IDENTIFYING DESIGN ALTERNATIVES FOR THE WINDHOEK MUNICIPALITY BY APPLYING THE FAST DIAGRAM

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ABSTRACT

Purpose - *Value management has been in use for many decades, yet in Namibia most built environment professionals are vaguely familiar with the concept and are not aware of the benefits of this practice, and that it can add value for money without reducing quality.*

This research seeks to focus on the value management methodology and more specifically give insight into the use of the Functional Analysis Systems Technique (FAST) diagram in the built environment within a local government context.

Design/methodology/approach - *To establish how a FAST model can be used as a tool to design roads and introduce alternative materials with a focus on reducing cost for municipal projects. This would address the design methods, design team composition, construction methods and availability of material taking environmental sustainability into consideration. The benefits and cost of value management are reviewed and the importance of value management as an integrated practice of the project management process of the Municipality is explored. A quantitative method is used to determine the applicability of the FAST diagram within the project team and current project environment.*

A likert Scale questionnaire was used to establish the current use of value management techniques, effectiveness of project implementation process and additional challenges related to availability of material in the Windhoek Municipality.

Results – The research delineated project management challenges which reduce project success rate. It also outlines the impact of FAST model and its advantages. This includes improving project cost, monitoring and successful execution of a construction project. The FAST has a positive impact on challenges as established by the research. Project risks are mitigated early during the planning, composition of the project team, efficiency is improved and scope is managed. There is a reduction in time and cost overrun resulting in improved project success.

Limitations – *Given the exploratory nature of this research, the amount of data is restricted to a single municipality of Namibia.*

Keywords *– Value Management, FAST diagram, Value Engineering*

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1. INTRODUCTION

This chapter provides an introduction and an overview of the study. The background to the study is also discussed.

The chapter further presents the problem statement, research question and objectives, a hypothesis, the aim of the study and research methodology. The outline structure of the report is also discussed

1.1 BACKGROUND TO THE STUDY

The Windhoek Municipality forms the administrative legislative and judicial center of Namibia, with a population representative of over 15% of the total population (Namibia Census report, 2011). As the Capital and the largest city in the country, it has become attractive to rural dwellers seeking job opportunities. This tremendous population growth in Windhoek is putting pressure on the municipality's financial resources for the provision of basic services and economic development. The Windhoek Municipality is tasked by the Local Authorities Act of 2002 with provision of basic services and development of land.

When the Government of Namibia came to power in 1990 it inherited a housing sector with disparities. As a result the government developed an array of legal instruments to facilitate the access to developed land, one of which is the National Housing Policy. The Namibia National Housing Policy Namibia-Government (2009) promotes an integrated township development approach. The policy further aims to pursue the concept of creating sustainable human settlements endowed with all social and economic facets necessary to sustain communities without compromising on quality and security of tenure. In line with meeting government objectives, the Windhoek Municipality introduced an Integrated Business Plan in 2012. The document provides a basic strategy of operations of Council for the next five years, placing emphasis on delivery of affordable, durable, adequate and qualitative township development outputs. For this very reason the plan advocates

mobilization of internal savings and commits to render affordable, efficient and effective services to its customers. To enable the Windhoek Municipality to provide affordable housing, alternative material, construction method and new technologies must be explored. The plan calls for sustainable development principles at the core of overall municipal planning (CoW, 2015). In order to manage urbanization and mitigate urban sprawl the planners must use resources optimally to maximize service delivery.

The Windhoek Municipality has encountered civic protests from May 2015 as the residents threatened to grab land illegally due to shortage of serviced land. Applications for land amounting to more than 20 000 where received in the year 2015 alone of which approximately only 300 could be provided with serviced land. The shortage of serviced land is mainly due to ineffective project implementation processes; project costs estimates, project schedule estimate, project integration and interdepartmental dependency of projects.

This research will focus on improving project success within the organization by introducing the value management technique, Functional Analysis Systems Technique (FAST) into the construction project implementation process of the organization. It argues that FAST can assist the organization to truly determine total impacts and cost and to identify sustainable construction strategies to reduce project costs without compromising on quality. The structure of the organization is assumed to influence the project implementation and decision making process. Baccarini (1996) found that project success is influenced by organizational structure in terms of communication and reporting, allocation of responsibility and authority for decision making and how projects are supported by top management. Especially in relation to construction projects which involve a lot of different role players such as clients, consultants and contractor for a specific periods of time. Many studies have concentrated on Value Management (V.M) in the construction industry, and confirmed its success in addressing problems such as budget constraints and project complexity (Fong and Shen, 2000; AL-Yami and Prince, 2006; Coetzee, 2009; Bowen *et al.*, 2010; Banaitiene and Banaitis, 2012; Amiril *et al.*, 2014). Value management embodies tools like Functional Analysis Systems Technique (FAST) that can be applied to analyze components of a system to ensure optimum use of available resources. These tools are useful in construction projects which make use of scarce resources especially in recent times where the global community is focused on sustainable development.

Sustainable development is about meeting basic needs and the integrity of the biophysical environment. The Construction sector's role is twofold; it is the intermediary for improving quality of life and also the "*actor that will determine the environment and social sustainability of development endeavors*" (Du Plessis, 2007: 68). The City of Windhoek is faced with a problem of to providing infrastructure and affordable housing. It also has to deal with scarce resources whilst finding solutions that retain quality in provision of services. This will require project management interaction to ensure that role players tasked with development goals are equipped with the tools to adopt improved techniques and gain value for money. To facilitate the development of a strategy for introducing this principle, the employment of FAST as a business technique is advocated by this research.

Value management originated in the USA manufacturing industry, and is now widely applied as an important project management tool all over the world (Ellis *et al.*, 2005). Hence a number of bodies have documented guidelines to provide a structured model for undertaking the value management process. The Value Engineering methodology was found to be useful in construction projects as a cost cutting exercise without compromising on quality requirements (Male *et al.*, 2007).

In the 1950's Value Engineering was growing at a rapid rate, which lead to the establishment of the Society of American Value Engineers (SAVE, 2015), the concept further spread to Europe in 1960's and this gave birth to the Value Engineering Association. Both this societies find the term Value Engineering and Value Management to be synonymous (Kelly *et al.*, 2015). The definitions provided by the Save International for both terms are:

Value Engineering – "*the application of a value methodology to a planned or conceptual project or service to achieve value improvement." (Kelly et al., 2015: 22)*

Value Management – *"the application of a value methodology by an organization to achieve strategic value improvement."(Kelly et al., 2015: 22)*

Value Methodology - "*provides the process and structure that is used to apply the Value Job Plan used in a workshop (SAVE, 2015)."*

This research report will review the organizational structure and project implementation process of the Windhoek Municipality, and map the project management process using the PMBOK (PMI, 2008) as a benchmark. It will then evaluate the feasibility of introducing of the Value Management technique, FAST within the structures of the Windhoek Municipality.

1.2 ORGANIZATION BACKGROUND

The Windhoek Municipality is a functional organization that resides under the Ministry of Urban and Rural Development. The author has been working for the Windhoek Municipality for the past 15 years in various capacities. The observation while working for the Infrastructure Department was that Value Management tools have not been applied to most of the processes. The various Department providing functions to projects are not integrated and do not support the basic Project Management processes.

The functional structure encourages individual implementation of projects in the departments. Projects are sourced by the heads of functional departments, while there is no project management office or project managers to oversee the project implementation process.

This research will concentrate on the implementation process of a road construction project from feasibility, design, implementation and closeout within the Windhoek Municipality department of infrastructure.

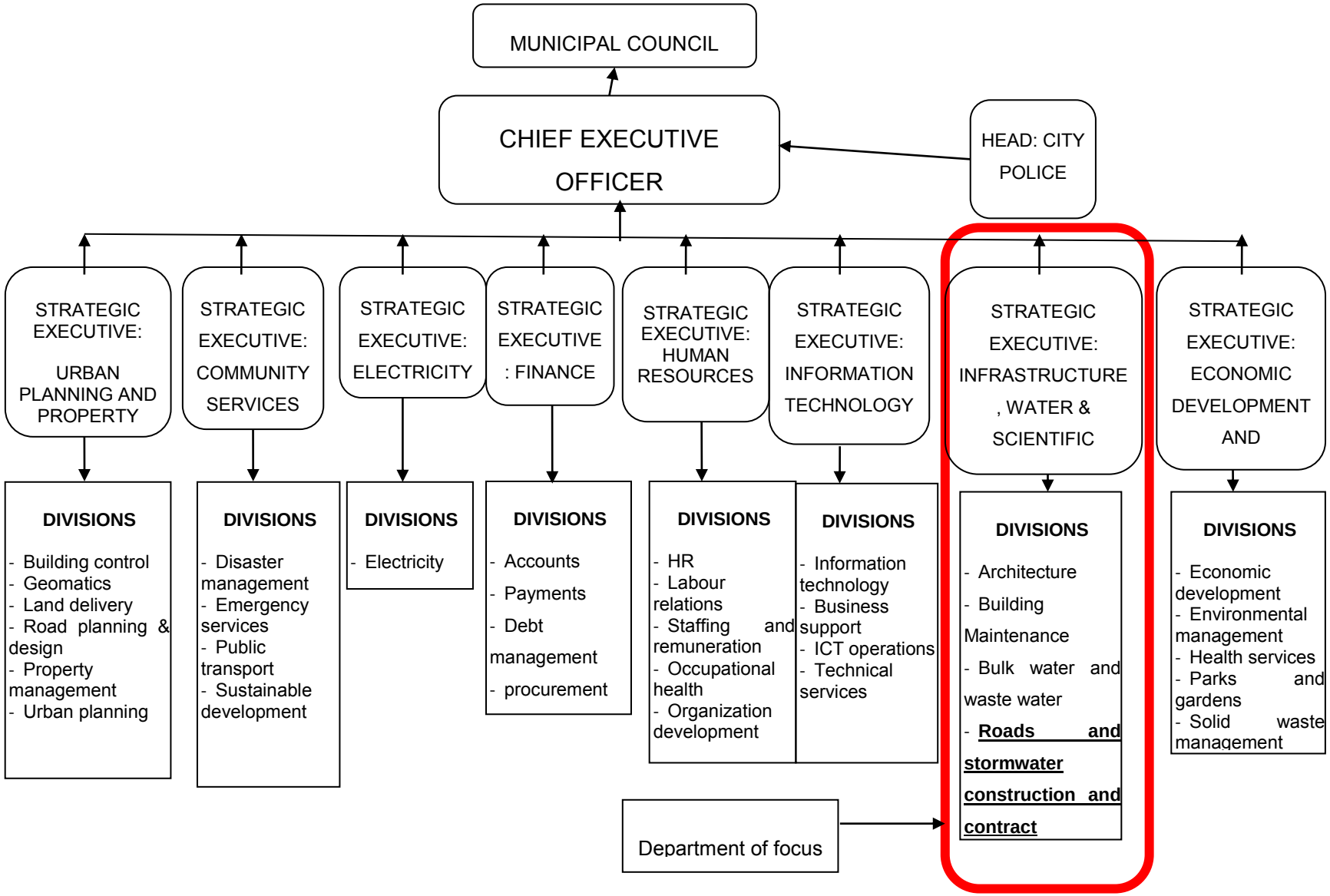


FIGURE 1-1: ORGANIZATIONAL MANAGEMENT STRUCTURE

1.2.1 Road construction project implementation process

Township layouts are prepared through the Town Planning office. Some of the Township layouts have been approved as far back as 10 years ago. But due to budget constraints, implementation of the projects is in most cases delayed indefinitely.

Once an area is identified for development the project is handed over to the Department of Infrastructure.

Due to a lack of capacity most projects are handed over to consultants to manage all the processes.

The project implementation process is as follows:

1.2.2 Feasibility study

The end of phase produces the following

Confirms the road alignment and alternatives

And Cost benefit analysis

1.2.3 Planning and development

The end of phase produces the scoping report, which summarizes:

- Description of the proposed project
- Description of the site on which the project is to be undertaken
- Description of the environment that may be affected by the proposed project in terms of geographical, physical, biological, social, economic and cultural aspects of the environment.
- An identification of laws and guidelines that have been considered in the preparation of the scoping report.
- Details of the public consultation

1.2.4 Design

The Terms of Reference (TOR) sets out the standard design criteria for road works offering an acceptable level of service while constructing infrastructure to be owned and

operated by the Municipality of Windhoek. The TOR is not intended to eliminate the necessity for detailed design by a professional engineer, rather it is intended to standardize the materials, design criteria, and method of construction to be utilized in the installation of standard municipal services. This creates much greater certainty for companies as all they have to do is comply with such standards. It is not intended to prohibit any alternative arrangements or approaches. Innovative or non-standard designs may be considered, but not necessarily accepted by the Municipality. Sufficient data and principles of design for any innovative or non-standard design shall be submitted for consideration. Where, in the judgment of the Consultant, variations from the standards are justified or required, and where the Consultant can show that alternate approaches can produce the desired results, such approaches are normally considered for approval as an “alternative”.

Without doubt this creates a time consuming exercise for the designer to produce two complete proposals for consideration. The time constraint normally limits such options to be explored by the designer, as such alternative designs do not guarantee compensation.

The contractor has an opportunity to propose alternatives through the Value Engineering Incentive Clause of his contract, during the construction stage. Paraphrased, this clause of the general contract conditions states: “the Contractor, if you determine that in any portion of your contract the basic function may be performed at least as well by another method, you may submit your Value Engineering Change Proposal (VECP). If approved, the client will share with in accordance with the sharing arrangement, of the contract clause.” Generally, the sharing arrangement is 50/50 of costs saved. The incentive clause avails the client the opportunity to effect construction savings and life cycle cost savings in accordance with the contractor’s functional analysis and actual in-the-field experience.

1.2.5 Construction

Design alternatives are offered at submission of bids or during construction as value engineering change proposals. The Tender document contains a Clause which makes provision for eth contractor contractors to produce design alternatives during the implementation stage if they so wish. The alternative design requirements are not limited

but are considered on condition that these are accompanied by the cost implications, designs, and drawings of such alterations or qualifications.

If designs change proposal is accepted to be used in the works and the change results in a reduction in the contract value, such identified saving are split 50%/50% between the Employer and the Contractor.

1.2.6 Close Out

The close out process entails submission of as-built drawings and a final report by the Consultant

1.3 RESEARCH PROBLEM

The Namibian national housing policy (2009) embraces the vision and principles of an ideal society. Apart from envisioning an ideal society, it is a reflection of the Namibian Government's commitment to healthy living and the socio-economic growth of the nation. The aim is to strategically position housing to play a more meaningful role in the development strategy for Vision 2030 goals. It promotes an integrated development approach from the housing point of view, especially within the context of Namibia's sustainable development efforts in collaboration with other socio-economic sectors such as health, education, nature conservation, energy, water and sanitation, transport, and financial services. The aim is to pursue the concept of "creating sustainable human settlements" endowed with all social and economic ingredients necessary to sustain communities, particularly in rural areas without neglecting urban development and to provide security of tenure (Namibia-Government, 2009).

A primary emphasis in the policy if to delivering affordable, durable, adequate, and qualitative housing outputs in order to shelter as many Namibians as possible. For this very reason, the policy advocates the importance of aggressive mobilization of domestic

savings, government interventions as well as exploring alternative building materials and technologies to enable Namibia to provide more and affordable housing to her people.

The Windhoek Municipality due to rapid urbanization has been a hive of infrastructure development in order to stimulate economic growth. This major development challenge has resulted in negative effects to the natural resources. Road construction is the most costly operation in provision of serviced land (55%). A recent study into availability of earthworks material revealed that the borrow pits available for the City's project have become depleted and the City would have to source such material from commercial sources which will increase the already costly road construction operation. The effect of such heavy financial obligation will reduce the Councils ability to provide affordable land which is already in high demand. Effective financial management through the process of V.M can assist the municipality to reduce development cost by exploring alternative construction material, design and sustainable construction practices (Amiril *et al.*, 2014). Value Engineering change proposals have not been effective due to the tender bid periods, which do not give the Contractor time to review design options.

The Windhoek Municipality has a functional organization structure with little or no project management characteristics. Robbins *et al. (2009)* found that the mayor disadvantage of a functional structure is the difficulty to coordinate the tasks of diverse functional specialists so that their activities are completed on time and within budget.

1.4 PROBLEM STATEMENT

The current process used by the Windhoek Municipality for road and infrastructure development do not sufficiently engage with the principles of sustainable and innovative design and use of construction material and methods.

1.5 RESEARCH QUESTION

The general research question to be addressed:

“How could the V.M FAST diagram approach be used to improve road and infrastructure development processes in Namibia?”

- What are the existing development processes and how inefficient are they?
- What is FAST and how is it applied?
- What benefits could be expected from using FAST?
- What implementation issues would arise from adopting FAST?

1.6 RESEARCH AIM

The aim of this research is to assess the feasibility of introducing Function Analysis Systems Technique (FAST) to the Windhoek Municipality to achieve sustainable construction strategies.

1.7 RESEARCH PROPOSITION

This study identifies factors contributing to the challenges in implementing value management in Windhoek Municipality with a focus on alternative construction methods that will increase value for money and improve sustainable construction strategies.

The research proposition is:

There are specific factors which are influencing the lack of successful project delivery process which can be improved by introducing the FAST.

1.8 RESEARCH OBJECTIVES

From the research question above the objectives of the study are as follows:

- Assess the feasibility of introducing the Value Management tool to the Windhoek Municipality and Project team
- Identify at which stage of the project the FAST can be introduced on future projects

1.9 RESEARCH METHODOLOGY

The above objectives will be achieved by adopting the following research methods:

- A literature review on the application of Value Management for construction projects, the project development process and sustainable development.
- Quantitative research method will be used.

1.10 LIMITATIONS

The study only focuses on the effective implementation of FAST to the project management process of the Windhoek Municipality. The reason why it is only narrowed to Windhoek Municipality is because it is the biggest municipality in Namibia predominantly known to attract an influx of people looking for greener pastures, thus dealing major service delivery project in a city which is developing at a fast pace with limited resources.

1.11 STRUCTURE OF THE REPORT

The research is structured in six chapters inclusive of this introductory chapter 1.

The contents of the remaining chapters are as outlined below:

Chapter 2: This chapter provides a theoretical framework where literature and concepts relevant to the study are discussed and critically analyzed. These include subjects concerning: Value management, Functional Analysis Systems Technique, change management, sustainable construction.

Chapter 3: This chapter will focus on the research design, the different research methodologies, presentation of the research design, the measuring instrument and data analysis applied in the research.

Chapter 4: This chapter presents the research findings.

Chapter 5: This chapter provides an in-depth discussion and concluding remarks as observed from the research findings.

2 LITERATURE REVIEW

2.1 INTRODUCTION

The major objective of this chapter is to present the relevant theoretical approaches and linkages regarding FAST and value management in general as an alternative way to approach the design process. Special focus will be on the construction industry with particular interest in the functional approach. The concepts and principles of value management methodology will be explored in the context of road design and construction projects. A conceptual framework within which value management technique, the FAST method can be utilized to produce a better design solution is presented. In addition to this, the chapter shall explore the thematic areas raised by the research questions, in terms of project process and sustainability, and what benefits can be expected from using FAST.

2.2 PROJECT DEVELOPMENT PROCESS

The process of planning and managing projects breaks the project into different phases to ensure better management control. Each phase of the project leads to the next and the phase can overlap, with each having a purpose and scope of work with results to move on to the next stage.

- Project concept phase includes a needs assessment process to determine the client needs.
- Planning and programming phase is to produce general plans.
- The design phase includes the actual planning and design of a project.
- The implement / construction phase completes the structure or building and the scope of the project
- The evaluation of project results occurs at the end of a project and involves determining whether the project's goal and objectives were achieved.
- Project monitoring occurs throughout all stages allowing for small adjustments in the project's planning, design, and implementation in order to ensure the project's success (Kelly *et al.*, 2015).

Project managers have to deal with difficult circumstance in decision making when they have to integrate sustainability and project success due to high level of uncertainty in the project environment. Project success in the construction industry is traditionally defined in terms of cost, schedule, quality and safety, which lacks interconnectedness with sustainability. Hence, Kilbert (1994) cited by (Gambatese and Rajendran, 2005) proposed three additional sustainable project success criteria, which are resource depletion, environmental degradation and healthy environment. The dilemma is how to consider all criteria within one project design tool to be implemented when choosing amongst a range of alternative materials, product and systems (Gambatese and Rajendran, 2005). Decision making is an important function of project management because strategies to meet project and organizational objectives depend on creative managerial decisions (Fong, 1999). Taking systematic decisions require creativity in the process of generating new, unique ideas and systems to improve project success whilst advancing construction sustainability. To ensure project success, the project team must utilize and establish tools, skill, techniques and available resources to facilitate the decision making process in terms of planning, function design and implementation methodology. Often, decision making relies on the acquired information, availability and analysis (Leung and Liu, 2003). Morris and Hough (1987) cited by (Kelly *et al.*, 2015) identified that project success depends on availability of key information which can be identified through a structured information sharing and analysis value study deploying value management techniques.

Challenges exist in the infrastructure delivery process, especially in the planning, budgeting and financial management during the project implementation stage. This leads to extensive delays as poorly planned projects cannot be budgeted for; budgets are often underestimated, or planned over several budget periods as a result funds are not made available in a timely manner; and procurement which leads to activities being poorly undertaken.

2.3 SUSTAINABLE CONSTRUCTION

The current demand for sustainable and economically viable structures in the Namibian construction sector requires efficient utilization of natural resources. To understand and implement sustainability objectives remains a challenge for the construction industry

worldwide due to multi-facet perspectives of sustainability such as, the economy, society, environment augmented by a lack of structured methodology at project process levels (Ugwu and Haupt, 2007). While the terms 'green roads', 'green building' and 'sustainable architecture' have been in use for some time, the first definition of sustainable construction was proposed at the First International Conference on Sustainable Construction in Tampa, 1994: "Sustainable construction is the creation and responsible management of a healthy built environment based on resource efficient and ecological principles" (Bourdeau, 1999: 357). Other definitions include: Sustainable construction, in its own processes and products during the project cycle, aims to minimize environmental and social damage through selection of suitable material, determining elements of design and choice of construction methodology (Abidin and Pasquire, 2005). Or as a way of building which aims at reducing (negative) health and environmental impacts caused by the construction process (Du Plessis, 2001). This definitions do not directly link sustainability to value management but issues addressed within sustainability such as energy efficiency, minimize waste, good indoor environmental quality, low running costs, aesthetics, user comfort etc. are common in V.M studies as a component of the FAST diagram (Abidin and Pasquire, 2005). Value Management takes many factors into account which include environmental protection and social issues to produce long term sustainable solutions within the construction industry (Phillips, 1999). The interpretation of value has thus broadened to include sustainability which considers concerns surrounding depletion of the environment. Abidin and Pasquire (2007) affirms that the dimensions of sustainability adds value to the project in terms of improved quality, quality outputs, increased productivity, reduction of life cost and business development whilst promoting a balance between business growth and preserving the environment. The issues surrounding sustainability can be adopted within the FAST method before major decisions are made within the project. The economic benefit for Windhoek Municipality's road infrastructure and use is visible but the scarcity and degradation of road construction material in and around the Windhoek Municipality is an indication that the environmental impact and associated future economic impacts have been underestimated. "A typical two lane bitumen road with an aggregate base can require 25000 tons of material per kilometer, showing why aggregates are the most mined resource in the world" for infrastructure development (Whistler *et al*., 2012). It is thus crucial that the Windhoek Municipality implements sustainability concepts through FAST in the infrastructure department to guarantee support by key stakeholders.

To manifest sustainability within an organization, change needs to take place on three specific levels within the organization, namely, the strategic level, process or methodological level and operational level. Integration of sustainability into the business environment is introduced at the strategic and operational levels, through endorsement of international agreements or by including the principles of sustainable development in the organization's vision and mission statements (Labuschagne and Brent, 2007).

2.4 FUNCTIONAL ANALYSIS SYSTEMS TECHNIQUE: FAST

Lawrence D. Miles of General electric developed value analysis, a systematic functional approach to cost reduction in the 1940s. After establishment of the Society of American Value Engineers (SAVE) the term value engineering came into existence. Various terms have since described the principle of value engineering. The SAVE International Standard uses the term value methodology, highlighting that it includes the processes known as value analysis, value engineering, value management, value control, value improvement and value assurance (SAVE, 2015).

Value Engineers (SAVE, 2015) defines Value Management as follows:

"*Value management (synonymous to value engineering, value analysis) is a function-oriented, systematic team approach to provide value in a product, system or service. Often, this improvement is focused on cost reduction, even though other improvements such as customer-perceived quality and performance are also paramount in the value equation."*

The British and European Standard on Value Management (3a), states that: *Value management is distinct from any other management approach by bringing together simultaneously attributes not normally found together into a single management system. It is the only system that brings together management goals, positive human dynamics consideration of external and internal environment, effective methods and tools within a single framework.*

It defines Value Management as: "a style of management, particular dedicated to mobilizing people, develop skills and promote synergies and innovation, with the aim of maximizing the overall performance of an organization (Kelly et al., 2015: 32).

The value management method can be applied at four levels in the project delivery process in systematic stages of; concept, feasibility, design, and construction through a nine step "job plan" (Table 2-1)(Kelly *et al.*, 2015). These nine steps are preparation, information, functional analysis, creativity, evaluation, development, presentation, and implementation and monitoring. Whilst it is recognized that this job plan was built up by Miles as a practical problem-solving method, the basic approach to problem-solving is similar with general problem-solving methods except for the specific focus on analysis of functions (Olanrewaju, 2013). The Value engineering Job Plan is the overall framework that carries out a value analysis study to ensure that alternatives are not unnecessarily omitted.

Table 2-1 Value Management Job Plan adopted from Olanrewaju (2013)

Work activities	**phases**	**What to do**	**questions**	**techniques**
Pre study	preparation	Select component to be studied, train members, arrange venue,	What is to be studied? Why must it be studied	Identify area of potential
Value study	information	Collect latest and correct information	What it is to be studied	Request for fact from reliable sources
	Functional analysis	Identify, classify and document function	What must it do	Identify main functions, cost and allocate worth
	creativity	Generate alternative ideas	What else will perform the functions	Simplify and classify functions, use creativity
	evaluation	Evaluate by comparison and modified alternative ideas	What is the cost and worth of the alternatives? Is it cheapest	Establish standard for evaluation, development cost and worth model
	development	Develop evaluate alternatives	Will it work, will it meet client's requirements	Collect, translate facts and consider alternatives
	presentation	Method of presentation, present workable alternatives	List benefits and constraints	Method of preparation, prepare reports
Post study	implementation	Implement presented ides	Who will implement it	Implement ideas
	monitoring	Monitor results	Ideas successful or not what are the benefits	Final feedback and feed forward

The Job Plan guides the study team through the process of identifying and focusing on key project functions in order to create new ideas and to ensure that alternatives are not unnecessarily omitted, that will result in value improvement.

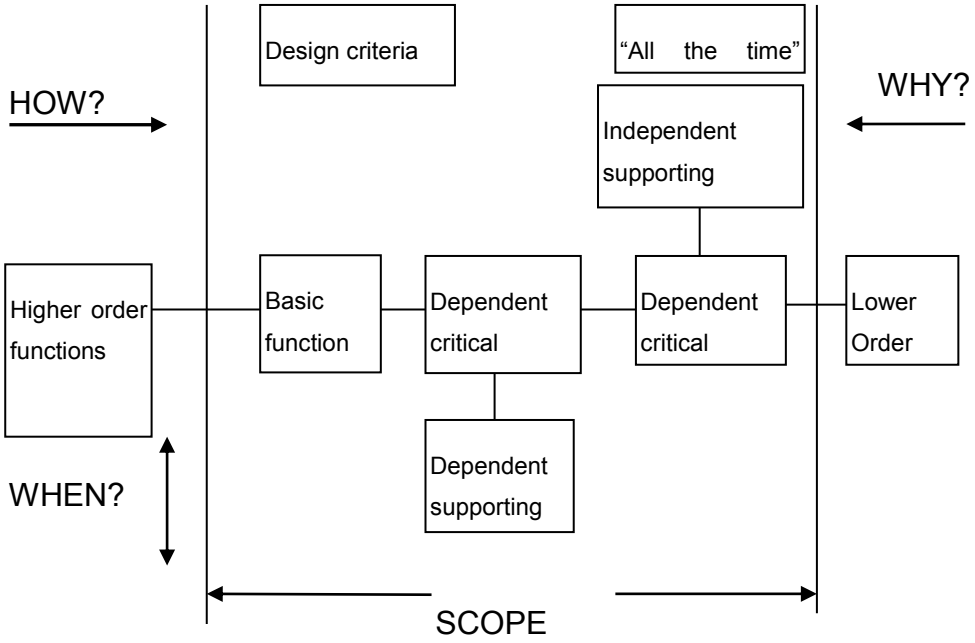
FAST is a requirement oriented and functional based tool, developed by Charles Bytheway in 1964, to support the functional analysis process in order to understand how the functions of a product, process or service performs (SAVE, 2015). Dell'isola introduced the

technique into the construction industry in the 1960's which has since spread widely in the world and has made successful contributions to cost savings and added value to construction projects. V.M has now become a common management tool used in identification of unnecessary costs and advances the concept of value and functions (Kelly et al., 2015). The technique enables a set of functions performed by a product to be expressed in terms of a diagram similar to a critical path precedence diagram. The technique is based on linking functions on the basis of "how-why" logic. The diagrams were developed in the same era as critical path analysis, particularly precedence diagrams, and bear a very similar appearance to those diagrams. The term "critical path" was used as part of the process.

FAST sets a platform for systematic and creative problem solving. The process employs a team of experts, project team members and the client that fully understand technical and value aspects of the project to review project objectives and define alternative options in achieving certain project goals (Fong, 1999). The Multidisciplinary make-up of the team creates a platform to address the problem objectively without bias or preconceived conclusions in a value workshop set up. FAST is concerned with defining what value actually means within a particular context, agreeing a clear statement of objectives and ensuring that solutions are consistent with those objectives (Kelly *et al.*, 2015).

The FAST diagram is introduced during the function and creative phases of the job plan. Although there are two basic types of FAST diagrams (technical or conventional and customer), I will concentrate on the technical FAST diagram in this paper, as this is the one utilized in the construction industry. The FAST diagram provides an understanding of the basic reason a function exists on a system. The description of the function is expressed as an active verb and a descriptive noun refer to Table 2-2. The functions and associated sub functions are displayed in a diagram as depicted in typical FAST in Figure 2-1 and an actual FAST in Figure 2-2. The diagram organizes the functions as that need to be performed, into a How/Why? relationship with the highest order needs at the top and the lowest order wants at the bottom.

FIGURE 2-1 Typical technical FAST diagram adopted from (Borza, 2011)



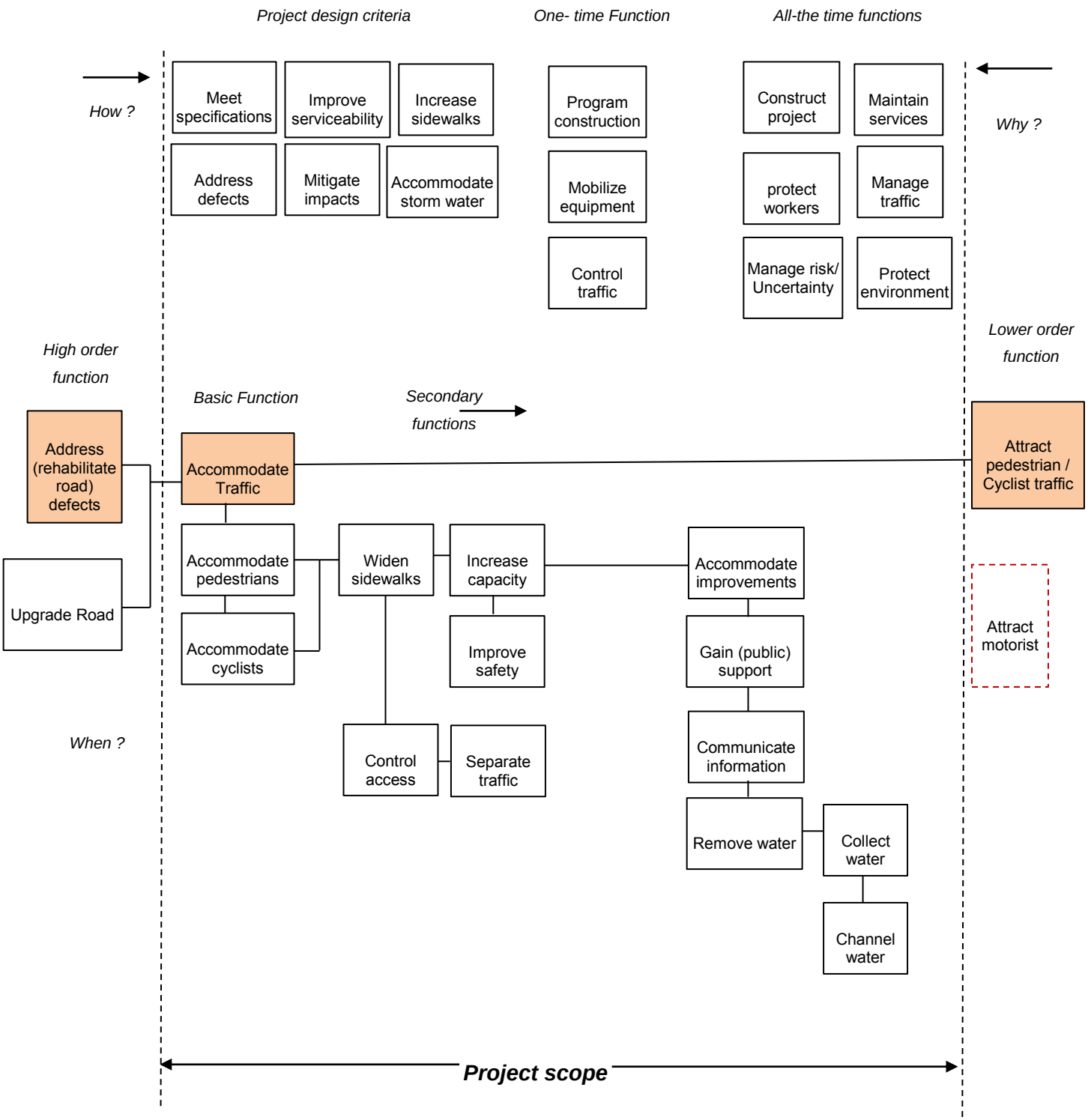
The FAST can be applied to any situation that can be described functionally which makes it an effective management tool. The tool however does have limitations which must be taken into consideration on application. The FAST diagram does not have dimensions. Functions are displayed in a logical sequence, prioritized and dependency tested. The dimensions to test specifications and performance must be added to the model to ensure successful application.

The "why-how logic" ensures creativity when analyzing a function and use thereof. By restricting the description of functions to just two words, forces the value team to clearly and concisely capture what task needs to be done and not how it is performed. This logic allows the team to be creative in exploring alternatives and is especially beneficial in breaking down tasks in manageable portions and to get to the root of the problem. Crucial to producing a successful FAST is the expertise of the team and grasping the concept of generating functions

Table 2-2 Function Analysis Verb-Noun Statement for a road construction project

Component	Verb	Noun
Project (Purpose and Need)	Address (rehabilitate)	Defects
Project	Accommodate	Traffic
	Increase	Capacity
	Improve	Safety
	Accommodate	Pedestrians/Bicyclists
	Attract	Pedestrians
	Gain	(Community) Support
Capacity	widen	sidewalk
	Increase	(width
Sidewalks (shoulder)	Accommodate	Pull-off / Recovery
	Accommodate	cyclist
	Refuge	Drivers
	Expedite	Stormwater
Median	Separate	Traffic
	Control	Access
Kerb & channel (Gutter)	Collect/Convey	Stormwater
	Control	Access
Road surface(Base and Pavement)	Support	Load
	Protect	Base
	Increase	Friction
Earthwork	Support	Roadway
	Create	Profile
Right-of-Way	Accommodate	upgrading
	Create	Space
Schedule	program	Construction
Public Services	Maintain	Services
Drainage	Collect	Stormwater
	Convey	Stormwater
	Treat	Stormwater
Traffic Control	Control	Traffic
	Manage	Traffic
	Maintain	Traffic
	Protect	Workers/Users
	Facilitate	Construction
Signalization, Signing & Pavement Markings	Control	Traffic
	Direct	Traffic
	Delineate	Road
	Communicate	Information
Mobilization	Mobilize	Equipment
Contingency	Mitigate	Uncertainty
	Manage	Risks
Lighting	Illuminate	Facility
Erosion Control	prevent	erosion

Figure 2-2 FAST diagram - Road upgrading



Once the team understands the concept of functions, the workshop facilitator leads the team through a brainstorming session to create functions (Table 2-2). There are several techniques to enhance creativity. The most suitable technique is selected depending on the project and the setup of the value team.

Functions are defined as “that what a product or service must do to make it work or sell”. Such functions are described in a two word format. The first word is always an active verb and the last word of the name is always a noun. “Protect base layer” is a name of a function, “protect being the active verb and “base layer” being the noun. The name given to a function describes what it is to accomplish without being specific about the method of accomplishment.

Figure 2-1 shows different description of functions. Functions are divided into two groups Basic functions and secondary functions.

“Basic functions describes describe the primary critical function performance feature(s) required of a product or service in order to satisfy customer’s needs. Secondary functions are those functions required for the basic function to work and are non-essential in satisfying the basic needs. The Secondary or supporting function can be either required or non-essential. The basic function and required secondary function(s) constitute the net function leading to the workability of a product or service. By focusing on the basic function and required secondary function, any unnecessary cost associated with a product or service will be removed” (Fong et al., 2001: 308).

The main goal of a development is to achieve end-user satisfaction and to optimize the total economic value of a project design. Traditional value management is mostly based on economic value aspects emphasizing techniques such as structured job plans, the Functional Analysis Systems Technique (FAST), Simple Multi Attribute Rating Technique (SMART)(Green, 1994) and methods to enhance creative thinking like brainstorming, Delphi method and weighted evaluation for selection of an optimistic solution to enhance value in a product, system or service (Leung and Liu, 2003). Design objectives can be achieved through a multitude of options with varying costs. Developers have to consider and select the most optimum design alternative that meets requirements at lowest possible

total cost. The economic value is defined as *"the lowest cost to reliably provide the required function or service at the desired time and place and with the essential quality*" (Elias, 1998: 385).

Value of a component is directly related to the requirements of the function to be performed which is defined as that which a product or process must do to meet requirements. The most accurate description of a function is *achieved when that description can be expressed in two words, an active verb and a descriptive noun" (Kelly et al., 2015: 98).* This approach identifies the total function requirements to be met and stimulates creativity by determining critical requirements to be delivered for a successful product, system or service. The FAST diagram is used to define the functions of the design and how these functions can be achieved. The tool is basically designed to structure analysis process (Kelly *et al.*, 2015).

Fong (1999) also advocates the success of the value management approach in addressing problems, as not only does it lay out steps for individual or group to follow but it also addresses issues of team selection. The ACID test approach specifically defines procedures to follow when selecting a value team (Kelly *et al.*, 2015).

FAST is requirement oriented and is a function based model which focuses on the aspects required by a design, process or service to accomplish its objectives at minimum cost through innovation (Jay and Bowen, 2009). The method is applied to an existing or new process or product to assist in identifying an alternative methodology on how to achieve defined functions.

FAST guides the team to use both the divergent and convergent brain storming technique to decompose a basic function and organizes it into a logic diagram called a FAST model. The model can serve as an assessment tool for identified functions to determine if they have been properly specified, documented or labeled and categorized (Wixon, 1987). Most important with the FAST diagram, redundant or unnecessary components or processes which absorb project cost can be identified and eliminated in the process to achieve the required function. As a result performance can be improved or maintained and cost reduced (Fong, 1999).

The practice remained true to Miles original methodology of:

- Analyze the component parts of a product in terms of function

- Consider ways of providing the functions at a lower cost
- Confirm the economic and technical viability
- Change production procedures

The value engineering concept can be implemented in the project stages of, feasibility, concept design, and design development, construction and operations phases. Whyte and Cammarano (2012) in their study of Western Australian engineering companies in both design and construction fields concentrated on the value management techniques as well as the time at which it should be implemented. Their findings revealed that implementation of Value Management techniques like FAST at the conceptual design phase yields the most cost savings as well as determining effective construction methods. Colin Gray and Will Hughes (2001) emphasize on the same finding and suggest that the introduction of Value Management into a project is ideally through a facilitated value management workshop either at the business case stage (feasibility) or at the outline design stage (concept design) or both. Value management provides analytical tools and recording techniques that greatly assist clients and the design team to articulate and prioritize their ideas (SANCANDI P. 2012). The techniques offer the team an opportunity to consider sustainable issues early in the project where the impact will be greatest, because as the project progresses project costs become committed. "*The lack of consideration paid to sustainability issues during the conceptual phase has resulted in higher consumption of materials and energy during both the construction and operational phases of many construction projects*" (AL-Yami and Prince, 2006: 328). The workshop setting ensures that sustainability issues are not sidelined as the project becomes more detailed. The drawback of the conceptual stage is that it lacks physical deliverables such as drawings, making it difficult to conceptualize. There are none to very low implementation cost for ideas shared during the briefing stage. Hence the technique is found to be highly effective not only in the early stages but also during the various stages of design and construction (Kirk, 1998). The greatest impact on total cost is highly influenced by the design team. Which supports the idea that implementation of the technique during the design stage has got the potential of great cost savings. Kelly *et al.* (2015) found that at conceptual stage 80% of the cost is committed but only 20% of the technical decisions has been made. They suggest that a value Engineering study be done when the design is 35% complete. The design stage serves as a review stage for major design decisions, like to revise

budgets, construction methodologies, and improve quality and value. The design engineer using a team approach utilizes creative problem solving techniques to selects the design material amongst various options which can be valued through the FAST process. The technique provides authoritative reviews at milestone points in the project. Thus to be productive, the tool must become a component of the design process thereby creating an effective design method. The concern amongst most authors is that the greatest opportunity to improve the value is at project inception (Hiley and Gopsill, 2000; Finch *et al.*, 2005; Male *et al.*, 2007). Although evidence shows that the design process has a high influence on the construction program, material choices and cost of later events.

The extent of the value study is determined by the scope and size of the project and at which stage the value study is contacted.

Figure 5 below, illustrates the different stages in a project life cycle and the potential cost saving to be achieved in the different project stages. In general a project goes through 5 phases of development where the value study can be done:

- Concept formulation

  At concept formulation, general requirements are translated into performance specifications. The concept is proposed.

- Preliminary design stage

  During the preliminary design stage approved concepts are established and finalized. The project team will commence with defining specifications and preliminary project costs are detailed with quantities and timelines.

- Final design stage

  In the final design stage design specification details are formulated and bills of quantities are created.

- Construction stage and,

  Plans are implemented on site. Any value study will result in change orders, which could be costly

- Operation and maintenance stage

  The product is put to use. Value study at this stage could result in cost savings by extending the life of the product

Figure 4. Portrays the decrease in potential cost savings as the project progresses.

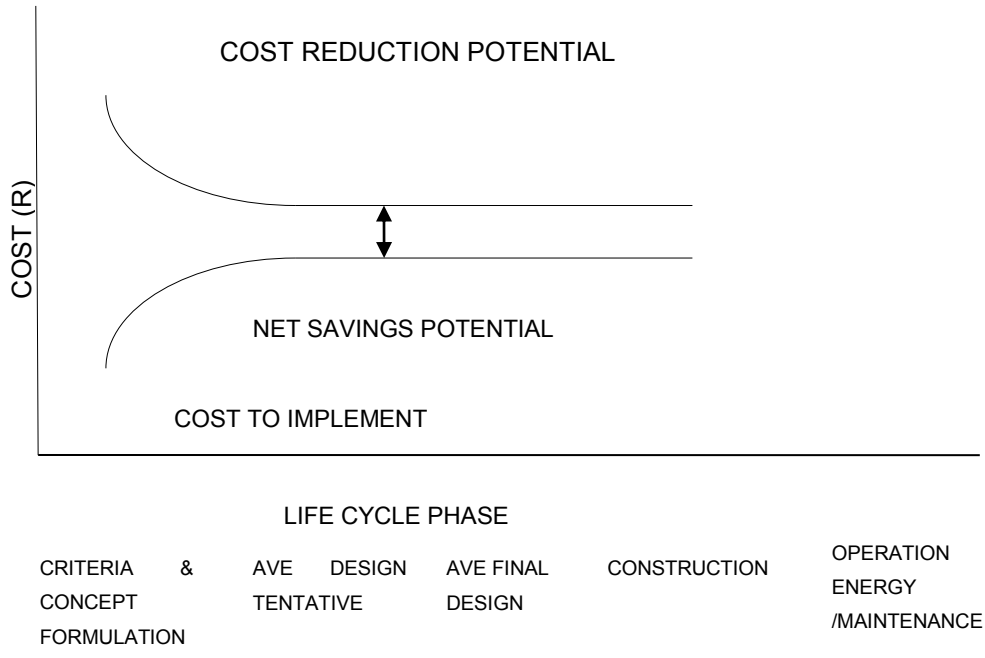


FIGURE 2-3 :LIFE CYCLE PHASES AND SAVING POTENTIAL (ELIAS, 1998: 387)

In order for the team to apply the appropriate technique, it is necessary to identify the intervention points that have been reached in the project.

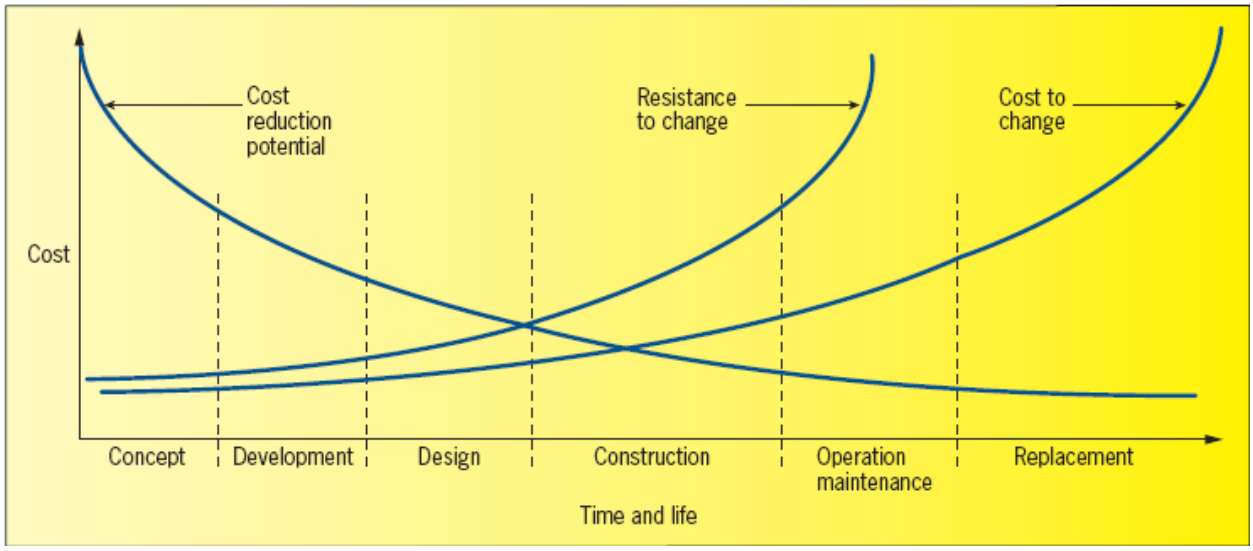


FIGURE 2-4: OPPORTUNITY AND POTENTIAL SAVING VIA V.M

2.5 AWARENESS OF VALUE MANAGEMENT IN THE NAMIBIAN CONSTRUCTION INDUSTRY

Namibia is a developing country. Namibia was colonized by South Africa from 1915 to 1989. After Namibia gained independence in 1990, the Namibia economy remains tied to South Africa through all trading platforms. Up until the present the Namibian dollar is linked to the South African Rand. As a result, the markets and industries are intertwined and trade closely with each other. Major trading companies in Namibia have their head offices based in South Africa. Due to the close relations with South Africa the two industries are closely comparable and thus studies done in South Africa apply to both industries (Odén, 1991).

In developed Countries, V.M is established with a common understanding of the methodology, tools, techniques and styles (Kelly *et al.*, 2015). In a study done in South Africa by Bowen *et al.* (2009), covering quantity surveyors, engineers, and architects it was found that V.M awareness is not as high as might be expected. The survey findings are that only 10% of the built environment professionals are utilizing the methodology. This finding contradicts the assertion by (Kelly *et al.*, 2015) that V.M has evolved to become an established and commonly understood methodology worldwide. V.M is not widely applied by the built environment professionals in South Africa. Bowen *et al.* (2009) found that those who use it confirm its benefits and agree that the concept needs to be introduced

more aggressively into the built environment. Creative thinking is compromised by this lack of knowledge and appreciation for the methodology (Whyte and Cammarano, 2012). Success of V.M in developed countries (Unites States, United Kingdom, Hong Kong, and Australia) is due to commitment by the respective governments towards the use of V.M in all projects (SAVE, 2015). This is evident through efforts made to introduce policies adopted and creation of V.M bodies to advance the methodology. Unlike South Africa, the V.M body is established but the government or built environment industry has not shown any focus towards aggressive marketing of the methodology (Bowen *et al.*, 2009). Namibia has not established such a body and as far as my knowledge goes no efforts are currently being directed towards advancing of the methodology by government or the industry. Introducing the concept into projects setup will raise awareness in the industry. The more success is attained the more the concept will advance.

Goals towards improved productivity and improved customer service, emanates from fundamental change within the organization. The main reasons for a lack of use of V.M can be summarized as failure to adopt a systematic approach, in the implementation process (Hiley and Gopsill, 2000). The rate of use must be affected by the method by which active participation, including that of management, is encouraged by ensuring that when proposals are presented benefits are accurately highlighted. Successful implementation of any program is contingent on it becoming part of an organization's culture. This in turn requires the appropriate administration, management participation, training and recognition of both individual and group effort. Hiley and Gopsill (2000) recommends that since V.M is about understanding and consensus, careful choice of team members is crucial. To enhance project results and realize implementation of V.M goals, effective integration between project and change management is essential. There is a need to put together project management, where the solution is designed, developed and delivered effectively on a technical side through change management, where the solution is embraced, adopted and used proficiently within the organization. There are benefits to be reaped from the dual approach to a common objective. This increases the chances of successfully transitioning from the current state of project approach to a future state and thus improving project delivery.

2.6 CHANGE MANAGEMENT

Introducing Value management into the organization commands a need for organization transformation.

Business process reengineering (BPR) project implementation is a complex process that involves various factors. It is important to manage change and focus equal attention to identified factors that could influence implementation of a new process or procedure.

Factors that contribute to successful change management are: Management support, technical competence, project management and process delineation.

Grover *et al.* (1995: 111) in their explorative study on problems related to BPR and organizational change management in the United States define BPR as "the Implementation of deliberate and fundamental change in business process to achieve breakthrough improvements in performance."

Planned change in underpinned by Kurt Lewin's theory of change, coined back in the 1940's. The Lewin model is universally known as three successive phased of a change process: unfreeze-change-freeze.

The first stage, "unfreezing" is to understand why change must happen, thus first employees must be motivated to implement change before change can occur. The second stage, "change" involves analysis, design and installation. People start understanding the process and the changes that need to be implemented. The final stage, "freezing", the organization internalize the changes. Changes are thus incorporated into everyday business (Burnes, 2004). Lewin's steps start with creating a sense of urgency and rely on focusing on short-term wins to anchor the new approach

Goals towards Successful organizational change management can be organized and implemented within five (5) categories: motivating change, creating a vision, developing political support, managing transition, and sustaining momentum leadership (Grover *et al.*, 1995).

2.7 CONCLUSION

This chapter was to define the initial research questions and to develop a general understanding for this study. The project delivery process and design challenges are discussed, which provides a background for implementation of V.M techniques into the design process. The concept and principles of the V.M methodology are presented forming the basis of developing a knowledge-based system to incorporate the FAST technique in the value study.

How could the V.M FAST diagram approach be used to improve road and infrastructure development processes in Namibia?"

- What is FAST and how is it applied?
- What benefits could be expected from using FAST?
- What implementation issues would arise from adopting FAST

Implementing sustainability objectives remains a challenge for the construction industry worldwide. Application of V.M techniques within the construction industry have resulted in significant cost savings and addressing sustainability objectives within project. According to Male *et al.* (2007) there exists evidence that there is existing significant opportunity for V.M in construction projects if introduced in the early stages of the project for design engineers to reduce cost by eliminating non-value adding components and activities. This creates a platform to review components and propose alternatives or replacements to improve project value and functions.

The literature review suggests that the designers need to pay attention to incorporating sustainability objectives into the design concepts. Further understand the evolving needs and challenges to improve project value. As such the complexity of introducing V.M into the project process of the Windhoek Municipality needs to be explored. It is important to understand the Windhoek Municipality project environment and awareness of the V.M methodology. It is important to understand how the industry operates and expectations of various stakeholders in introducing a new process within the Windhoek Municipality.

3 RESEARCH METHODOLOGY

3.1 INTRODUCTION

According to Creswell (2009), methodology is necessary to ensure that a research project comprehensively address the research questions. To meet these objectives, a research study should have a detailed research design that can be used as an outline for collecting observations and data that rare connected to the research questions.

This chapter outlines the methodologies used to guide the research which aims to determine where in the municipal project cycle Value Management can be introduced to achieve more sustainable construction practices.

When undertaking the research it is important to ensure that the research objectives can be met and the findings justified through the correct methodology. This chapter explains the research methods that are to be used to obtain findings in terms of the main objective of the research. In order to reach a credible conclusion the chapter will cover the systematic research processes, methods and procedures applied. The issue of reliability and validity, ethical consideration and limitation of the research will be discussed.

The methodology is expected to provide an approach to find answers to the questions as outlined in chapter 1 and eventually address the primary objective which is to:

- Assess the feasibility of introducing the Value Management tool to the Windhoek Municipality and Project team
- Identify at which stage of the project the FAST can be introduced on future projects

3.2 SELECTION OF RESEARCH METHODS

According to Fellows and Liu (2015) data collection is a communication process that involves the transaction of information between the provider (respondents) to the collector (researcher). In this research only one research method was used to aid the researcher to create this communication link with the respondents.

Methods of collecting data can generally be categorized as either one-way or two way communications. One way communication methods, such as structured questionnaires are regarded as linear data collection method. While two-way methods such as semi-structured interviews, permit feedback and the gathering of further data via probing is non-linear.

3.3 DATA COLLECTION

Wilson *et al.* (2009) found that quantitative research is a systematic subjective approach that produces quantifiable insights into to behavior, motivation and attitudes. The data collection methods for quantitative research rely on random sampling and structured instruments that suits multi-facet experiences into predetermined response questionnaires. The qualitative research produces a non-quantifiable insight into the behavior, motivation and attitudes of the sample of population. A formal, objective and systematic process used to describe, test relationships and examine cause- effect relationships.

Table 3-1: comparison of qualitative and quantitative research adopted from **Houser (2008)**

Comparison of qualitative & quantitative research		
	Qualitative	**Quantitative**
Goals	To gain insight; explore the depth, richness, and complexity inherent in the phenomenon.	To test relationships, focuses more in counting and classifying features and constructing statistical models and figures to explain what is observed.
Characteristics	**Soft science**	**Hard science**
	Focus: complex & broad	Focus: concise & narrow
	Holistic	Reductionist
	Objective	Subjective
	Dialectic, inductive	Logistic, deductive
	Basis of knowing: cause-effect, relationships	Basis of knowing: meaning & discovery
	Develops theory	Tests theory
	Shared interpretation	Control
	Communication & observation	Instruments
	Basic element of analysis: words	Basic element of analysis: numbers
	Individual interpretation	Statistical analysis
	Uniqueness	Generalization

Various data collection techniques can be used

a) Using available information
    a. Usually there is a large amount of secondary data that has already been collected by others, although it may not necessarily have been analyzed or published. Locating these sources and retrieving the information is a good starting point in any data collection effort. Due to the nature of this research no secondary data is considered.

b) Observing

Observation is a technique that involves systematically selecting, watching and recording behavior and characteristics of participants, objects or phenomena. Observation of human behavior is a popular data collection technique. It can be undertaken in different ways:

- ✓ Participant observation: Often the researcher actually takes on the role being studied.
- ✓ Non-participant observation: The observer watches the situation, openly or concealed, but does not participate.

c) Interviewing (face-to-face)

An interview is a data-collection technique that involves oral questioning of respondents, either individually or as a group.

Answers to the questions posed during an interview can be recorded by writing them down (either during the interview itself or immediately after the interview), by tape-recording the responses, or by a combination of both. Interviews can be conducted with varying degrees of flexibility. No interviews will be conducted for this research.

d) Administered written questionnaires

Written questionnaire (also referred to as self – administered questionnaires) is a data collection tool in which written questions are presented that are to be

answered by the respondents in written form. A written questionnaire can be administered in different ways, such as by:

- ✓ Sending questionnaires by mail with clear instructions on how to answer the questions and asking for mailed responses;
- ✓ Gathering all or part of the respondents in one place at one time, giving oral or written instructions, and letting the respondents fill out the questionnaires or
- ✓ Hand-delivered questionnaires to respondents and collecting them later.

e) Focus group discussions

A focus group discussion allows a group of 8 – 12 informants to freely discuss a certain subject with the guidance of a facilitator or reporter.

- ✓ Focus research and develop relevant research hypotheses by exploring in greater depth the problem to be investigated and its possible causes
- ✓ Formulate appropriate questions for more structured, larger scale surveys.
- ✓ Help understand and solve unexpected problems in interventions.
- ✓ Develop appropriate messages and later evaluate the messages for clarity.
- ✓ Explore controversial topics

This survey will concentrate on quantitative structured questionnaires. Questionnaires will be distributed via email. The survey questionnaire is found to be sufficient in collection of the data.

The respondents will be given 10 days within which to return the questionnaire after which a reminder will be send out via email. If still no replies are received, the researcher will make an effort to go pick up the questionnaire in person.

A high number of data collection sheets where received from the Windhoek Municipality staff members, however only two were received from external companies. All efforts were made to get a response.

3.4 RESEARCH DESIGN

Science is based on two pillars, theory and observations hence scientific research operates at two levels: A theoretical and empirical level. The main aim is to build scientific knowledge. The theoretical level is concerned with developing abstract concepts about a natural or social phenomenon and relationships between those concepts, while the empirical level is concerned with testing the theoretical concepts and relationships to see how well they reflect our observation of reality, with the goals of ultimately building better theories (Bhattacherjee, 2012).

Building knowledge requires the process of scientific enquiry through the cycle of research which is defined in two terms: inductive and deductive. In inductive research, the goal researcher is to deduce theoretical concepts from evidence and reasoning rather than from explicit statements, thus testing a theory. In deductive research the goal of the researcher is to test concepts and pattern known from theory using new empirical data to develop a theory (Bhattacherjee, 2012).

The design and method of the research report must be clear and explicit. So that it is repeatable. The nature of research can be either qualitative or quantitative. Both methods can be used for descriptive, investigative, explorative, inductive, and opening up purposes.

Some of the popular research designs include (Bhattacherjee, 2012: 38-40):

a) **Experiment studies** is a study in which a treatment, procedure, or program is intentionally introduced and administered the cause to one group of subject but not to another group and a result or outcome is observed.

b) **Field surveys** are a collection of information outside a laboratory or controlled setting through statistical methods. Some of the survey methods that can be used are: informal interviews, direct observation, collective discussions, analyses of personal documents produced within the group, self-analysis, results from activities undertaken off- or on-line, and life-histories. Although the method is generally used in qualitative research, it may include quantitative research aspects. Field survey capture snapshots of practices, beliefs or situations from a random sample subjects in the filed which is not relevant for this research thus this method will not be used.

c) **Secondary data analysis** “is an analysis of data that has previously been collected and tabulated by other sources” (Bhattacherjee, 2012: 39). This method was used

to extract information on the project process of the Windhoek Municipality as described in Chapter 1 to review project documentation, to analyze current design methods and construction project cost estimation.

d) **Case research** the purpose is for in-depth experience of one person, family, group, community, or institution in a real life setting over a defined period of time. Data may be collected using a combination of interviews, personal observations and internal and external documents. This method will not be used because there is no specific case to be reviewed.

e) **Focus group research** is a form of qualitative research in which a **group** of people are brought together in a setting and asked about their perceptions, opinions, beliefs, and attitudes towards a product, concept or idea. Such a discussion is normally moderated and led by a trained facilitator. Due to time constraints, this method will not be used.

f) **Action research** is an enquiry carried out by introducing a new organizational procedure of technology to a selected group within an organization to improve the methods and approach of those involved in an effort to improve the quality of an organization and its performance. Typically it is designed, introduced and conducted by consultant within the social context of the subject matter. The action approach must be based on theory, which should elaborate how and why such an action will cause the desired change. The method is not being introduced thus this method will not be relevant for the current. research

g) **Ethnography** is the study of real social group culture within a natural setting through close observation, reading, and interpretation. **Ethnographic researchers** must live within the culture they are studying for an extended period of time (8 months to2 years), and during that period, engages observes and records the daily life activities of the culture. Further deduct theories about the evolution and behavior of the culture. This method is not relevant to the research being contacted.

3.4.1 Unit of analysis

Leedy and Ormrod (2014) found that a case study may involve one or more unit of analysis allowing the research to have increased complexity of the data to be gathered and analyzed. This research study is concentrating on value management in the Windhoek Municipality and although the problem of project failure is evident on most projects, the

area of study will be confined to projects related to construction. The research target will be the project team members that were involved in a project undertaken by the Municipality. The chosen area of study is ideal because of its convenience as far as resources and accessibility of data is concerned. The researcher is as well most familiar with the area because she is an employee of the Windhoek municipality.

3.4.2 Population

A population can be defined as a group of individuals who have one or more characteristics in common that are within the interest of the researcher (Best and Kahn, 1998). To date budget and time factors have been recorded as major contributing factors to the failure of construction projects and the inability of various Divisions to resolve challenges in subsequent projects. This study will consider people are involved in project management within the Municipality and those external that offer services as consulting Engineering firms or Contractors

The main focus of this research is the divisions involved in construction projects namely, Roads Planning, Design and Traffic Flow, Infrastructure, Electricity and Urban Planning.

3.4.3 Sample size and sampling techniques

There are various overlapping types of sampling method in quantitative research literature which makes the process a complex issue (Creswell, 2009). Nonetheless, Kothari (2004) indicated that to fulfill the requirements of efficiency, representativeness, reliability and flexibility the selected size of the sample should be the most optimum. The complexity is mainly associated with two sampling types i.e. purposive and theoretical sampling (Creswell, 2009). The most common sampling type used with quantitative surveys is the random sampling , one where the researcher uses own judgment to select cases according to the aims of the research by using categories such as age, gender, status, role or function in an organization. The researcher believes that she can obtain a representative sample (Cooper and Schindler, 2014). Saunders *et al.* (2009) found that the sampling method is most effective for limited numbers of people that can serve as primary data sources. The specific target group should be holders of desired information and able

to answer research questions, and are expected to have been exposed to the project process in one way or the other. Thus identifying the selected sample based on the criteria explained above will assist in ascertaining information relevant to answer questions.

In table 1 below is a table showing a basic sampling design adopted from (Kothari, 2004). A total number of 60 respondents comprising of Windhoek Municipality technical staff, Consultants that are involved in outsourced design and project management work on behalf of the Windhoek Municipality and contractors that does the implementation of construction projects, will form part of the sample size.

There are two types of sampling designs which are non-probability and probability sampling. This universe is small and allows for an intensive study with known characteristic, where non-probability sampling is most appropriate.

This study will as well take into consideration the following non-probability sampling methods:

- **Convenience sampling:** respondents to be selected based on the availability and the convenience of the researcher.
- **Judgment sampling:** respondents to be selected based on the judgment of the researcher on what constitutes a representative sample.

Table 3-2: Chart showing basic sampling design adapted from Kothari (2004)

Element selection technique ↓	Representative basis ↓ Probability sampling	↓ Non-probability sampling
Unrestricted sampling	Simple random sampling	Haphazard sampling or convenience sampling
Restricted sampling	Complex random sampling (such as cluster sampling, systematic sampling, Stratified sampling etc.)	Purposive sampling (such as quota sampling, judgment sampling

3.4.4 Data sources

When dealing with real life challenges there is a need to collect data from the most appropriate sources to avoid relying on existing information which could be inadequate to reach the survey objectives.

Researchers have a choice between two types of data sources, namely, primary and secondary data. Primary data is information gathered specifically to address a specific research question or problem, which has been observed, experienced or recorded specifically for the research project. Secondary data is information that has been previously gathered for existing research other than the research at hand. There are two basic sources of secondary data:

a) Data available within the organization(internal data) and
b) information available from published electronic sources originating outside the organization (external data)

Internal data may include, internal records concerning materials, preferences, construction costs, budgets, correspondences, reports and service record. External data may include, government reports, newspapers, the internet, published research reports (Wilson *et al.*, 2009).

The sample target for this study is the Windhoek Municipality technical staff and technical staff from consulting firms. Technical staff from consulting firms have been included because the Municipality out sources some of the design projects and implementation is also done by private contractors.

This study will include primary and secondary research data complemented by a literature review of relevant studies and related materials to address the research questions. The primary data will be collected using questionnaires. Administering questionnaires in surveys allows for the collection of standardized data from a certain population in an economical way and are easily understood. Questionnaires will be made up of closed and open-ended questions and will be distributed via email and direct delivery methods.

First, emails were sent out to 60 chosen respondents, of which 40 are employed within the municipality and 20 are employed by consultants and contractors, with a description of the

study, the required data and information about data integrity. The email was followed up with a call to each participant to notify each person of the email and to make sure they received it.

The key themes to be used in the questionnaire are provided in Appendix A.

3.4.5 Administration of the research

Ethical issues

Weitzman (2005) cited by Le Roux (2005: 6) describes four basic ethical guidelines for conducting an inductive quantitative survey.

a) Informed consent: This guideline refers to the understanding that research participants have the right to be informed about the nature and consequence of the survey in which they are involved. The following condition will apply:
   - Participants must agree voluntarily to participate
- Their agreement must be based on full and open information

b) Deception : The code of ethics in qualitative research consistently opposes deception hence emphasis on informed consent

c) Privacy and confidentiality: This guideline emphasizes the ethical code to provide protection to people's identities and those of research location. Confidentiality must be assured as safeguard against unwanted exposure and data should be made public only behind shield of anonymity

d) Accuracy: Data must be internally and externally valid. Fabrications, fraudulent material, omissions and contrivances are viewed as both non-scientific and unethical

3.5 RESEARCH INSTRUMENT

According to Panas and Pantouvakis (2010) the natural science is dominated by the objectivist and positivist stance attributed to the strong standpoint of traditional interest in studying technical issues related to project time and cost.

Depending on the subject being investigated, the built environment factors can be considered multidimensional and can have a different impact or meaning. Hence, due to the technical nature of the information available when doing a study, the most suitable research method applied in the industry is survey research. Survey research allows for data gathering from individual participants based mainly on the experience of the participants. As indicated earlier, to collect data for this research a survey instrument will be used. The selection of a questionnaire for the study was based on its adequacy to address the research questions taking the area of study into consideration.

The study should be able to gather high and credible amount of data to ensure meeting attributes of efficiency and effectiveness. Thus it is vital to ensure content validity by aligning the research questions to the subject area to be evaluated. Cooper and Schindler (2014) define content validity as the extent to which the research instrument addresses the research questions. In meeting this premise the two research questions where broken down into smaller questions to gain in-depth information.

The questionnaire is designed to produce data relating to the assessment of the feasibility of introducing the Value Management tool to the Windhoek Municipality and Project team at the Windhoek Municipality. The questionnaire consists of an introductory part and themes as follows:

1. Respondent information
2. Knowledge and awareness of value management
3. Value Management related issues – elements examining if V.M is a familiar method
4. Information related to Project planning and cost estimates
5. Project processes and mapping of Value management techniques
6. Interest in Value Management

Questions are structured closed and open ended with the use of a 5-Likert rating scale to ensure increased measurement precision. The Likert scale is 5 point agreement scale used to measure respondent's agreement with a variety of statements.

Considering between a structured questionnaire and an interviews, a structured questionnaire was chosen because it is cheaper, easy to administer to participants and simplifies the data analysis unlike the interview which is rather time consuming both in conducting it, and when analyzing responses that first need to be categorized.

Further the interviews require a great amount of time to collect information. Below is a table with a basic summary of advantages and disadvantages of Interview and questionnaires adopted from Burcu (2000), in their study of comparison of two data collection methods: interviews and questionnaires used in social science and education researches.

The questionnaire will first be distributed to 10 respondents within the organisation to check the accuracy and sufficiency before distribution for data collection to all respondents.

Table 3-3 : A summary of advantages and Disadvantages of interview and questionnaires

Criteria	interviews		questionnaires	
	advantage	disadvantage	advantage	disadvantage
Access to information	√			×
Anonymity		×	√	
Application skill		×	√	
Bias		×	√	
Confidentiality		×	√	
Cost		×	√	
Data Analysis		×	√	
Flexibility	√			×
Reliable	√			×
Response Rate	√			×
Sample size and Sampling		×	√	
Time		×	√	
Validity	√			×

Meaning of Symbol: √ *advantage* × *disadvantage*

Both these techniques have certain advantages and disadvantages, it cannot be said that the one techniques is superior to the other, however the questionnaire fits the variable considered in this survey

3.6 DATA ANALYSIS AND INTERPRETATION

This study adopted a systematic approach as it is more appropriate to effectively analyses data from questionnaires and literature review. The quantitative analytical approach allows the reporting of summary results in numerical terms to be given with a specified degree of confidence. The prevalent manner of interpreting quantitative data is by systematically creating themes to identify a specific observable hierarchy which plays a key role in data analysis as well as in computerizing the information collected (Abeyasekera, 2005). This study will analyze the collected data using the SPSS descriptive statistics module. The data will then be presented in tables, charts and graphs. This technique is versatile and helps to simplify the interpretation, descriptions and explanations of findings.

It is assumed that there is a relationship between knowledge on Value Management, years of experience and area of knowledge. A statistical hypothesis test, the Chi Square test will be done, which is the sampling distribution of the test statistic when the null assumption is true and further confirm consistency of opinion among the respondent's groups. A common usage of the Chi-square test is the Pearson's chi-square test, also known as the chi-square goodness-of-fit test or chi-square test for independence. The Chi square test will be used to test the null hypothesis, with available categorical data (Plackett, 1983).

3.7 ISSUES OF RELIABILITY AND VALIDITY

Reliability is the extent to which data collection yields consistent results between measures of the same item and validity indicates the extent to which differences found with measuring instrument reflects true differences among those being tested (Kothari, 2004). Quantitative data is structured and designed to collect direct, hard facts with a fair degree of reliability. It provides a good base when you need to draw general conclusions from your research (Panas and Pantouvakis, 2010).

4 RESEARCH RESULTS AND INTERPRETATION

4.1 INTRODUCTION

In the previous chapter, the methodology that was employed to collect data, including the methods and tools to analyses the data, are extensively discussed This chapter presents the results of the analysis of the responses made to the questionnaire.

The objective of the study is to:

- Assess the feasibility of introducing the Value Management tool to the Windhoek Municipality and Project team
- Identify at which stage of the project the FAST can be introduced on future projects

Data analysis was done in such that it responds to the research questions and objectives of the study.

The questionnaire was first distributed to 10 respondents within the organisation to check the accuracy and sufficiency after which it was changed to address the short coming before distribution for data collection to all respondents.

4.2 RESPONDENT PROFILES

A total number of 60 questionnaires were distributed to the following institutions:

Table 4-1: Distribution and response to questionnaires

Name of institution	**sector**	**No. of questionnaires distributed**	**No of questionnaires returned**
Windhoek Municipality	Public	40	39
Geomar Consult	Private / Consultant	5	1
Namibia Construction	Private/ Contractor	5	1
Tulipamwe Consulting Engineers	Private/ Consultant	5	0
Indigenous Construction	Private/ Contractors	5	0

In the distribution of the research instrument, respondents were chosen based on their involvement in the implementation of projects from inception to completion. The sample population is composed of four project Managers from the Windhoek Municipality, officials that head main infrastructure delivery, planning, delivery and maintenance. Projects for implementation are decided at this level for implementation for a particular period.

The sample also includes consultants, as some projects are executed through implementation agents, which assemble a project team consisting of consultant personnel depending on the project scope. Moreover, it is significant that the respondents to the questionnaires included by different stakeholders because V.M is known as a multi-disciplinary team approach. Two Contractors were chosen to complete the diversity of respondents. The researchers obtained the list of members form Divisional heads and through project associates. A total of 60 questionnaires were disseminated in May 2017. Twenty – two questionnaires where hand delivered to respondents in the Windhoek Municipality and thirty-eight where send via email. Two e-mail reminders over the course of two weeks were sent out and respondents were also contacted by phone and reminded to answer and return the survey questionnaire. The distribution of the questionnaire is summarized in Table 4-1 and graph 4-1 depicts the response.

A total number of 60 questionnaires were given to the respondents and 41 questionnaires were completed and returned, giving a response rate of 64% and providing the ability to generate the result of the population.

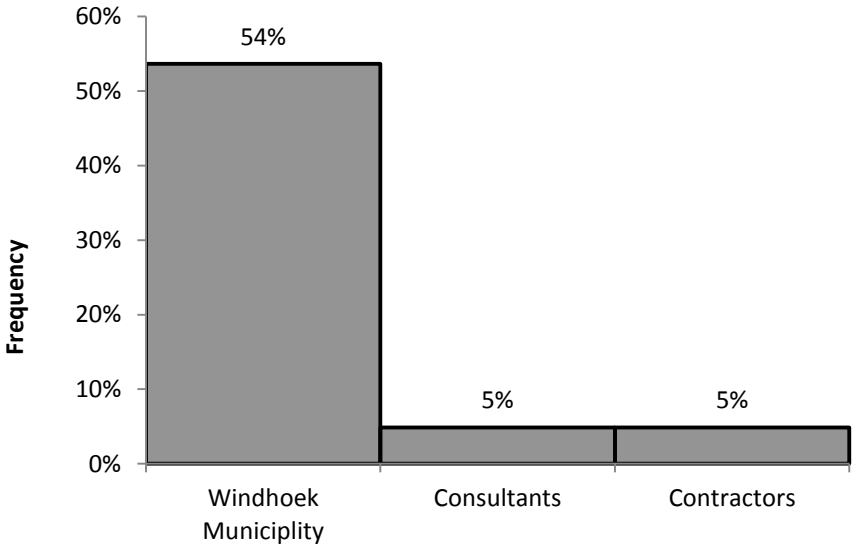


Figure 4-1: Organization response to survey

4.3 SUMMARY OF DATA ANALYSIS

Quantitative data collected from the responses was processed in Microsoft excel for analysis of the data. The result will present in descriptive statistics in the form of graphs, cross tabulations and other figures.

The questionnaire data collected was categorized into the following themes and sub-themes illustrated in table 3 below:

Table 4-2: Survey themes and sub-themes

Theme	Subtheme
The concept of Value Management and municipal infrastructure	• Reasons for adapting value management into construction projects instead of the traditional approach • Driving forces for value management • Factors enhancing value for money • Critical success factors for projects • Status of knowledge on value management and its techniques in the municipality • Reasons for the organization to engage value management • Satisfaction level for project success in the Windhoek municipality
Implementation and mapping process of value management into the project process of the Windhoek Municipality	• Causes for failure of projects in the Windhoek municipality • Scarcity of material and the design strategy • Barriers to effective project process in the Windhoek municipality • Interest of value management to improve project success

4.4 BIOGRAPHICAL DATA

4.4.1 Biographical information

Summarizing the biographical characteristics of the respondent is important as it assist to determine whether the respondents were suitable enough to provide data that is credible. This study considered the following points as important to establish the suitability of the respondents:

- Organization
- Department of expertise
- Position held in the organization
- Number of years of project experience

4.4.2 Profiles of respondents

Table 4-3 summarizes the profiles of the respondents in the study. The highest number of questionnaires received was from Infrastructure, Electricity, housing and Properties and Urban which are mostly involved in construction projects account for (83%), followed by ICT (15%), and Economic Development (46%). Regarding the designation of the respondents, the Engineers/Technicians, Project managers, and specialists who possess a certain level of professional knowledge, ability and maturity account for more than half (64%) of all respondents. With respect to years of experience, the number of respondents with five to 15 years of experience is 44% and those with more than 15 years are 27%. Because these two groups account for a large portion of the respondents, the collected data are considered relatively reliable. Respondents with less than five years of experience account for only 29% of all respondents.

Table 4-3: Profiles of Respondents

Variables	Category	frequency	percentage
Q1.1b Field of work			
	Infrastructure	16	39%
	Electricity	7	17%
	Housing and Property	6	15%
	Urban and Transport Planning	5	12%
	ICT	4	10%
	Economic Development	3	7%
	Total	41	100%
Q1.1c Designation of respondents	Engineer	18	44%
	Technician	4	10%
	Project Manager	4	10%
	Valuer Technician	2	5%
	Environmentalist	2	5%
	Administrative assistant	2	5%
	Valuer	1	2%
	Inspector	1	2%
	Site Agent	1	2%
	GIS Operator	1	2%
	Valuer	1	2%
	GIS Support Specialist	1	2%
	Contractor's Representative	1	2%
	Property data collector	1	2%
	Liaison officer	1	2%
	Total	41	**100%**
Q1.3 Experience in Project Management			
	None	3	7%
	Less than 5 years	9	22%
	5 to 15 years	18	44%
	More than 15 years	11	27%
	Total	41	**100%**

4.4.3 Invalid respondents and non-response

In order to ensure quality, all responses were examined in detail after the data collection was completed. One main challenge with the sample was missing data. Some respondents had submitted the questionnaire without responding to all questions. Most of

the questions not answered are those requesting for any additional information. Questions not answered were removed from the sample. Thus does not have an effect to the outcome of the analysis.

The overall response rate is 68%. Majority of surveys (95%) were returned from internally (i.e. employees) and 10% were returned from private companies. Thus there is a high nonresponse rate from external units. This is mainly due to unavailability of units and some ignored the several reminders. Nonresponse can have two effects on data: first, it introduces a bias in estimates when non-respondents differ from respondents in the characteristics measured; second, it contributes to an increase in the total variance of estimates since the sample size observed is reduced from that originally sought. An overall response rate of 68% eliminates the negative non-response bias.

4.5 THE CONCEPT OF VALUE MANAGEMENT

4.5.1 Value management, Value Analysis and Functional Analysis Systems Technique

The first category is to determine whether the respondent has any knowledge or familiarity of the terms and concept of value management. It is important for the respondent to have understanding of the subject matter on which they are being questioned as it will ultimately assist to establish the knowledge status of the V.M.

The analysis confirm that awareness of VM was already established in the industry as at least 61% of respondents are aware of the concepts based on the training and exposure they have received from graduate studies (58.8%).

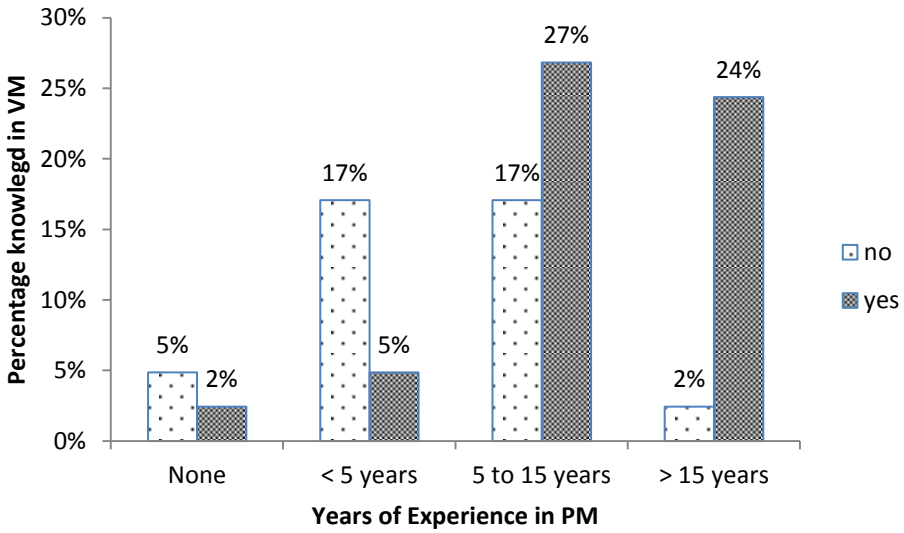


Figure 4-2 Knowledge in Value Management verses number of years in experience

4.5.2 Establishing the Significance of a Relationship

Chi-Square Analysis

Researcher observed that the chi-square is most relevant and appropriate in analyzing categorical variables in this specific case. The chi-square test is a statistical test used to examine differences with categorical variables. It is relevant here for estimating how closely an observed distribution matches an expected distribution. It is also useful here for estimating whether two random variables are independent or not. Assessments of significance levels were done correctly with the help of chi-square tests in this specific case. The table of observed frequencies is, one output of the Table analysis. A second useful output is the level of significance of a relationship between two variables. For example, suppose we wish to establish whether there is a significant relationship between the years of experience and knowledge in Value Management. Firstly, tables of observed frequencies of these two variables are drawn.

A null hypothesis of no relationship between years of experience and knowledge in Value Management is equivalent to a model which says that the column and row categories of the table of percentage observed frequencies are independent.

The null hypothesis is tested using the Chi-Squared test at a level of significance of 5%. If the level of significance after running the test is less than 5%, the null hypothesis of no relationship is rejected. This means that a result of less than 5% indicates the existence of a relationship between the variables, years of experience and knowledge in Value Management.

Table 4-4 indicates that years of experience in project management is significantly related to knowledge in value management.

Observed Values			
	Knowledge on V.M		
Years of experience in PM	**no**	**yes**	**Total**
None	2	1	3
< 5 years	7	2	9
5 to 15 years	7	11	18
> 15 years	1	10	11
Grand Total	**17**	**24**	**41**

Expected Values			
	Knowledge on V.M		
Years of experience in PM	**Yes**	**no**	**Total**
None	1.24	1.76	3
< 5 years	3.74	5.27	9
5 to 15 years	7.46	10.54	18
> 15 years	4.56	6.44	11
Grand Total	**17**	**24**	**41**

Table 4-4: Chi-square test to establish whether years of experience in significantly related to Knowledge on Value Management

p- Value = 0.014939553

Level of confidence 95% confidence = 0.05

- if the p-value is more than the alpha level than we reject the null hypothesis
- there is a relations between years of experience and knowledge on Value Management and years of experience in project management

H_0 is dependent on the knowledge on Value Management

H_1 Number of experience in years is independent on the knowledge on Value Management

Critical Value = 0.127086

Degree of freedom = 3

4.6 GRAPHICAL ANALYSIS

In order to meet objectives of this survey, the following graphical analysis have been carried out.

4.6.1 Acceptance and use of Value Management

Questions in this category is to establish the present usage of V.M (if any) in the Windhoek municipality, and to find out factors encouraging such a concept to be incorporated in the project management process, hindrance factors, its benefits and level of interest.

Q2.1 How widely is value management used to manage projects in your organization?

The result confirm that the majority (71%) of respondents did not practice the VM methodology in their working environments despite that 75% of the total respondents agreed that VM will be suitable for most of the project in addressing the scarcity of material and improving project cost.

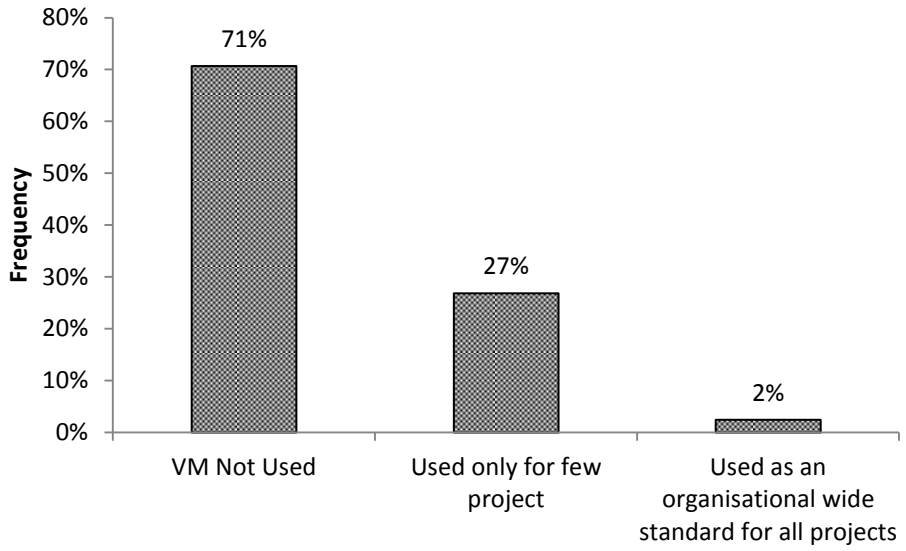


Figure 4-3: Distribution of use of VM

Q2.2 If your organization has not applied V.M across all types of projects, what are the reasons?

Table 4-5: Q2.2 mean and standard deviation results

	QUESTIONS	Mean	Standard Deviation
1	Lack of motivation from Top Management to use V.M	3.85	0.73
2	Lack of Value Management Knowledge	3.78	0.94
3	V.M is not suitable for most projects	1.39	0.77
4	There is resistance to Implementation	1.73	1.07
5	Current project control systems work, no need to change	1.34	0.69
6	Requires lots of time and cost commitment	1.61	0.97
7	It is a waste of project valuable time	1.34	0.53
8	Not cost effective to implement	1.85	0.85
9	Lack of financial resources to implement	2.46	0.87
10	It is a management fad	1.41	0.87
11	Lack of V.M standard	4.24	0.86

4.6.2 Standard Deviation

A standard deviation that is lower or close to the mean indicates that the data points tend to be expected values of the set. The standard deviation is the most commonly use measure of spread.

An important attribute of the standard deviation as a measure of spread is that if the mean and standard deviation of a normal distribution are known, it is possible to compute the percentile rank associated with any given score that the data set is reliable.

The **results Q2.2** are presented in Table 4-5. The main observations are as follows:

1. 66% and 51% agree that lack of motivation from top management and lack of value management knowledge has contributed to the value management concept not being used in the Windhoek Municipality, respectively.
2. 75% agree that Value management will be suitable for most of the project in addressing the scarcity of material and improving project cost.
3. Because this system has not been proposed before it is difficult to say whether there has been resistance to it but the sample that took part in the survey 61% believe that there will be no resistance to implementation of such a concept.
4. Current project systems are not working and some level of change is required 76% trust that implementing such a system will not be a waste of time.
5. 63% strongly disagree that Value Management requires lots of time and cost commitment.
6. 49% of the respondents are neutral in terms of availability of financial resources which could hamper such an implementation process.
7. 76 % strongly disagree that it is a management fad.
8. 88% agree or strongly agree that there is a lack of V.M standard guide the process.

Table 4-6 Result of Table analysis to determine reasons why V.M is not applied

	QUESTIONS	Count	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Total (%)
1	Lack of motivation from Top Management to use V.M	**41**	2%	0%	20%	66%	12%	**100%**
2	Lack of Value Management Knowledge	**41**	2%	7%	20%	51%	20%	**100%**
3	V.M is not suitable for most projects	**41**	76%	12%	10%	2%	0%	**100%**
4	There is resistance to Implementation	**41**	61%	15%	17%	5%	2%	**100%**
5	Current project control systems work, no need to change	**41**	76%	17%	5%	2%	0%	**100%**
6	Requires lots of time and cost commitment	**41**	63%	22%	5%	10%	0%	**100%**
7	It is a waste of project valuable time	**41**	68%	29%	2%	0%	0%	**100%**
8	Not cost effective to implement	**41**	44%	27%	29%	0%	0%	**100%**
9	Lack of financial resources to implement	**41**	17%	27%	49%	7%	0%	**100%**
10	It is a management fad	**41**	76%	12%	10%	0%	2%	**100%**
11	Lack of V.M standard	**41**	0%	7%	5%	44%	44%	**100%**

2.3 Driving forces leading to adoption of Value Management and its Techniques in the Windhoek municipality

Amongst the highest reasons observed on why the adoption of VM and its techniques will need to be applied to construction projects in the work environment were to improve project value (59%), and reduce project costs(49%), in addition 68% of the respondents agree that the concept must be introduced to address environmental sustainability values. Top management must ideally not pressure employees to adopt the techniques. 71% of respondents agree that the concept must be introduced to address shortage of construction materials in the industry.

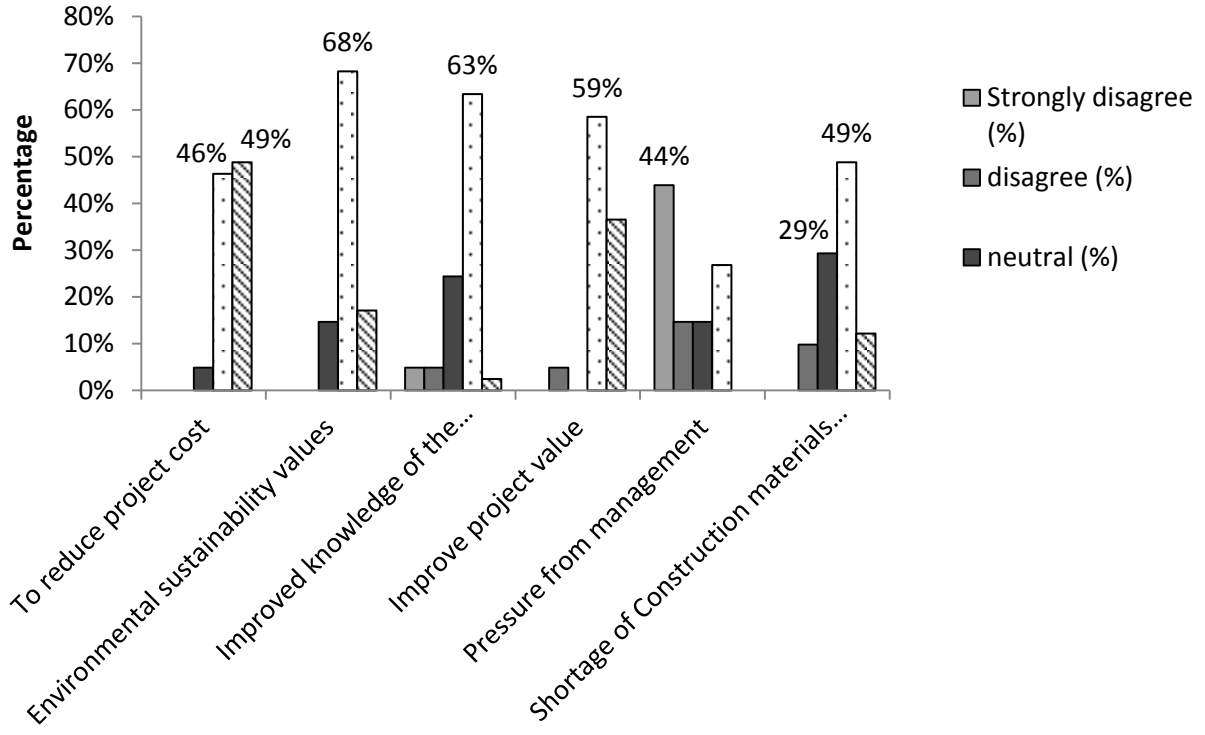


Figure 4-4: Distribution on driving forces leading to adoption of Value Management and its Techniques

2.4 Please evaluate the relative importance of the following factors to successfully implementation of value management.

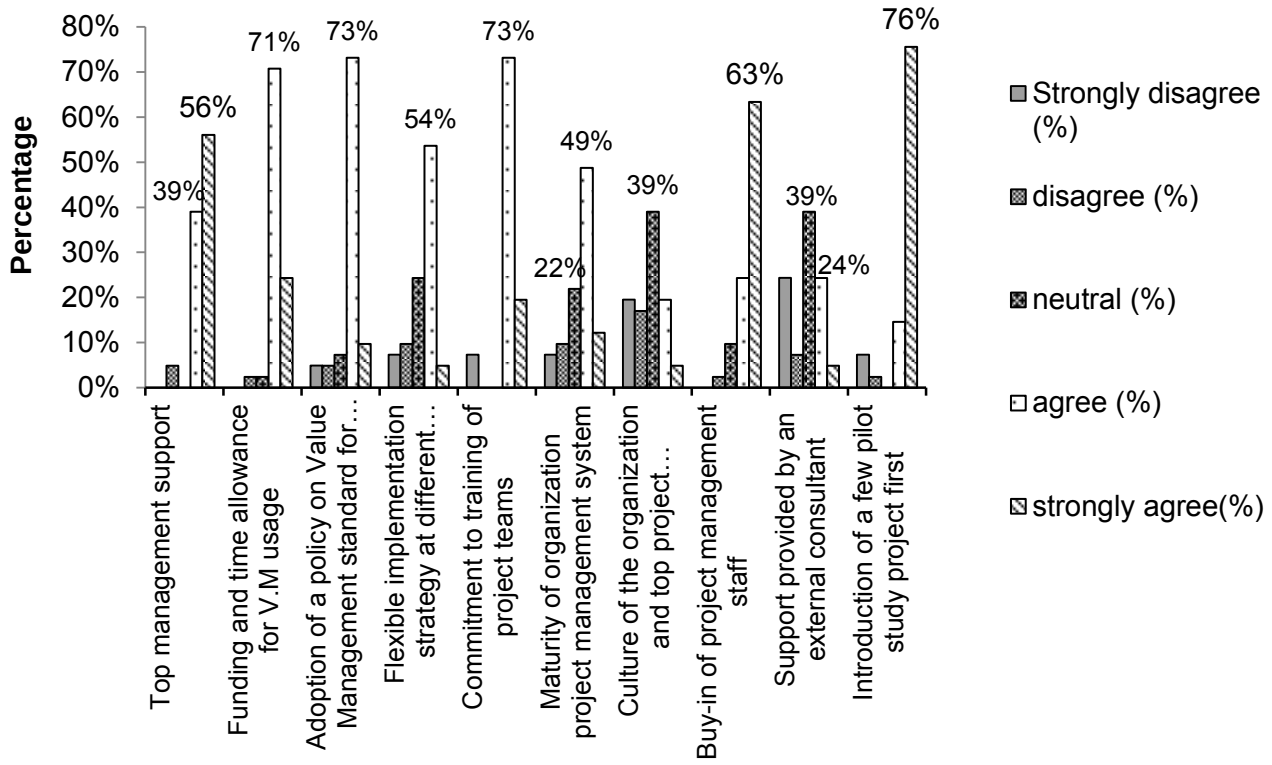


Figure 4-5 Success factors for implementation of VM

The aim is to determine the factors that could hinder successful implementation of value management at the Windhoek Municipality. The study revealed that 89% of the respondents reported that buy in of project management staff members is one of the most important factor to be in place followed by top management support through a pilot study project at first. 80% strongly agree that funding and time allowance for the process to unfold will be necessary.

70% of respondents agree that adoption of policy on value management for the organization would improve the success rate of the implementation process, as well as commitment of training of project teams.

50% of respondents do not recommend support from an independent consultant to provide support in the introduction of the methodology.

2.5 Projects in your organization mainly fail due to?

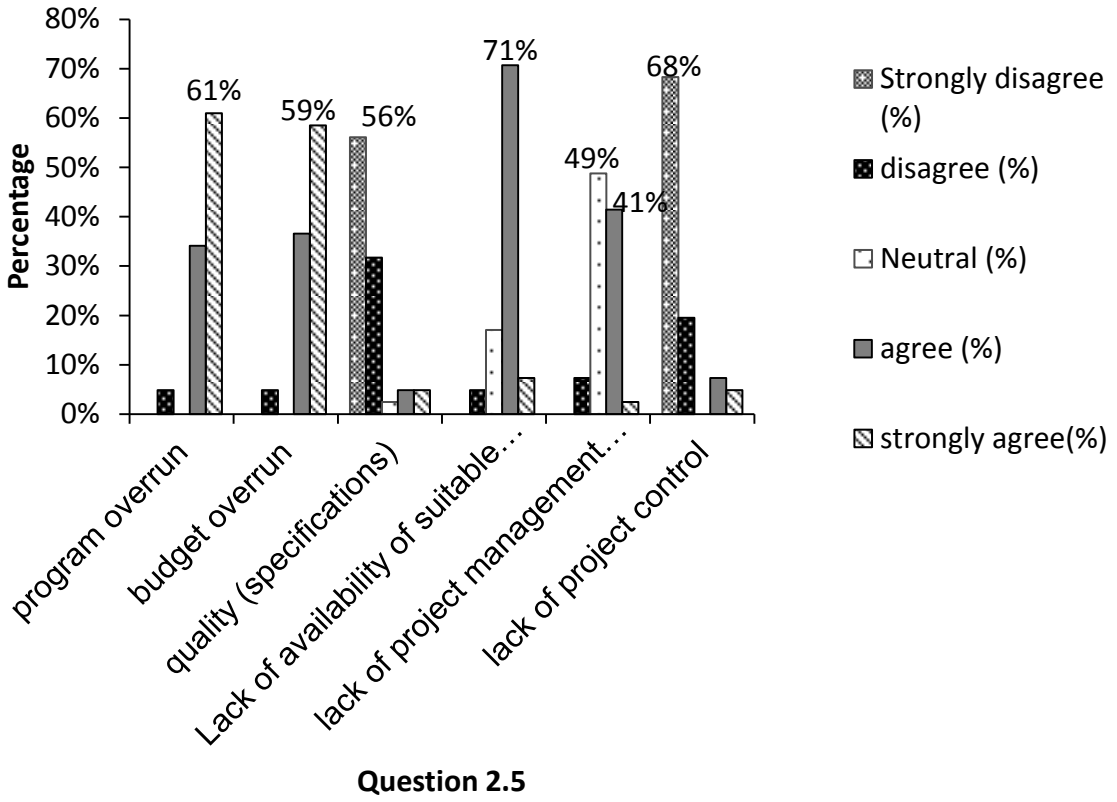


Figure 4-6: Causes for project failure

This question's is to determine the respondent's view on why projects fail. 71% of respondents agree that most of the time project in their organization fail due to lack of availability of suitable material, project overrun (61%) and budget overrun (59%)

2.6 Project process of Windhoek Municipality

2.6.1 How satisfied are you with holistically considering projects scope management, cost, time and procurement management processes of the Windhoek Municipality.

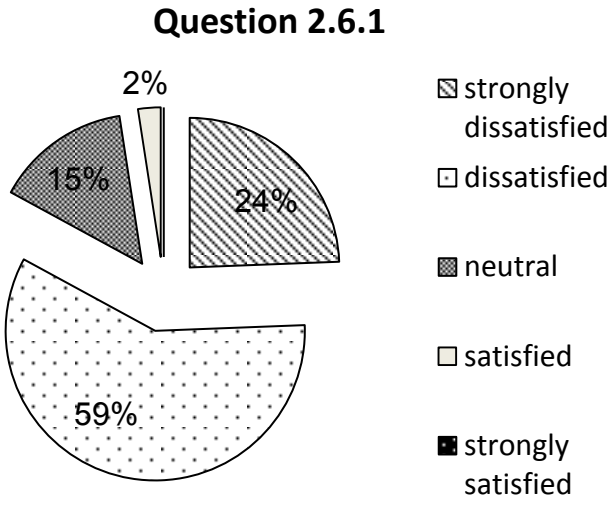
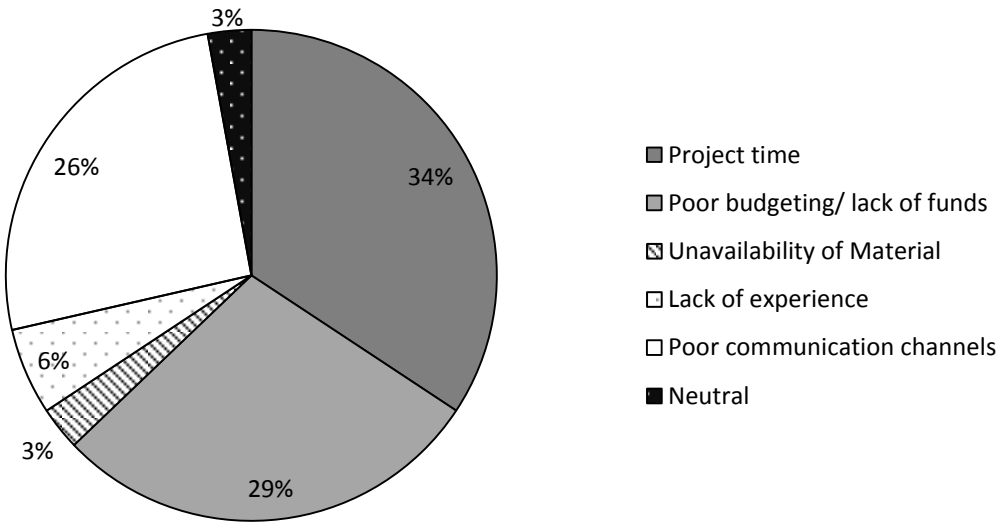


Figure 4-7: Satisfaction levels of employees with project process of Windhoek Municipality

The results are of 83% not satisfied with the with the project process not surprising considering that there is a margin of projects that fail.

2.6.2 Give reasons for your answer in question 2.6.1



Majority of the respondents cite poor budgeting and project time as the main reason for the dissatifaction in the project process.

2.7 Which of the following VM standards is applied for projects in your organization?

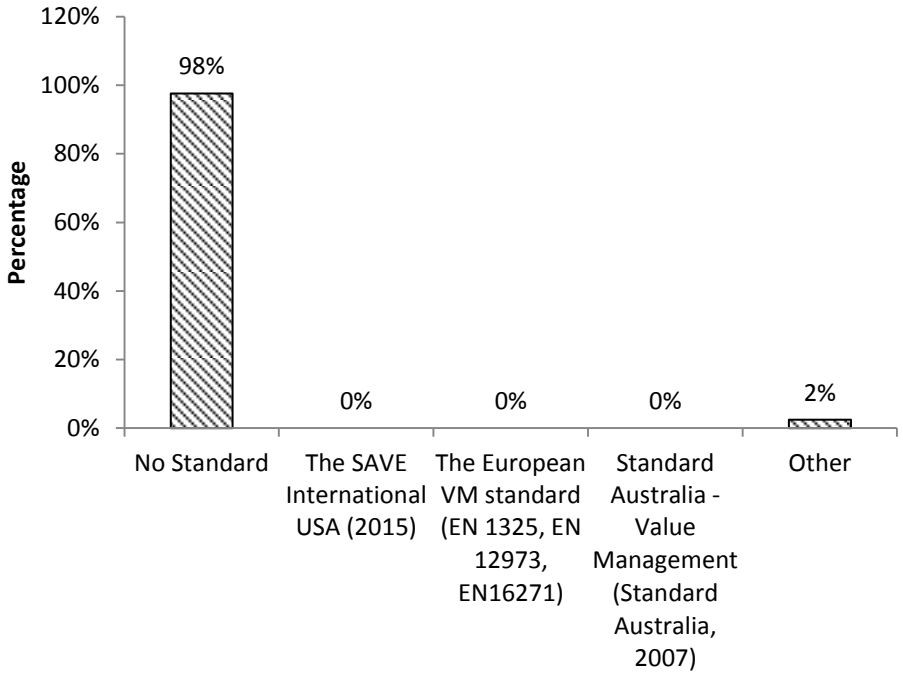


Figure 4-8 VM Standard used in Projects

The survey result indicate that there is currently no VM standard being applied to the projects

2.8 Does your organization have a formally defined documented project system?

95% of the respondents confirm that the Windhoek Municipality does have a documented project system. This sets a platform to integrate the VM technique with existing processes not to reinvent the wheel completely and to ensure benefits like optimizing the design, schedules and costs before implementation.

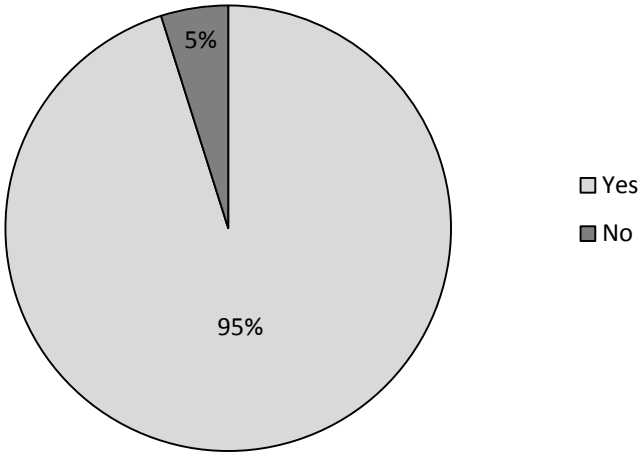


Figure 4-9: Organization project system

2.9 In which project phase must VM be introduced.

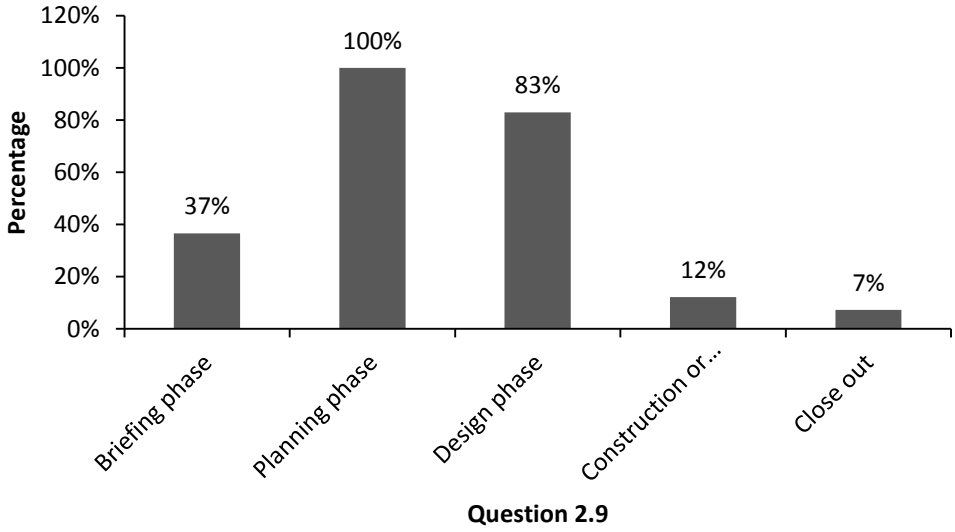


Figure 4-10: Project Phases to apply VM

Majority of the respondents (100% and 80%) support that value management can be introduced in the planning phase and design phase.

2.10 *V.M, according to its methodology, intends to increase the project's value for the client. Do you think that something like this would be of interest to the Windhoek Municipality and or the organization you work for?*

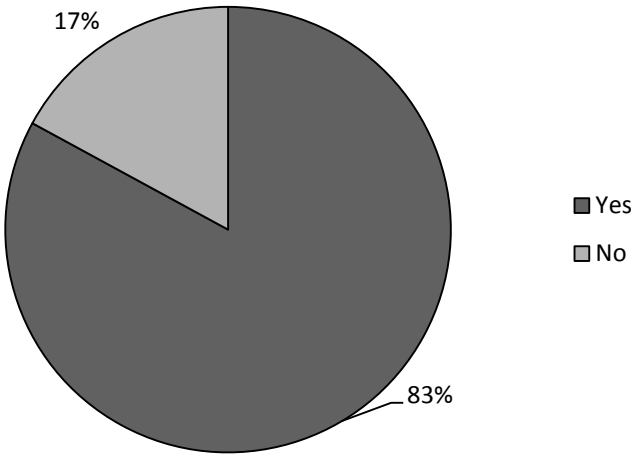


Figure 4-11: Interest to use VM in projects

As 83% believe this approach would be of interest to the Windhoek municipality and would increase project value.

2.11 How would you rate the communication level between project stakeholders?

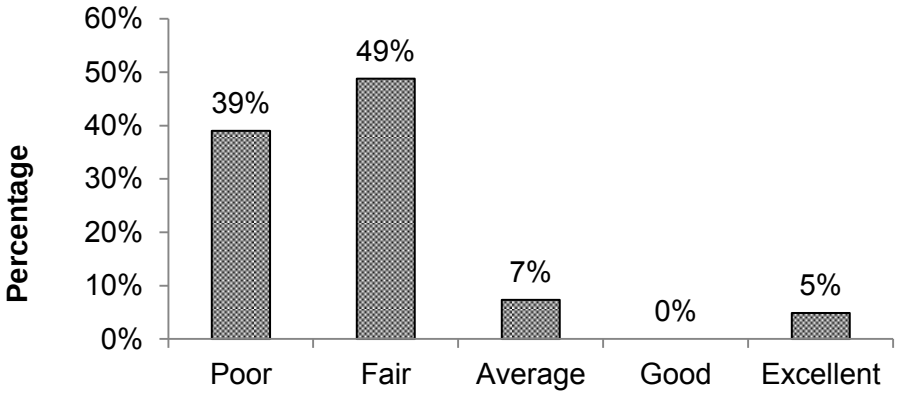


Figure 4-12: Communication level between project stakeholders

The communication in the Windhoek municipality is currently seen as poor or fair only 5 % think it's excellent. Thus communication strategy needs to be address if this process is to be introduced affectively.

2.12 Do you consider alternative road construction materials within your designs and which method are you using if you do?

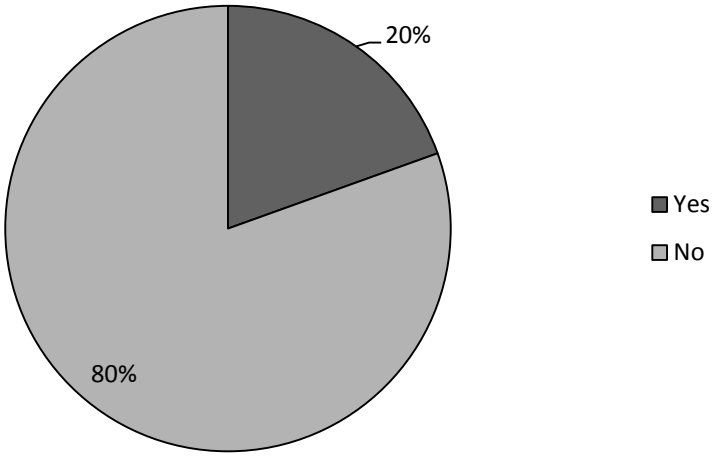


Figure 4-13: Consideration of alternative construction materials

80% of respondents indicated that they do not consider alternative construction when doing their designs.

2.13 Which method do you use to consider an alternative design and cost?

This question only had a 2% response rate and thus will be excluded from further analysis.

2.14 In many European countries and the United States of America, V.M is being applied in the construction industry. By doing that, a 6% to 20% of each project's financial cost is saved without any impact on time and quality. Do you think that this would interest your company so as for it to gain this benefits and to implement projects more efficiently?

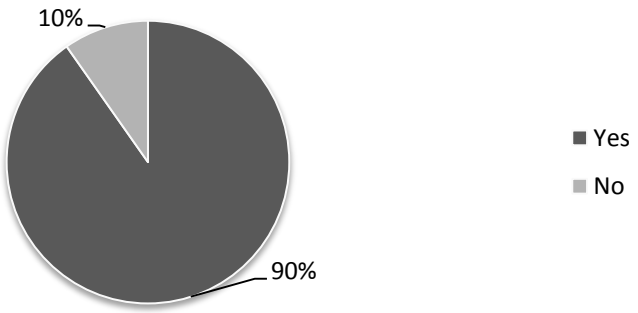


Figure 4-14: Interest for the organization to adopt VM

2.15 would you be interested in taking part in an informative workshop related to Value Management?

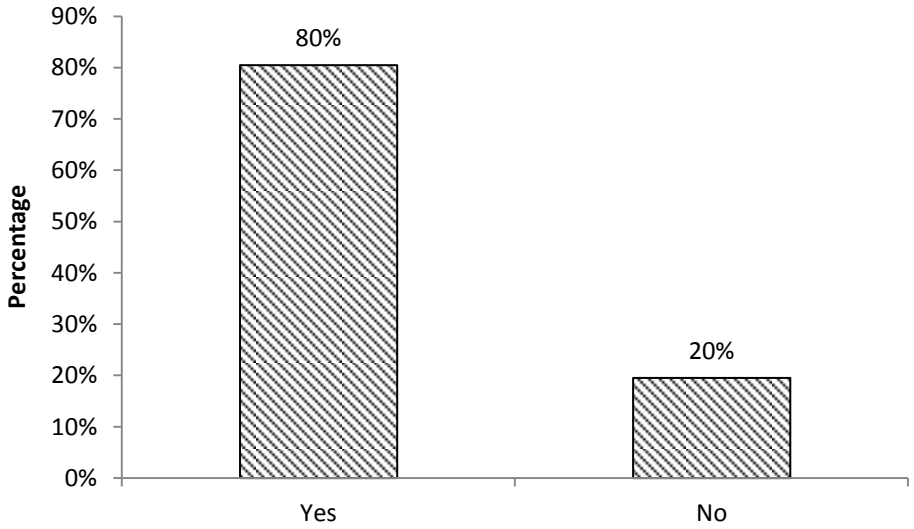


Figure 4-15: Interest for employees to take part in informative workshop on VM

80% of respondents indicated that they would very much like to take part in a training or workshop to improve their knowledge

4.7 SUMMARY

This chapter presented the results obtained from the survey questionnaires. The response rate of the questionnaires distributed translates into 68% response rate. The biographical characteristics of the respondents indicate that the data provided is f a worthy and credible nature as all respondents are highly qualified and knowledgeable.

Most respondents have a good understanding of value management, project processes and display a general agreement on the driving forces of successfully implementing the approach and required changes to ensure value for money. They all express similar views to improve project cost. The next chapter will provide discussions on the findings.

5 FINDINGS AND DISCUSSIONS

5.1 INTRODUCTION

In the previous chapter, the methodology that was employed to collect data, including the methods and tools to analyses the data, are extensively discussed. In this chapter the researcher is aiming to preset the findings of the research and the results of the data collected and presented in the preceding chapter. The discussions are related to the data obtained from the survey questionnaire followed by the theoretical expansion of the literature detailed in chapter 2. The chapter than presents and highlight a summary of the important findings and see whether the objectives of the study have been met and whether the fundamental research questions has been answered.

The study made use of an inductive study approach, meaning there was no preexisting theory upon which the research objective was based on. The data analysis was guided by insights learnt during the literature review.

5.2 Research objectives

To address the research problem statement, objectives of the study were drawn up. To recap, the problem statement is that the demands of urbanization and population growth in the Windhoek Municipality cannot be addressed using existing design project processes and conventional materials for infrastructure construction. The unavailability of construction material in and around Windhoek has long contributed to project delays due to the challenges faced to identify sustainable road construction material. The absence of an identifiable project process has been identified as one of the challenges causing project failure in most of the projects with regard to time and cost. The Value Management technique FAST is proposed for the Windhoek Municipal as a proven approach that results in creating value for projects.

The analysis and discussion of the survey results will be presented as follows:

5.2.1 Assess the feasibility of introducing the Value Management tool to the Windhoek Municipality and Project team

Discussion in this section will cover the survey finding with respect to respondent's' awareness, knowledge and understanding of value management and its techniques. The gauging of respondents understanding of value management was done with the belief that a clear understanding of the subject matter will assist in giving a sound assessment of research question 1 and 2.

5.2.2 Identify at which stage of the project the FAST can be introduced on future projects

Questions in this section will discuss finding in responses aimed at determining the hindrance factors in the implementation of value management and/or its techniques in the Windhoek Municipality, in order to strengthen the discussion around survey results of the questionnaire, the literature review in chapter 2 and the findings from will also form part of these discussion.

5.2.3 Assess the feasibility of introducing the Value Management tool to the Windhoek Municipality and Project team

i) The concept of Value Management and municipal project process can it be introduced to achieve more sustainable construction practices?

The analysis of the survey results outlined in Appendix 2 show that respondents are in agreement that the reasons to adopt value management is to improve project value to address the challenges with respect to public budget constraints and to accelerate project delivery. The highest rating was to reduce project cost. The above resonate with Jay and Bowen (2009) who assert that FAST is requirement oriented and is a function based model which focuses on the aspects required by a design, process or service to accomplish its objectives at minimum cost through innovation. The majority of respondents affirming project cost as a concern is a justification to introduce the value management concept techniques.

Given the above argument, one can deduce that the results were substantial for those who advocate budgetary constraints as being the main reason why the Windhoek municipality needs to adopt the concept instead of traditional methods.

The level of understanding of the value management concept within the group of respondents is 61% which translate to understanding between fair and good. The level of understanding of value management from those with less than 10 years of experience and those with more than 10 years of experience does not differ significantly either. In terms of the correlation between the level of understanding of the value management terms and the usage of the concept within the municipal infrastructure sector, there is no correlation with the use because it is not being applied in any of the project processes, even though the majority of respondents are aware of the concept. Hence, there must be some other reasons why the value management principle has not been introduced in the Windhoek Municipality. Some of the driving forces most respondents indicated are to improve project success rate and to reduce project cost. Current project processes have not accomplished project objectives, a predominant large number of respondents reported that projects are not completed on time and within budget citing lack of availability of suitable material and an absence of a clear project management methodology for the organization as some of the main reasons. Project management methodologies are regularly employed in organization with the aim to increase project efficiency and effectiveness (Wells, 2012).

The lack of experience and clear insight of the concept in the organization is ranked as the greatest barrier to the implementation of value management, followed by a lack of value management standard and lack of top management support. Therefore, this barriers ties in with the finding related to the preceding paragraph where a group of respondents display only fair to good understanding of value management, this indicates a lack of confidence in implementing value management on projects. From the survey it is clear that current project control systems are ineffective in reaching project objectives. To gain confidence most respondents prefer that the concept is introduced through a pilot project. Lack of knowledge about V.M can result in the employee's disregard of V.M existence. Even though employees are aware of V.M and its benefits, it is difficult to apply with low confidence levels in the application thereof. It is easier to stick to what you know because it has become normal practice. Use of different methods presents a possibility for hurdles

and a learning curve that normally has causes decreased output levels in the initial stages. Hence, they prefer sticking traditional methods in their projects. Moreover, it is very unlikely for clients who have no or little knowledge of V.M to request their designers and contractors to conduct V.M studies for their projects (Fong and Shen, 2000).

ii) Can FAST be introduced and at what stage of the project process can it be introduced for most benefit

The survey results indicate that the most preferred stage to introduce the principle is during the planning stage and design phase. Especially when using the FAST. This premise is in line with Phillips (1999) who during his case study found that value methodologies may be applied at any point during the project development. But it is best results are obtained through early application. Preferably the value process is introduced as early as the needs identification stage during the design process.

iii) What are the change management issues that need to be addressed to implement Management tools like the FAST diagram?

Change is naturally unsettling for people at all levels of an organization, and when it is on the horizon all expectation are on top management to create an environment of certainty. Employees turn to the leadership team for strength, support, and direction. The leadership must change first to challenge and motivate the rest of the organization(Grover *et al.*, 1995). This same idea is amongst most respondents that top management support is required to convince project management staff to buy-in to the concept.

There change in the budgeting model will be required to ensure adequate funding for the projects and a flexible implementation strategy at different levels. One of the concerns is internal communication which is currently lacking in the Windhoek municipality as confirmed by 86% of respondents. Communication is important as it is a way to manage resistance.

iv) Will training be required to introduce value management in the Windhoek Municipality at first?

To ensure successful implementation, training will be required because as previously indicated in the above findings, knowledge on the subject matter is not above average and 78% of respondents have indicated the need to for further training of the value management concept.

Preposition: There are specific factors which are influencing the lack of successful project delivery process which can be improved by introducing the FAST.

The identification of the factors hindering successful implementation of value management can be traced back to the responses given by respondents for factors such as lack of top management support, lack of value management knowledge and buy-in of project management staff.

Looking at the synthesis and analysis from the quantitative research findings, it is clear that projects in terms of construction do not live up to expectations. As indicated in most projects in the Windhoek municipality fail in terms of delivery time and cost. According to the research findings the absence of a clear project management system or standard supporting the implementation process of projects in the organization has been a great contributing factor to project failure. From these findings it is can be concluded that that the Windhoek Municipality would need to redefine project processes and introduce a workable solution. Value Management through its technique of FAST can provide such a solution.

Based on the above, Preposition 1 has been proven

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

In the previous chapter the researcher outlined the detailed findings of the research and the analysis thereof to make sense of the raw data that was collected from the sampled respondents. It was further proven to be realistic that, while V.M is a needed concept change management is inevitable, the engagement of the employees and the relevant stakeholders was very important to achieve the desired results.

This chapter provides a summary on the V.M and FAST principle features of the research. The main findings are reviewed as well as the key concepts and theories that were identified in the literature. Additionally, suggestions for implementation and change management practice are given followed by recommendations for future research.

6.2 CONCLUSION

This research proposes to introduce Value management and the FAST diagram technique as a methodology for road designs to the Windhoek Municipality design team, in order to consider alternative construction materials. The dissertation has pointed out that many researchers emphasize the use of V.M and its techniques to redefine the design and construction process exploring material sustainability, streamlined construction processes and reduction of overall project costs.

The main purpose of this research was to determine how the V.M FAST diagram approach can be used to improve road and infrastructure development processes in Namibia. This study proves that V.M is a beneficial practise that should form an integral part of a project and that it is worth investing time and effort in the process as a whole.

The sub questions were carefully chosen and constructed to provide an answer to the main problem. The combined outcome of the different chapters address part of the main question what V.M entails and the following conclusions could be drawn:

The application of Value Management has been practiced in various countries around the world over many decades and is recognized as one of the most effective methodologies for achieving best value for money (Kelly *et al.*, 2015). Nevertheless, the discussion has shown that the research results support the key concepts of the literature that is, most Engineers in the construction industry have not explored the benefits that come with V.M methodology and its techniques. There is a need to introduce the concept and to change the attitudes of professionals in the construction industry of Namibia. Management and the design project team should be more open-minded to the idea of V.M. Change is essential for innovation and VM provides a platform for a structured creativity process. With this change, training and introduction of the concept will be required. Thus there is a further need from the construction to recognize the benefits and work on a strategy to sensitize the professionals to pay attention to V.M.

The biggest challenge, however, could be management support and to create awareness at senior management level to convince management to release additional funds required for implementation of the concept. A promising implementation approach would be to combine a high opportunity with a relatively low risk pilot project as a start to act as a role model.

It is observed that the Windhoek Municipality design team is receptive to the Value Management concept and is willing to be introduced and trained on the concept. To improve project performance the Windhoek Municipality needs to ensure successful management, development, and delivery of projects through introduction of a clear project methodology (Wells, 2012).

Furthermore, it can be concluded that the V.M methodology definitely helps project managers control construction projects by providing accurate forecasts and early warning signals. All necessary information to implement this methodology is available in most construction projects. This information has to be employed to integrate both schedule and costs in one project proposal.

6.3 RECOMMENDATIONS

The literature study review in this report has conferred on the need for the systematic design process that enables the design team to consider alternative design material and improve project costs. In addition, the structured design process focuses on value rather than cost and seeks to achieve an optimal balance between time, cost and quality which will help to reduce project risk, improve project implementation and efficiency (Kelly *et al.*, 2015). From a sustainability perspective the methodology allows the company to develop competencies that lead to enhanced value and client satisfaction.

There is a need to change the attitudes of professionals in the construction industry. Change is a prerequisite for improvement

It is recommended that the Value Management is introduced to the team initially in the form of the FAST diagram technique in a systematic manner by starting off with a pilot project, identifying and communicating the wins to the organization before increasing its use in more projects. The Windhoek Municipality would be required to assign responsibility for the development and implementation of a change management approach for the new process. The process would ensure that decisions can be made to support implementation of the change or assign suitable resources to promote the concept and monitor the outcome.

Introduction of V.M methodology into the design process will necessitate the need to shift the regulatory landscape in Namibia in consultation with engineering professional bodies and the construction industry. Organizations and professionals who are knowledgeable in V.M practices should encourage its practice and insist on its application on projects. The involvement of the clients and the consultants is an important driver in value management since they are the key players serves an active role during the construction process.

The government being the largest clients to the construction industry can further enhance the value of V.M procedure by introduction and enactment of policies and regulations enforcing the application of V.M studies on certain projects. Also, the government should ensure that it utilizes the V.M procedures and practices in its own projects so as to encourage interests in V.M utilization across the board.

Government involvement through the introduction of value management policy, regulations, guidelines and enforcement of V.M will make the practice one of the important activities carried out by the Namibian construction industry.

Future research should be carried out to examine the possibility of teaching V.M in higher institutions in Namibia. Also, it would be interesting to investigate further into the creation of V.M workshops for construction professionals as this will aid fostering the implementation of V.M in the industry.

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APPENDIX A - QUESTIONNAIRE

QUESTIONNAIRE: IDENTIFYING DESIGN ALTERNATIVES FOR THE WINDHOEK MUNICIPALITY BY APPLYING THE FAST DIAGRAM

Respondent number …….

Dear Sir \/Madam

Introduction

My name is Mary Shiimi, a Master's of Science in Project Management degree student at University of Cape Town (UCT).

The purpose of this questionnaire is to gather data to establishing the status of the use Value management Techniques at the Windhoek Municipality in relation to projects. The Research dissertation is done under the supervision of Mr. Ian Jay a renowned lecture at UCT. Your participation in this Survey is voluntary and all information will be highly confidential

The questionnaire consists of questions related to personal information, demographics, education and value management related questions. In total there are 20 questions

Answering the questionnaire would take about 15 minutes of your time.

Category 1: Respondent and organization information

1.1 Personal information

Organization: *(Tick√ applicable box)*

Windhoek Municipality ☐ Consultant ☐ Contractor ☐

Department:_____

Position:_____

1.2 Gender: Male ☐ Female ☐

1.3 How many years of experience do you have in Project management (Tick√ applicable box)

none ☐ Less than 5 years ☐ 5 to 15 years ☐ More than 15 years ☐

1.4 Do you have any knowledge the following terms (Tick√ applicable)?

no	
yes	

(If yes to above questions answer question 1.5)

1.5 This awareness of the terms V.M, VA, etc. comes from (Circle applicable)

1. Graduate studies

2. Training at work

3. Seminars and conferences

4. Scientific papers, books, publications

2. ACCEPTANCE AND USE OF VALUE MANAGEMENT

2.1 How widely is value Management used to manage projects in your organization? (Circle applicable)

1 Not used
2 Used only for few projects
3 Used as an organization wide standard for all project

Please rate the following statements based on the Likert scale from 1-5 (1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = agree, 5 = strongly agree) (Tick√ applicable scale)

2.2 If your organization has <u>not</u> applied V.M across all types of projects, what are the reasons?

	1	2	3	4	5
Lack of motivation and support Top Management					
Lack of value management knowledge					
V.M is not suitable for most projects					
There is resistance to its implementation					
Current project control systems work no need to change					
Requires lots of time and cost commitment					
It is a waste of project valuable time					
Not cost effective to implement					

Lack of financial resources to implement					
It is a management fad, we do not see the benefits, lack of interest of project teams					
Lack of V.M standard					

2.3 Driving forces leading to adoption of Value Management and its Techniques in the Windhoek municipality

	1	2	3	4	5
To reduce project cost					
Environmental sustainability values					
Improved knowledge of the standard by staff member					
Improve project value					
Pressure from management					
Shortage of Construction materials in the industry					

2.4 Please evaluate the relative importance of the following factors to successfully implementation of value management

	1	2	3	4	5
Top management support					
Funding and time allowance for V.M usage					
Adoption of a policy on Value Management standard for the whole organization					
Flexible implementation strategy at different organization levels					
Commitment to training of project teams					
Maturity of organization project management system					
Culture of the organization and top project management leadership style					
Buy-in of project management staff					
Support provided by an external consultant					
Introduction of a few pilot study project first					

2.5 Projects in your organization mainly fail due to?

	1	2	3	4	5
program overrun					
budget overrun					
quality (specifications)					
Lack of availability of suitable material					
lack of project management knowledge					
lack of project control					

2.6. Project Process

2.6.1 How satisfied are you with holistically considering projects scope management, cost, time and procurement management processes of the Windhoek Municipality. (Tick√ applicable statement)

Strongly dissatisfied	
dissatisfied	
Neutral	
satisfied	
Strongly satisfied	

2.6.2 Give reasons for your answer above:

_____

_____

_____

_____

_____

2.7 Which of the following Value Management standards is applied by your organization? (Circle applicable statement from list below)

1. No standard used
2. The SAVE international standard USA (2015)
3. The European V.M standard (EN 1325, EN 12973, EN16271).
4. Standard Australia - Value Management (Standards Australia, 2007)
5. Other (Specify)_____

2.8 Does your organization have a formally defined documented project system? (Circle applicable statement from the list)

1. Yes
2. No

2.9 In which project phase must Value Management be introduced? ((Tick√ most preferred, you may tick more than one)

Briefing phase	
Planning phase	
Design phase	
Construction or implementation phase	
Close out	

2.10 V.M, according to its methodology, intends to increase the project's value for the client. Do you think that something like this would be of interest to the Windhoek

Municipality and or the organization you work for? (Circle applicable statement from list below)

1. Yes

2. No

2.11 On a scale of 1-5 (1 = poor, 2 = fair, 3 = Average, 4 = good an 5 = excellent), how would you rate the communication level between project stakeholders: (Tick√ applicable):

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

2.12 Do you consider alternative road construction material within your design, for City of Windhoek Projects (circle applicable statement from list below) (if yes, answer question 2.13).

1. Yes

2. No

2.13 Which method do you use to consider an alternative design and cost?

_____

_____

2.14 In many European countries and the United States of America, V.M is being applied in the construction industry. By doing that, a 6% to 20% of each project's financial cost is saved without any impact on time and quality. Do you think that this would interest your company so as for it to gain this benefits and to implement projects more efficiently (circle applicable statement from list below)

1. Yes

2. No

2.15 Would you be interested in taking part in an informative workshop related to V.M? (Circle applicable statement from list below)

1. Yes

2. No

2.16 Any additional comments on implementation of Value management in the Windhoek Municipality or Namibia at large

_____

_____

APPENDIX B – INFORMED CONSENT FORM

INFORMED CONSENT FORM page 1

Title of research study: Identifying design alternatives for the Windhoek municipality by applying the FAST diagram

I would like to invite you to participate in the research study examination, which will add to the knowledge related to Value Management and the FAST technique. My name is **Mary Shiimi** and the data is collected in this research questionnaire will help fulfill the requirements for a **Master of Science in Project Management** at the **University of Cape Town**. I am under the supervision of my faculty lecturer **Mr. Ian jay.**

Participation requires you to: to provide personal information, demographics, education and to answer 18 related to value management and construction project related information. There is no planned use of deception involved in the study.

Your privacy: your participation in this study and your responses will be kept confidential. Any reference to you will be by pseudonym, including any direct quotes from your responses. This document and any notes that might personally identify you as a participant in this study will be kept in a locked place that only the researcher will have access to. Only the researcher and the research supervisor might know who has participated in this study. Three years after this research study all personally identifying information will be destroyed.

Risk to you: there are five acknowledged risk general associated with participation in research studies such as this one: Physical, psychological, social, economic and legal. The researcher foresees minimal risk for those who choose to participate in the study. There are no foreseen physical risks associated with this study; other risks might include the following;
You might experience social economic or legal implications if you share your responses or your participation in this study with others. If you choose to participate in this study, you are encouraged to keep your participation in this study and your responses confidential. The researcher will maintain your confidentiality throughout the study and will destroy the records of your participation three years after the study is complete.

Benefit to you: there are not foreseen direct benefits to you regarding participation in this study beyond the general knowledge that you are assisting in furthering the knowledge related to this research topic and assisting the researcher in completing the MSc degree requirements. There is no compensation associated with participation in this study.

INFORMED CONSENT FORM page 1

Title of research study: Identifying design alternatives for the Windhoek municipality by applying the FAST diagram

This document acknowledges you understand of your rights as a participant in this study, which the researcher has explained to you prior to signing the document.

I acknowledge that the researcher has explained my rights, the requirements of this study, and the potential risks involved in participating in this study. I understand there is no compensation for or direct benefit of participating in this study. By signing below and providing my contact information, I am indicating that I consent to participate in this study that I am at least 18 years of age, and I am eligible to participate in this study.

You may withdraw from this study at any time by notifying me by email. If you have concerns regarding your participation in this research study you may contact my Supervisor Mr. Ian Jay. You may ask for a copy of this document for your records.

Signed Name: _____ date

Printed name: _____

Phone number, email address or postal address: _____

Thank you for your participation,

Student name: Mary Shiimi

University of Cape Town

Email address: Mary.Shiimi@windhoekcc.org.na

Mr. Ian Jay

Department of Construction Economics and Management
Faculty of Engineering & the Built Environment

University of Cape Town

Email address: ian.jay@uct.ac.za

The Engineering & the Built Environment Ethics in Research Committee (EBE EiRC) oversees the ethical practice of research involving human participants conducted by students of the University of Cape Town, in the Faculty of Engineering & the Built Environment

APPENDIX C - APPROVAL LETTER FROM THE ORGANIZATION TO DO A RESEARCH

Department of Human Resources

✉ 59
Corner of 5378, Independance Avenue and Garten Street
WINDHOEK, NAMIBIA

Fax (+264) 61 290 3212 • Tel: (+264) 61 290 2911 • www.citywindhoek.org.na

ENQ:	Ms CN Lilimqwe	**PHONE:**	09 264 61 290 2366
DATE:	27 September 2016	**FAX:**	09 264 61 290 3212
		EMAIL:	cnl@windhoekcc.org.na

RE: PERMISSION TO CONDUCT RESEARCH TITTLED "IDENTIFYING DESIGN ALTERNATIVES FOR THE WINDHOEK MUNICIPALITY BY APPLYING THE FAST DIAGRAM" – MARY SHIIMI (STUDENT NUMBER: SHMMAR005)

This letter serves as confirmation that Ms Mary Shiimi, a student pursuing a Masters of Science in Project Management at the University of Cape Town, has been granted permission to conduct her research on the above subject within the City of Windhoek.

The research, which is in partial fulfilment of Ms Shiimi' s studies, aims to assess the feasibility of introducing Function Analysis Systems Technique (FAST) to the Windhoek Municipality to achieve sustainable road construction strategies. Ultimately, the research aims to establish whether the application of the FAST to projects within the Windhoek Municipality will help determine alternative road construction methods that will lead to increased value for money for the organization.

Respondents to the study are therefore requested to render the student their cooperation and assistance. Should there be any queries, please feel free to contact the Human Resources Development Division on the above contact details

Yours Sincerely

MA Nikanor
Manager: Human Resources Development

CITY OF WINDHOEK
HUMAN RESOURCES
DEVELOPMENT
2016 -09- 27
NAME: M.A Nikanor
SIGNATURE:

All official correspondence must be addressed to the Chief Executive Officer

APPENDIX D – ANALYTIC OUTPUT

Analytical Output

A total of 60 questionnaires were given to the respondents and about 41 questionnaires were completed giving a response rate of about 68.3 percent

Background characteristics of the respondents

Category 1: Respondent and organization information

1.1a. Personal information

		Frequency	Percentage
1	Windhoek Municipality	39	95%
2	Consultants	1	2%
3	Contractors	1	2%

1.1b. Department

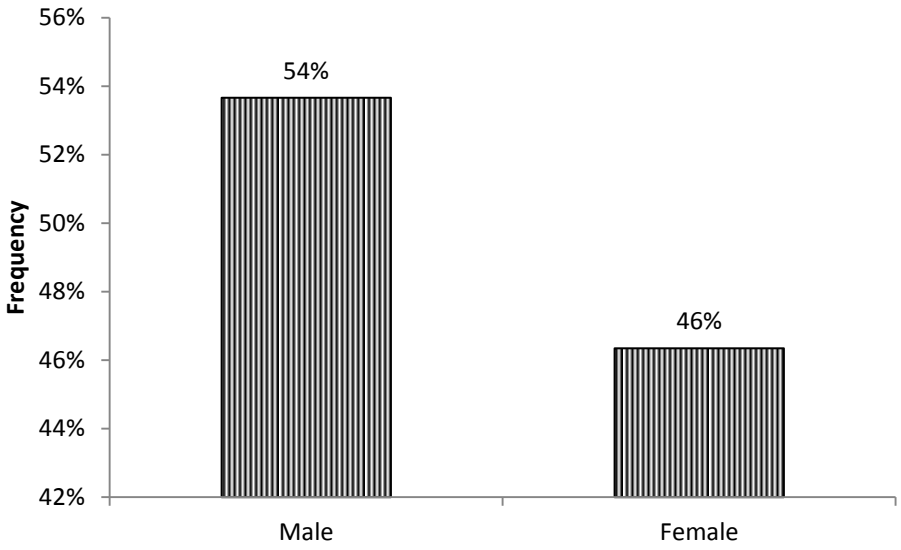
	Departments	**Frequency**	**Percentage**
1	Infrastructure	16	39%
2	Electricity	7	17%
3	Housing and Property	6	15%
4	Urban and Transport Planning	5	12%
5	ICT	4	10%
6	Economic Development	3	7%
7	**Total**	41	100%

1.1c. Position of the respondents in their respective organizations

Q1.1c Designation of respondents	Engineer	18	44%
	Technician	4	10%
	Project Manager	4	10%
	Valuer Technician	2	5%
	Environmentalist	2	5%
	Administrative assistant	2	5%
	Valuer	1	2%
	Inspector	1	2%
	Site Agent	1	2%
	GIS Operator	1	2%
	Valuer	1	2%
	GIS Support Specialist	1	2%
	Contractor's Representative	1	2%
	Property data collector	1	2%
	Liaison officer	1	2%
	Total	41	**100%**

1.2. Gender of the respondents

		Frequency	Percent
Valid	Male	22	54
	Female	19	46
	Total	41	100.0

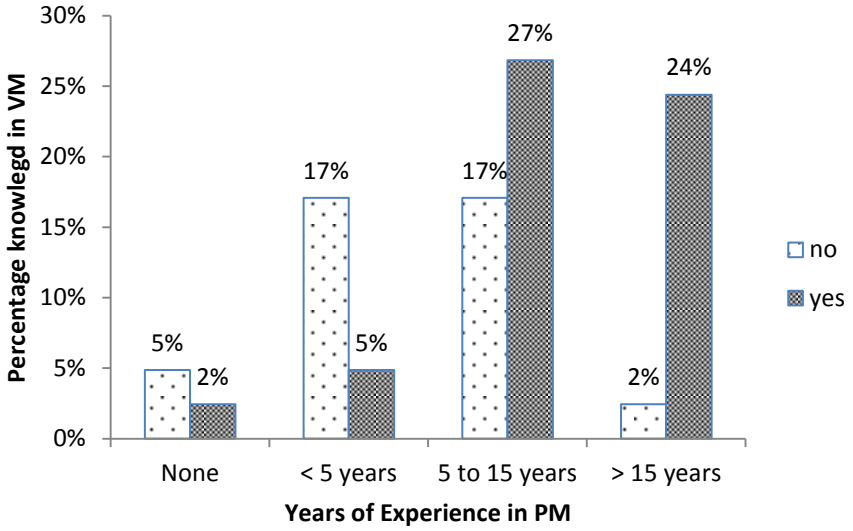


1.3. Years of experience in project management

1.3 How many years of experience do you have in Project management applicable box)

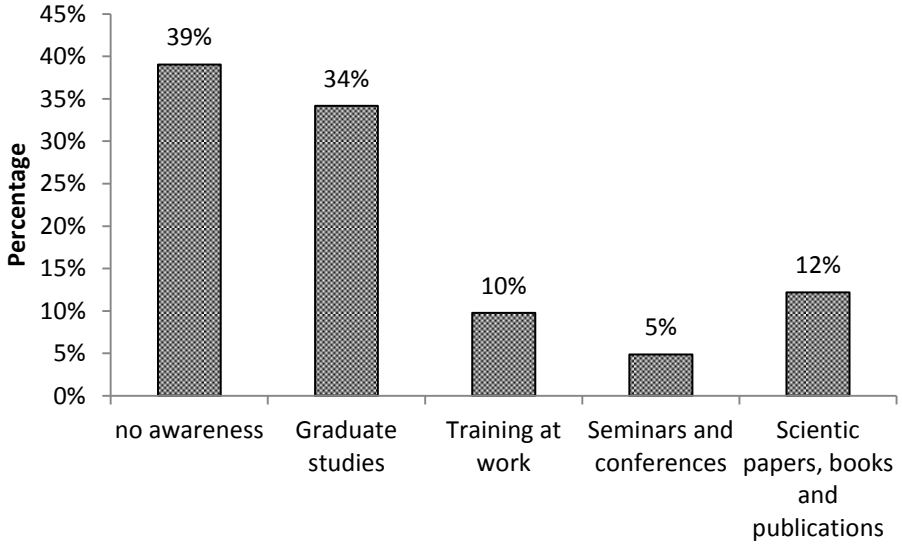
1.4 Do you have any knowledge the following terms (Tick√ applicable)?

	Knowledge in VM (frequency)			
Year of experience in PM	yes	no	Total	Percentage
None	2	1	3	7%
< 5 years	7	2	9	22%
5 to 15 years	7	11	18	44%
> 15 years	1	10	11	27%



1.5 This awareness of the terms V.M, VA, etc. comes from (Circle applicable)

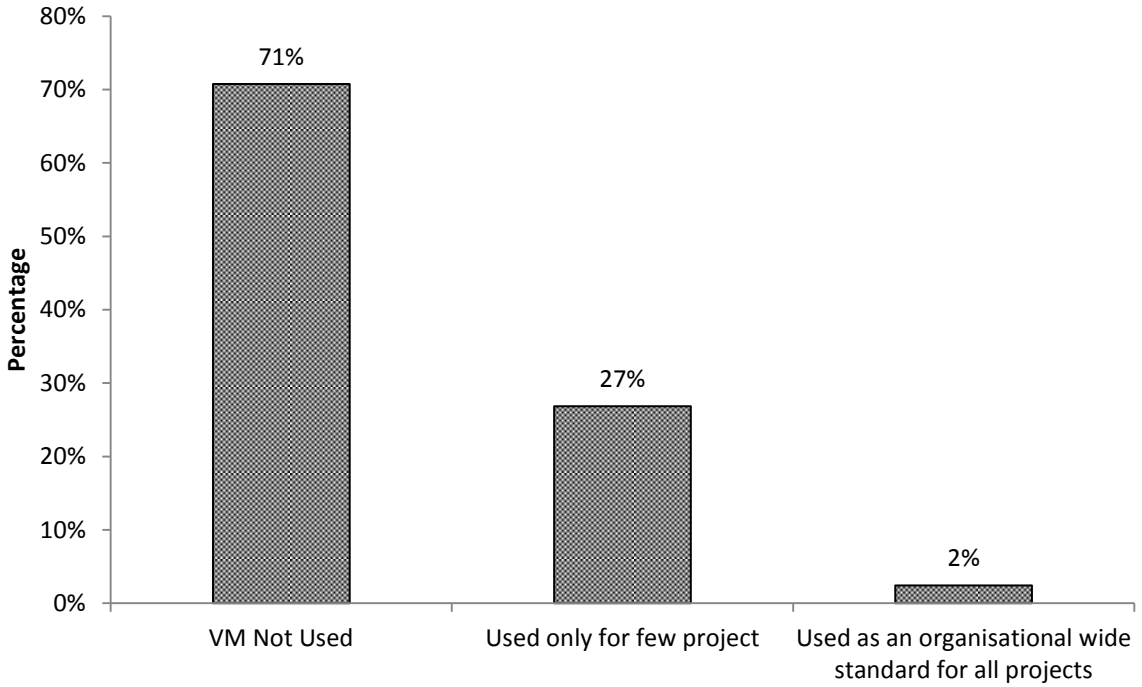
1. Graduate studies
2. Training at work
3. Seminars and conferences
4. Scientific papers, books, publications



2. Acceptance and use of V.M

2.1 How widely is value Management used to manage projects in your organization?

	Statement	**Frequency**	**Percentage**
1	VM Not Used	29	71%
2	Used only for few project	11	27%
3	Used as an organizational wide standard for all projects	1	2%
		41	100%



Please rate the following statements based on the Likert scale from 1-5 (1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = agree, 5 = strongly agree) (Tick√ applicable scale)

2.2 If your organization has not applied V.M across all types of projects, what are the reasons?

	QUESTIONS	Total	Strongly disagree (%)	disagree (%)	neutral (%)	agree (%)	strongly agree(%)	Total (%)
1	Lack of motivation from Top Management to use V.M	**41**	2%	0%	20%	66%	12%	**100%**
2	Lack of Value Management Knowledge	**41**	2%	7%	20%	51%	20%	**100%**
3	V.M is not suitable for most projects	**41**	76%	12%	10%	2%	0%	**100%**
4	There is resistance to Implementation	**41**	61%	15%	17%	5%	2%	**100%**
5	Current project control systems work, no need to change	**41**	76%	17%	5%	2%	0%	**100%**
6	Requires lots of time and cost commitment	**41**	63%	22%	5%	10%	0%	**100%**
7	It is a waste of project valauble time	**41**	68%	29%	2%	0%	0%	**100%**
8	Not cost effective to implement	**41**	44%	27%	29%	0%	0%	**100%**
9	Lack of financial resources to implement	**41**	17%	27%	49%	7%	0%	**100%**
10	It is a management fad	**41**	76%	12%	10%	0%	2%	**100%**
11	Lack of VM standard	**41**	0%	7%	5%	44%	44%	**100%**

2.2 The table presents the average responses to the following statements

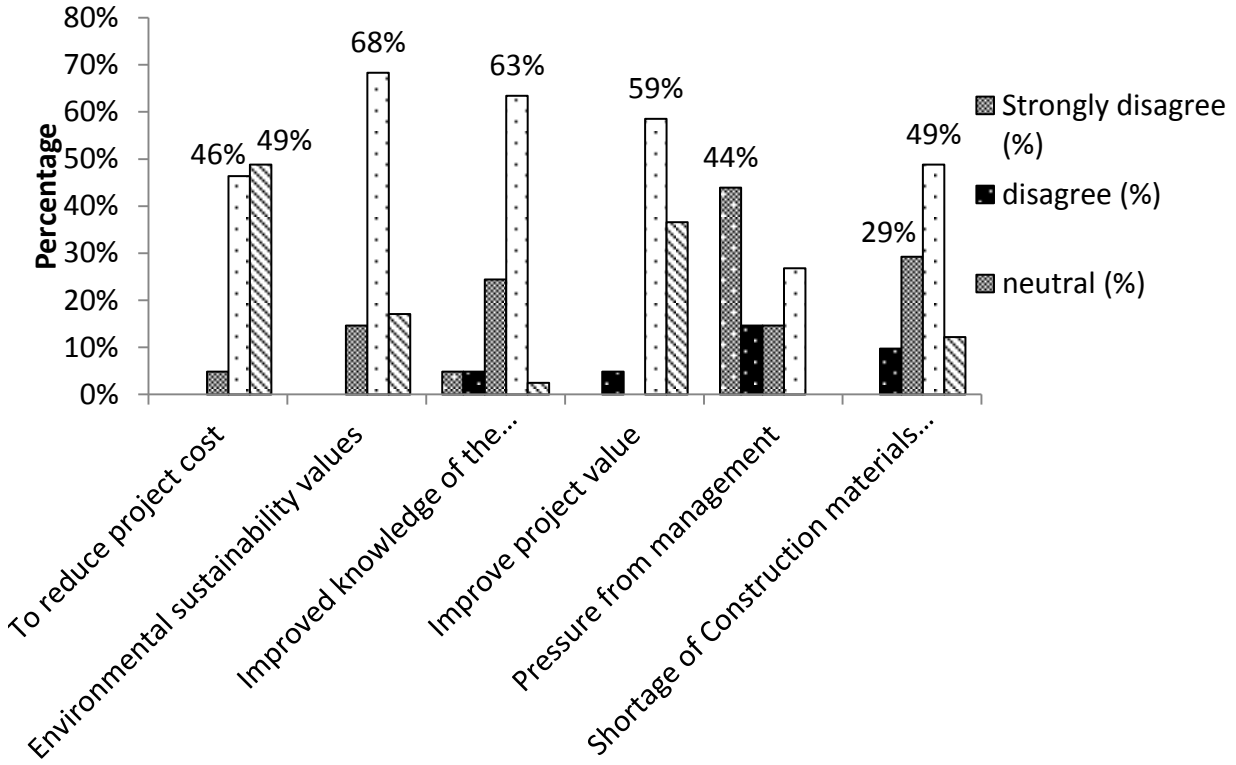
Statement	Average rating	Likert scale
1. Lack of motivation and support from Top Management	3.85	4
2. Lack of value management knowledge	3.98	4
3. V.M is not suitable for most projects	1.44	1
4. There is resistance to its implementation	1.76	2
5. Current project control system work no need to change	1.37	1
6. Requires lots of time and cost commitment	1.59	2
7. It is a waste of project valuable time	1.32	1
8. Not cost effective to implement	1.76	2
9. Lack of financial resources to implement	2.44	2
10. It is a management fad, we do not see the benefits, lack of interest of project teams	1.34	1
11. Lack of V.M standard	4.10	4
12. Pilot study failed to show its value	1.68	2

2.3 Driving forces leading to adoption of value management and its techniques in the Windhoek Municipality

The table presents the average responses to the following statements

Statement	Average rating	Likert scale
1. To reduce project cost	4.46	5
2. Environmental sustainability values	4.05	4
3. Improved knowledge of the standard by staff member	3.54	4
4. Improve project value	4.24	4
5. Pressure from management	2.27	2
6. Shortage of construction material in the industry	3.56	4

	QUESTIONS	Count	Strongly disagree (%)	disagree (%)	neutral (%)	agree (%)	strongly agree(%)	Total (%)
1	To reduce project cost	41	0%	0%	5%	46%	49%	100%
2	Environmental sustainability values	41	0%	0%	15%	68%	17%	100%
3	Improved knowledge of the standard by staff member	41	5%	5%	24%	63%	2%	100%
4	Improve project value	41	0%	5%	0%	59%	37%	100%
5	Pressure from management	41	44%	15%	15%	27%	0%	100%
6	Shortage of Construction materials in the industry	41	0%	10%	29%	49%	12%	100%

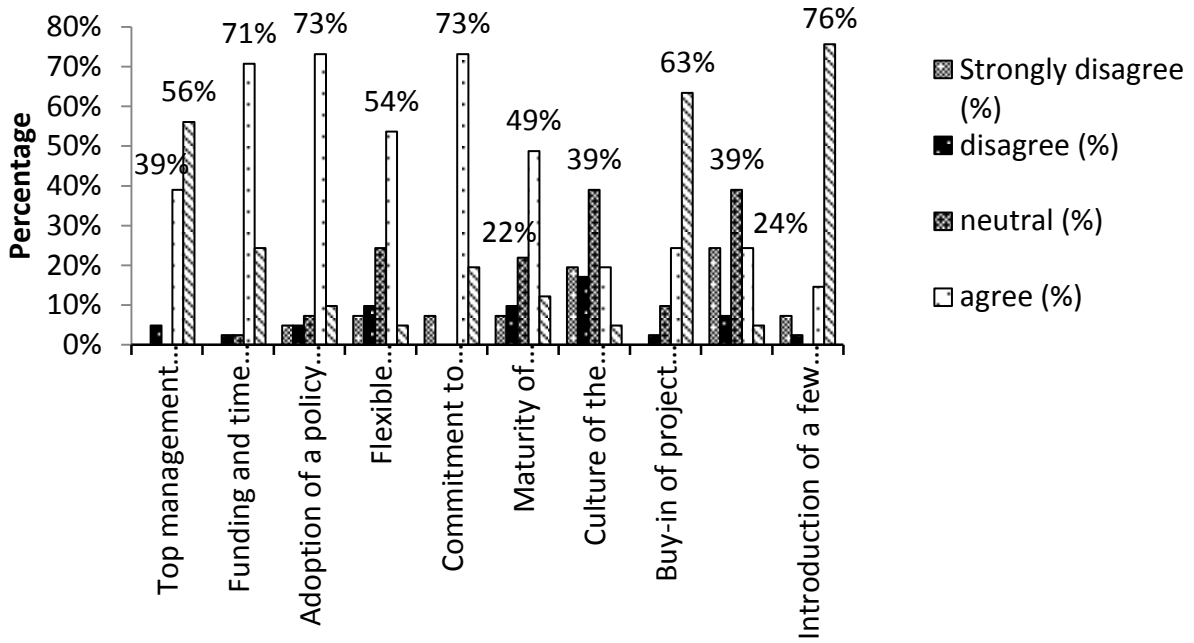

80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage
46%
49%
68%
63%
59%
44%
29%
49%
Strongly disagree (%)
disagree (%)
neutral (%)
To reduce project cost
Environmental sustainability values
Improved knowledge of the...
Improve project value
Pressure from management
Shortage of Construction materials...

2.4 Please evaluate the relative importance of the following factors to successfully implementation of value management

The table presents the average responses to the following statements

	QUESTIONS	Count	Strongly disagree (%)	disagree (%)	neutral (%)	agree (%)	strongly agree(%)	Total (%)
1	Top management support	41	0%	5%	0%	39%	56%	100%
2	Funding and time allowance for V.M usage	41	0%	2%	2%	71%	24%	100%
3	Adoption of a policy on Value Management standard for the whole organization	41	5%	5%	7%	73%	10%	100%
4	Flexible implementation strategy at different organization levels	41	7%	10%	24%	54%	5%	100%
5	Commitment to training of project teams	41	7%	0%	0%	73%	20%	100%

6	Maturity of organization project management system	41	7%	10%	22%	49%	12%	100%
7	Culture of the organization and top project management leadership style	41	20%	17%	39%	20%	5%	100%
8	Buy-in of project management staff	41	0%	2%	10%	24%	63%	100%
9	Support provided by an external consultant	41	24%	7%	39%	24%	5%	100%
10	Introduction of a few pilot study project first	41	7%	2%	0%	15%	76%	100%

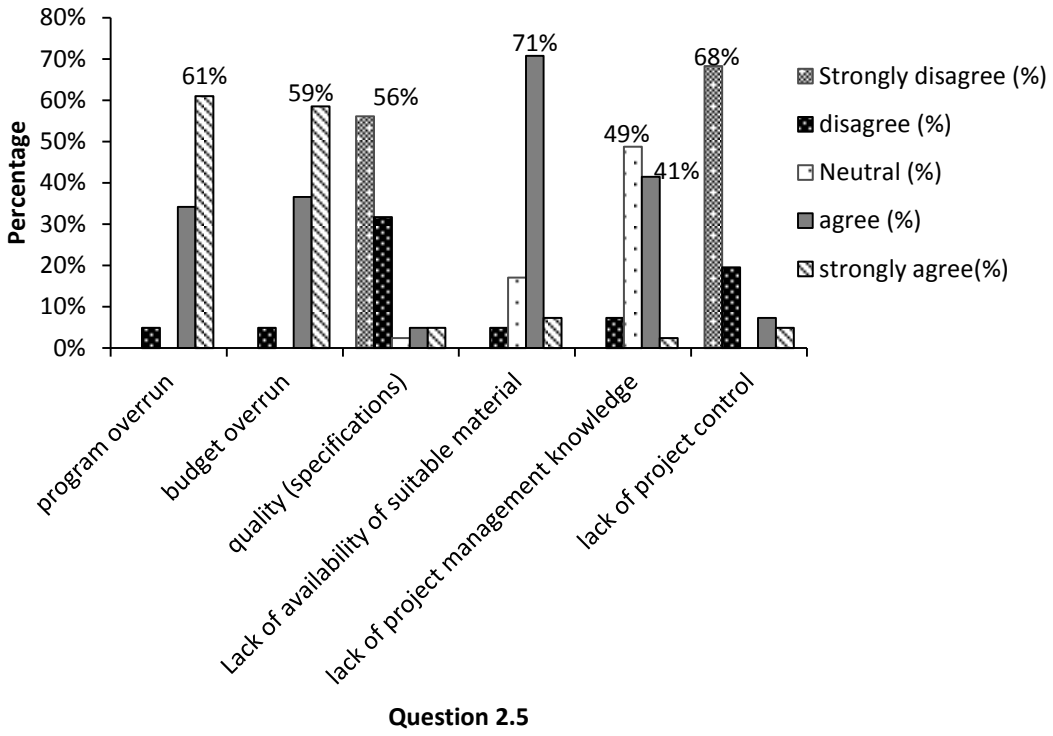


Question 2.4

2.5 projects in your organization mainly fail due to?

The table presents the average responses to the following statements

	QUESTIONS	Count	Strongly disagree (%)	disagree (%)	Neutral (%)	agree (%)	strongly agree(%)	Total (%)
1	program overrun		0%	5%	0%	34%	61%	100%
2	budget overrun		0%	5%	0%	37%	59%	100%
3	quality (specifications)		56%	32%	2%	5%	5%	100%
4	Lack of availability of suitable material		0%	5%	17%	71%	7%	100%
5	lack of project management knowledge		0%	7%	49%	41%	2%	100%
6	lack of project control		68%	20%	0%	7%	5%	100%



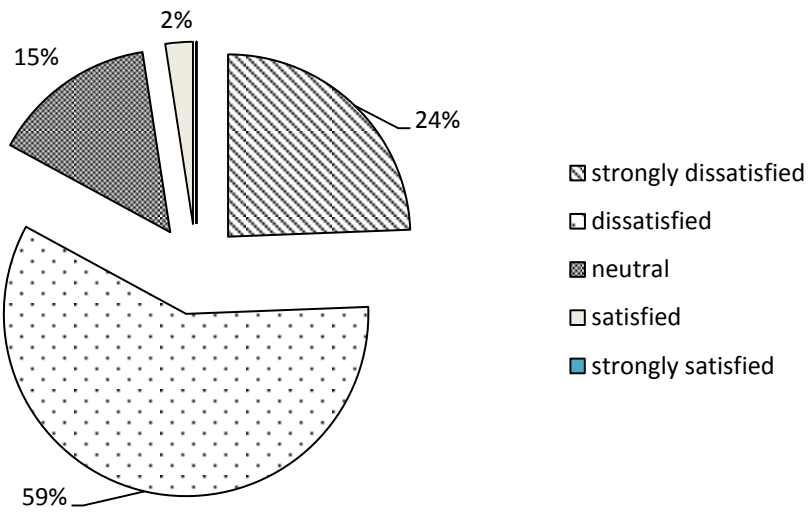
Question 2.5

2.6

2.6.1 How satisfied are you with holistically considering projects scope management, cost, time and procurement management processes of the Windhoek Municipality. (Tick√ applicable statement)

	Statements	**Count**	**percentage**
1.	strongly dissatisfied	10	24%
2.	dissatisfied	24	59%
3.	neutral	6	15%
4.	satisfied	1	2%
5.	strongly satisfied		0%
6.	Total		100%

Question 2.6.1

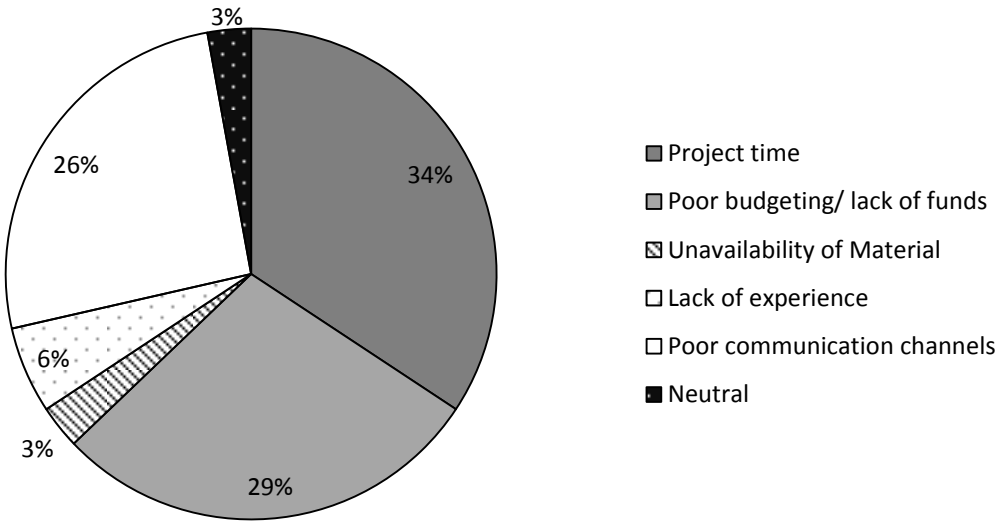


2.6.2 Give reasons for your answer above (in question 6.2.1)

	Main themes identified:	theme code	Count	Percentage
1.	Project time	1	12	34%
2.	Poor budgeting/ lack of funds	2	10	29%
3.	Unavailability of Material	3	1	3%
4.	Lack of experience	4	2	6%
5.	Poor communication channels	5	9	26%
6.	Neutral	6	1	3%
	Total		35	100%

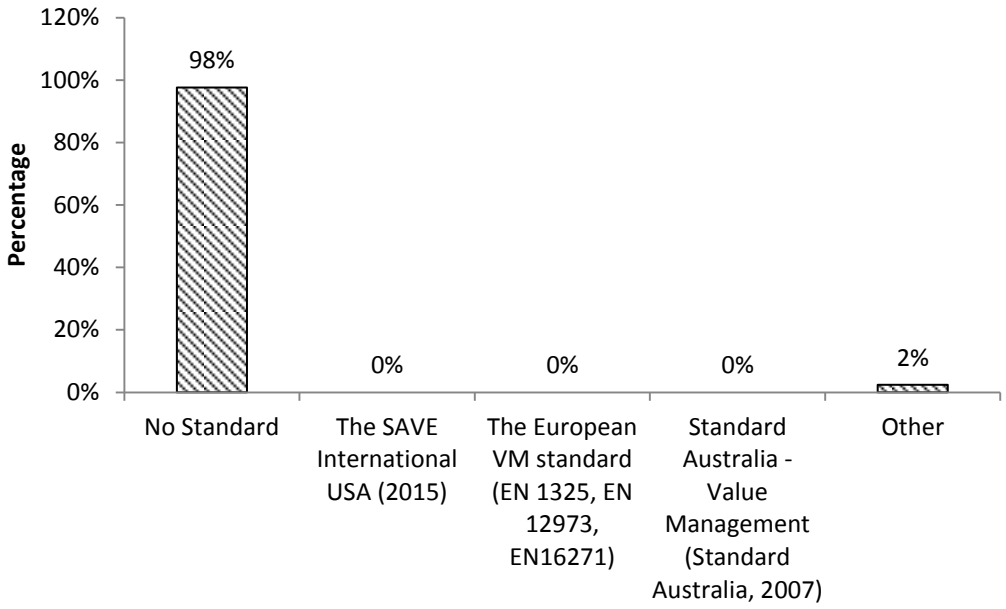
No.	Statements	Theme
1	Projects take long from inception to implementation	1
2	Projects take long to implement due to lack of funds	2
3	Because of poor scope control. The Councilors always want to add more items to the project while working in the area.	2
4	The red tape delays projects implementation and projects are started with no committed funding.	1
5	Projects do not complete on time mostly due to the delayed supply of material. Most Material are not available locally	5
6	Contractors employed on the projects do not always have the experience to do the work.	4
7	Red tape and poor budgeting process. Weak project controls	1
8	Because of inaccurate estimates and lack of funds	1
9	Some projects are successful and some are not. So I can't say	6
10	Development is slow due to lack of funds	2
11	Most projects do not complete within the time specified.	1
12	Projects get implemented with not enough funds available.	2
13	Scope control is not strict enough. Projects run over budget	2
14	Project run over a number of years due to lack of funds	1
15	During construction the project program is mostly interrupted due to waiting for delivery of materials	1
16	Unavailability of material	3
17	There is lack of project control tools or software.	1
18	Projects do not complete on time mostly due to lack of funds and planning is not done as a whole, each Department budget and plan their own projects but the funds are not always available for all projects.	1
19	Program and budget over run because the estimates are from long time ago, projects take long from design to construction.	1
20	Program runs over due to unavailability of material locally. Importing material from other regions cost more and delays projects	1

21	Lack of project management expertise, poor morale and high turnover in Municipal staff	4
22	inaccuracy in cost forecasts due to material supply uncertainty	2
23	Red tape and rigid design criteria.	5
24	poor communication channels	5
25	Every Department fights for funding for their projects. There is no tool for prioritizing projects for the organization.	2
26	Completed projects are not communicated soon after completion. There's a communication gap	5
27	Project teams are not integrated with all required expertise for the projects to plan better.	5
28	Issues on the project do not get resolved quickly due to communication gap with management.	5
29	The claims process take long on projects to get a reply from the Municipality	5
30	Its slow	1
31	Communication is not always open between management and workers	5
32	Lack of funds for implementation of important project.	2
33	The project process is not being followed in the whole organization. Thus it needs to be clearly documented and shared	5
34	The planning has a lot of room to improve still to align projects to available funds.	2
35	Projects are not put through gates to focus in the overall objectives of the City.	2



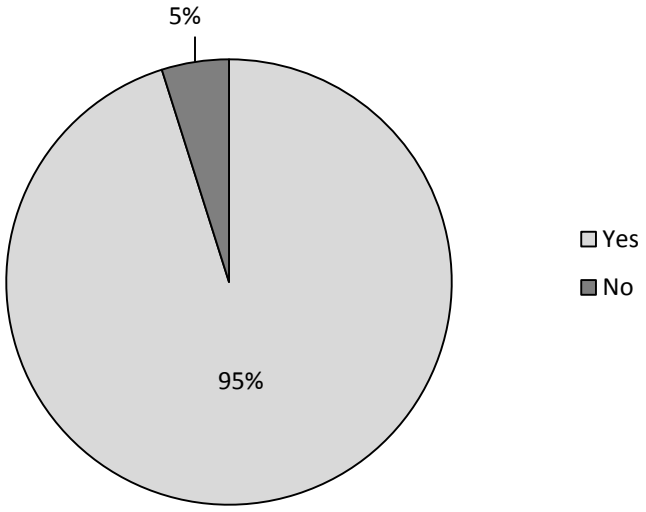
2.7 Which of the following Value Management standards is applied by your organization? (Circle applicable statement from list below)

	Statements	**frequency**	**Percentage**
1	No Standard		98%
2	The SAVE International USA (2015)		0%
3	The European VM standard (EN 1325, EN 12973, EN16271)		0%
4	Standard Australia - Value Management (Standard Australia, 2007)		0%
	Other		2%
	Total		100%



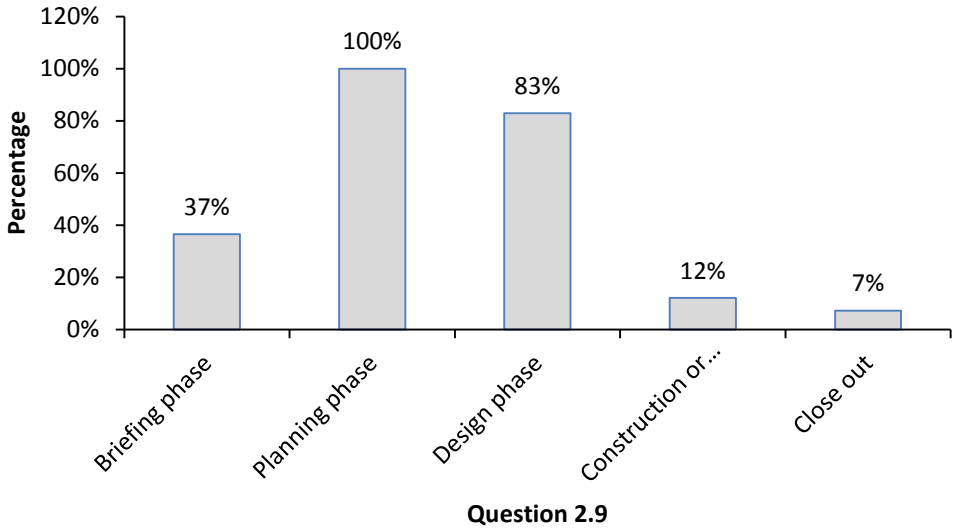
2.8 Does your organization have a formally defined documented project system? (Circle applicable statement from the list)

	Response	%
1	Yes	95%
2	No	5%
		100%



2.9 In which project phase must Value Management be introduced? ((Tick√ most preferred, you may tick more than one)

	Count	Frequency	Percentage (%)
Briefing phase	41	15	37%
Planning phase	41	41	100%
Design phase	41	34	83%
Construction or implementation phase	41	5	12%
Close out	41	3	7%

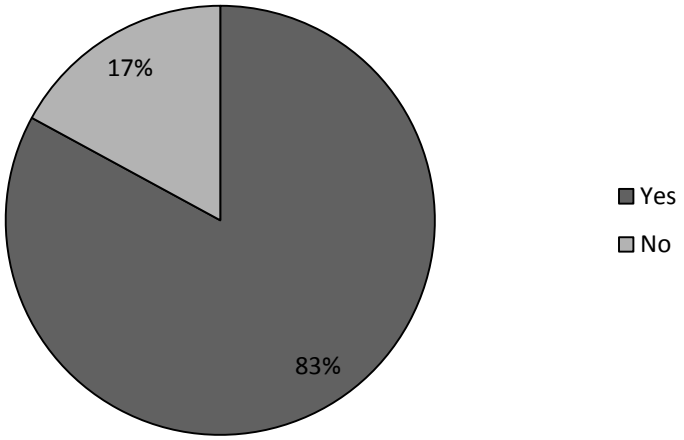


Question 2.9

2.10 V.M, according to its methodology, intends to increase the project's value for the client. Do you think that something like this would be of interest to the Windhoek Municipality and or the organization you work for? (Circle applicable statement from list below)

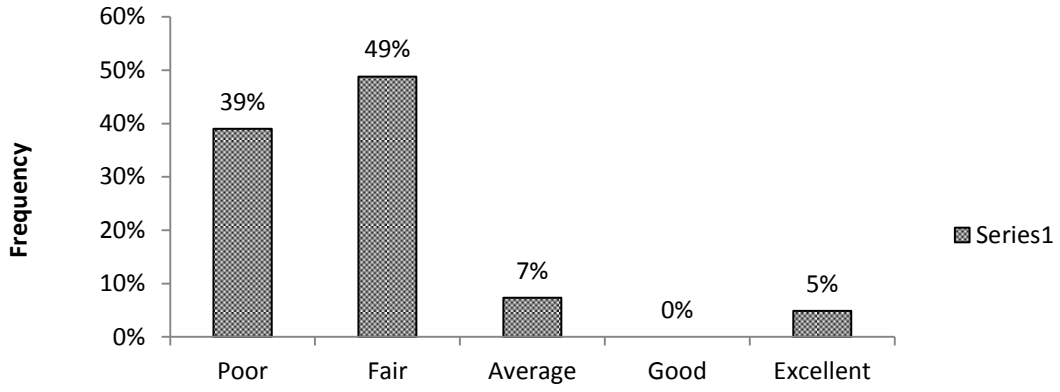
		Frequency	Percentage (%)
1	Yes	34	83%
2	No	7	17%
	Total	41	

Question 2.10



2.11 On a scale of 1-5 (1 = poor, 2 = fair, 3 = Average, 4 = good and 5 = excellent), how would you rate the communication level between project stakeholders: (Tick√ applicable):

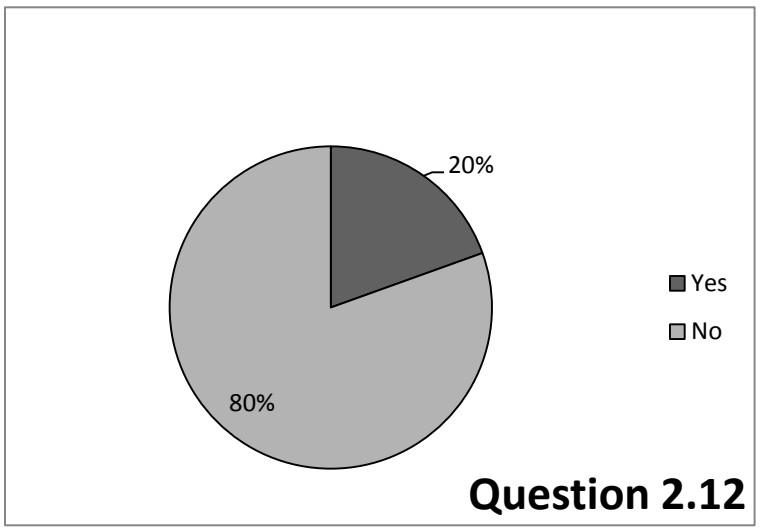
	Statement	Frequency	Percentage
1	Poor	16	39%
2	Fair	20	49%
3	Average	3	7%
4	Good	0	0%
5	Excellent	2	5%
		41	100%



Question 2.11

2.12 Do you consider alternative road construction material within your design, for City of Windhoek Projects (circle applicable statement from list below) (if yes, answer question 2.13).

	Statement	Frequency	Percentage
1	Yes	8	20%
2	No	33	80%
	Total	41	100%



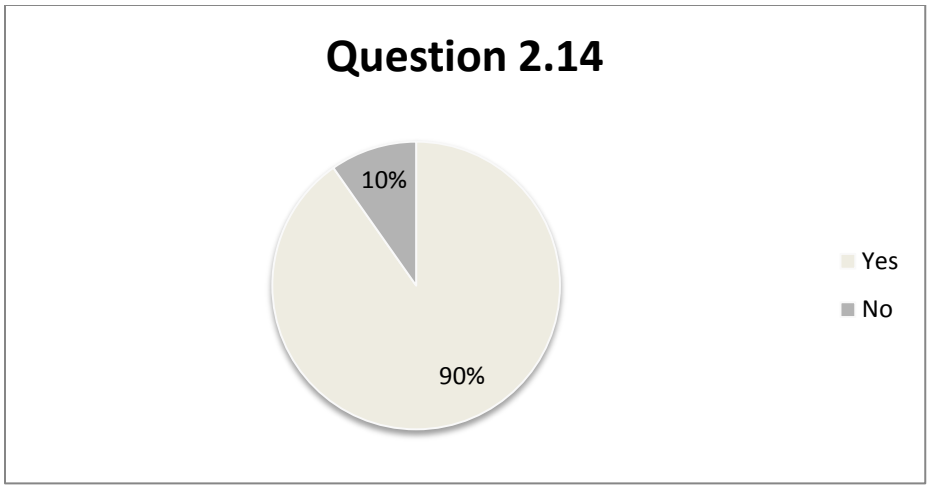
2.13 Which method do you use to consider an alternative design and cost?

Value Engineering	1	2%

This question was answered by only one respondent thus will be excluded from the analysis.

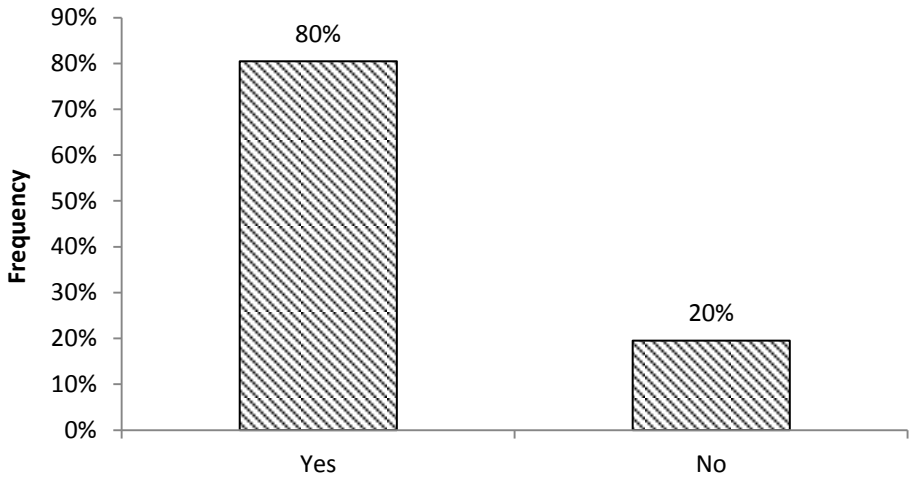
2.14 In many European countries and the United States of America, V.M is being applied in the construction industry. By doing that, a 6% to 20% of each project's financial cost is saved without any impact on time and quality. Do you think that this would interest your company so as for it to gain this benefits and to implement projects more efficiently (circle applicable statement from list below)

	Statement	Frequency	Percentage
1	Yes	37	90%
2	No	4	10%
	Total	41	100%



2.15 Would you be interested in taking part in an informative workshop related to V.M? (Circle applicable statement from list below)

	Statement	Frequency	Percentage
1	Yes	33	80%
2	No	8	20%
	Total	41	100%



2.16 Any additional comments on implementation of Value Management in the Windhoek Municipality or Namibia at large?

No further comments were provided. This question will be excluded from the analysis.