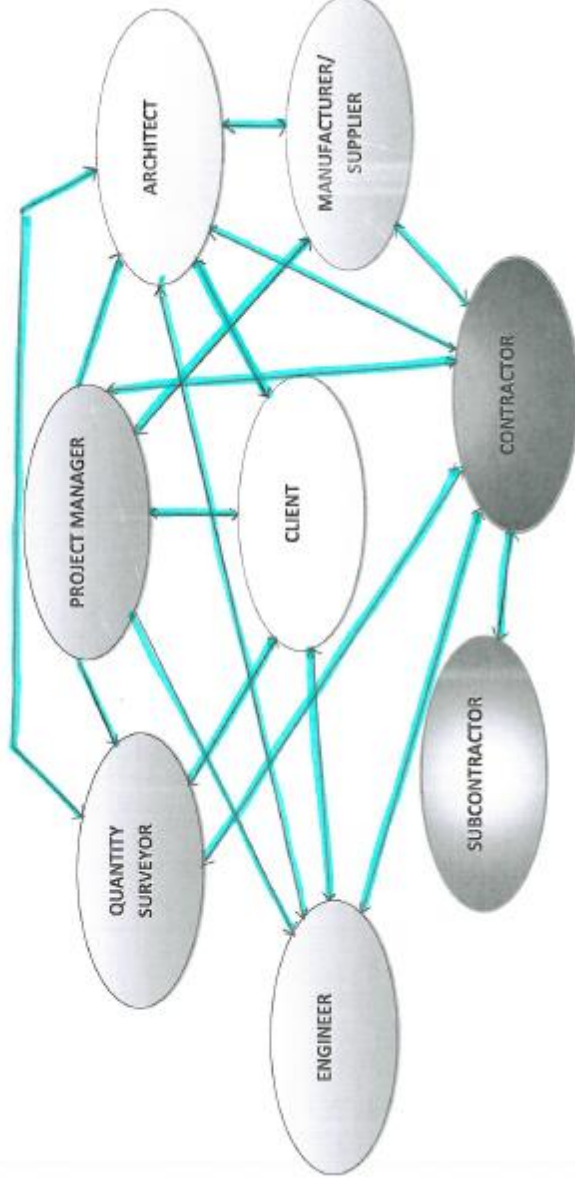
Making use of directional arrows, indicate the flow of communication **which currently exists** on public sector construction projects

One way communication flow →
 Two way communication flow ↔



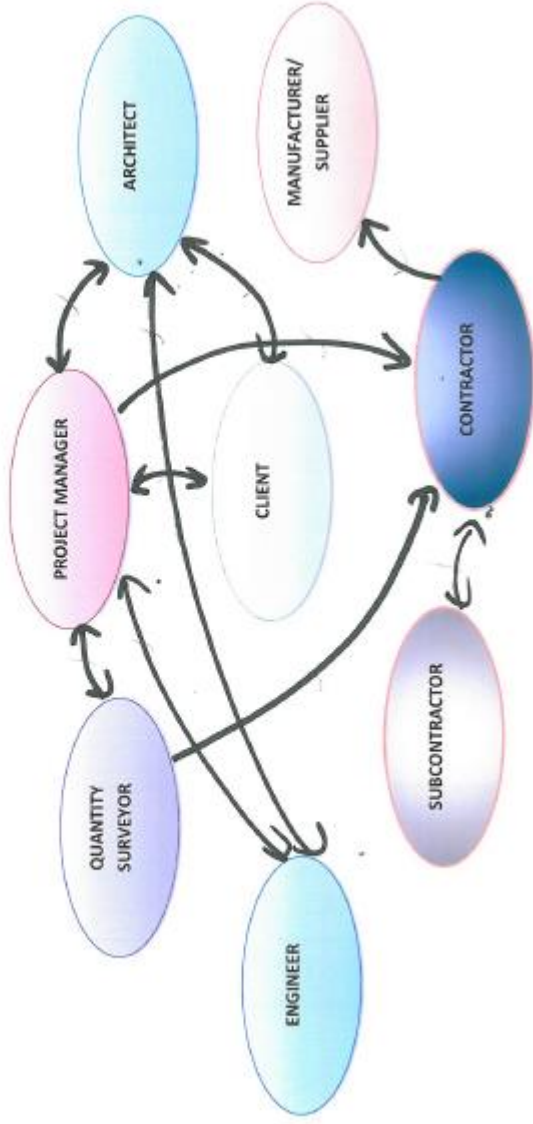
Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



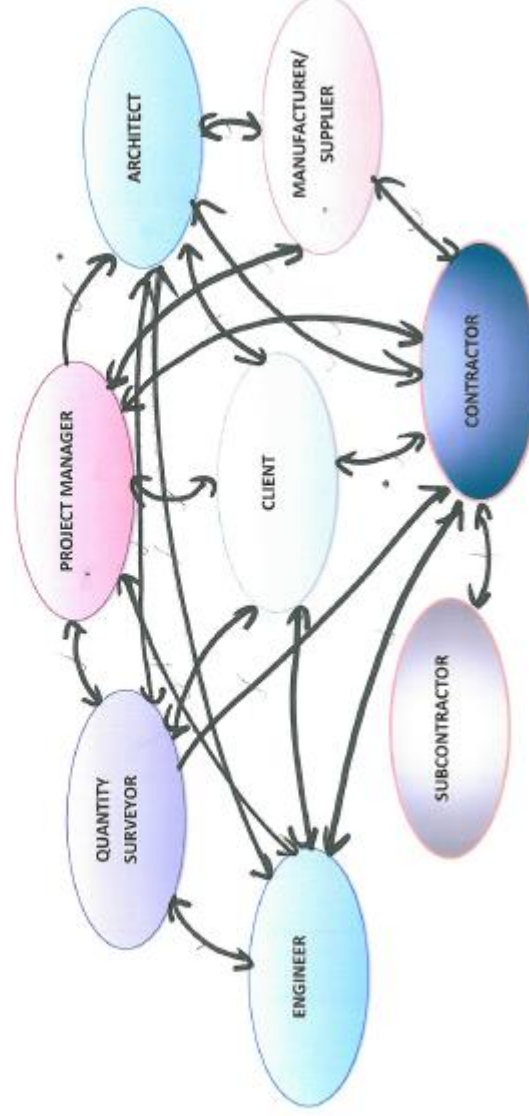
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
 Two way communication flow ↔



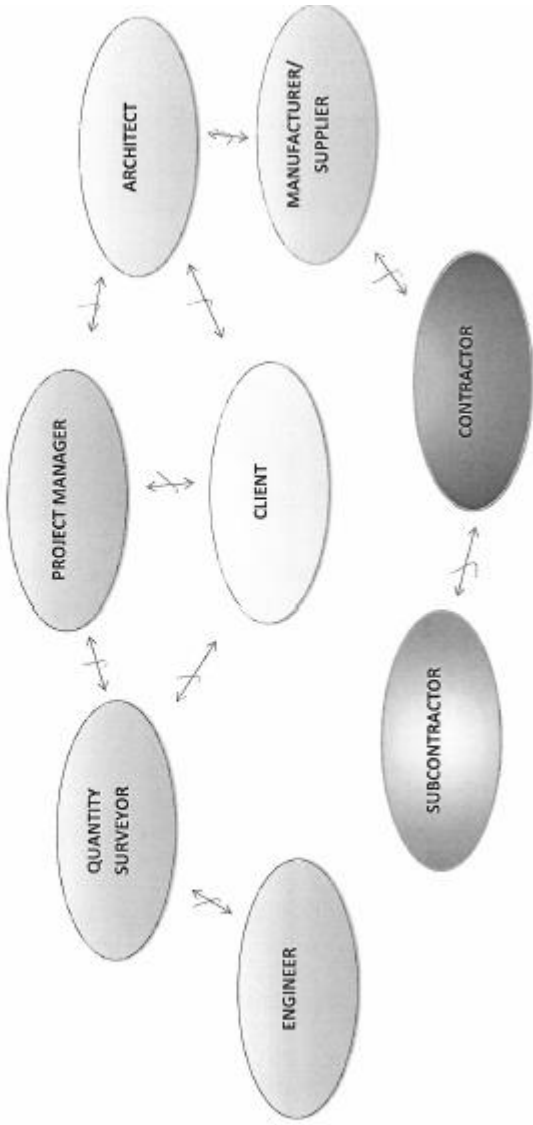
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



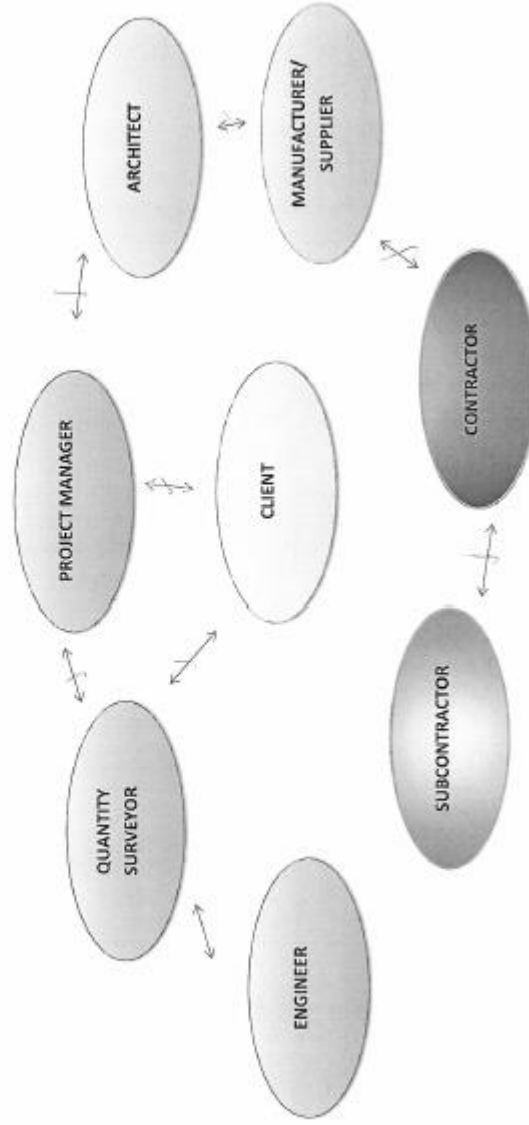
Making use of directional arrows, indicate the flow of communication which currently exists on private sector construction projects

One way communication flow →
Two way communication flow ↔



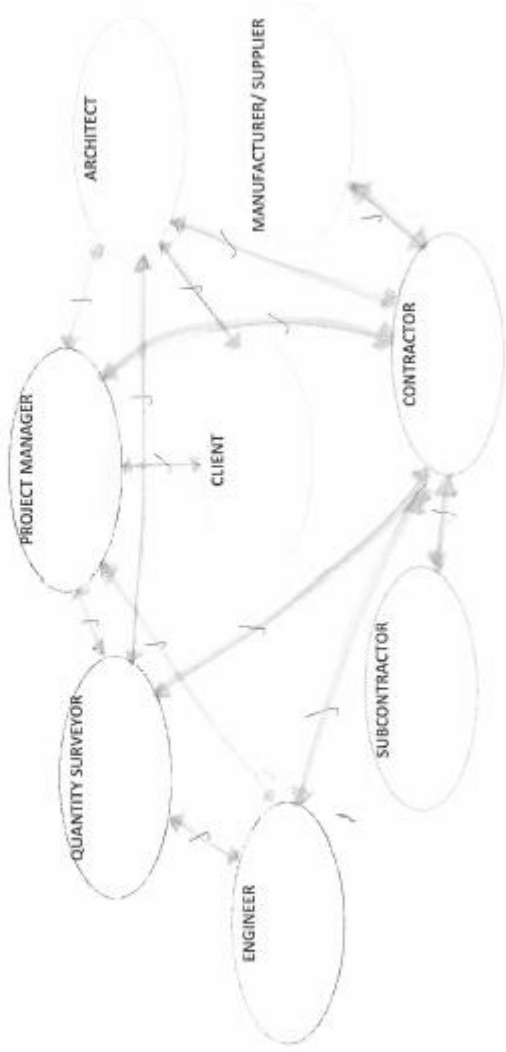
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



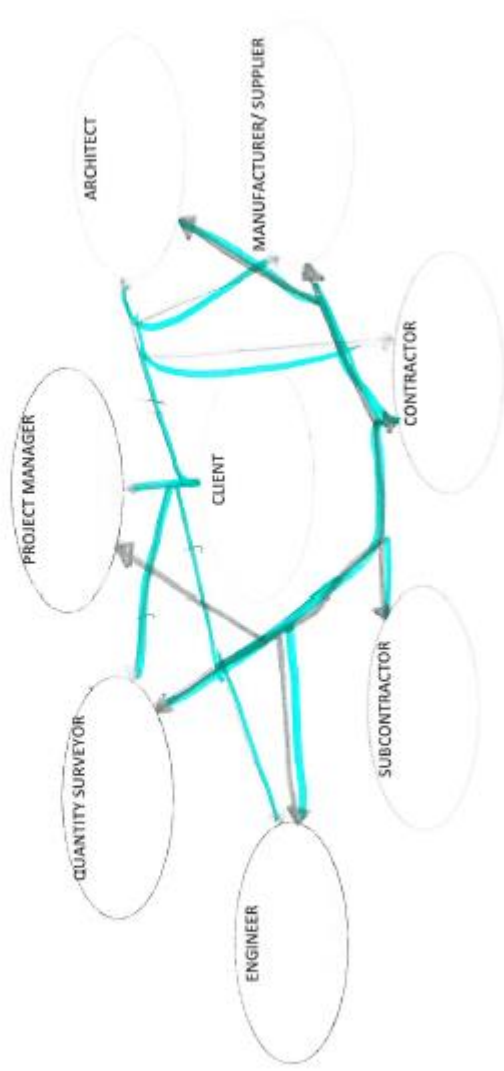
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
Two way communication flow ↔



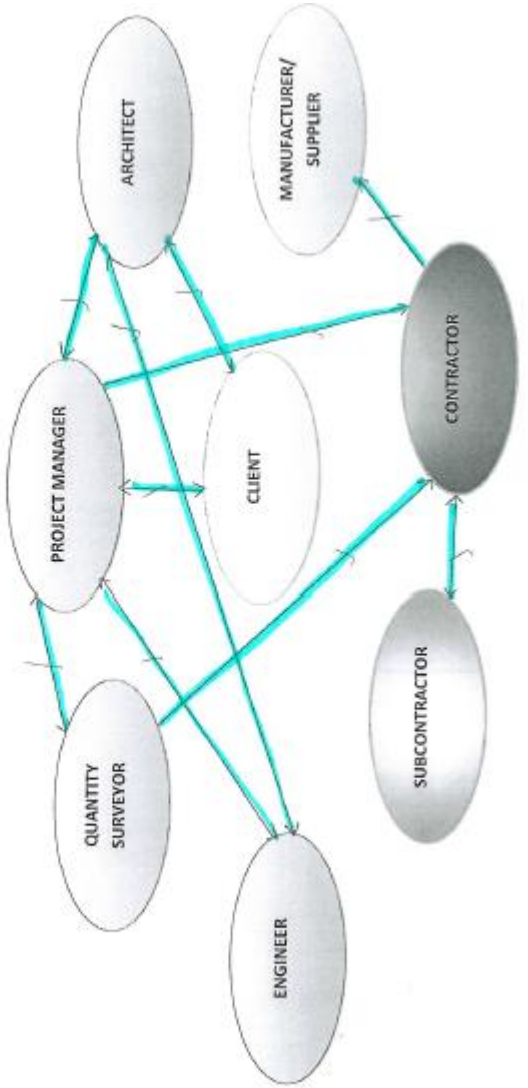
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



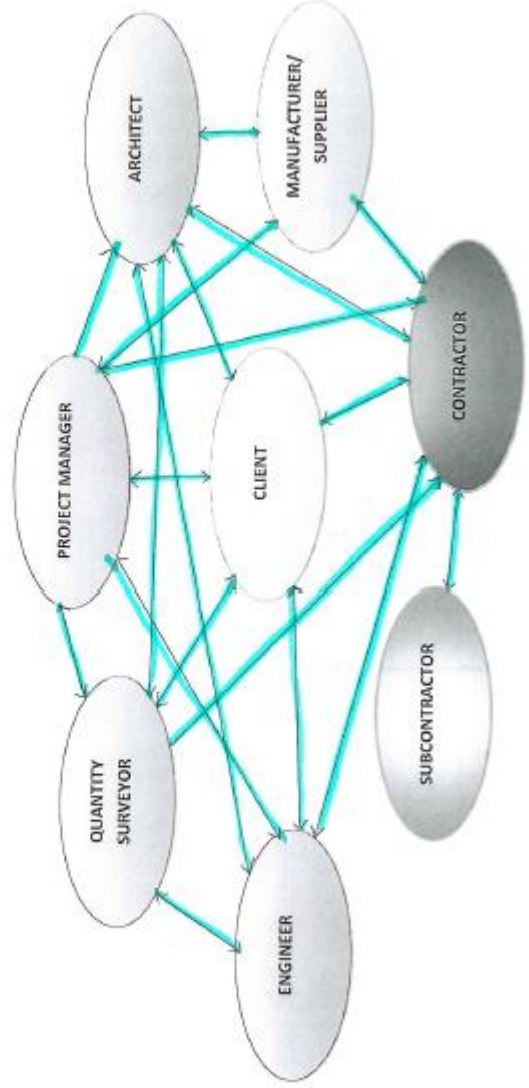
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 Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
 Two way communication flow ↔



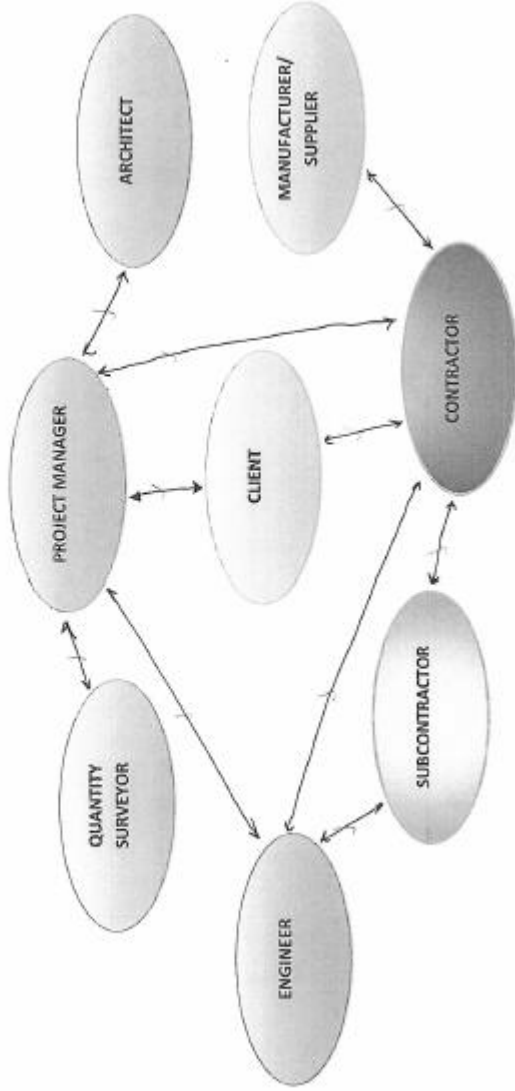
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 Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



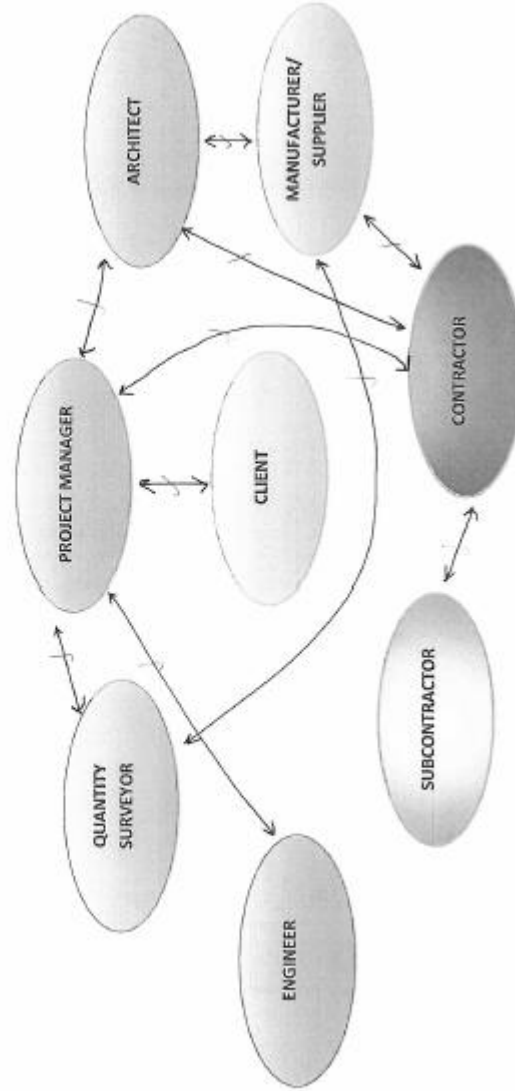
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
Two way communication flow ↔



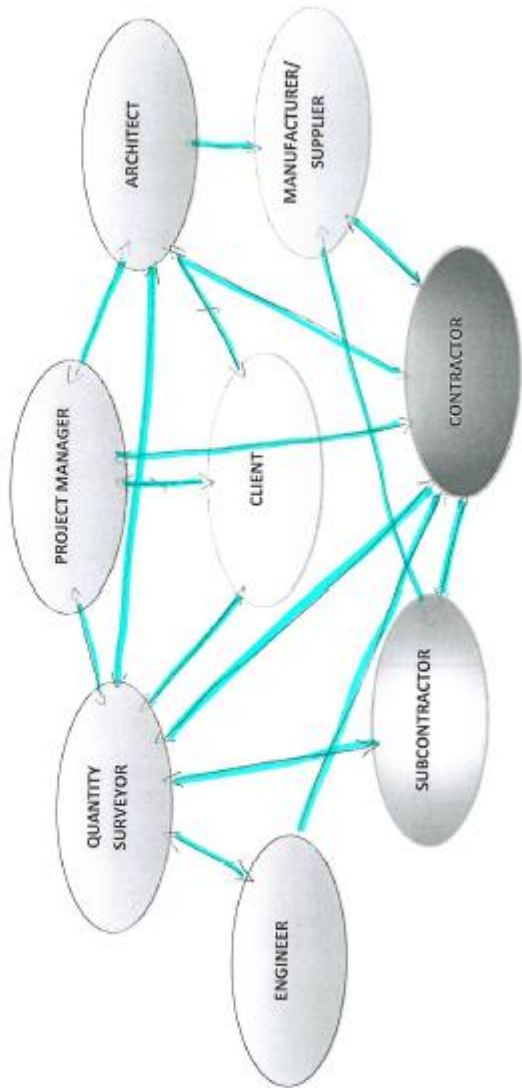
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



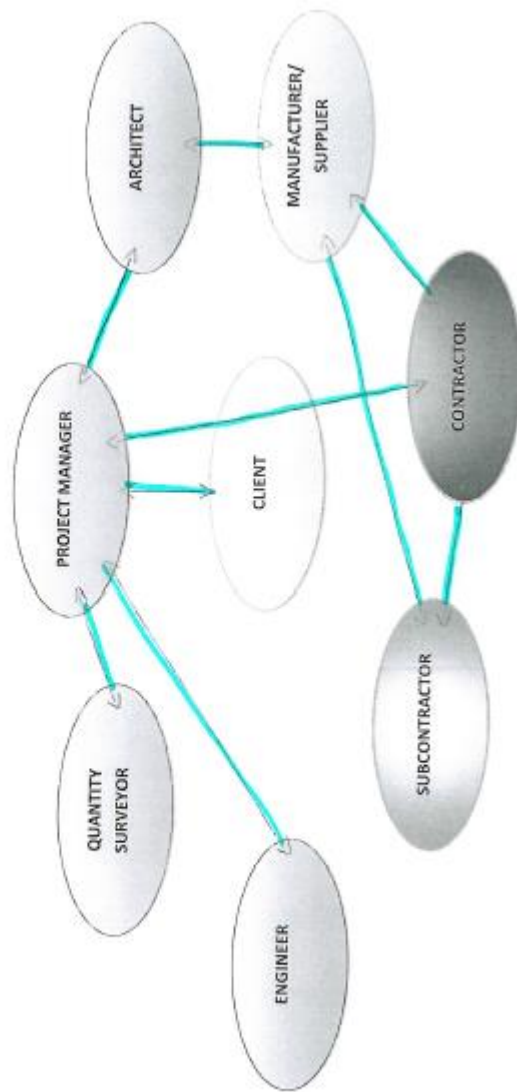
Making use of directional arrows, indicate the flow of communication **which currently exists** on public sector construction projects

One way communication flow →
 Two way communication flow ↔



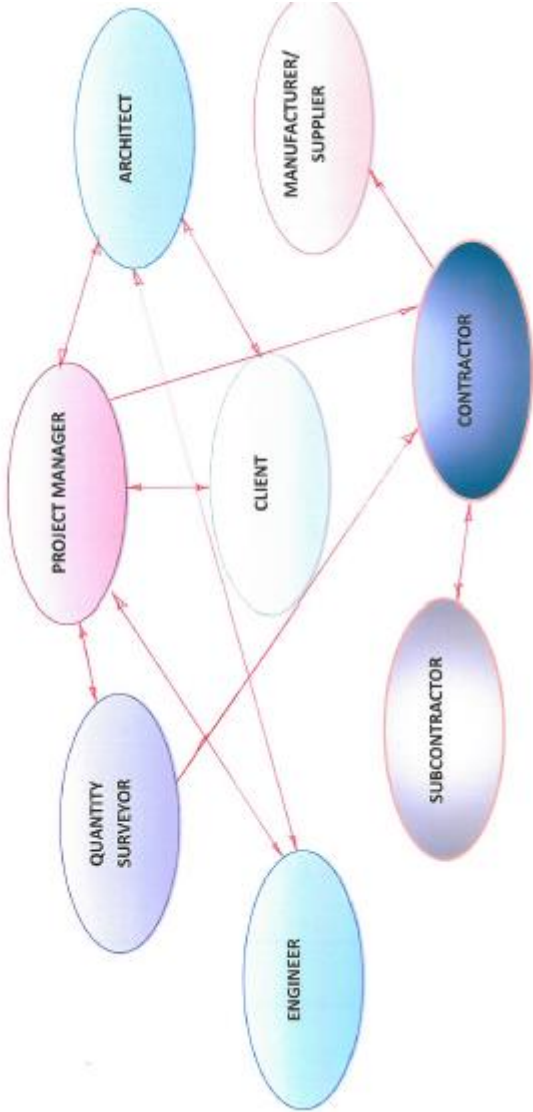
Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



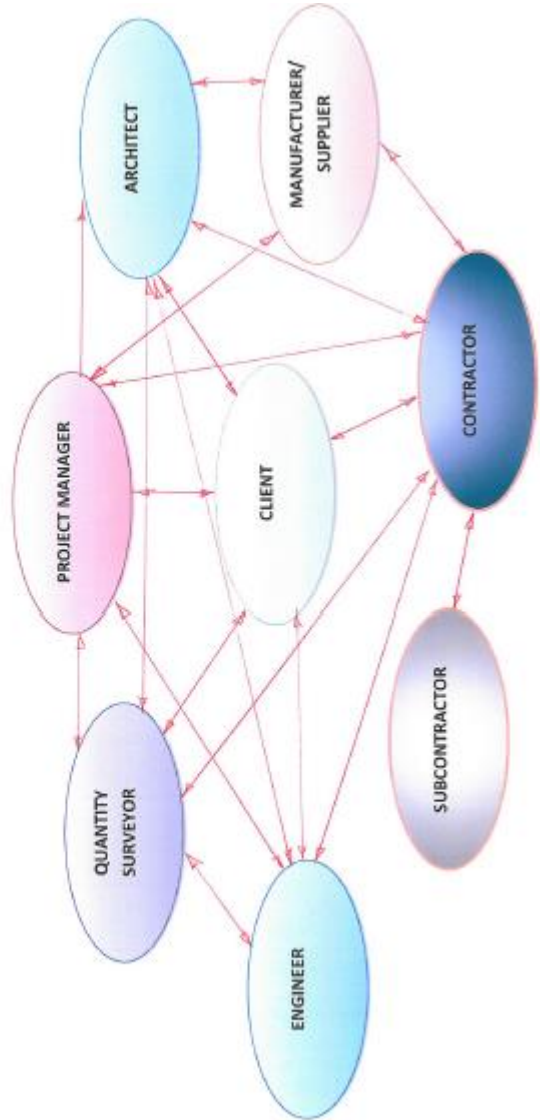
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
 Two way communication flow ↔



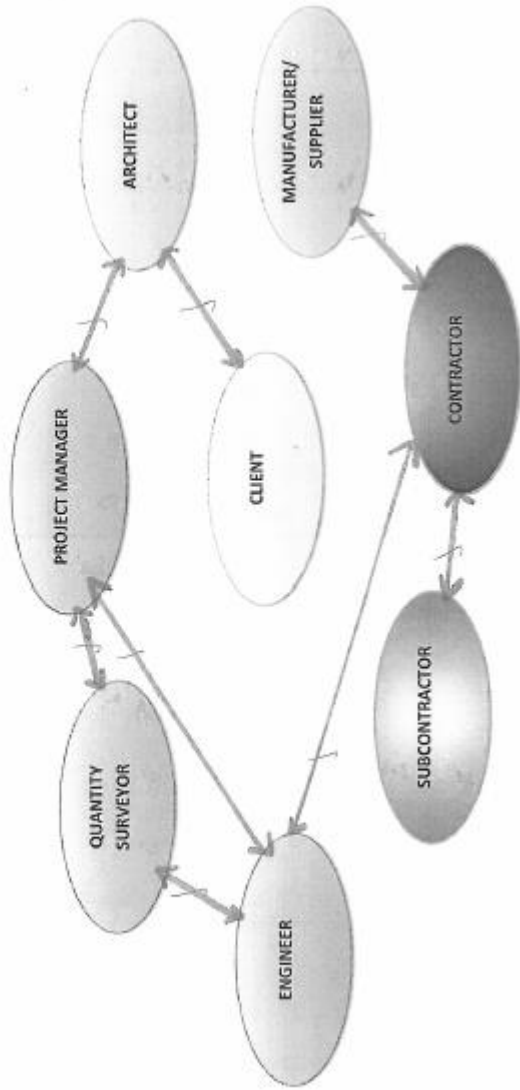
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
 Two way communication flow ↔



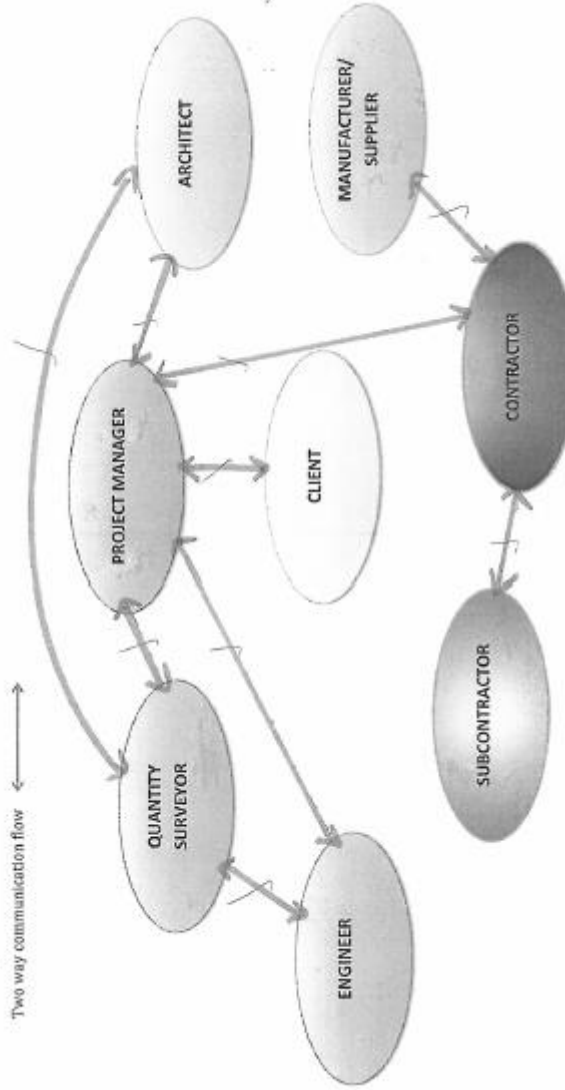
Making use of directional arrows, indicate the flow of communication which **currently exists** on public sector construction projects

One way communication flow →
Two way communication flow ↔



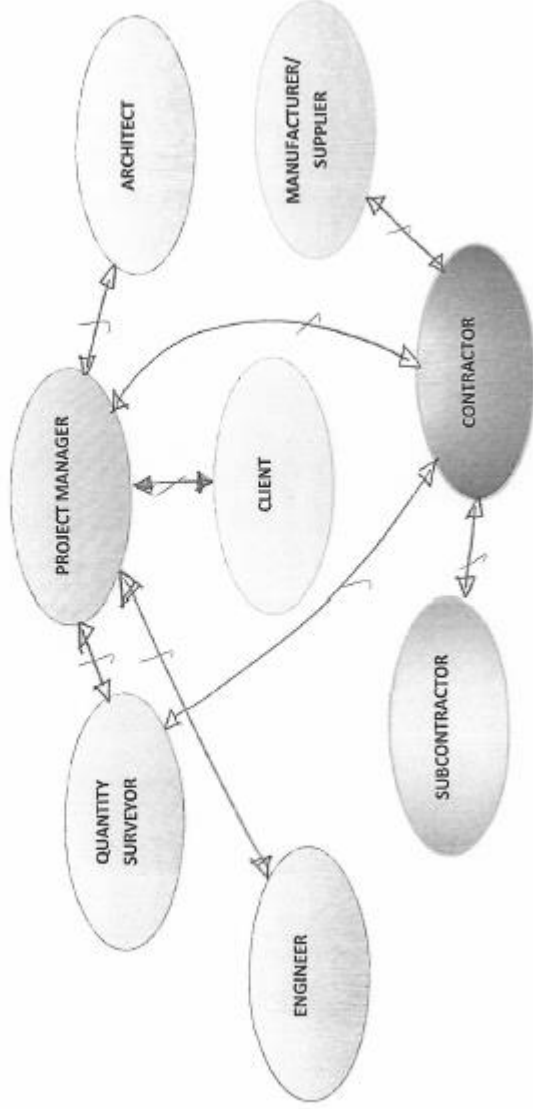
Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



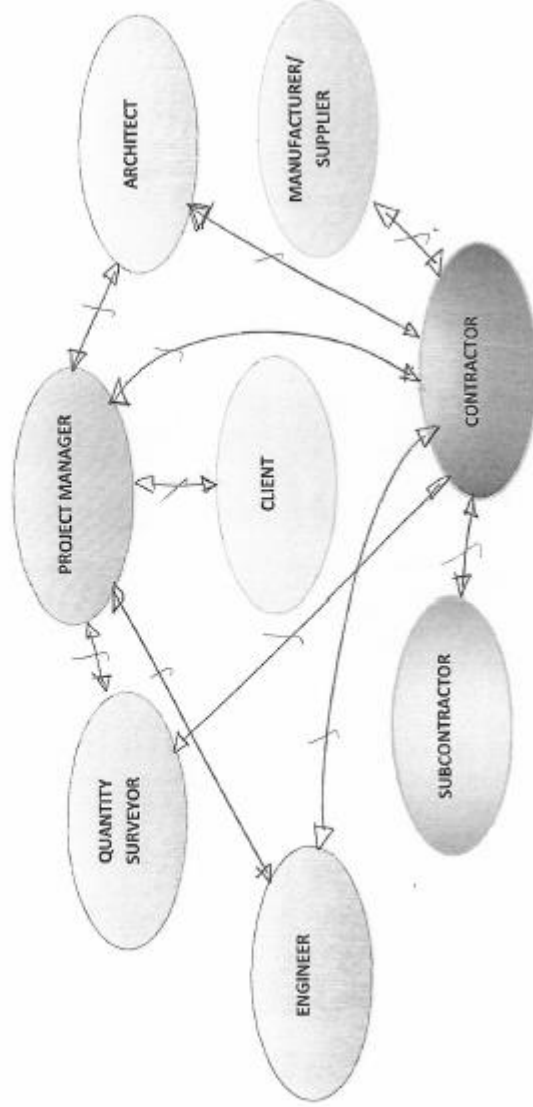
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow \longrightarrow
 Two way communication flow \longleftrightarrow



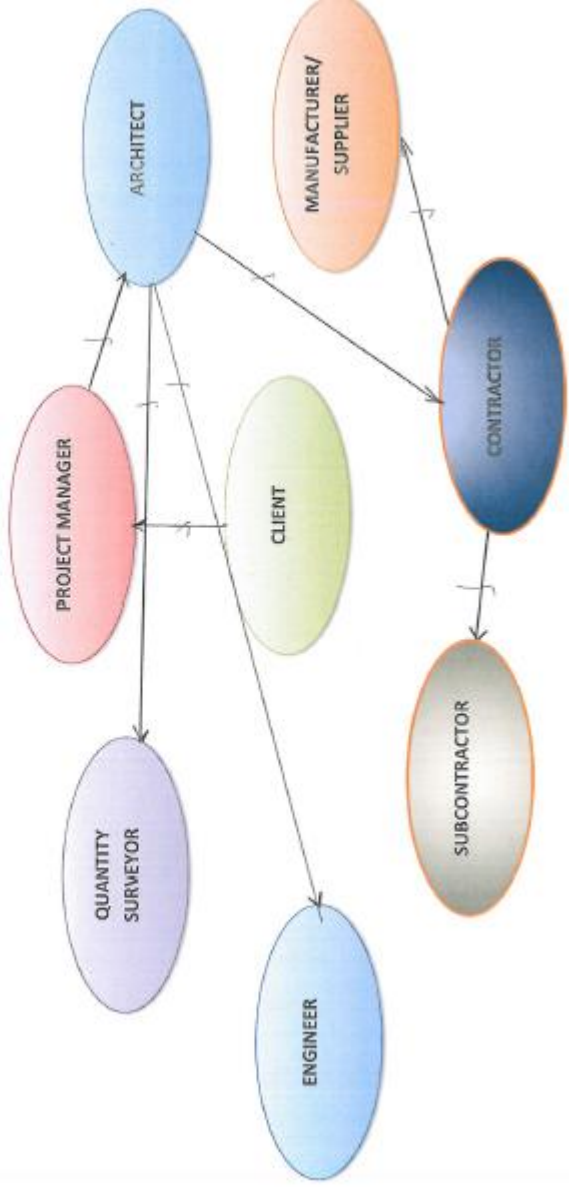
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow \longrightarrow
 Two way communication flow \longleftrightarrow



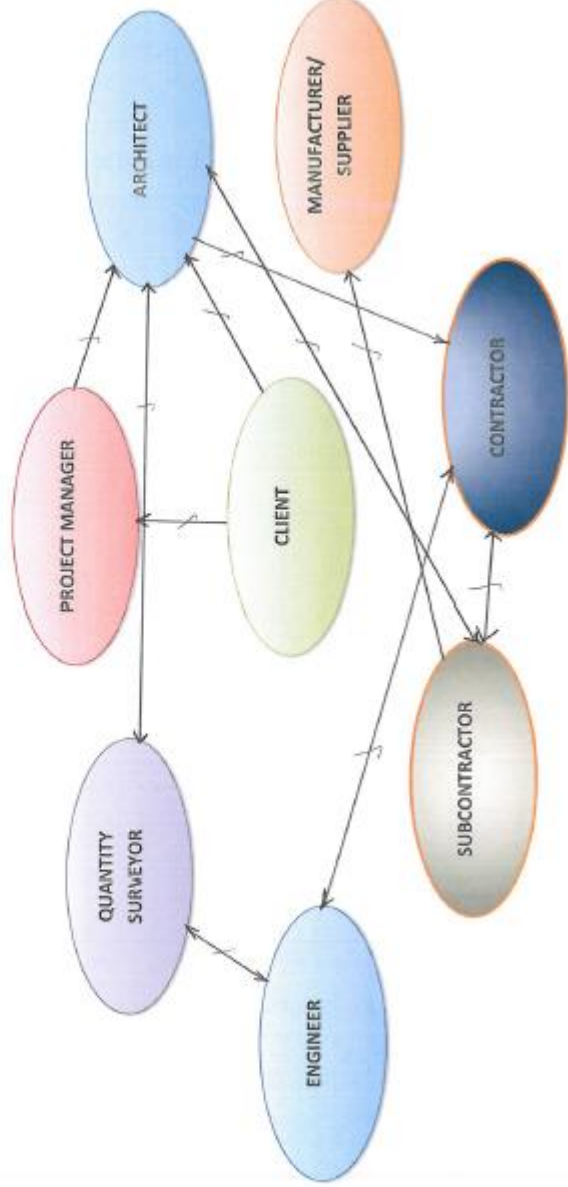
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
Two way communication flow ↔



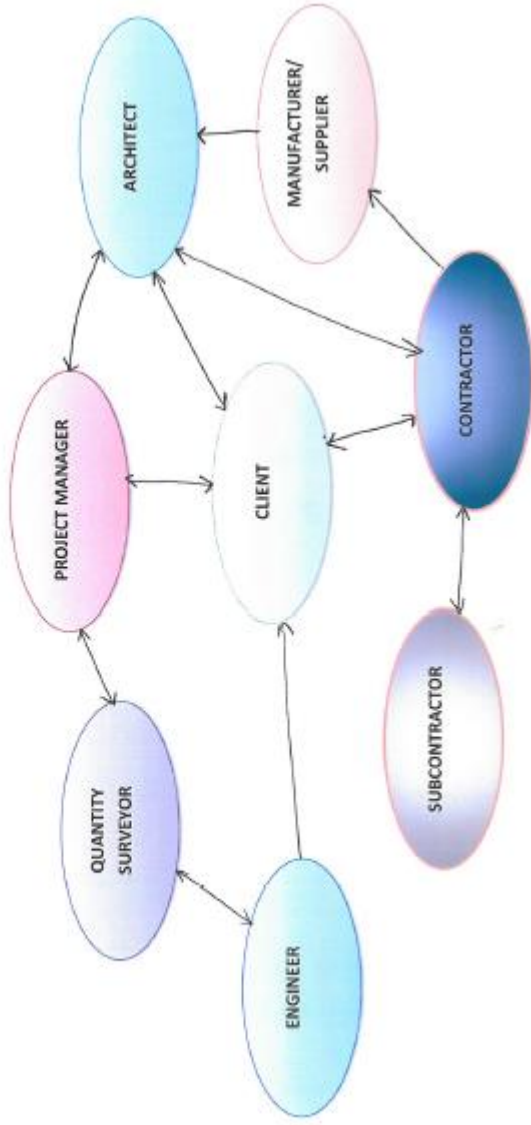
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



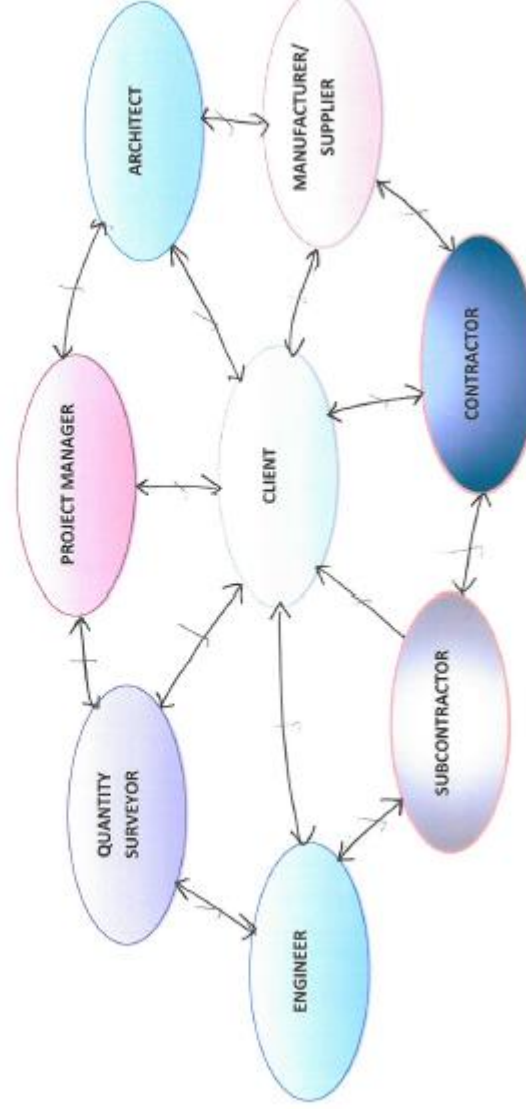
Making use of directional arrows, indicate the flow of communication which currently exists on public sector construction projects

One way communication flow →
Two way communication flow ↔



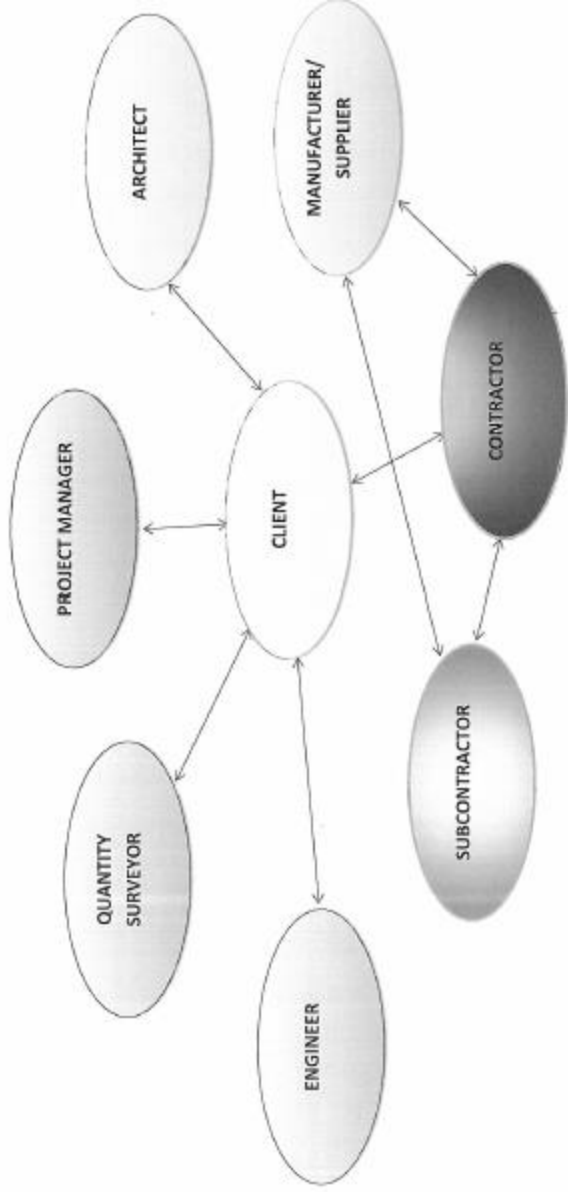
Making use of directional arrows, indicate, in your opinion, the desired flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



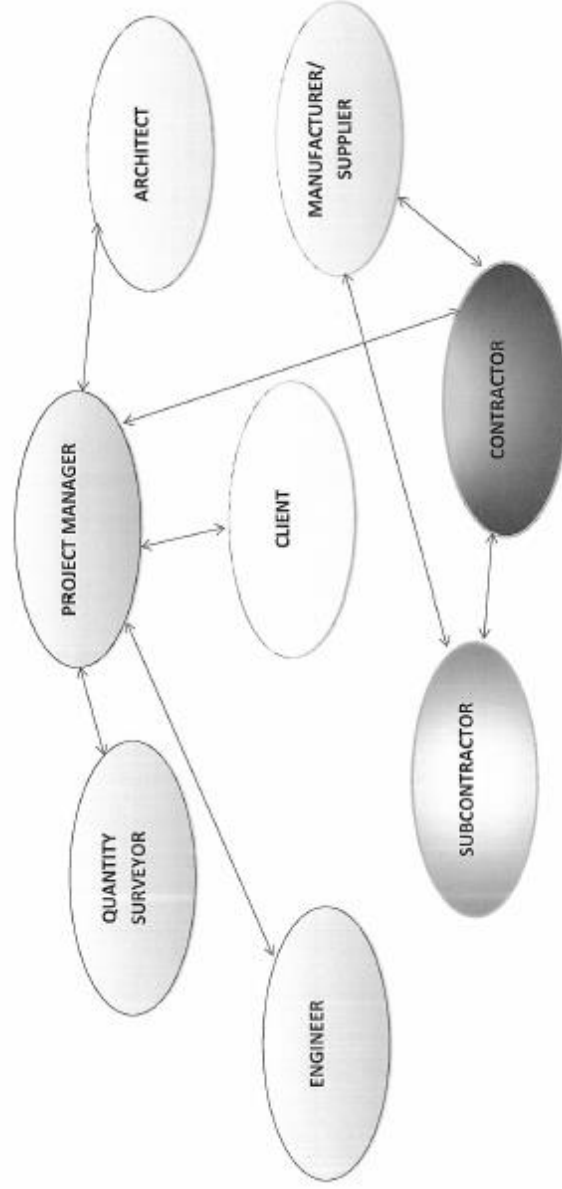
Making use of directional arrows, indicate the flow of communication **which currently exists** on public sector construction projects

One way communication flow →
Two way communication flow ↔



Making use of directional arrows, indicate, in your opinion, the **desired** flow of communication on public sector construction projects

One way communication flow →
Two way communication flow ↔



Appendix F: Interview Transcriptions and Emerging Themes Analysis

Interview Response

Question 1	While the public sector has experienced successful project delivery to some degree, most projects do not satisfy the required project objectives. What are your thoughts on this statement?
Case	Response
1	From my experience, most public sector projects tend to exceed time and budget constraints. There are varying factors as to why this occurs.
2	I don't know of any projects within the public sector which has completed on time. They seem to always experience delays which translates to project failure.
3	The objectives are not always clearly defined within the department. It is owing to this that project objectives are not met. The capacity to understand the objectives and then carry out the work to meet those objectives is lacking and requires development.
4	The public sector procedures seem to delay everything. Approvals are time consuming and there are specific channels such as Treasury which need to be consulted with. It has been proved to work in some instances but not often.
5	I agree with this statement. The public sector has a greater data base of specialists whereas the private sector is streamlining to a strategic market. This creates room for error within the public domain.
6	I agree with this statement. Most of these projects do not meet their objectives in terms of time and budget.
7	I agree with this statement base on the fact that the projects do not finish on time nor within budget and changes to scope.
8	The statement is largely true. If you analyze public sector projects the objectives of time and budget are not met.
9	There is a prevalence of unsuccessful projects within the public sector. There exists a matrix of dynamics which contribute to the failure of government projects.
10	The public sector procurement is a long drawn out process with client turn-around time being lengthy. This has consequences for the project duration and the projects are usually delayed. Time management seems to be an issue.

Emerging Themes from Response to Question 1:

	Agree	Disagree
1	x	
2	x	
3	x	
4	x	
5	x	
6	x	
7	x	
8	x	
9	x	
10	x	
	100%	0%

Agree- due to delays	Agree- due to budget	Other
x	x	
x		
		x
x		
		x
x	x	
x	x	x
x	x	
		x
x		
70%	40%	40%

Question 2	<p>Successful project delivery in construction may be described as attaining the predetermined objectives of a project with relation to time, cost, quality and scope and other project parameters. Based on construction projects carried out within the public sector during the past three years, what percentage of projects, in your opinion, has attained complete project delivery success? Discuss the reasons that projects fail.</p>
Case	Response
1	<p>In terms of numbers, none of the projects within the public sector have met all the objectives, in my experience. They fail due to a number of factors:</p> <ul style="list-style-type: none"> • Lack of understanding the scope of work and client requirements at inception stages • Architects and policy documents need to align to the project • QS needs to be aware of allowable's • Poor flow of communication and understanding the specific needs of the project. • Variations due to changes in the scope due to various reasons as a result of the inception stage • Prolonged turn-around time for decisions which has a knock on effect on the program and budget. <p>All decisions boils down to estimates and the choices made at that stage. This is specific to the public sector. Private sector is a lot more fluid.</p>
2	<p>0%</p> <p>Some of the reasons for failure are:</p> <ul style="list-style-type: none"> • Breakdown of communication • Emerging contractor who lack experience being appointed resulting in remedial work or variations which cause budget overruns • Lengthy approval processes within the public sector
3	<p>0-10%</p> <p>Some of the reasons for failure are:</p> <ul style="list-style-type: none"> • Planning • Lack of understanding of the clients requirements and demands by the professionals
4	<ul style="list-style-type: none"> • None have achieved complete project delivery success, every project has been delayed • Political interference • Procedures, processes are time consuming
5	<ul style="list-style-type: none"> • From my experience, an 85% success rate would be applicable to public sector construction projects <p>Some of the reasons are:</p> <ul style="list-style-type: none"> • Lack of effective communication • Lack of appropriate contractors and specialists being appointed • Approval processes are time consuming
6	<p>50%</p> <p>Some of the reasons for failure are:</p> <ul style="list-style-type: none"> • The public sector/ public works is under resourced • Lengthy processes • Poor communication • accountability • Political issues
7	<p>Approximately 50%</p> <p>Some of the reasons for failure are:</p> <ul style="list-style-type: none"> • Incompetent contractors • Incompetent consultants • The client • The attitude of the project participant's

8	<p>0-10%</p> <p>The planning processes are poorly conducted. The complete scope needs to be understood including the end user requirements. If a school needs to be built, the occupation date needs to be relative to the needs of the students. The core deliverable of what the department wants to achieve displays great inefficiencies.</p>
9	<p>10%</p> <p>Some of the reasons for failure are:</p> <ul style="list-style-type: none"> • The client does not engage the relevant inter departmental committee to adequately address the scope and the deliverables required • Generic scopes issued by clients • The procurement methodology and implantation is completely wrong and not suited to the type of project • Human error • Level of performance of design team • Inadequately prepared consultants • Design turn-around time is not met
10	<p>50%</p> <p>Some of the reasons for failure are:</p> <ul style="list-style-type: none"> • The hierarchy • Lack of responsibility and accountability • Poor planning and management of budget allocation • Political influence • Budget constraints

	Percentage of projects which attained complete project delivery success			
	0	0-10%	50%	>50%
1	x			
2	x			
3		x		
4	x			
5				x
6			x	
7			x	
8		x		
9		x		
10			x	
	30%	30%	30%	10%

Poor project briefing and scope definition	Poor project document and procurement process alignment	Delayed decision-making and processes	Poor communication	Limited stakeholder experience	Lack of planning	Political interference	Budgetary constraints
	x	x	x	x			
			x	x	x		
	x						
			x			x	
			x	x	x		
			x	x		x	
	x			x			
	x				x		
	x	x		x	x		
				x	x	x	x
	50%	20%	50%	40%	50%	30%	10%

Question 3	Based on construction projects carried out within the public sector during the past three years that you have been involved with, which are the procurement methods primarily selected and experienced and why? (eg traditional; design-bid-build etc.)
Case	Response
1	Traditional Procurement Method. This is the way it has been done and the legislative framework makes the most provision for this. This has been entrenched in us as professionals.
2	The Traditional Procurement Method is mainly used. I think this is a fair system and the project participants are familiar with it and they understand it.
3	The Traditional Procurement Method with public tender is always selected by default.
4	Traditional Procurement Method. There is only the option of the open tender process in order to prove to Treasury there is transparency and competitiveness.
5	The Traditional Procurement Method is selected in order to ensure transparency and afford the competition a fair opportunity amongst contractors. We are governed by the PPPFA.
6	The Traditional Procurement Method is usually selected by default. I am working on a project where it has been set aside for a Contractor Development Program (EPWP) and the appointment is done by the National Treasury and Public Works.
7	The Traditional Procurement Method is selected. This is the method preferred on projects within the public sector. I have seen design-build being implemented on a few projects.
8	The Traditional Procurement Method is selected due to the fact that it is widely known and it largely conforms to the legalistic requirements of our country
9	The government has one method available which is the open tendering system ie the Traditional Procurement Method. This is based on the CIDB model.
10	The Traditional Procurement Method by default.

	Procurement Route primarily selected			
	Traditional	Design-Build	Collaborative	Management
1	x			
2	x			
3	x			
4	x			
5	x			
6	x			
7	x	x		
8	x			
9	x			
10	x			
	100%	10%	0%	0%

Reason for selection			
Default approach	Legislative framework	Client's decision	Habit/familiarity
x	x		x
x			x
x			
x	x		
x	x		
x	x	x	
x		x	
	x		x
x	x		
x			
90%	60%	20%	30%

Question 4	What are the criteria for this selection of procurement method? Describe why these criteria are used and whether they in reality contribute to the appropriate method being selected.
Case	Response
1	<ul style="list-style-type: none"> • Project Value at estimate provides for the type of contract one would implement • The grading of the project in terms of the CIDB grading. • The CIDB heavily influences the selection criteria. <p>Under the assumption that the CIDB provides for an accurate measure of criteria, the system should perform accurately and therefore result in the appropriate method being selected.</p>
2	<ul style="list-style-type: none"> • The client has control over what system is being implemented. The professional team can advise and make recommendations to the client but it is ultimately the client's decision. • I don't think it contributes to the appropriate method being used but rather this is the default system selected and the project team need to implement it accordingly.
3	<ul style="list-style-type: none"> • Equity via public tendering • Functionality • Legislature <p>I think the administrative process of the procurement method does not always align with the technical requirements of the project. The open tendering system does align with our legal requirements of the country.</p>
4	<ul style="list-style-type: none"> • Legislation • CIDB grading • The selected method is not necessarily the appropriate method due to corruption and many contractors attaining the CIDB grading unlawfully.
5	<ul style="list-style-type: none"> • Legislative framework governs the selection. It does not always contribute to the most effective method being selected however it is up to the project team with emphasis on the professional team to ensure that the selected method works to the advantage of the project.
6	<ul style="list-style-type: none"> • Targeting structures aligned with PPPFA (above 30 mill) • Legislative framework
7	<ul style="list-style-type: none"> • The type of project determines this eg complexity and nature • CIDB • PPPFA • BBBEE • I think it does contribute to the appropriate method being selected since the size and complexity of the project are considered
8	<ul style="list-style-type: none"> • Transparency • Accountability • Value for money • SCM • PPPFA • Open tendering basis <p>These variables lead us to the traditional method. The method is easily adaptable. It works if the project is conventional. The method is not suited to urgent projects. Where there are time constraints the conventional method may be best suited but this may be at the expense of the cost.</p>

<p>9</p>	<p>* there is only one method selected using the CIDB Model:</p> <ul style="list-style-type: none"> • Price; Preference • Price; preference; quality • Price; preference; quality; functionality • PPPFA <p>I think this is used due to the current economic climate of our country. I am not of the opinion that this results in the appropriate method being selected in all circumstances.</p>
<p>10</p>	<ul style="list-style-type: none"> • Legislature • CIDB • Treasury <p>Time is a determining factor more recently so while the Traditional Method is followed, it is up to the professional team to negotiate with the client on an appropriate method being selected to suit the project requirements.</p>

	Does the criteria (legislature) result in the appropriate method being selected		
	Yes	No	Sometimes
1	x		
2		x	
3			x
4		x	
5			x
6			
7	x		
8			x
9		x	
10			x
	30%	30%	40%

What are the criteria for the selection of procurement method?			
Project Specific	CIDB	Legislature	Client
x	x		
			x
x		x	
	x	x	
		x	
		x	
x	x	x	
		x	
	x	x	
x	x	x	
40%	50%	80%	10%

Question 5	It is typical of currently used procurement systems to appoint a principal agent on a project. Briefly discuss the advantages/ disadvantages of this role in relation to responsibility of attaining project delivery success. How does this appoint contribute to achieving the project goals and objectives?
Case	Response
1	I think having a point of contact, a head, is essential especially on larger projects which are larger and tend to get complicated. The client needs a single liaison as opposed to an entire team. Someone needs to take charge and be responsible for the project. This person needs to be adequately equipped to handle the requirements of the role. Often I find that the principal agent has a desire to protect his trade whether it is the QS protecting his budget or the Architect protecting his design. I think this is where a conflict of issues arises. I prefer a Project Manager assume this appointment in order to avoid this conflict.
2	The role of a Principal Agent is advantageous. A single liaison for the client is essential as opposed to many people. It contributes positively to the project by ensuring the project goals are attained.
3	The role of a Principal Agent is beneficial if it is a competent individual. It is difficult to assess the competence. The role is the driving force behind the design and delivery of the project.
4	The principal agent can be the PM, Architect, QS. I have a personal issue with dual roles ie the Architect and QS. There is a tendency to want to protect trades which brings in conflict of interest so I find it more suitable that the role of the PA is fulfilled by a Project Manager. It is imperative to have a single head and point of contact for the team to be successful.
5	The principal agent needs a clear understanding of his duties and responsibilities in order to contribute positively to the project success. He must be knowledgeable on all legislation and contractual obligations applied. The Architect or QS is usually appointed and the dual role poses issues since each professional is primarily concerned with the task of their respective trade. An effective PA needs to assess complete functionality of a project and not just in terms of design or cost implications. Assertive authority is a necessity. A dual role is not recommended.
6	The role of a Principal Agent is advantageous to the project in terms of being able to give the project direction. In older structures the Architect is appointed the PA by default which could be to the detriment of the project. The PA should be an independent party.
7	The role of a Principal Agent is necessary. The PA should drive a project forward. Architects acting as the PA pose an issue due to lack of clear understanding of all project parameters and contractual agreements. They rely on other professionals such as the QS. The PA should be a project manager, since he is an independent professional not playing two roles. In my opinion the Architect is the worst choice for the PA appointment.

<p>8</p>	<p>In many cases the Principal Agent is the Architect under the misconception that since they manage the design they can manage the team. I do not share that opinion. I think that greater efficiencies can be achieved if a Project Manager is appointed as the PA since it is distinct from the design process. The role of the PA is highly beneficial at the inception stages of a project where he has the most influence. His commitment to planning, programming and organizing will determine the success of the project. He needs to identify clear deliverables in order to do so and wider knowledge than the other consultants.</p>
<p>9</p>	<p>Disadvantages:</p> <ul style="list-style-type: none"> • Encourages lethargy amongst other professionals due to having a ‘scape goat’ • The PA in his contractual capacity assumes all risk so the professionals are not as proactive as possible • Lack of accountability by the client and the professional team • The client tend to have an over-reliance on the PA <p>Advantages:</p> <ul style="list-style-type: none"> • Experienced and well versed PA’s are able to pull the project team together and encourage them to work harmoniously to benefit the project • Coordination • Single point responsibility <p>It can contribute positively to the project if the PA is knowledgeable. The arising issue is that the PA does not have to be professionally affiliated with a registry council. The PA is appointed at the client’s discretion.</p>
<p>10</p>	<p>The role of a Principal Agent should be a project manager and not the architect as it has been done. The PM is an isolated role and this is advantageous to the project in terms of being a single point of contact and accepts responsibility for his role only and not a dual role. Coordination is vital and the PA assumes this responsibility. The role is only advantageous if he has the correct skill set.</p>

Is the role of the Principal Agent advantageous in relation to the project delivery success				
	Yes	No	Sometimes	Yes if it an independent professional such as the Project Manager
1	x			x
2	x			
3			x	
4	x			x
5	x			x
6	x			x
7	x			x
8	x			x
9	x			
10	x			x
	100%	0%	10%	90%

Contributions of Principal Agent towards Project Objectives		
Single point of contact	Conflict resolution	Planning and Coordination
x		
x		
		x
x		
		x
		x
		x
	x	x
x	x	
x		x
50%	20%	60%

Question 6	Discuss the relationship between the method of procurement on a project and successful project delivery. Comment on whether there is in fact such a relationship.
Case	Response
1	It depends on the project and the type. TPS works well on the average, generic projects. The procurement method will attribute more to the delivery success if the project entails a specialist trade. Complexity of the project also influences this. TPS does not work well if there are time constraints on a project since the process is too time consuming. If the project needs to be on site sooner it would be ideal for the contractor to be involved at an early stage. On Project A, the procurement would not have made a difference due to the contractor defaulting on practical completion.
2	The method of procurement is related to successful project delivery. Depending on what the project constraints are and the type of project in terms of complexity, the appropriate method will result in project success.
3	Yes there is always a relationship but unfortunately we do not currently have the data available to prove to the client that alternative methods other than the conventional method will offer greater benefits.
4	The method selected is vital to project delivery success. This is dependent on the type of project and the environment. Traditional is very time consuming so it will not suit a project which is under time constraints.
5	Procurement is intertwined with the project delivery success. The delivery of a project is dependent on the procurement method.
6	The type of procurement affects the quality of the end product so I think there is a strong relationship.
7	There exists a strong correlation between the two on larger projects. I do not think it is as significant on smaller simpler projects.
8	The relationship is directly proportional. Your method selected will determine project success.
9	There is a multi-faceted relationship. Procurement is the acquiring of goods and services in order to attain a set of desired objectives. The poorer the service procured, the less chance of success the project has. Procurement must be married to project objectives and when there is no 'big picture' view, we see failures.
10	The method of procurement is directly related to the outcome of the project. The procurement method is aligned to the project objectives.

	Does a relationship exist between method of procurement and successful project delivery		
	Yes	No	Sometimes
1			x
2	x		
3	x		
4	x		
5	x		
6	x		
7			x
8	x		
9	x		
10	x		
	80%	0%	20%

Question 7	Have you ever explored options of using alternative procurement routes which are relational and non-adversarial? If not why not? If so describe the procurement route and how it affected the project outcomes.
Case	Response
1	I have explored other routes which are relational and I enjoy the fact that the entire team shares an understanding of the project and scope. It is more collaborative and solutions are thought of easily. I have never worked on a project within the public sector which has explored other procurement methods. I think it could work however there are many issues which would require resolution before it is implemented.
2	I have not worked on projects where alternative methods were used. Clients and professionals tend to use what they are familiar with and systems that have been tried and tested are associated with less risk.
3	I have worked on a turnkey project within the public sector and it had a positive outcome. There were still issues on the project but the end result was attained.
4	I have explored implementing alternatives routes to procurement within the public sector. Due to the urgent nature of the project the Traditional method would prove too time consuming so we proposed an alternative strategy which will deliver within the time constraints. We worked with the NEC contract and a predetermined budget and the contractor agreed to work within that budget. The client understood the urgency of this appointment and therefor agreed to it.
5	Yes I have. We have approached specialist subcontractors and requested pricing within a predetermined budget. This alternative method offered price certainty and high quality of workmanship due to us approaching selected specialists.
6	Yes. I am working on a project where it has been set aside for a Contractor Development Program (EPWP) and the appointment is done by the National Treasury and Public Works. The environment is more relational since they appoint consultants and sub-consultants to ensure flow of communication is effective. It assists the focus of the project. When dealing with traditional methods, the contractors are afraid to put forward their ideas and seek a medium who is higher up on the food chain due to the hierarchy in traditional methods.
7	Yes. Collaborative approaches are better suited to larger projects and have a more evident outcome than on smaller projects. The level of contractors on smaller projects require micromanagement.
8	Yes. Single source procurement. The professional team was joined with a contractor contractually and the project was delivered with great success.
9	I have worked on a project where an alternative method was used and it had a positive effect on the outcome. Contractors were invited based on relevance of experience.
10	I have explored using methods which deviate from the traditional method. There were significant time constraints on a project and we implemented a process which is the NEC option E which is a cost reimbursement structure. This saves time and offers price certainty since the targeted cost is established.

	Have you ever explored options of using alternative procurement routes			
	Yes	No		Positive outcome on projects which used alternative proc methods
1	x			x
2		x		
3	x			x
4	x			x
5	x			x
6	x			x
7	x			x
8	x			x
9	x			x
10	x			x
	90%	10%		90%

Question 8	What in your opinion are the greatest or most common causes of delays, disruptions and cost overruns on projects you have been involved with and with the case in particular?
Case	Response
1	<ul style="list-style-type: none"> • Going out to the open market. Capability of contractors is not guaranteed. The CIDB provides for grading and upskilling but not capability. • Lack of skilled contractors. The fact that they have past experience still does not guarantee the capability or the quality of the work.
2	<ul style="list-style-type: none"> • Misallocation of resources • The client's indecisiveness and lack of understanding • Lack of skilled contractors • Corruption within the tendering process
3	<ul style="list-style-type: none"> • Misallocation of resources • Processes not being implemented timeously within the public department • Delayed payments
4	<ul style="list-style-type: none"> • The client puts the professional team under tremendous pressure to deliver a tender without a detailed scope or design. This gives rise to delays and budget overruns • Approval processes • Political unrest • The procurement process took 6 months longer than intended due to the review and approval processes by the public sector. This had a major impact on the time.
5	<ul style="list-style-type: none"> • Unforeseen items caused major delays (hard rock and water beneath the surfaces) • Varying levels of understanding amongst the contractors and subcontractors • Delayed and inaccurate payments to the contractors
6	<ul style="list-style-type: none"> • Lack of established systems • Political • Lack of resources
7	<ul style="list-style-type: none"> • Lack of sufficient funding • Contractor not understanding the project scope correctly
8	<ul style="list-style-type: none"> • Poor initial planning • Client insufficiently equipped to plan • Contractor performance
9	<ul style="list-style-type: none"> • Generic scopes issued by clients • Defaulting contractor due to lack of experience • Level of performance of design team • Inadequately prepared consultants • Design turn-around time is not met
10	<ul style="list-style-type: none"> • Clients lack of understanding and involvement • Poor planning • Lack of skilled resources

	Lack of skilled resources	Client	Inefficient Departmental Processes	Political	Design	Poor communication	Poor Planning
1	x						
2	x	x					
3		x	x				x
4		x	x	x	x		
5	x	x	x		x	x	
6	x		x	x			
7	x					x	
8	x	x					x
9	x		x	x			
10	x	x					x
	80%	60%	50%	30%	20%	20%	30%

Question 9	How much do you know about this procurement approach? Is the Integrated Project Delivery System a term/method which the public sector/ you are familiar with and would consider using?
Case	Response
1	I am not entirely unfamiliar with features of the suggested procurement route. Methods such as Turnkey have worked within the private sector and could similarly work in the public sector however transparency is essential and must be maintained.
2	<ul style="list-style-type: none"> • I am familiar with it but I would be hesitant to implement it. With our legislative framework, I am uncertain how one would prove an unbiased appointment of contractor.
3	<ul style="list-style-type: none"> • I am familiar with the approach but I would implement it on a project in the private sector instead of public sector.
4	<ul style="list-style-type: none"> • I understand features of the approach but I believe it is difficult to manage in our environment if implemented
5	<ul style="list-style-type: none"> • I am familiar with features of this approach and I welcome the implementation of this approach.
6	<ul style="list-style-type: none"> • I am not too familiar with it but it sounds like a positive system which involves first world thinking
7	<ul style="list-style-type: none"> • I am familiar with features of this approach and I would consider the implementation of this approach with caution.
8	<ul style="list-style-type: none"> • My knowledge is moderate; I have read about it and experienced a variation of it on projects. I would consider implementing this approach.
9	<ul style="list-style-type: none"> • I am familiar with the concept but the term is new. There would have to be very specific circumstances for implementation
10	<ul style="list-style-type: none"> • I am familiar with features of this method and am currently using it on projects within the public sector

	Is the Integrated Project Delivery System a term/method which the public sector/ you are familiar with		Would you consider using IPDS?		
	Yes	No	Yes	No	Uncertain
1	x		x		x
2	x				
3	x				x
4	x			x	
5	x		x		
6		x	x		
7	x		x		
8	x		x		
9	x				x
10	x		x		
	90%	10%	60%	10%	30%

Question 10	In your opinion what would prevent you from using this approach?
Case	Response
1	<ul style="list-style-type: none"> • How would the contractor be selected? Due to the open market this would prove difficult • How would emerging contractors be involved • A monopoly of the successful contractors needs to be avoided. Competition keeps the industry alive, hungry and innovative. I fear that a monopoly would extinguish this. • The process must remain accessible to a new emerging contractor • What criteria would be used to appoint the contractor? Fear of recycling tried and tested contractors • The comfort of being assured a project due to lack of competition may cause contractors to become complacent and this could result in driving costs up • Checks and balances need to be in place to ensure the client is getting value for money
2	<ul style="list-style-type: none"> • The selection process involved with appointing the contractor would be complicated • Transparency issues • The process is very similar to a negotiated contract which has features that I find unfavourable
3	<ul style="list-style-type: none"> • What about the privity of contract law which is the law of our country? You cannot impose another's liability onto a third party
4	I don't think there is anything that would prevent me from using this approach except the client.
5	Nothing would prevent me from using this approach. I think this new innovation is a brilliant concept and I am open to trying it.
6	<ul style="list-style-type: none"> • Implementation of EPWP and government programs must be considered • Emerging contractors must remain empowered • Forcing an individual to accept responsibility of another's actions
7	<ul style="list-style-type: none"> • Consultants may not be motivated to push the team but rather adopt a lazy attitude since the others will carry the load • The contractor should not impact the design since it allows him too much allowance to manipulate the project to his advantage • The project budget being disclosed to the contractor without a BOQ poses many issues
8	<ul style="list-style-type: none"> • Minimal incentive for a contractor to provide the lowest price if he is appointed early in the process and has knowledge of the budget • Limited knowledge of this method • Resistance to change attitudes. The professional team enjoys the hierarchy synonymous with the traditional method • Contractors have a design inferiority complex which has been instilled over time
9	<ul style="list-style-type: none"> • I have concerns regarding transparency • The quality may be compromised on projects due to lack of skills
10	<ul style="list-style-type: none"> • I think transparency would be an issue • trusting the project team with the shared liability • key project participants monopolizing the market needs to be avoided

	Transparency issues	Contractor appointment criteria	Trust amongst PTM's	Client	Nothing
1		x	x		
2	x	x			
3	x	x	x		
4				x	x
5					x
6					
7					
8		x			
9	x				
10	x		x		
	40%	40%	30%	10%	20%

Question 11	In your opinion, what impact would implementing the IPDS approach have on public sector projects? On this particular project?
Case	Response
1	<ul style="list-style-type: none"> • Solutions would be arrived at with greater ease. • Managing the expectations of the client and community by early involvement would be simpler • Collaborative attitude would be adopted • An improved project delivery would be possible due to innovation and collaboration • This would have an effect on fee scales which professionals could view as negative
2	<ul style="list-style-type: none"> • I cannot say completely since I have not dealt with alternative procurement methods within the public sector but I do see the efforts of collaboration as a positive attribute and it would ensure that flow of communication is improved.
3	<ul style="list-style-type: none"> • I think the approach is admirable as long as the tender remains competitive and transparent • The projects which are complex in nature would benefit much more than a generic development would • Singular responsibility allocation would be beneficial
4	<ul style="list-style-type: none"> • The contractor, with his market knowledge can procure materials with increased efficiency • Time would be saved in terms of design • Reduced contract period • Reduced procurement period
5	<ul style="list-style-type: none"> • The team working towards a common milestone • Price alignment • Participation clauses could have a negative impact on implementation
6	<ul style="list-style-type: none"> • The outcome is dependent on the contractor. • The team would motivate each other • The collaborative effort • Time saving impact • More effective communication and improved understanding • Improved accountability
7	<ul style="list-style-type: none"> • The early involvement of the contractor would assist him in understanding the scope. The collaborative effort of the team would ensure all parties are well informed and have the same goals.
8	<ul style="list-style-type: none"> • Implementing IPDS on this project would have resolved many issues with planning and coordination.
9	<ul style="list-style-type: none"> • If implemented by the right team on a suitable project I think it could positively impact the project but I think there are too many variables to consider implementation
10	<ul style="list-style-type: none"> • I think with our current environment implementing this alternative would pose issues but given the opportunity I would implement it due the potential time and cost savings.

	Impact of implementing IPDS				
	Positive collaboration	Improved Innovation	Time saving	Price alignment	Improved planning and coordination
1	x	x			x
2	x				x
3					x
4		x	x	x	
5	x			x	
6	x		x		x
7	x				x
8					x
9	x				
10			x	x	
	60%	20%	30%	30%	60%

Question 12	By implementing IPDS, would successful project delivery have been possible on this project?
Case	Response
1	To some extent. If the contractor had been appointed early enough he would have an improved understanding of the project scope.
2	Perhaps it would enable the contractor to gain an improved understanding of the project and therefore reducing the delays.
3	It would offer great time saving benefits
4	Yes it would result in: <ul style="list-style-type: none"> • Reduced procurement period • Time would be saved in terms of design
5	Yes it would result in: <ul style="list-style-type: none"> • Price and rate certainty • Goal alignment
6	Yes would assist with understanding of scope
7	Yes it would have had a positive effect but not significant.
8	Yes it would have based on the description of IPDS. The buildability would be improves. Accelerated delivery would be a benefit however I predict increased costs.
9	Possibly could have had a positive impact on the time due to improved flow of communication
10	It would have saved time due to a shared understanding of the requirements.

	Yes	No
1	x	
2	x	
3	x	
4	x	
5	x	
6	x	
7	x	
8	x	
9	x	
10	x	
	100%	

Question 13	If you were able to implement IPDS on public sector projects why would this be? Would you be willing to undergo specific training to implement the approach?
Case	Response
1	The collaborative attitude. Training would be welcome.
2	In my opinion a specialized project would accommodate the IPDS approach. It could offer price and quality certainty. Training is definitely a must.
3	The nature and complexity of the project would determine implementation. Perhaps more on specialist trades.
4	To illustrate to the client we can achieve value for money. Training will be necessary
5	To achieve the objectives of the project which, contrary to common belief, is not just the cost factor. I foresee time saving as a key benefit. Training will be essential.
6	The inclusion of technological advancement ie BIM. Yes, training is necessary.
7	To encourage the collaboration on larger specialized projects and where there are time constraints.
8	<ul style="list-style-type: none"> • Implementation would be primarily to adhere to a client requirement. • The complexity of a project would also be a determining factor. • Collective responsibility • Training is required to 'unlearn' the norms that we know.
9	If I were to implement it, this would be on a complex project and where there is an adequate skill level within the project team. The only way to reach the skill level is to undergo the training. I would also implement IPD on projects which have strict time lines and a high level of skill requirement where the risk of 'each man for himself' and appointing a contractor who meets the minimum requirements is eliminated.
10	<ul style="list-style-type: none"> • Cost saving • Time management • Efficiency • Improved communication

	If you were able to implement IPDS on public sector projects why would this be?			
	Collaboration	Complex and specialized Projects	Time Constraints	Price alignment and improved value
1	x			
2		x		x
3		x		
4				x
5			x	
6	x			
7	x	x	x	
8	x	x		
9	x	x	x	
10	x		x	x
	60%	50%	40%	30%

Question 14	Would other public sector project parameters required as part of the PPPFA affect the use of alternative procurement routes? In which ways if they do?
Case	Response
1	<ul style="list-style-type: none"> • The risk of corruption could be more prominent with alternative methods. The project objectives need to be incentivized to avoid or reduce room for corruption. • Alternative systems are open to abuse and a framework to avoid this must be implemented so transparency is essential • Promotion of emerging contractor's is essential
2	I do not see them affecting the framework in any way unless they are contradictory to the legislature of the country.
3	I don't see them affecting the implementation. I think the framework can be applied to any method although the associated risks must be noted.
4	I do not think this should affect the implementation of alternative procurement methods since they can still be applied throughout the processes. The project team all need to meet the minimum requirements in order to be awarded. The tender qualification process must remain the same.
5	Yes since this would need to be published in the gazette and propose for governance. It is not an issue which cannot be overcome.
6	Yes the government programs which are structured to assist the emerging contractors and HDI's will act as a barrier to implementation and affect the extent of the use of alternative methods.
7	Yes, due to the laws in our country, fair opportunity needs to be afforded to everyone and the BBBEE clauses need to be implemented. All appointments need to be fair, equitable and transparent. Our legislation makes it difficult to adopt alternatives
8	<p>Yes it would.</p> <p>Public municipal finance act has a built in requirement for a competitive process, value for money and equal competition.</p> <p>What is the basis of the team's appointment? Imposing team members on each other may contradict some of our legislature. I think some elements of this approach will not comply with our regulations and in order to reach compliance, you will lose some of the effect of IPDS.</p>
9	The inherent challenge is that the PPFA regulations speak to the CIDB's model. It is adaptable but will need work. There are various aspects for consideration and unless some of the regulations are relaxed, it will be difficult to implement alternate procurement methods.
10	I don't think they would affect the implementation since alternative methods are being explored currently.

	Would other public sector project parameters required as part of the PPPFA affect the use of alternative procurement routes?	
	Yes	No
1	x	
2		x
3		x
4		x
5	x	
6	x	
7	x	
8	x	
9	x	
10		x
	60%	40%

Question 15	What other comments do you have about public sector procurement?
Case	Response
1	Processes are too time consuming within the existing methods of procurement. The fear of individual accountability, (which is not in dispute) does bring about elements of over designing or performing a trade with extreme unnecessary caution and inhibits innovation to a degree.
2	<ul style="list-style-type: none"> • Consider appointing a coordination officer to detect issues such as service clashes • Upskill the resources within the public sector • Allocate the appropriate budget to a project and stick to it.
3	<p>IDMS- Infrastructure Delivery Management System</p> <p>SIPDM-Stand for infrastructure Procurement, Delivery and Management: this is an element of the IDMS. This is a 9 gated project management system which will assist with integration in the context of government. This is to facilitate the integration of synergies between programs so that they are developed simultaneously to increase efficiencies and reduce waste reduction. Each sector has their own goals and budgets but the end goal is to align these.</p> <p>The separation of infrastructure and goods shows a positive change towards transformation within the public sector procurement.</p>
4	<p>There is nothing wrong with public sector procurement except the approval process and the screening of contractors.</p> <p>The main issue for me when screening the contractors is that the criteria of quality, functionality and price but the lowest priced tender is still awarded and the capability of the contractor is disregarded resulting in workmanship being compromised.</p>
5	Public sector processes have a long turnaround time. Budget allocations are not planned accordingly and a great deal of effort is put into the pre tender processes with no result. In 2016 we launched 230 projects, in 2017 we launched 9 due to lack of budget. The feasibility studies are compiled however the reviewing processes are so lengthy that the professionals are notified at a late stage that while it is a feasible project, there is no budget to support the project.
6	Late payments to contractors is a recurring issue. This stems from many political issues with public sector and it has a negative impact on the quality and time frame. The processes are too lengthy. Accountability is shifted amongst individuals and therefore there is minimal resolve to issues.
7	<p>Traditional method is rigid but has been proven to work.</p> <p>Public sector has solid systems in place to promote emerging contractors and to upskill communities however the implementation of the systems is questionable. The system to select contractors and EME's need to be refined to include functionality and physical capability and not just financial capability.</p>

<p>8</p>	<p>Public sector procurement in the recent years has become much more complex due to advent of consultant tendering. Prior to this there was a roster based on circulation and work load. It was subjective however it eliminated the need for competition and an additional layer of tender. A request for quotations from consultant based on an estimated budget from the department is on average a 6 month long process before the design is even started. These projects are also largely generic. These processes are very time consuming. The public sector and its entities, over time, will improve and evolve. It is very likely that the IPDS approaches will be adopted.</p>
<p>9</p>	<p>I think that the systems are rather rigid but it is the best system for right now within this developing economy, considering lack of resources; skill shortage; mal-administration; rampant corruption, gate keeping etc. I agree that a system like IPD is necessary but implementation will have to wait until we have the capacity.</p>
<p>10</p>	<p>Processes are inefficient. Political influences are an issue. There are too many gate keepers and lengthy drawn out processes.</p>

Appendix F: Turnitin Report

Turnitin Draft 2			
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