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The influence of scope change on the Iron Triangle and on effectiveness of a project manager at Ergosystem Walling Solutions

By

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DECLARATION

I, Docus Nyasha Zenda, declare that the contents of this thesis represent my own unaided work, and that the dissertation/thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

DZENDA   **28/10/2018**

Signed   **Date**

ABSTRACT

This research aimed to investigate the extent to which changes in the scope of a project will influence on the iron triangle and how that impacts on the effectiveness of a project leader/manager. The reason for this research was to show and evaluate if scope changes made on the iron triangle have impact on the effectiveness of the project leader/manager and in so doing understanding the impact of such changes in the light of broader project management precepts and how these could be harnessed.

A questionnaire was carefully structured as the tool for data collection at Ergosystem. The sample for this research comprised of projects managers, project administrators, project engineers, and project management officers of Ergosystem. They have been working at this position for more than 18 months, which would have given them opportunity to have worked on multiple projects. The participants have had the opportunity to have worked in different departments of Ergosystem, this would be helpful to evaluate how scope change affects project managers in different fields

Data collected was categorized, edited, coded and analysed using this Statistical Package of the Social Science (SPSS) software. . This software package use for organised/logical batch and non-batched statistical analysis This The data analysis tool had been selected simply because it is user friendly and will assist with converting the data to graphs, charts and other formats that June be used to store and interpret the data.

The research noted that most left out during decision making on the way the project should be conducted or implemented, thus project managers will have little confidence as they have not been trusted to run the project the best way he knows how. Indolent of project team on changes being made is important. Once the project has started being implemented unforeseen situations can occur and ay change made impacts the iron triangle will make changes to each on the 3 elements thus deliverables can change. A project manager is more effective if there are given the opportunity to solve problems with consultation with superiors they face once implementation. Authority gap is a huge problem for project managers therefore changes on the Iron triangle has positive and negative impact on the effectiveness of

a project manager but this depends of the leadership style and support of the top management.

ACKNOWLEDGEMENTS

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GLOSSARY

List any terms, acronyms or abbreviations (with the appropriate caption) used here. Use single-line spacing, with a line between each item.

Terms/Acronyms/Abbreviations	Definition/Explanation
PM	Project Manager
WBS	Work Breakdown Structure
CPM	Critical Path Method
PMBOK	Project Management Body of Knowledge

CHAPTER 1:
INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

Over the past few decades the world of project management has evolved into a very well knit area within the professional services industry. According to Crawford, Pollack and England (2006:1), definition of project management as an area of expertise which is growing rapidly as an area of research, and competency which is being applied across all industries and therefore the demand for project management continues to grow   Project management essentially involves the coordination and management of client requirements towards achievement of predefined objectives Newton, (2015:7). Projects are best understood to be temporary endeavours aimed at the creation of a new plus unique service or product also refer to as a series of interlinked/dependant activities undertaken through set given paths and goals to be reached through the cost allocated, resources and time set. Kelly, (2007:13). A project should have a set limit in terms of time, duration and resources, stated objectives of the endeavour must be accomplished (Clement &Gido, 2006:4). The Project Management Book of Knowledge PMBOK (2008:112) explained project scope as the identification involves a procedure of compiling a precise description the whole project from start to finish and giving vivid details of the outcome and the path to follow to realise the goal. Project scope is crucial as this document guided the project manager and his team on what is the client wants to solve and how they want the final outcome to be like. A project scope is derived from a project charter which is the documents that translate the need and all requirements for the project the project team Hamilton, (2001:111). According to Petersen (2013:59) project scope includes all the deliverables of the project In this regard project scope of a project involves the activities to be done as agreed on between the supplier of the service and the customer Crawford *et al.,* (2005).

Sylvester, Rani, and Shaikh (2011:116) quoting Turner (1988:68) defines scope as tied to the deliverable item produced, drawings, specifications, data sheet, and equipment; and material requisition. Project scope seeks to identify the deliverables on the basis of which the agreement is signed, and the iron triangle can then be developed from the agreed on scope. In order that project scope deliverables are met, the scope and extent of the planning and scheduling services offered by the

contractor should be clearly defined and highlighted Barber, (2004:184) Explained the fact that projects are undertaken to meet certain goal and objectives to solve a certain gap in the market, growth and competitiveness and thus the deliverables should meets these objectives to cover a gap to support company growth, therefore a brainstorming/ strategy session is help to draft what these deliverables ought to be. .As the implementation starts there is what is called scope control which requires the implementation of Control mechanisms and techniques in project management to keep track of the activities as they unfold to ensure that the project plan and objectives are aligned to the work being implemented. Project management techniques such as work breakdown structures, critical path and status reports are put in place and used as basic for scope control.

Machado & Martens stated that there is an increase in organisations using project management as a strategy tool to formulate plans and use project management techniques to reach the goals/objectives which generally forms basis on which project management success is evaluated. They further highlight that evaluating the success of project managements, one can make use of approaches such as the Iron Triangle approach. This approach states that there are 3 aspects at each point of the triangle that need to be monitored concurrently to ensure successful project outcomes are: scope, cost and time Machado & Martens, (2015:2). Figure 1.1 below is an illustration of the triple constraints of the iron triangle.
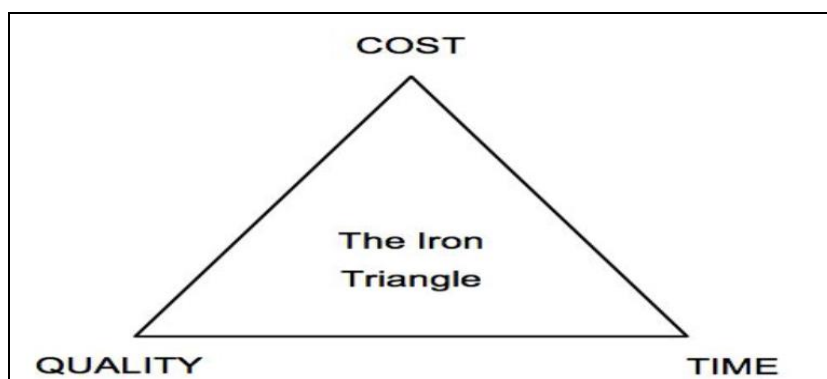
Figure 1.1 Iron triangle of time, cost & quality
Source: Atkinson, 1999

Because of the nature of projects generally, these elements of the project often become the deciding factors between project management success and project management failure. Whereas the management and adherence to the iron triangle determine the project management success, but any change to the scope then introduces new requirements. Song &Abourizk, (2005:360).

The PMI (2013:105) explained project scope as "the work performed to deliver a product, service, or result with the specified features and functions". Project scope should therefore include every item listed on scope   of work as deliverables, normally listed in the form of a check list Machado & Martens, (2015:83). The project manager is expected to establish a scope of work preparation team consisting of human resources and level of competencies that he/she deems appropriate for successful project execution. Kerzner, (2009:426-428). Project scope identification is a fundamental requirement in initiating a project Nokes& Kelly (2003:144-145). The scope of work to be implemented generally when the client knows what they want done, and the service provider knows how to get it done and that they have the capabilities to deliver. Depending on the type and size of project, there are usually cross sections of different levels of stakeholders involved in the process, who also need to be kept abreast with all requirements at all stages during the planning and execution of a project. It is noteworthy that it is not in all cases that project managers are involved in the initiation/conception stage of the project and therefore not typically involved in the drafting of the business case (scope identification document); too often the project manager is introduced to a project that has already been decided upon with most of the scope items identified upfront Erik Bethke, (2003.65).

According to Fourie (2010:14) "to be successful, a project was required to be completed or implemented on time, within budget and with a defined quality". He further highlights that even though this method of measuring success was acceptable its accuracy was questionable. Because even in a situation where two projects with identical in terms of project requirements but had differing time and cost allocations had been completed within budget, time and delivering the defined quality, if both a completed with the time and cost framework, the project with more conservative initial estimations will be deemed as less successful Therefore in this case the definition of scope will take into project management into consideration as a mechanistic procedure whereby the success of a project has do with the motivation and negotiation of the project boundaries that the execution of the project ,Fourie, (2010:14).

The Iron triangle and the square root

The most common known and used measure of success in project management is the Iron Triangle which emphasises that time, cost and quality are the centre for measure project success. This method of measuring project success by Atkinson is one of the basis of foundations of project management. And is an ideal starting point. Most ideal approach to this study would be to understand the two concepts, namely The Iron Triangle and Square Route

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┌─────────────────────┐                              ┌──────────────────────────┐
│  The Iron Triangle   │──────────────────────────────│ The Information System   │
└─────────────────────┘                              └──────────────────────────┘
           │                  ┌──────────────┐                    │
           │                  │    The       │                    │
           │                  │ Square Route │                    │
           │                  └──────────────┘                    │
┌─────────────────────┐                              ┌──────────────────────────┐
│ Benefits (Organisational) │──────────────────────  │ Benefits (Stakeholder Community) │
└─────────────────────┘                              └──────────────────────────┘
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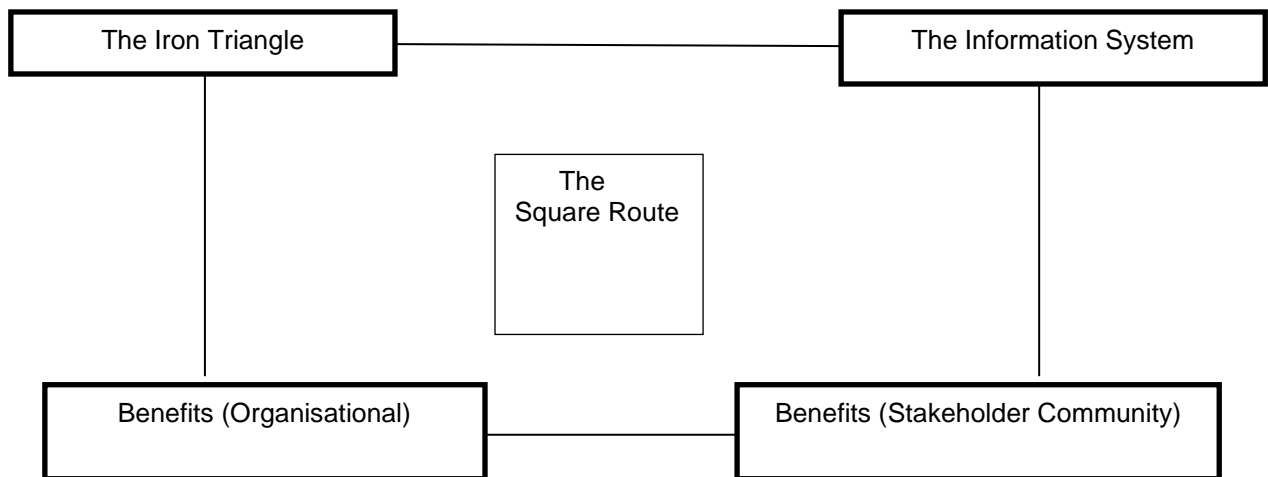
Figure 1.2 The square root of project management
Source: Atkinson, 1999

Square Route consists of four categories, each with their own small list of criteria to help evaluate the project on multiple levels. The first category is, in fact, the Iron Triangle, with cost, quality, and time. The second category is the information system, with such points as maintainability, reliability, and usability. The third category is titled "Benefits (organization)" and has such points as improved efficiency and improved effectiveness. The fourth and final category is titled "Benefits (stakeholder community)" and touches on such areas as satisfied users, and social and environmental impact.

What is scope change?

The scope of a project is all the activities and tasks that need to be undertakes in order to deliver a project product or service .as alluded to above. Scope change therefore makes reference to the "changing" of what was agreed on as the deliverables. Scope change is defined as any changes made at the request of the

client, sponsor or owner of project after the initial deliverables have been signed off on. Other practitioners Nicholas, (2004:349) have made reference to scope change as modifications or adjustments to the agreed upon project scope as alluded by the project charter and translated by the work breakdown structure during the conception stage. Changes made to the scope of work and requirements will be directly associates with an increase in time and cost. Scope management that is effective may also be used a measure of project success as it reflects directly on the accuracy of interpretation of the clients' request, needs and requirement in terms of deliverables. In summary a project has deliverables which are budgeted for in terms of how much material is needed, how much time will be needed, and what are the technical expectations to be met as per customer's requirements. Any alteration to the elements will affect outcomes, the change June be reducing the work to be done, increasing the work to be done or changing the technical aspects of the project.

A request for change on the scope comes from various stakeholder depending on the project and structure of the business, this change is passed to the project manager in writing because it has to be formal and recorded to consider for measure of success of the project and other cater for related time & costs which incurred due to the change request. The project manager will assess the request for change and will evaluate if the change is feasible and genuine. The project manager will then assess the impact the change will have on the deliverables of the project also impact on cost that I the budget, time (durations) and quality. If the impact is deemed small then the project manager may approve the change (this however defers from project to project depending on how sensitive the project it and the stakeholders agreement on giving project manager to accept and make small changes without consultation

If the change requested will greatly impact the project's duration budget and the deliverables altered then, the project manager will have to consult other stakeholders such the project sponsor, project owners and other superiors depending on the nature of business and project. The resolution to either accept the changes will then lie in the hands of the above-mentioned groups/individuals and the project manager only takes the role of consultation. If changes has been approved, because of the major impact it might have the budget might need to be updated, resources allocated in term of labour and technology, the scope statements and supporting documents will also need to updated. Once all is approved the project manager will then communicate with his team and any other interested stakeholders.

Who is responsible for scope?

Scope change may be initiated by different stakeholders or department within the organisation, the change may be genuinely be associated with regulatory changes that affect the outcome or procedure of the project, change might also be caused by the lack of expertise or resources because of projects running concurrently in an organisation that has a certain matrix structure where human resources across the structure where employees still have their day to day jobs/responsibilities but are also part of the project team.

According to Clements &Gido (2006:309-310) states that is of paramount importance for the project manager to take charge as the projects unfold to control and monitor changes to a minimum so that changes will not impact negatively on the success of the project.

Some of the scope changes on a project may be beyond a project manager's or any other stakeholder's control such as a storm may cause a halt to any construction onsite and therefore might have not been anticipated when compiling possible risk to the scope of the project. In this case the manager still has to inform stakeholders as the delay on waiting for the storm for a day or 2 may cause delays on the delivery date or just the milestone being accomplished, especially the fact that tasks depend on each other and the next task may be delays because the predecessors are not completed. .

Effects of change on the project

A project scope statement gives the definition as to what activities and tasks need to accomplished Barkley, (2007:83). It is followed by the work breakdown structure that highlights all of the discrete components of the product that the client will receive separate or in the aggregate, at the end of the project (Rad &Levin, 2003:24).

Barry et al. (2002) showed a correlation between software project duration and effort. However, a thorough investigation of the effect of scope changes on project duration has not yet been conducted.

Possibility of scope change is almost as inherent in the mature of projects because of the nature of projects that are unique and complex at the same time therefore there is some level of unforeseen risk Ertel, (2000:57). That being said thus we can conclude to say changes on the scope will affect cost/budget. Chick (1999:59) shared that as

long as there is significant changes to the project scope the project budget will be affected thus also affecting the project schedule. There is a process that need to be followed I order to make changes and this consumes time thus the schedule is affected. For this reason Kauffmann et al (2002:312) made use of the earned value methodology in assessing the impact of scope changes on project costs/budget. However no research has been conducted on the effects that scope change has the duration of the projects.

It is of paramount importance that the project manager evaluate the impact that scope change has on the triple bottom constraints and then he should come up with possible solutions that cater and consider the constraints, thus should creates a balance on the 3 constraints (Morris & Sember). The options of solution will aid on the best decision to take with minimum risk but will still contribute positively to the success of the project.

In project management scope creep maybe deemed inevitable because of the nature of project and this may result on growth on the scope as compared to the original scope Pyzdek, (2003:90).

According to Dayal (2008:143), suggested that scope creep is a result of failure to grasp or understand the expectations of the stakeholder such as the owner, sponsors requirements of the project during the initials stage. Heldman, (2009:108) stated that whenever there are changes made on the scope there should be a comparison of the updated scope and the scope statement served as a baseline for work related to the project initially. Project manager's role is to facilitate the plans and schedules of a project and monitor and controlling any deviation to the plan to achieve the objectives of the project Lewis, (2001:4) It is also defined by PMBOK (2008:6) as an application of knowledge, skills, tools and techniques to project activities to meet project requirements and it is accomplished through the appropriate application and integration of the group project processes comprising five process groups.

Projects frequently finish late and over budget due to scope changes on the iron triangle and other factors, thus causing organisations heavy penalties and the goodwill, integrity and prestige of the company id damaged. As projects are hardly ever finished without some form of changes taking place, the major challenge that project manager's face to recalculate the project delivery date after changes to the

original scope have been made whilst bearing in mind other aspects such as team involvement and motivation as well as the quality of the final deliverable.

The work beak down structure is therefore particular use when you need to evaluate the impact of a requested change in scope as part of integration change control and also when assessing the scope of the project due to an approved changed

Effect of scope change on project manager effectiveness

Most of the project leaders are selected by their profession that the project is highly dependent on, an expertise in the industry area the project is being implemented, for instance there are mechanical engineering project manager. Jowah Matrix structure and projects: (2012) where the matrix system is used, project managers work closely with functional managers in order to get right people for the project Verzuh, (2003:43). In this case the project manager's responsibilities are primarily to coordinate the execution of the project Gido, (2009:412) by both controlling the performance within project, monitoring the budget and providing feedback to their superiors. Clients and any other relevant stakeholder the function of the project manager starts by the manager needing to define and understand the scope of work to be done Schwalbe, (2009:183), and understanding the four constraints of the square root. Good scope definition is critical for project delivery success as they have limited time, budget, technical specifications and expected deliverables.

Majority of project failures has been identified to be directly linked with poor project management on the project scope control and measure where there his time consumption on defining work that needs to be done that was not accounted for in the initiation stage of the project, or changes that weren't authorised that the project manager just went ahead to make without assessing the cost of adding resources and time, what was defined as scope creep above.

Scope creep is one of the biggest category of threat to the project success and the scope needs to be managed firmly, and this begins with understanding what scope and scope creep are and then the project manager plans his/her scope management accordingly.

Scope change and creep creates destruction to the goals and objectives of the projects therefore threatens the focus of the project team thus it is common that projects fail due to failure to manage & control scope creep. Russell (2007:47) view

is that, scope creeps negatively impacts the projects only in circumstance that stakeholders and the project manager are not in agreement of the change being requested.

In terms of scope creep and timing is weather the project manager can make scope changes incrementally, this is usually scope creep changes made as they arise or to approve the changes in a clustered form, i.e. as the name suggested have a significant number of changes that can be tackled approved or not all at once. The disadvantage of clustering changes is that some activities might have to be suspended for a while until a certain number (cluster) of changes to be made are evaluated. With incremental changes are made faster and might reduce cost as tackling the changes does not consume a lot of time to wait for approval from management or consumer as they could be minor changes with minimum impact on the 3 constraints. Kerzner, (2009: 952)

This study therefore attempts to establish to what extent the impact of scope change on the iron triangle impinges on effectiveness of a project manager. As project scope is the basis of any work undertaken by the project team, the scope specifies project deliverables which will leave a successful completion. A project has a budget and timeline and as the Iron triangle explains there 2 as paramount importance for project success, in reality project scope change once implementation has begun and this will impact the progress of the project and changes usually cost money time and affect quality. Scope change therefore makes reference to the "changing" of what was agreed on as the deliverables. Can project managers and management measure the project success basing only on the iron triangle? Scope change disrupts work in progress and this usually means more briefings and the project manager has to communicate the changes to his team. The completion of any projects depends on the work done by the team and once change happens, it is normal for people to react to change differently and this might bring confusion to the team, delays and therefore affect the work for the project manager and his effectiveness is closely linked to his team. The following subsection elaborates on the statement of the research problem.

1.2. Problem Statement

Scope change is a common phenomenon in the project management discipline, though not liked by project managers; but it is the reality they live by. There are many factors that lead to the need to change the scope of a project, most of whom could

have been controlled if things were thought through properly from the beginning. What is inevitable is that the environment changes, the thoughts change, disrupts the scope and project plans, schedules, resources and quality. Contemporary communications amongst project managers showed that they agreed that managing never ending changes in tasks and priorities is most irritating (Meredith & Mantel, 2010:501). With the project manager irritated, this will affects his ability to motivate his own team. Projects have budgets and in most the case of Ergosystem project managers are rarely involved in the decision making process, this creates what is known as Authority gap Jowah (2014) this mean that instruction come from management and the changes will bring about changes to many other aspects of the project. This study seeks to establish the effect of scope changes (intended or induced) on the effectiveness of the project manager and how change impact upon the triple constraint leading project success.

1.3. Research aim

This research aimed to investigate the impact of scope changes at Ergosystem System affect the project manager and his team to successfully complete a project and how these changes affect the triple constraint as highlighted by Atkinson's Iron Triangle. The researcher achieved this, by achieving the objectives listed in the following subsection will guide the research endeavour.

1.4. Research Objectives

The reason the study was to evaluate the impact that scope change made on the elements of Iron Triangle and how changes made on projects affected the effectiveness of the project leader/manager to successfully deliver the project successfully.

The sub-objective were as follows:

I.   Conducted a literature study on Scope change and researched on the Iron Triangle Theories and identified key elements of influence on project management success.
II. Researcher identified the company to approach as the case study for this research. Identified the scope change procedures implemented at Ergosystem to and the involvement of project managers within the change process.

III. Evaluated the impact scope changes on the triple constraint of project management

IV. Evaluated the effectiveness of the project manager and how motivated and how project managers communicate changes to the project team leading to project success.

1.5 Research Questions

Questions that were addressed in the research are as follows:

I. What procedures are taken within Ergosystem to make adjustments to the original project scope (scope change)

II. Are project manager involved in the scope change process?

III. Once there a request for change, were project managers communicated with to change or evaluate the impact these changes had on the triple constraints and the new project deliverables cooperated into new plans.

IV. How does the scope change affect the project manager's effectiveness as to delivering the project?

1.6 Review of relevant literature

Sylvester and Rani (2011:100) assert that the success of a project is measured against set cost, performance and time often referred to as the "iron triangle". Accordingly to a few more researchers on project success is indicated by delivering the project within budget, on time and acceptable quality and functionality as perceived by the project owner/client to them,

Sylvester et al stated that the measure of project success is by evaluating satisfaction of the team, client, contractors together with technical performance, innovativeness, personal growth, project termination, business performance. Sylvester *et al.,* (2011:4338) also recognised that at some point different inputs have different effector impact on the projects outcomes, and further indicates that this brings into context the prevailing disciplines which are inherently critical in the achievement of project overall satisfaction within the project management iron triangle. A change to one element of the triangle inevitably impacting the others and projects often fail, because attention is not afforded to this detail (Browser, 2008:85).

According to Kless (2007:109) these triple constraint variable, also referred to as the triangle of truth are the 3 points of the triangle and if change is made on one points, the other point if not both will need to be changed to compensate otherwise the chain will be broken. Such insight brings to the fore the key elements of need for meticulous planning requirements and effective strategies to counter this very fundamental area of study.

1.7 Research Methodology

The nature of the problem looked directly into the primary research objectives to determine the extent of the impact of scope change had on the iron triangle and how the changes influenced the effectiveness of a project manager. Despite controversies around the positivistic and the phenomenological research pragmatics, the researcher believed that the choice of research methodology gave contribution to the knowledge required. The study will be carried out in 2 phases that is by means of a broad literature review and an empirical study.

1.7.1 Target population

The target population for this research were project managers, heads of project and project officers from all 3 branches of Ergosystem Walling Solutions. The target population worked directly in project execution. This target population was carefully selected because all project managers worked under head of projects and project officers. The idea was to collect data from all contributing counterparts involved/approved with scope changes. This helped the researcher to view the concepts from all angles in the chain of command that is vertical: top to bottom. Head of projects being at the top of the chain of command with the Projects Department for Ergosystem Walling Solutions

1.7.2 Sampling frames, sampling and sample size

The sample size for the study wasto a minimum of 50 participants and these included project managers, project administrators, project engineers, and project management officers at Ergosystem and the equivalent thereof. Welman*et al.,* (2008:173) proposed that when the sample used is bigger it results in minimum mistakes, therefore the sum of people involved was of paramount importance for accurate

analysis and assumptions for the research. Project managers were generally fewer in number and 50 was considered adequate for the purposes.

1.7.3 Sampling technique

Purposive sampling involves selecting the participants according to certain characteristics and for this study it was of paramount importance for the study to be successful. Cressell & Clark (2011:84) defined sampling as the process of identification, segmentation and selection of individuals or group that have the expertise and knowledge about the subject of interest. The sample for this research comprised of projects managers, project administrators, project engineers, and project management officers of Ergosystem. They also should

> ➢ Have been working in their current position for more than 18 months, the period in office would have given them opportunity to have worked on multiple projects.
> ➢ Should be working in at least 2 projects departments of Ergosystem, this would be helpful to evaluate how scope change affected project managers in different departments and also accessed which department has a deferent approach toward scope changes. Ergosystem has a construction department, a renovations department and Interior design
> ➢ Be willing to participate

1.7.4 Data Collection & Research Methodology

An appropriate design questionnaire was carefully structured and made use of as the tool for data collection at Ergosystem. Collis and Hussey (2003:173) As suggested by Collis & Hussey a questionnaire has a series of thoroughly thought questions research questionnaire should be consist of questions that a thoroughly thought questions that will give the most to the research to make accurate findings The planning of questionnaires seeks to support in gaining the proper information from the people concerned as precisely as possible to get the best and closely accurate data.

The questionnaire was distributed to 3 Ergosystem Office Branches. Questionnaires were sent via email and participants were asked to print them and fill them in. Interviews were conducted in all branches as the research observed and got involved

in some projects' procedures and only the Head of the Project Management Office (PMO) in the branches were interviewed

The table below shows the dates at that the researcher visited the different branches collecting data that is the questionnaires, observation and minimal participation and interview

Table1.1: Questionnaire distribution table

Branch	Starting Date	Finishing Date	Head PMO Interviewed	Time & Date
Johannesburg	22 June 2016	24 June 2016	Toni Johnson	15.20pm 23/06/16
Durban	28 June 2016	29 June 2016	Kevin Brown	10.15am 29/06/16
Cape Town	30 June 2016	02 July 2016	Dirk Durnez	2.00pm 01/76/16

Source: Own Construction

1.7.5 Data analysis

Data collected was categorized, edited, coded and analysed using this Statistical Package of the Social Science (SPSS) software. This software package use for organised/logical batch and non-batched statistical analysis This data analysis tool was selected simply because it is user friendly and assisted with converting the data to graphs, charts and other formats that researcher used to store and interpret the data. Content analysis was used to analyse data from the official documents dealing with the observable fact. Welman and Kruger (2002:194) state that content analysis can be conducted from the response of open ended questions. This was done through the asked open ended questions and instructed interviews to report in a qualitative manner and made a qualitative analysis of the content of the interviews (Welman and Kruger, 2002:195).

Graphic statistical and statistics and statistical implication were the two mains features for the data analysis tool for this research it's significance to take note that the information provided by participants was not going be 100% accurate Collis and

Hussey (2003:17) assume that the choice of the methods and technique used for data analysis be influenced by on the type of data; quantitative or qualitative. Fowler (2009:145) outline that once data have been collected by the survey, no matter what the methods, the nearly always must be interpreted into a form suitable for analysis. The data was analysed in this study was quantitative, the questionnaire was allocated arithmetical value to measure the importance of given behavioural probability by the respondents.

Three principals were used for the actual statistical analysis, to be accurate

- The data was submitted to exploratory factor analysis to evaluate classify rationality of measure contrivance

- Testing the measuring instrument's dependability by measuring inside constancy

- The instrument found both dependable and lawful were used in the model for getting worse analysis to measure the independent variables

1.7.6 Research design

Purpose the research design is to create a structure that will used as a guide for collecting, measuring and analysing the information collected to answer the research questions Blumberg, (2008:195) The researched planned the data collection methods through issuing a questionnaire, analysis of records, as well as observation/participation at a minimal. Quantitative research methodology was used with the assistance of questionnaires.

1.8 Delineation of the research

This study focused on scope change on the iron triangle in project management and how these changes affect the effectiveness a project in different levels of project manager's involvement and decision making on changes made on the project. The study reviewed the scope change management procedures followed at Ergosystem Walling Solution

1.9 Significance of the research

The study will benefited the employees and management to identify the impact of the scope change on iron triangle in a project. It highlighted project failures or successes and the involvement of project managers in decision making on scope change process and the importance of motivation.

1.10 Ethical Consideration

The researcher followed ethical guidelines and considered to account the general guidelines for ethical research as recognized by CPUT (www.cput.ac.za. 2015:2) this includes the participants' rights for human dignity, confidentiality and right to the information upheld by the researcher. Researcher took into consideration categories highlighted by Leedy & Ormrod, (2015:101) As this researcher approached people as the subject for research therefore researcher had to consider the ethical implication on how they conducted the research The considerations taken into account were as follows:

- Documentation of content to participate ,

- Privacy and Anonymity of participants

- Truthfulness and honesty with colleagues.

1.11 Conclusion

According to Denscombe (2002:43) the research must be relevant to the research questions and be applicable as a solution to existing problems if it is applied research. Welman, Kruger and Mitchell (2005: 274) propose that the research must contribute to current discussions in research circles and contribute new knowledge to the debate. This research aimed to observe and evaluate the ways in which the management and staff communicate with each other. Researcher was able to facilitate the understanding of the importance of effective communication, be it vertical or horizontal, formal or informal. This could lead to the projects that are finished within the timeframe and cost allocated will have all the benefits of a performing organisation that are discussed in the background of the proposal for the research.

1.12 STUDY OUTLINE: Chapter classification

Chapter 1. This chapter introduces the topic and tittle of the study by providing the introduction, background to the theoretical applications through literature review followed by the problem statement. Research objectives, research methodology & design sampling, data collection methods and analysis and including ethical considerations

Chapter 2: This chapter address the theoretical aspect and overview of scope management and scope change on a project and how it impacts on Iron triangle,

Chapter 3: this chapter address the theoretical aspect of the role and responsibility of a project manager and his duties on the project scope and change to the impact of scope change and the effectiveness of a project management.

Chapter 4: This chapter clearly states the path the research is going to go through, that is the roadmap of the research, research methodology, data collection, data analysis tools and techniques.

Chapter 5: Data analysis and Discussion, Data analysis process, analysis of action research, diagnosis and action plan

Chapter 6: discussion and outcome of the research, Intervention diagnosis, action planning, action taking and participatory observations, outcome. Conclusion and Recommendations, submittal, evaluation, decision, integration, and communication

CHAPTER 2
SCOPE CHANGE MANAGEMENT

2.1 Introduction to Project Management.

Wikipedia (2009) defined a project a temporary endeavour that has set timeframe and resources, cost that is undertaken to create a unique product. Heerskens (2001:147) defined a project as "the response to a need, the solution to a problem" linked to a prospective outcome of a monetary reward that come with the project. This statement suggests and indicates some form of responsibility in project management process which is to define the solution to the problem. Thus, project management is the act of planning/preparation, organisation of task/activates and management of the resources allocated for the project and to deliver the project solving the change and completing the project with the deliverables as documented and requested by the client thus successfully handing over the project to the owner, having achieved the goals and objectives of the project needed to close the identified gap/need. (Kerzner 2006:49) defined project management as the process of planning and monitoring, his definition made clear the process of stating and defining of the work that needs to be done, that is work requirements, quality requirements, the pressure/load of the work in its full quantity, identifying and making available the resources needed for the project then the monitoring process o

If comparing the actual against the budgeted, resources consumption and tracking the time schedule. Following the initial definition of project management Heerskens (2008:147) make it clear the importance of project delivery in terms of time and cost

Project management as defined by Lewis (2002:76) as "facilitating the planning, scheduling and controlling of all activities that must be done to achieve the projects objectives." He argues that many project managers perform the planning process without involvement of the team and thus results in poor performance and a huge lack of by in and support as team has no sense of belonging for that feeling of having made a difference through their contribution in the planning process. Jowah (2014) talks about authority gap which even states further problems that at time the project manager has no authority even in the planning as they are just handed instructions and manuals to go by throughout the project.

The Project Management Institute defined project management as "the application of knowledge, skills, tools and techniques to project activities to meet project requirements" states and the process is a follows

- Identifying the deliverables and requirements of the project

- Stating clear goals and objectives of the project

- Allocation of resources for the project and constantly monitoring them as the project unfolds.

- Implementation of the projects and application of available project management techniques for to measure control and progress/performance of the project

2.2 Project scope

Projects arise for a reason and it differs from organisation to organisation. Most projects are undertakes to satisfy a need or gap within the organisation/industry or to comply with legislation, growth, gain competitiveness etc. a project a temporary endeavour that has set timeframe and resources, cost that is undertaken to create a unique product. The initiation is that stage if any project is where a business identifies the need/gap that needs to be satisfied because of the project taking place. In the corporate world, the client identifies the need or gap they have identified and need. During project initiation, a feasibility study will be conducted to establish if what the project wants to achieve is realist and/or achievable and there is substantial evidence that there is a need/gap. This is where the project scope is formulated. As all work that needs to be done can be stated clearly

Project Scope derived and formulated from the project definition and charter, which highlights the outcome/ output to be accomplished by the project. Project scope is a formal document with complete detail on all the work that needs to be undertaken and accomplished to deliver the project successfully. The scope is then formulated into WBS which makes it easier to manage the scope and tasks as.

The scope is used as the bases of everything that will be done and not done in the project, thus the WBS and milestones. The WBS is a hierarchy of all the work in the scope statement broken down into manageable tasks/activities and milestones. The milestones are a significant stage of the project that needs to be accomplished. An

element on the WBS can either be data, product or service. Refer to WBS diagram below. The diagram show an event that is being prepare for. The WBS is derived is developed using the scope statement and it be used to estimate tasks durations, resources allocated and responsibilities. These 3 are critical elements for the project to be a success. Project scope only includes that the work that needs to be done to accomplish the purpose of the project.
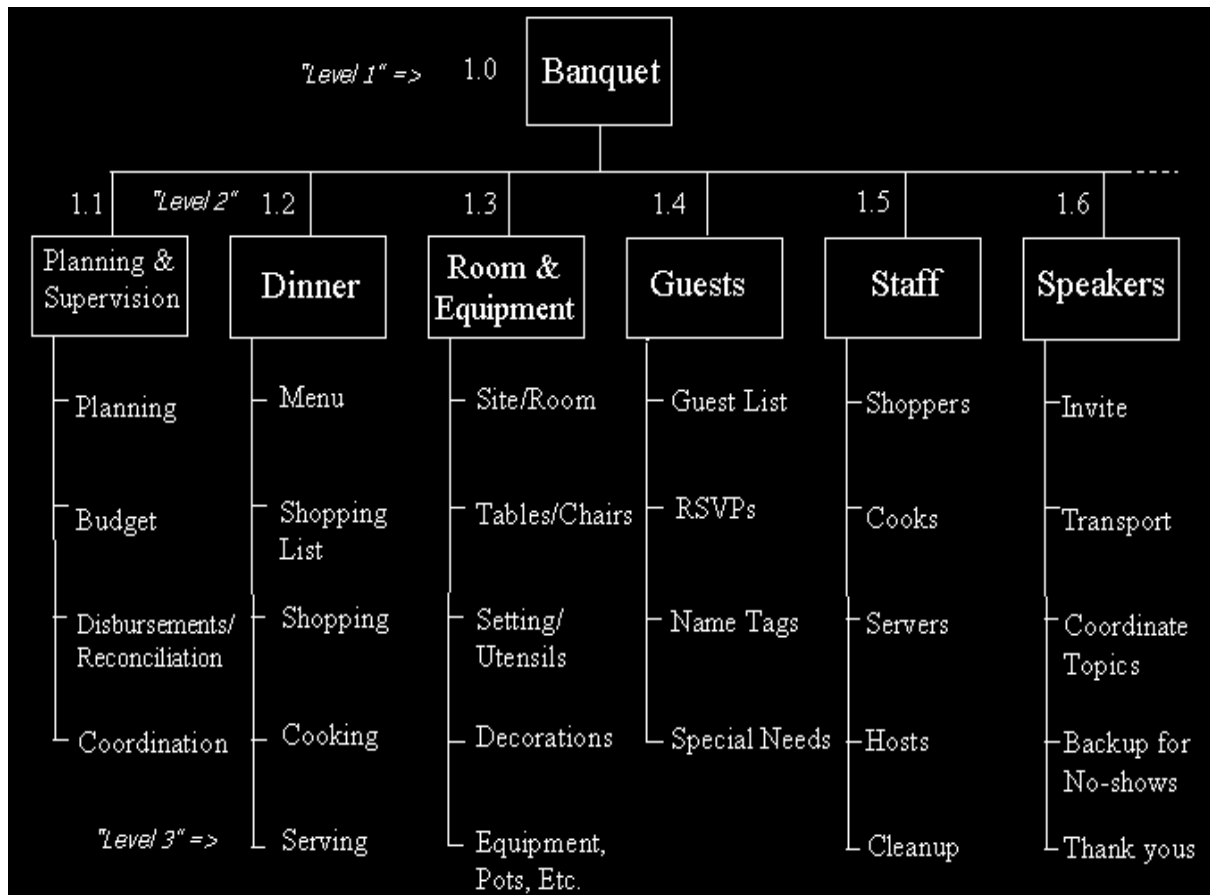
Figure 2.1 Work breakdown structure
Source: https://sites.google.com/a/als.edu.vn/project-management/project-definition/dinner-party-project

It is the responsibility of the project manager and with the assistance of the project team to formulate the Gantt chart and Critical Path from the information on. This will enable the project manager to manage the tasks that are critical. The Gantt is a project management tool that make it easy for project managers to put the activities and tasks in a manner where resources can be allocated and team members are given responsibilities. The Gantt chart will give light as to the sequence the tasks should be. It shows tasks dependency and the data will be further used to create the critical path.

This project management tool called the critical path method is used to monitor project schedule. It entails the sequence in which client activities of the projects should follow from start to finish and highlights the possible latest earliest starts and finish. This technique enables the manager to monitor the critical tasks of the project that he cannot delay as they may affect the whole project. The critical path highlighted on the project will need the manager to strictly monitor the implementation. He might need to add more resources to fast track the critical path because this path cannot be tempered with negatively. The tasks on the critical path have no slack which means they need to start as per schedule and finish as per schedule. It is defined as the mathematical network analysis technique of planning complex working procedures with reference to the critical path of each alternative system.
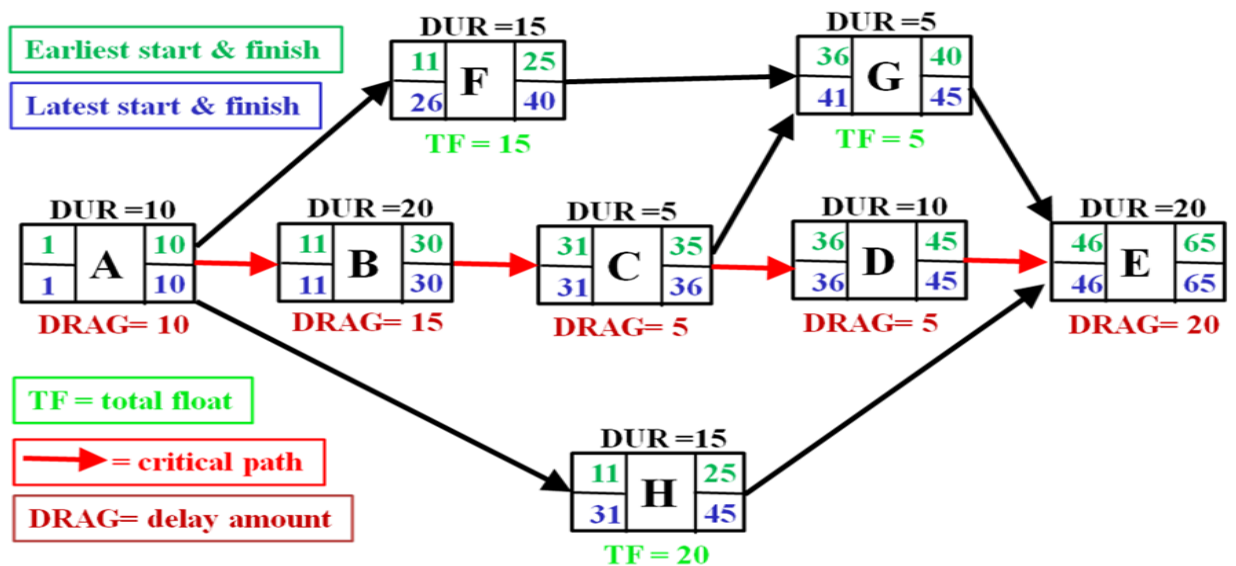
Figure 2.2 Critical Path Diagram

Source: https://en.wikipedia.org/wiki/Critical_path_method#/media/File:SimpleAONwDrag3.png

It is very important that the project scope and project charter are accurate to determine the deliverable therefore the documents should be clear and as accurate as possible so that the Project manager and team will not have to assume what the project owner wants because of lack of accurate documentation of the project charter or project scope

These 2 documents will be used at the end of the project to cross examine the project deliverables against the concept that the client envision in the beginning as

the charter and project scope entails which gave life to the Work Break Down of the project. Project Scope Management.

SCOPE MANAGEMENT PROCESSES

PROCESS	PROJECT GROUP	KEY DELIVERABLES
Plan Scope Management	Planning	
Collect Requirements	Planning	Requirements document
Define Scope	planning	project scope statement
Create WBS	planning	WBS, WBS dictionary
Validate Scope	Monitoring and Controlling	Acceptance deliverables
Control Scope	Monitoring and Controlling	Change Requests

Figure 2.3 Scope Management Process

Source: https://www.simplilearn.com/project-scope-management-importance-rar89-article

Includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. It is primarily concerned with defining and controlling what is or not included in the project

Project scope management involves the following and the process of planning scope management: A **scope management plan** is mapped out based on input from the project plan, the project charter, and consultation on project requirements with project owners and other relevant stakeholders.

The **requirements management plan** is one of the crucial document in collecting project scope information as it is created based on the input on expectations of the client. Interviews, focus group discussions, surveys, and more will be used to understand requirements and all the information gathered and documented to ensure that project outcome is as accurate as possible for project success handover Gu & London, (2010:988-999).

All information collected is documented and developed/translated into a project scope statement, project charter and the scope management plan The next step will be to analyse the requirements documents and charter to create a the project scope

into the WBS. As mentioned above this structure segments the entire project to individual activities/tasks, milestones as well as deliverables. Once all deliverables have been stated out, the scope will need to be validated and the relevant stakeholder sign off the scope as the true reflection of the requirements of the project.

Validating the scope entails inspecting and reviewing the milestones and/ deliverables and it may be done by the project owners, sponsors and relevant stakeholders, they will either accept the scope as complete accurate and give a go ahead, or they can request further revisions to be made. As the project implementation is underway, the scope must be controlled. Controlling the scope includes performance reports compared against the project requirements and deliverables to see if there are any gaps, if any exist this might lead to scope creep or major changes

2.3 Scope change

  Project scope is the process of planning the content of the project to be undertaken, it involves determining and documentation of the goals and objectives of the projects contracting list of the deliverables, project specifics, functions budgets resources needed and deadlines as project have a defined life span as alluded to above. Clark, Kim (1989:1247-1263) Scope change therefore refers to the "changing" of what was initially agreed on as the deliverables. Project scope outlines the boundaries of all the work that needs to be done and not done of the projects, it is more of the motherboard of the project, and it is used to drive the project towards the deliverables.

Other practitioners Nicholas, (2004:349) have referred to scope change as the amendment to the initial scope, which translated into the scope statement of the project plan upon which the creation of the WBS was based upon and accordingly and signed upon in the concept stage of the project. Any changes made to the scope will in-turn reflect change to the requirement of the project, once there are changes on the scope and work I redefined will result in adjustments on time, cost and resources. . Effective scope management can be used a measure of project success, the less changes to scope the better as the course of work will not change and no changes translate to no extra cost to stretch the budget and resources or time. When there are minor or no changes to the scope this will also be an indicator

that the project manager was accurate in interpretation of the clients' requirements. Clarke, A. (1999:139-14) In summary, project deliverables which are budgeted for in terms of how much material is needed, how much time will be needed, and what are the technical expectations to be met as per customer's requirements. Any alteration to the elements will affect outcomes, the change may be reducing the work to be done, increasing the work to be done or changing the technical aspects of the project. Usually for large projects the scope might include all companies or organisations that will be affected, the departments or transactions that will be affected.

2.3.1 Why is scope change necessary?

Change is necessary on projects because of a number of reasons. Change may be made as a consequence to quality control on the project. The growing technology market and ever changing tastes of customers can also be a necessity to have project changes so as to meet and exceed customer expectations whenever possible. Change could be necessary in order to meet projects deadlines for instance to use fast drying concrete to reduce scheduled time on waiting for the concrete to dry up.at times change is inevitable because of law and regulation on the nature of project, government restrictions, tariffs and export rules may also be a source of change on a project.

2.3.2 Who should initiate scope change?

A request for change on the scope comes from various stakeholder depending on the project and structure of the business, this change is passed to the project manager in writing because it has to be formal and recorded to consider for measure of success of the project and other cater for related time & costs which incurred due to the change request. The project manager will assess the request for change and will evaluate if the change is feasible and genuine. The project manager will then assess the impact the change will have on the deliverables of the project also impact on cost that I the budget, time (durations) and quality. If the impact is deemed small then the project manager may approve the change (this however defers from project to project depending on how sensitive the project it and the stakeholders agreement on giving project manager to accept and make small changes without consultation

If the change requested will greatly impact the project's duration budget and the deliverables altered then, the project manager will have to consult other stakeholders

such the project sponsor, project owners and other superiors depending on the nature of business and project. The resolution to either accept the changes will then lie in the hands of the above mentioned groups/individuals and the project manager only takes the role of consultation. If changes has been approved, because of the major impact it might have the budget might need to be updated, resources allocated in term of labour and technology, the scope statements and supporting documents will also need to updated. Once all is approved the project manager will then communicate with his team and any other interested stakeholders.

As mentioned a client can initiate change, a client can have different reasons such as Budget constraints. In big projects, there are project sponsors that are not particularly the project owners. The sponsor may promise to fund the projects and because the world is full of uncertainty and situations beyond any stakeholder involved the project might become more expensive that budgeted thus the client can ask for change on the scope and this change can be inform of quality, reducing resources etc. The sponsor might also pull out of reasons best known to them for instance if project seems more of a risk in the course of implementation this changes might have to be changed

Change can come due to client's change of mind. For instance with ever changing technology, the client might decide to change the technology agreed upon during project initiation and changes will have to be done to cater for the new design or technology to be used. In the corporate world where projects can be system upgrade or security upgrade for instance when banks changed their door security systems to close one and light green. The client may change their mind on sensors used thus the changes need to be documented and the new sensors will need to be ordered, With such change will require scope change from the budget that is to factor in the cost of the new sensors, lead-time for delivery of the new sensors, technical skill availability otherwise the team members will need to go for training. Thus change management will need to be formulated.

Scope change can be initiated by the service provider, this could be to compile with legislation, rules and regulations introduced by the government can push the service provider to change the scope for instance, if the project was making use of imported material and the government puts a ban of certain products due to safety and/ quality reasons for instance in building materials to those particular products. A service provider may also request changes to resolve a difficulty that may prove impossible

practically for instance if a client wanted a fountain but the position of the initials plans were above a sewage pipeline. Thus might have to move position of the fountain so not to interrupt/burst the pipes during implementation

As the diagram below elaborates the stages of scope change. It is proof that scope change can be necessary and of paramount importance, however the scope changes have to be monitored, documented and the project scope should be reviewed as well as the tasks that will be affected i.e. Scope management

When scope change is necessary, the process of estimating and recommending the changes to the scope must be carried out. A project director must be given the change request document, which he will review and either approved or reject the proposed changes. The change director if he/she approves the change the he can set a meeting called a change control meeting, with relevant stakeholders project manager and project sponsor, in some instances the project owner is not as the sponsor to evaluate changes requested a bit more When they all agree on the changes the project Sponsor will sign upon depending on how big the project is. At times there can be a board that manages and controls changes that will have to approve and sign off the changes requested Thereafter the project manager will have to update project documents and communicate with the team the changes to be implement and how the change these changes will be implemented.
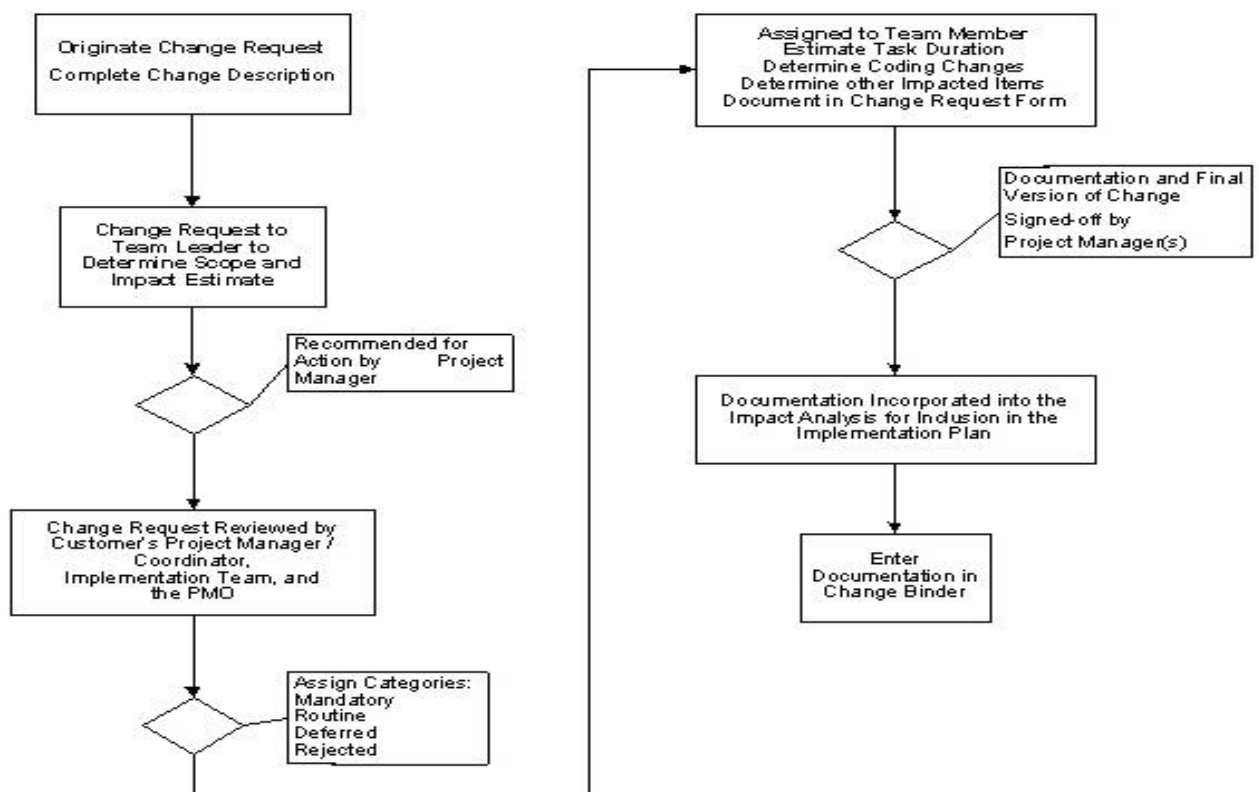
Figure 2.4 Scope change Flow Chart

Source: http://www.icgsoftware.com/projectmanagementmethodology.aspx?mn=5

2.4 The iron triangle

Atkison defines the iron triangle of a project as. This essentially means that there is a relationship between the three elements and that these measure the successful management of a project given the contractual obligations to deliver on deliverables. The triangle has been used as criteria access project success. The triangle demonstrates that quality cost and time are interrelated. Focussing or fixing one point of the triangle impacts the other two points Lock. (2007:21)
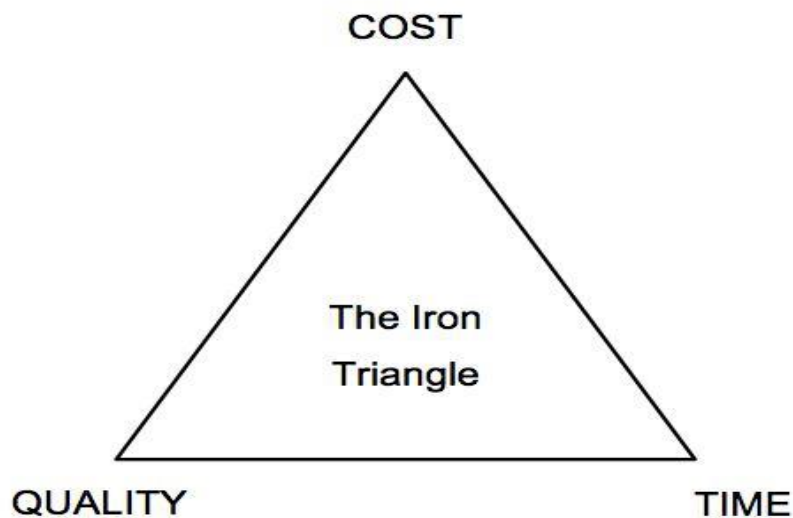
Figure 2.5 Iron Triangle

Source: Artlison (1999)

Dependency on Iron Triangle Constraints above diagram as highlighted by Atkison known as the "Project Management Triangle," Atkison explains that each end on the triangle represented a constraint. 3 constraints are time, cost and quality. The triangle represented the 3 constraints and that change made on one corner of the triangle will affect the other id not both the remaining sides. Artkison identifies time as an aspect representing the timeframe or duration allocated to the project. Quality is the acceptable functionality of the deliverable as per the client's perception and cost relates to the budget set aside for the projects. The 3 constraint can be known as competing constraints. . For instance if changes are made on the project scope that

will lead to increased scope, then this usually lead to increased time, as more tasks may be added to the critical path to cater for the new changes that need to be made. Increased time can be resolved in to ways, the project manager may suggest attending more resources to kill time which means team members may be added or the exciting pool of skills might have to work overtime either way this will lead to increased cost, and these cost include increased overtime and extra materials that might need to be purchased to make the changes needed.

Limited time may cause an increase in costs and reduction in scope for instance deadline date such as product launch of closer to home the start of the World cup back in 2010, most projects needed to be finished in a specific timeframe. To speed up the process some scope had to be reduced to eliminate some not necessary tasks which could hinder the projects being finished in time. Reduced scope was only necessary if the cut tasks where not critical. In other instances the time constraint led to increased cost, the reason being more resources needed to be pumped in to reduce duration of projects. This could be done in 2 ways either to use more advanced technologies which could be very costly thus increased costs. Secondly to beat the time constraint, project managers could have to increase man power or introduce overtime, this also lead to increase costs. Because team members are working tirelessly overtime and racing with time at some point quality would be compromised, if not the quality of resources could be compromised so that the budget will not be increased for additional funds.

A tight budget could mean increased time and reduced quality. When the project has a tight budget and there aren't enough resources, the project could take longer to complete than anticipated. Without a favourable budget quality can be compromised in that the materials used, for instances a bridge building project which require some type of quality cement be used for the concrete but the budget does not allow for the best quality recommended cement.

Morris & Sember, (2008:38) states that is important for the project team to rank these constraint as the project starts implementation stge. This will assist later when there are changes that might need to be implemented the project manager can evaluate the change give possible solutions the impact that each solution will make and the risks associated with these solutions. He will also need to accurately measure the impact the change will have on the iron triangle triple constraints. This is very important as to which ever solution they decide to take there should be balance on

the triple constraints. This tool is helpful in the initiation to understanding the projects for most stakeholders and the team to priorities activities and the effects they have on the constraints. It is important for the project team to work and assist the project manager to prioritise the constraints and notify the project manager any area of risk so that the project manager may focus on these tasks. .At time it is difficult to ignore changes and even after design freeze changes may need to be seriously considered maybe because of regulations or a change in the market, the ever changing environment thus the need to adopt other methods and adjust the iron triangle to suit the circumstances surrounding the success of the project and changes too. Companies have realised that even if they can control a projects triple constraints, their project might still fail thus concluding that there are other concepts that can be adopted together with iron triangle to successfully complete a project.

  Morris & Sember (2008:35) The most important aspect that the iron triangle brings out is the showing the independence of each aspect and how it will affect the project and how the constraints affect one another Garret 2008 argued that the role of a project manager is to implement the scope of work and steer the project to deliver the expected deliverables for the owner/client and relevant stakeholders, furthermore he urged that the iron triangle is not implemented or used effectively the reason being that that many project managers have understood the concept but that does not translate to effectively making use of the iron triangle. Therefore it can be safe to say the concept might need to be modified if this is true.

Atkinson conceived the iron triangle concept for project manager to be able to assess and balance off the triple constraints for the project implementation. Shenhar & Dvir (2007:86) The concept then became a technique for measuring project success thus project managers took the concept solely to base their criteria to measure project success. Removal are substitution of any element of the triple constraints will cause problems which will need to be avoided or corrected as soon as deviation is identified. Shenhar & Dvir, (2007:184); Turner and Bredillet, (2009:165). The whole idea of the iron triangle lies on the dependency of the triple constraints. An increase in quality, will result in an increase in time, which will rightfully increase the cost/resources. Limited time of a project will decrease the quality of work produces and will result in increased costs Morris & Sember, (2008:176) The validity of the iron triangle has since been debated upon. Garret (2008:175) suggested that the triple constraints are efficiency based and project managers should shift their focus on

business oriented results and the satisfaction of the customer. This focus direction suggested by Garret opens up the question of sustainability as a planning tool can therefore be a new concept to add to the traditional iron triangle

Silvius & Schipper (2017:143); Eid, (2011:85) Studies have revealed that projects are failing as a result of failure to address and prioritise the sustainability issues and project managers are no equipped with the necessary tools to integrate the principle of business sustainability into their project plan and implementation

However, as Atkinson's iron triangle was agreed upon and accepted as a useful concept, but other writers suggested that the iron triangle could not be solely used as a tool to assess project success. Hough. Morris & Turner are some of the writers that did acknowledge the importance of using cost, time and quality to measure project success they however argued the point of using only the iron triangle to measure success. Over 50 years ago Oilsen suggested that the triple constraints would be could then be bundled within the description of project success criteria. On the other hand, Wright reduced the list and taking into consideration the customer's perception or the view of a customer, suggested that the only two parameters are of importance, budget and time are the important aspects Various writers Other authors and researchers such as Morris& Turners, Pinto & Ballantine et al agreed with Atkinson on the elements of the iron triangle being a measure for project success but argued that there elements could not be exclusively be measure criteria for project success. Temporary criteria can be checking if the project is going according to plan, this will useful during implementation and delivery stages, with the use of milestones the actual can be measured against the plan to see if the project is unfolding in the . , right direction or according to the plan. These temporary criteria measurements can be used to measure progress to date of the project, as William suggested the use of the earned value method as a temporary criterion in this case id the EV is less than the actual cost to date will indicate the project is going according to plan. On the other hand De Wit identifies cost as a control mechanism to measure project progress as project cost and time can be project objectives. A millennium project for example must hit the on-time objective or problems will follow.

Projects measured against cost, time and quality are measuring the delivery stage that means at the end it's about doing some- thing right as described by Meyer, the Results Measurements. Meyer described these as the Results Measurements, when

whereby the main focus is the tasks to be done and doing the right thing on the project management task.

Table 1 gives the four guiding principles described by Meyer.

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Table 1 Results measures

- **The overarching purpose of a measurement system should be to help the team rather than top managers, gauge its progress. * A truly empowered team must play the lead role in designing its own measurement system.**

- **Because the team is responsible for a value-delivery process that cuts across several functions ...it must create measures to track that process.**

- **A team should adopt only a handful of measures (no more than 15), the most common results measures are cost and schedule.**

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Source: Own construction

Meyer made a valuable point in terms of performance measurement for the project team based organisations is of paramount importance when it is also the team that will deliver the project to its clients. Project management is evident that the organisations with traditional functional structures don't always make use of traditional functional teams performance measurements thus these can be argued to be essential success criteria. Life critical systems projects, quality may be the overriding criteria. This will lead to a shift priority of the project to getting the right thing done rather that the measurements criteria to be on project cost and time as final result is the major focus.

According to Alter, describes organisational goals and the process as 2 separate criterions of success and this different measures of success. This changes priority from focus from doing it right to getting it right. The importance of its concept is that project manager can measure project success while project is being implemented rather than at the end where it could be more costly to notice deviations only at the end. However this does not allow the project manager to determine the success of the project at the end or other benefits as it is real-time criteria only measures success with the information that is available at that point in time. Time, one criteria

of the process function seems to overarch the chance of other criteria, post implementation from being included. Providing time is not critical, the delivery criteria are only one set against which success can be measured. Measuring the process criteria for project management is measuring efficiency. Measuring the success of the resultant system or organisation benefits, the criteria changes to that of assessing, getting something right, meeting goals, and measuring effectiveness. So what are these criteria?

Post-delivery stage: this is at the end of the project, where the system (getting it right firs) is used as a measure of project success. Strucken suggested that there are four stakeholders that should decide the criteria and the four would be: considered the four most important stakeholders to decide the criteria, were

- client or project owner

- senior management

- the project team and

- the project manager

. There are two more criteria elements which are the resultant system (the final product) and the benefits the finished product has to the project owner, users and customers DeLone et al. (2001:27) identified six post implementation systems criteria to measure the success of a system.

What is often asked about is the validity. Take for instance two projects that are similar in terms of scope and quality, but not the same in terms of initial time and cost estimations. If all two are finished in identical time and cost frameworks then the project with a higher conventional initial estimation would be considered as less successful. After providing the above scenario, project management can therefore be defined as a mechanistic procedure whereby success has more to do with initial motivation and the negotiation of the project boundaries than with the actual project initiation.

Lester (20017:45) further defines cost, quality and time by referring to cost-bound, quality-bound and time-bound frameworks. Time remains unchanged whist cost and quality can be negotiated. Henceforth, given a time-bound framework; less money equals lower quality and higher quality demands more money. Therefore we can

conclude that only two of the three legs of the triangle remain unchanged and the third one is customary.

2.5 Re Imagining the Iron Triangle

The legitimacy, accuracy and truthfulness of the iron triangle has since been debated on as an aspect of project management. Thus other researchers and authors had swapped the elements of the iron triangle for instance Bourne & Walker, (2004:321) refer to scope as a constraint instead of "scope" as a constraint in place for quality as they vies quality to be constraint within scope. Others authors such as Chan et al, (2002:89) substituted time with "schedule" (Regardless of the constraints that are used, they should have clear definitions of what exactly does such constraint or element mean, for instance as clearly stated by Turner & Bredillet (2009:106) as they discussed the definition quality as a criteria in what context is quality measure, of it is meeting expectations /specifications or functionality? That being said they concluded that a few stakeholders can define the element as a criteria to measure success. Jha & Iyer (2008:257) suggested that the criteria to measure success are categorised as "objective" in terms of sustainability or subjective because of the nature for satisfaction for the clients, some others categorised between tangible which were objectives and intangible being the subjective success criteria's However sustainability may also be categorised as subjective. On that same point (Stevens 1996) discussed that there are 2 sides to measure project success and these being soft side and hard side to measure project success, the cost and time being on the hard side then satisfaction of quality being on soft side.

Other Authors have also categorises the criteria's to measure success in more explanatory ways to clarify the definitions or expectations easier. (Chan et al 2002) developed the categorise into 3 trends)

- Meeting the objectives identified by the client and this is whereby success is measured with the elements of the traditional iron triangle although understanding project success is agreeably becoming more complex.

- The global approach. The second trend is described by Chan et al., (2002) as the global approach,

- Project success beyond the project. Here these cannot be determined by the use of the traditional iron triangle Measures of factors such as sustainability,

client satisfaction, health and safety issues, project functionality and performance.

Because of these shortcomings of the iron triangle there has been other researches and authors have attempted to add more elements and constraints to the traditional iron triangle. Even the Project Management institute (PMI 2009) reimagined the traditional iron triangle and made a few adjustment as they tackled to re address the constraints, to have more realistic success criteria they replaced cost as the budget, quality was supplemented with schedule, resources and risk
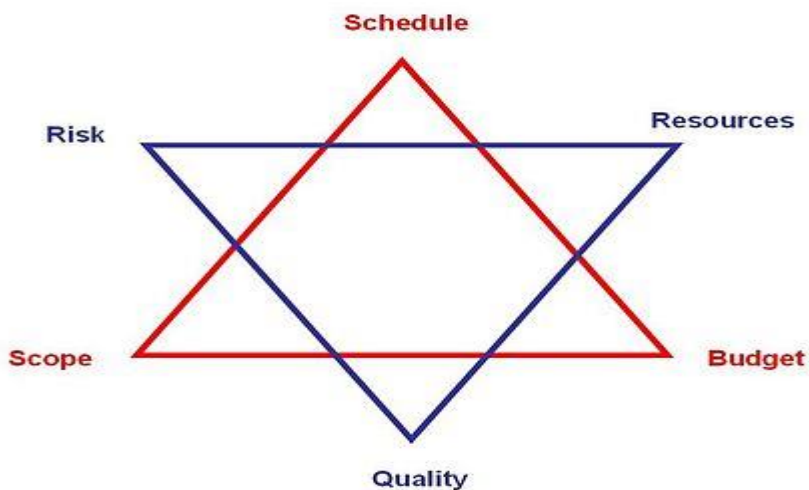
Figure 2.6 The Triple Constraint
Source: http://passionateaboutoss.com/triple-constraint/

Other authors suggested that the iron triangle needs to be upgraded to add on some more elements to use as a criteria of project success. Another author suggested that the iron triangle should be dismantled all together and organisations should have a complete understanding of it means to project success. Haughey (2011:163) identified the project management diamond, which had been developed by Shehnar & Dov (2007:143). This concept has four ends and an addition to the iron triangle is scope and expectations. That being said Atkison introduced the Iron triangle and square root.
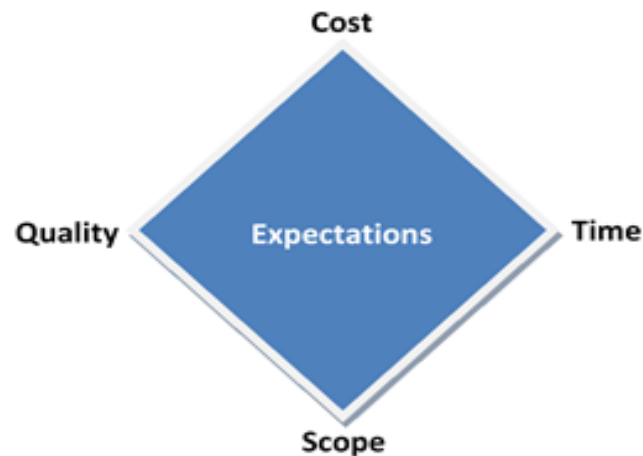
2.6 The Iron triangle and the square root of project management

We can agree as researchers that the Iron Triangle by Atkinson, 1999, has been the most known and applicable concept used as the measure of project success. As so, becomes the foundation of project therefore it can be sued as a starting point for leveraging and use to the advantage for the sustainability in project management. An ideal approach to this study would be to understand the two concepts, namely the iron triangle and the square root of projects; when project information is least available

According to Kerzner, (2006:165), point of view on success (he adds two more requirements which are customer acceptance and to use resources with efficiency and in an effective manner.

There is a mixture of the information system, the iron triangle, organisational and stakeholder benefits; Atkinson's Square Route criteria for success correlates to Kerzner's description of success. The information system comprises of reliability, information quality and maintainability. Within Kertzner's definition: the organisational benefits comprise of; effectiveness, strategic goals, efficiency and profits, while stakeholder benefits comprise of personal development, social and environmental impact and satisfied users.

Despite the fact that Atkinson defined the criteria of his square root to apply to project management, he also added the criteria for project success. The following highlights his realisation of the distinction between project management and project success.

Atkinson rounds up his research by suggesting that the explanation of the project management process is to be refined.

The iron triangle is very correct in terms of the explanation success; there is just a need to refer to all the success criteria in order to make sure that a Type 2 mistake is avoided. This is deducted from Atkinson's motivation towards the necessity of adding onto the success criteria using a Type 1 and Type 2 mistakes illustration. A Type 1 mistake is described as the mistake that is not made by a beginner musician who plays a piece of music until he gets it correct. A Type 2 mistake is one that a professional musician strives not to make as he will keep rehearsing a piece of music until perfection.

2.6 The square root of project management

Introduced by Atkins (1999) was a simple addition to the existing iron triangle supports the inclusion of the scope as a proper definition of the correct measure of success, quality on its own makes reference to technical specifications more than it does to the measurable deliverables. The scope of the project is essentially the complete or full work to be done, on the basis on which the costs, the time and possibly the quality can be measured. Hence successful project execution will involve; finishing the project within the specified time, within the specified budget, with all technical requirements met, and all the aspects of the project completed within time.
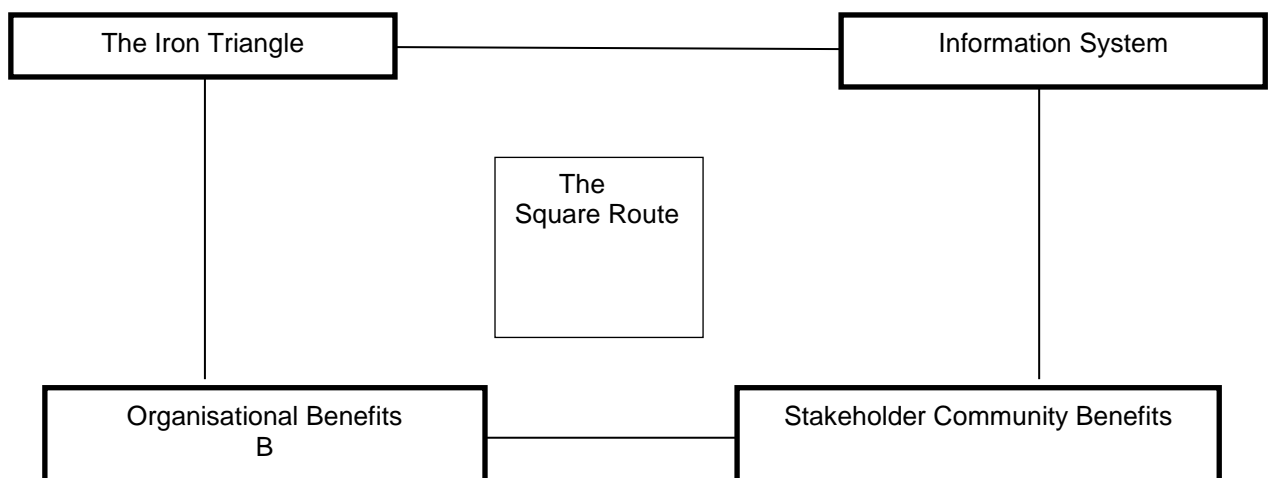
Figure 2.7 The square root of project management
Source: The Square Route (Atkinson (1999)

The Square Route consists of four categories, each with their own small list of criteria to help evaluate the project on multiple levels. The first category is, in fact, the Iron Triangle, with cost, quality, and time. The second category is the information system, with such points as maintainability, reliability, and usability. The third category is titled "Benefits (organization)" and has such points as improved efficiency and improved effectiveness. The fourth and final category is titled "Benefits (stakeholder community)" and touches on such areas as satisfied users, and social and environmental impact.

Table 2.2 Square route to understanding success criteria

Iron Triangle	The-information System	Organisation Benefits	Stakeholder Benefits
Cost	Maintainability	Improved Efficiency	Satisfied user
Quality	Reliability	Improved Effectiveness	Social & Environment impact
Time	Validity	Increase profit	Personal Development.
	Conformation quality use.	Strategic	Professional Learning
		Organisational Learning	Contractors profit
			Capital supplier, project team, Economic impact to surrounding community

2.7 Conclusion and Project Success

A clear distinction between project success and project management success was given by De wit (1988:12).In 1988 De wit succeeded to explain the difference between project management success and project success. In his definitions De wit explained the project management success only concentrates on the management processes, it is measured on the measures of overall performance against time, quality and cost whereas project success is the performance measure of the specific projects on objectives being accomplished. Nelson R, (2005:65) argued that the project success should encompass process and outcome criteria. And according to him cost, product and time this is product acceptation, customer satisfaction, user

friendly of the product all translate to the process criteria. On the other hand product value, use and learning define the management process success criteria. Collins and Baccarini (2004) suggest that success parameters should be project's management success and project's product success. Westhuizen & Fitzgerald (2005:65) also described project success as a system of two components, but they argue that success is based on project management success and project's product success. Therefore the projects that have process succeeded have failed as the only passes the would have failed and those that seceded the outcome are successful failure. .

With the use of the iron triangle project failure/success has been limited only to the 3 identified constraints this is known as the project constraint according to Brewer & Ditman. (PMBOK 2004) also agreed that each project is administered by the triple constraints These 3 constraints have been used to measure project success because they are easy and simple to use not complex really as its basically comparing actuals against budgets which are basis as each project a set timeframe for duration of the project, a budget to measure cost and outcome to measure quality. Dobson 2006:243) thus if these constraints were met, the project will be classified as successful because the actual cost and budget will be equal or the actuals being less, if the project was finished within the set time frame and the clients accepted the outcome then project would be deemed successful. Unfortunately this misled many organisation s as this criterion to measure success only focused on the operations of the project but overlooked the strategic value of the projects. Lock then suggested that the iron triangle constraint should be used as a benchmark for project success. Though Cleland & Ireland (2002:98) argues that project success should be able to measure the technical performance of the final product and the objectives attained as indicated at the conception stage of the project. Therefore Wyangard et al, (2012:76) developed what is known "Triple Constraint Project Management Model (TRIJECT", whereby the 3 constraints and balancing these competing goals as a measure of project success.

CHAPTER 3:
EFFECT OF SCOPE CHANGE ON PROJECT MANAGER'S EFFECTIVENESS

3.1 Managers and leaders in project situations

The role for a project manager has grown and since project manager has been clearly stated as an area of occupation the last decade has seen a grown within tertiary institutions offering project management as an area of study. Project management is generic and its principals and tools can simply fit into practice in any industry. Many authors have given their own definitions of a project manager and mostly importantly his/her key roles with regards to project delivery. A Swedish researcher by the name of Tonnquist, (2010:232), who came up with a project managers' list of functions and responsibilities

- He is responsible for reaching the objectives and goals set for the project

- He is the communication engineer for the team and other stakeholders

- He communicates, delegates and motivates his team to perform

- He communicates and gives progress/status reports to relevant stakeholders

- He is in charge of scope management and any change management

- He foresee and handles project risk or opportunities that may arise.

When analysing the findings of this research we can compare the above list by Tonnquist to those by Kotter. The 2 theories are very similar. Only that's Tonnquist argues that there is no difference between the characteristics of project managers and that of leaders and managers.

3.1.1 Project Manager

The project manager is the individual who has been given the power of authority, accountability and is responsible for accomplishment of project objectives securely through in a given initial agreed upon framework of money, performance or quality and time. Frame (2002:76) after seeing how new business environments impact on the way projects take place and witnessing gaps in the original modal and suggested a new definition for the role of project managers. In it, he re-explained the role to be that project managers are to be more empowered to function in an effective manner and customer orientated.

Frame went on to suggest that project managers are to attain a high standard to accommodate uncertainty. Project managers are to have the ability to concentrate on details while looking at the bigger picture. They should have the ability to work sternly and flexibly while paying attention on time, quality frameworks and budget. They are to be empathetic and susceptible towards personal needs and wants while being strict when working with individuals. They are supposed to have conviction of their personal instinct and they are to have analysing abilities. Thomas Mengel (2008:154) expresses his worries of the project manager's social make, their contextual and political understanding, spiritual and emotional intelligence and leadership knowledge.

There are two lines of thought amongst the kinds of project managers mentioned above. Firstly, it is that of someone who uses analysis, method and precision, they put stress onto the effective progression of a project and secondly, it is that of a more sociable person who pays more attention the effective delivery of the best idea. Thomas & Mengel (2008:138) also express their worries regarding the capabilities of a project manager to initiate adaptable and flexible conditions into conservative project tools and models.

Weaver (2008:180) suggested that project managers that are skilled should continuously deliver more predictable and reliable project results after plummeting the fabricated prospect of conviction and organisation given by typical project management principles.

3.2 Selection of project manager on a project

Projects are deemed unique as they fall in any department of an organisation and in any industry thus the project manager may be selected from a matrix organisational structure. A project manager can be an expert in the department where the project falls under, a project manager can be selected according to experience.

In the tertiary education on project management has been on the rise as an area of study from degree levels to short courses an enrolment, the reason being that change is the money constant in work places. Consumer change in expectation in services and products has forced more organisations to focus on a project management flexible structure (matrix structures) shown the diagram below. Considering the nature of a project, the project team may selected from within organisational functional structure therefor the project manager is usually an expert in the department from which the project has originated from.

Figure 3.1 Matrix Organisational Structure

Source: https://www.quora.com/What-are-the-pros-and-cons-of-a-matrix-organisational-structure

In some instances, organisations outsource the project manager from outside the organisation for many reasons such as, the organisation has no expertise in such projects, or the organisation does not want to risk the organisations employees working on projects as well as their usual responsibilities depicted by the matrix structure. The reasons will vary therefore if the Project team and manager is outsourced the organisation might not have a choice in choosing the PM. Despite how the project manager is selected the role of the PM will be depicted in the contract and their responsibilities re as follows. Add more flesh

3.3 Roles, Functions and Responsibilities of a project manager

A project leader is given authority, accountability and responsibility to see the accomplishment of project objectives securely through in a given initial agreed upon framework of money, performance or quality and time. Frame (2002:79) after seeing how new business environments impact on the way projects take place and witnessing gaps in the original modal and suggested a new definition for the role of project managers. In it, he re-explained the role to be that project managers are to be more empowered to function in an effective manner and customer orientated.

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details while looking at the bigger picture. They should have the ability to work sternly and flexibly while paying attention on time, quality frameworks and budget. They are to be empathetic and susceptible towards personal needs and wants while being strict when working with individuals. They are supposed to have conviction of their personal instinct and they are to have analysing abilities. Thomas & Mengel (2008:86) expresses his worries of the project manager's social make, their contextual and political understanding, spiritual and emotional intelligence and leadership knowledge.

There are two lines of thought amongst the kinds of project managers mentioned above. Firstly, it is that of someone who uses analysis, method and precision, they put stress onto the effective progression of a project and secondly, it is that of a more sociable person who pays more attention the effective delivery of the best idea. Thomas & Mengel (2008:88) also express their worries regarding the capabilities of a project manager to initiate adaptable and flexible conditions into conservative project tools and models.

Weaver (2008:63) suggested that project managers that are skilled should continuously deliver more predictable and reliable project results after plummeting the fabricated prospect of conviction and organisation given by typical project management principles.

In a nutshell the project manager is ultimately accountable and responsible for the project from start to completion of the project, on time, meeting expectations, requirements and within approved budgets. Therefore, his/her the key roles are:
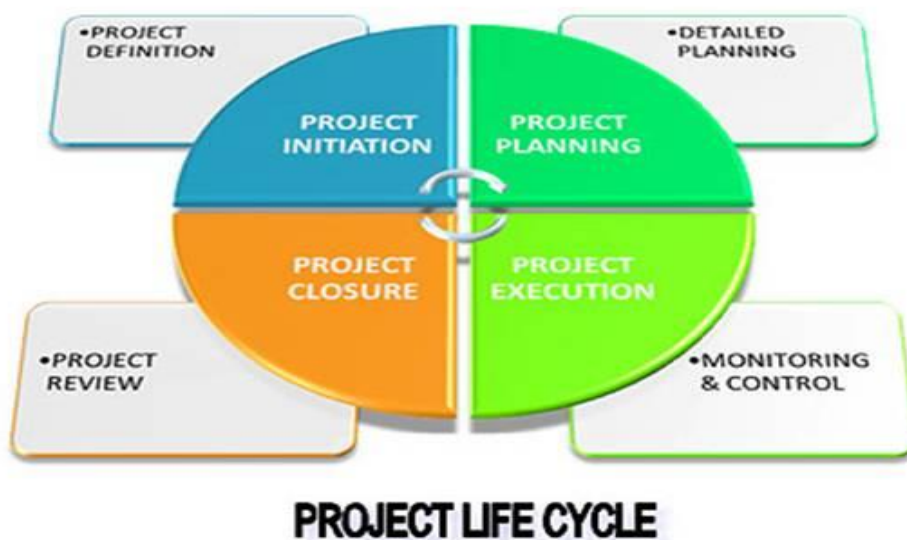

Figure 3.2 Project Life cycle

Source: https://www.guru99.com/initiation-phase-project-management-life-cycle.html

Project manager gets involved to see the project through therefore at every stage of the project lifecycle he/she has responsibilities and accountability for the work produced by his team.

3.3.1 Project Planning Phase

A project is a temporary endeavour undertaken to satisfy a certain need, it has a time frame, therefore it is the PM's responsibilities to determine the road map of the project including all organising and monitoring all the tasks that need to be accomplished to deliver the project.

(http://searchcrm.techtarget.com) States that, planning for a project entails collection of information on the request by a client, creating a roadmap as to how the project objectives and goals will be reached, planning the whole project from start to finish in order to deliver a successful project in terms of quality and functionality as perceived by the project owner. In a nutshell project planning includes:

- outlining the goals and objectives of the project

- Identification of milestones and deliverables

- Scheduling for the tasks that need to be accomplished and identifying resources that are needed to accomplish the project.

- Creation of contingency plans and risk in case of a possibly identified risk/challenge (risk management plan) arising when implementation starts.

Ensuring that all resources needed for the projects are available in case of scarce resources then contingency plan can be put in place. Planning for the project also includes the project manager selecting his team, expertise/competencies that he needs to implement the project. It is also at this point that other resources needed are identifies and verified their availability to avoid delays after implementation and there is a shortage of resources so the planning has all resources should be confirmed available in the quantity the project requires if resource is scarce /unavailable then substitutes or other alternatives will need to be considered.

3.3.2 Project Execution/Implementation

- **Organising**

  The PM can be given the authority of selecting his team therefore assigning tasks and responsibilities to his team. The project manager will also use tools

available in project management to communicate these tasks and responsibilities to the team, for instances the use of a Gantt chart to identify the person responsible for the start, the resources the team need to complete the tasks and their duration. These tasks need to be scheduled their duration, resources allocation, costs, risks and contingency plan. The project manager ensures that the project scope detail all tasks that need to be taken, giving clear milestones to measure progress. A Critical Path Method can be developed for easier planning of time and budget as below, with other supporting methods such as Work Break down structure and Gantt chart,
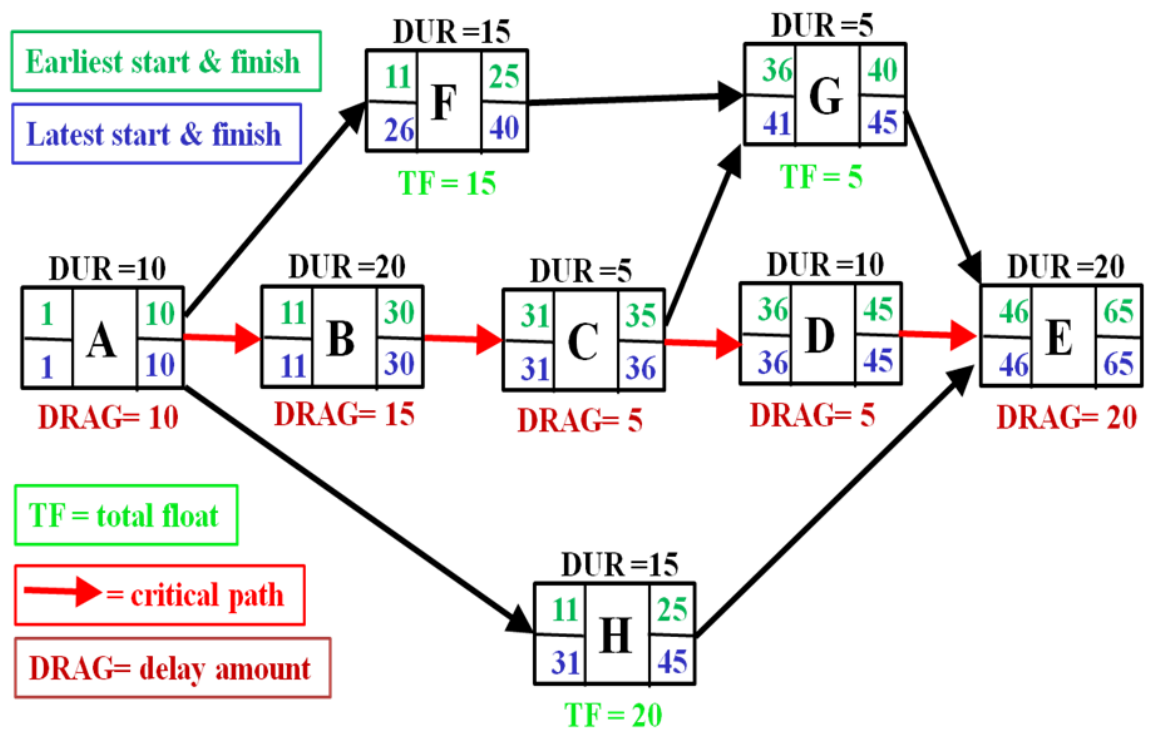
Figure 3.3 Critical Path Method

Source: https://en.wikipedia.org/wiki/Critical_path_method

- **Coordination**

The PM coordinates the team and other sub-contractors and consultant for the project. He is ultimately responsible to opening communication channels amongst the team and the sub-contractors so that the coordination of task dependencies will be easily carried out and delivered as they all rely on each other to archive the project goals and deliver the completed project. Add project phase and the involvement of the pm

- **Supervising & Controlling**

  Once implementation of a project has begun, the responsibilities of the project leader will be supervising project team, controlling the project schedules and issuing resources as they are needed, monitoring quality cost and time at the same time. Supervising & Controlling He will give feedback to his superiors, his team and clients as it progresses, therefore he will need to put control measures and techniques in place to monitor progress in terms of milestones, budgets, costs, resources, design and time. A project manager will use the scope plan (requirements), WBS and CPM that have been constructed to compare the plan and the work in progress to check for gaps and if there is need to make changes such as adding resources to fast track the project or shifting resources to tackle the more critical activities.

3.3.3 Project Closure

The project manager presents the completed project to the client. At this stage before the handover is done the project manager has to go back to the scope and note and tick every deliverable ever set either from the initial documentation in project initiation of changes made during the projects execution (if any) The project manager is responsible for project closure documentation. These will include closure reports for future reference all documentation that was used throughout the project will need to be consolidated and filed, as well as recommendations and reference for project to come (adding to the pool of information) The project manager will then handover to the client who will accept or decline ownership the project

3.4 Project Manager Traits

Even though the project manager is usually selected on the basis of experience, expertise and/competence, there are generic traits that every project manager as a leader need to poses, a good project leader will also know when to employ and exercise these traits;

- **Integrity**

  This means that the PM has the quality of being honest and have strong moral principles. A pm is a team leader therefore needs to lead by example and must be respected not only because of his/her position but also his

personality. The pm is responsible for setting ethical standards and code of conduct for his team thus needs to demonstrate good ethics, honesty, commitment to his duties and responsibility for his actions.

- **Competent**

  Being competent simply means having the necessary ability, knowledge, or skill to do something successfully (Wikipedia). The team looks up to the Project manager for guidance and therefore need to gain confidence in their leader, in that, he/she knows what he/she is doing. The project manager needs to be competent there his work and have knowledge about the technicalities of the project so that he can communicate well with his team, solve problems has they come because he will have the knowledge and competent, this include conflict resolution and technical problems that may arise.

- **Problem Solving**

  An efficient project manager should have the power to solve problems that arise within the project. A problem can be conflict between team, it is the duty of the project manager to help resolve conflict so that the team can coordinate to work together. The project is dependent on the performance ability to work together therefore any conflict can harm the success of the project as team members will not share information or will not be effective because their differences have not been resolved, thus it is important for the project manager to have the skill to solve problems. Besides team conflict other problems such as scarce resources, delay in delivery of inputs and changes on the scope require problem solving technique to be acted upon and managed before the project derails.

- **Communication**

  .In the business atmosphere, regardless of nature of business, communication is of paramount importance. It is essential that the lines of communication are clearly stated when it comes to project management. The project manager therefore should open channel of communication that best move and shares information that is to be shared with the right people. Communication of the project requirements and objectives is done by the project manager to his

team. Therefore it the project manager's role to identify the modem of communication for the project. Information must be made available to the right people at the right time therefore it is his duty to make sure that all team members are well equipped with information to reduce confusion and assumptions which could impact negatively to the deliverables. The manager will need to develop a communication map that best suits the project. Communication will also relate to negotiation, a trait that a project manager should possess to be able to negotiate for his team and also scarce resources.

3.5 Project manager's responsibilities on scope management

Project managers on Scope Management

Project scope management involves the following and the process of planning scope management: A scope management plan is mapped out based on input from the project plan, the project charter, and consultation on project requirements with project owners and other relevant stakeholders depending on the type of project. Project scope management ensures that all the work required, and only the work required to complete the project, is included in the project. It is the Project Manager's responsibility to ensure effective scope management throughout the life of the project. By applying a well-planned and structured approach to scope management he/she can ensure this.

In a nut shell the PM is involved with the project scope and this process starts from understanding the needs of the stakeholders and/ client, Designing a feasible yet ambitious initiative that effectively works towards the aims of the three key stakeholders.

The scope and planning the project

- Creating suitable budgets and schedules

- Designing a team structure

Managing the project

- Track budget cost and schedule time (the iron triangle)

- Recruit and manage team to deliver the initiative

- Deliver a high-quality initiative, on time and within budget

- Report team activities and progress towards goals to key stakeholders

The project manager's limitations / constraints and problems

Pinto (2000:85 - 91) Urged that is of paramount importance for project managers to comprehend the impact that organisational politics has on project success. In a sense, politics is the management of influence. By individuals or groups to get outcomes or processes to outcomes that have not otherwise been sanctioned by the organization. Aquinas (2006:305) posits that power is closely linked to the concept of politics, and that power is used to advance personal or organizational interests. Jowah (2014) talk about authority gap which even states further problems that at time the project manager has no authority even in the planning as they are just handed instructions and manuals to go by throughout the project. Because of this structure, the manager needs to negotiate for all the resources that are required since he / she does not have direct authority (Brown & Hyer, 2010:69).

Project managers are more executors in most organisation whereas they have little or involvement in the planning. And it usually impact their effectiveness of the project manager therefore affected.

3.7 Effect of scope change on project manager effectiveness

Most of the projects are led by a professional in the industry or relevant project expert in the filed the project is being undertaken. In embedded projects (Jowah – google and look for article on Matrix structure and projects) where the matrix system is used, project managers work closely with functional managers in order to get right people for the project Verzuh, (2003:43). In this case the project manager's responsibilities are primarily to coordinate the execution of the project Gido, (2009:412) by both controlling the performance within project managing and controlling the project schedule and giving feedback and reporting to the client and the company management. The function of the project manager starts by the manager needing to define and understand the scope of work to be done Schwalbe, (2009:183), and understanding the four constraints of the square root. Good scope definition and accuracy in capturing the customer's requirements are critical towards project success as projects have constraints that limit them to a certain timeframe, access to certain resources and, budget, technical specifications and expected deliverables.

Thus when there are changes that are made on the scope that deviates the schedule, cost and resources, the project manager is liable to assess the impact that

the change will have on the triple constraints of a project. It is his responsibility to come up with options for rectifying the reason for change so that the options will give real-time scenarios of the impact of each alternative provided and the effect the change will have on the triple constraints Morris & Sember, (2008:164)

Project scope statement A scope statement defines what work need to accomplished (Barkley, 2007:83). It is followed by the work breakdown structure that highlights all of the discrete components of the product that the client will receive separate or in the aggregate, at the end of the project Rad &Levin, (2003:24).

Scope change in the project almost involves scope creep these are minor changes that are made once project implementation has started and as they pile they grow and divert from the original scope unintentionally and a significant change is made overtime of these never ending scope creeps scope creep Pyzdek, (2003:90).

Dayal 2008, stated that scope creep and scope changes occur because the requirements and goals of the project were not captured and interpreted well at the beginning of the project (concept stage) in the initial planning. The scope statement defines all the work that need to be done and when change is proposed, it is ideal to go back and compare the changes to the initial scope statement and rectify to see/reason why the change is needed and if change is being requested because a deviation has occurred to the initial statement. Heldman, (2009:108).

Project manager is the person who facilitates in the planning of the project, put measures in place so that the implementation of the projects stays according to plan and controls the project and sees over all activities that the team need to accomplish for project success and achieve the set goals Lewis, (2001:4)

Project leaders are extensively responsible for the project roll out and is not involved in the decision-making process, instruction on change are passed down to project managers, this has negative impact on the manager's performance. Previous research has shown with not questions that, employees that are involved in changes and decision making process or at least consulted in the process perform better and own the change process as they feel more involved and trusted. Same theory applies to project manager being involved in the change decisions. The diagram below shows the phases/stages of change.

Project have a time constraint by nature "a project is a temporary endeavour undertaken to create a unique product/service, it has a defined beginning and end time, with defined resources." Therefore, the stages of change on an ongoing project

will impact the timeframe set for the project and also the resources budgeted for the project.

Being involved will enhance a project manager's confidence to present the changes to his team with confidence and will be well equipped to give accurate information and instructions to his team.

Confidence

Communication, empowering team to get their work done best way possible to realise a sense of self-actualization and job security because they feel trusted and useful on the project.

CHAPTER4:
RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

Research is known as the quest for knowledge. As Clifford Woody clearly explains that research the process to identify and redefine a problem or cap that needs to be closed or problem that need a solution, and at that formulate a hypothesis and alternative solution, gathering information about the best solution and then plan, organise and testing and control the solution to produce the final product that will fulfil the purpose of the research and solve the problem identified. The dictionary's definition of research is a careful investigation or inquiry specially through search for new facts in any branch of knowledge. D. Slesinger & M. Stephenson (1930:564) in the Encyclopaedia of Social Science defined research as the manipulation of things, concepts or symbols for the purpose of generalising to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art. Thus, the researcher would say research is the search of the truth from the unknown or known with the help of studying observing and experimenting, thus finding solution to a research problem

There are different methods that researchers use to conduct research known as research methods or techniques. These are all methods that the researcher used during the course of studying the gathering information for research problem. Research methodology is defined as ways to solve the identified research problem systematically.

The researcher used 2 types of research which are

      I.   Quantitative Research Method

     II.   Interviews

Target population

The target population for this research were project managers, heads of project and project officers from all 3 branches of Ergosystem Walling Solutions. The target population worked directly in project execution. This target population was carefully selected because all project managers worked under head of projects and project officers. The idea was to collect data from all contributing counterparts

involved/approved with scope changes. This helped the researcher to view the concepts from all angles in the chain of command that is vertical: top to bottom. Head of projects being at the top of the chain of command with the Projects Department for Ergosystem Walling Solutions

Sampling frames, sampling and sample size

The sample size for the study wasto a minimum of 50 participants and these included project managers, project administrators, project engineers, and project management officers at Ergosystem and the equivalent thereof. Welman *et al.,* (2008:173) proposed that when the sample used is bigger it results in minimum mistakes, therefore the sum of people involved was of paramount importance for accurate analysis and assumptions for the research. Project managers were generally fewer in number and 50 was considered adequate for the purposes.

Data Collection & Research Methodology

An appropriate design questionnaire was carefully structured and made use of as the tool for data collection at Ergosystem. Collis and Hussey (2003:173) As suggested by Collis & Hussey a questionnaire has a series of thoroughly thought questions research questionnaire should be consist of questions that a thoroughly thought questions that will give the most to the research to make accurate findings The planning of questionnaires seeks to support in gaining the proper information from the people concerned as precisely as possible to get the best and closely accurate data.

The questionnaire was distributed to 3 Ergosystem Office Branches. Questionnaires were sent via email and participants were asked to print them and fill them in. Interviews were conducted in all branches as the research observed and got involved in some projects' procedures and only the Head of the Project Management Office (PMO) in the branches were interviewed

4.2 Sampling

Prof. C.A Ille (2013:56) defined a population as all the elements/individuals within the environment of which the research is conducted and that may be affected by the results of the research or that the results may relate to"

N = Population

In this research N= the project managers of Ergosystem

In research terms a sample refers to the individuals that will be involved in the investigations, these are known as participants, who will help identify if there is a problem that the researcher's aims to solve. The process identifying and selecting these participants form the target population is thus referred to as Sampling. The term target population identifies to the total group from which the sample will be drawn from. The reason why the researcher conducted sampling from the target population was because would have been impossible to get the whole population to participate, not only would that had been costly but it would have been time consuming, thus the sample will resemble and represent the population. For these reason the researcher made sure that the sample accurately represented the target population and not biased.

Purposive sampling involves selecting the participants according to certain characteristics and for this study it was of paramount importance for the study to be successful. Cressell & Clark (2011:84) defined sampling as the process of identification, segmentation and selection of individuals or group that have the expertise and knowledge about the subject of interest. The sample for this research comprised of projects managers, project administrators, project engineers, and project management officers of Ergosystem.

Participants involved in this research sample are to met the specific criteria as identified by the researcher. They will all have to be projects managers of Ergosystem

They also should

➤ Have been working in their current position for more than 18 months, the period in office would have given them opportunity to have worked on multiple projects.

- Should be working in at least 2 projects departments of Ergosystem, this would be helpful to evaluate how scope change affected project managers in different departments and also accessed which department has a deferent approach toward scope changes. Ergosystem has a construction department, a renovations department and Interior design
- Be willing to participate

Bernard & Spradley, (1979:354) explained that participants need to be willing to participate, communicate well with the researcher and provide the right information that is their own experience as it is important so that the results are not biased influenced by the known and/or unknown

4.3 Literature review

A literature review is an evaluation report of the information found in the literature related to the field of study. Literature review refers to the report that a researcher develops after conducting a study in the area of his/her interest. It's usually forms the theoretic base of what is available about the subject of interest. This is when the researcher needs to find out is a similar research has been conducted before and what the findings by other authors and researchers are. At this stage the researcher can then make a decision if he/she has identified a valid problem that has not been tackled before and also test if his hypothesis has been tested already or he is on to something. The researcher should be able to group similar information and see the angle at which his study should take. . Relationships between the literature must be noted and articulated, in relation to the author's field of research

Literature review can be done by making use of published materials such as journals, books, newspapers or magazines that deals with a particular subject or topic or professional activity Collis & Hussey, (2013:90) Journals are mostly used in literature reviews as they usually have an up-to-date information and formats for research. Books are also used in literature review though they tend to be less up to date as compared to journals but they can offer a good starting point as to where to find more up-to-date and detailed information. Conference proceedings can also be used in literature review as they offer and provide useful information on recent researches and also gives information on the individuals that conducted the research. This will help the researcher track down other researchers in the same fields and interview them if need be. Magazines, newspaper articles, government publications can also be used as sources of information by the researcher. Many governments across the

globe regularly conduct researches and issue publications and these can also be used by the researches and can be useful if there are in a related field of study for the researcher.

The Internet formed part of establishing a well-informed theoretical background. The last 2 decades has seen an increase in researcher making use of the web as a source of information. The internet has a pool of information from all around the globe and most publications and journals are found on the internet. The researcher can get a boundless information on researches conducted anywhere around the world on the related field.

In general aim of conducting the literature review it to justify the study for the researcher and provide the context as well. The other reason is also to ensure that the field of research the researcher wants to do has not been done before and shows him/her where they fit in the existing body of knowledge. Conducting a literature review will enable the researcher to learn from other researchers conducted in the past and other theories on that are relevant to the field and this will also enable the researcher to see the gaps and flaws from the previous theories. Above all the Literature review will aid the researcher to refine or even refocus his topic

4.4 Data collection procedure
The research study will make use of quantitative research approach.

4.4.1 Quantitative Research Approach
Quantitative data collection techniques make use of data collection method that will fit various experiences into prearranged responses groups Burns & Grove (199:93) defines quantitative research as formal, objective, systematic process to describe and test relationships and examine cause and effect interactions among variables. Results of the data are easy to evaluate summarise and compare as well as to generalise them. Quantitative research is typically focused with testing the hypothesis that has been derived from the theory. The type of quantitative method the researcher will use in the research is a face to face interview with the participants of the sample. Qualitative research is all about getting the opinions from the selected sample in a structured way that can give and produce hard facts

The researcher made use of a **questionnaire as a tool of collecting data.** This instrument was used to collect data from a sample that has been identified from the target population.

The advantage of this technique is that is tested the hypothesis which had been constructed already before data has been collected and also the findings were generalised when it has been replicated on different population and subpopulation.

4.4.2 Questionnaires and Data collection

The dictionary defines a questionnaire as a set of questions where the participant has a choice of answers, developed for survey/research study purposes. The sample of participants for this study were project managers, project portfolio managers, head of projects and project officers who have been with Ergosystem for more than 3 years to have had dealt with a number from projects and they have had a few scope changes on some of their projects. Researcher requested the support of Ergosystem Walling Solutions to identify the criteria qualifying project managers. All respondents where from the projects departments such as Industrial designers, Architects on projects, Project administrators, project portfolio managers, project managers that had experienced scope changes during execution of their projects. Respondents will be will then be selected as the sample and the questionnaires will be handed to them, The reason why the researcher decided to hand questionnaire was because of the realisation that participants were busy and researcher felt like asking them to print the questionnaire would have been time consuming that just handing the questionnaire out and ask participants to fill in and answer the questions. The questionnaire issued was written in English as researcher was not familiar with any other vernacular language in South Africa and also data analysis tool used was in English. It was appropriate to do the data collection in English to avoid translation errors etc. Completed questionnaires were returned anonymously. The researcher had like a ballot box where the participants dropped in their questionnaire once they have completed it. The answers were then reviewed and collected by the researcher.

Though the company used for the research is in the construction industry, the information collected and analysed by the researcher will not involve the company, although participants were asked to report on their experience with their jobs at the company in hand.

A cover letter accompanied every questionnaire distributed to assure the participants that their information that's was recorded will be kept confidentially and anonymity. Prior to the distribution of an expert provided by the university viewed the questionnaire for any incorrect implications and gave a green light where the questionnaire was deemed suitable for the study and verified that the questionnaire was asking ethical questions nor suggest answers for participants and was not biased, Podsakoff et al, (2003:40) also supported this as the procedure that decreases social desirability. In a bid to encourage the respondents to be interested and eager to fill in the questionnaire, the researcher put an incentive: a chance to win a full spar voucher for 2 worth R1 500. To minimise respondent from being biased, according to Podsakoff et al steps were done to make sure that participants were truthful

- The identifications of respondents were kept secret and the researcher reassured participants that no answer was right or wrong and which encouraged them to answer in all honesty.

- To reduce the chances of a participant guessing their answers, some of the questions were reverse coded which is a common variance methods according to Malhotra et al, (2006;92), this method caused some participants not to be able to combine related questions

- Research model was so complex such that the hypothesized relationship is part of the participants' cognitive map according to Chang et al, (1996:96)

Lastly, the questionnaire consisted of only 35 items. The questionnaire was divided in to sections which made is easy and simple to understand.

➢ The first Section A, which aimed at acquiring basic demographic information about the participant such as level of education, age, gender etc. to aid the researcher to interpret the responses for instance, is the project manager educated enough and has the skills required to run such projects depending on the department. This section aided the researcher to understand the background of the participant

➢ Section B were a series of question on which the participant had to answer the questions according to the grading given where the answer ranged from strongly agree to strongly agree. These questions were the ones that were relevant to the study at hand.

➢ Section C question asked the participant to elaborate on the questions that were asked and give their opinion and how they view the system in which they are working in. The purpose was to give the participant a chance to express their feelings on issues that the research is trying to solve and this gave more depth as to the feelings and how the project managers are affected

➢ Section D asked participants for any suggestions or if they had anything they would have wanted to be added if they felt the questionnaire did not address.

The questions were short and sweet so that participants would not get bored of the questionnaire which could have diverted their attention and accuracy to just rush through the questionnaire as stated by Yu & Cooper (1983:25) A questionnaire was user friendly and assisted converting the data to graphs, charts and other formats that the researcher used to store and interpret the data. Content analysis made used to analyse data from the official documents dealing with the observable fact. Welman & Kruger (2002:194) state that content analysis can be conducted from the response of open ended questions. This was done through asking open ended questions and instructed interviews to report in a qualitative manner and made a qualitative analysis of the content of the interviews Welman & Kruger, (2002:195).

Graphic statistical and statistics and statistical implication were the two mains features for the data analysis tool for this research of the data analysis; it's is significance to take note that the information provided by participants would not be 100% accurate of the truth that information on any people will never be 100 percent accurate. This presented another idea to data analysis. Collis and Hussey (2003:17) assume that the choice of the methods and technique used for data analysis be influenced by on the type of data; quantitative or qualitative. Fowler (2009:145) outline that once data have been collected by the survey, no matter what the methods, the nearly always must be interpreted into a form suitable for analysis. The data was analysed in this study is quantitative, the questionnaire was allocated arithmetical value to measure the importance of given behavioural probability by the respondents

Three principals were used for the actual statistical analysis, to be accurate

• The data was submitted to exploratory factor analysis to evaluate classify rationality of measure contrivance

- Testing the measuring instrument's dependability by measuring inside constancy

- The instrument found both dependable and lawful will be used in the model for getting worse analysis to measure the independent variables

4.5 The Interview Research Instrument

An interview is a conversation between two or more people where questions are asked by the interviewer to elicit facts or statement from the interviewee. Powell, (1997:157) Interviews are standard part of qualitative research. They seek to describe the meaning of central themes in the life world of the subjects.

The main task of interviewing was to understand the meaning of what the interviewee says and vice versa. The interviewees asked the interviewer to elaborate on questions that they did not quit understand so that the interviewee could give the researcher the information the interviewer was trying to derive from their questions. An added advantage of these interviews was that the researcher was able to explain the entire research and the reasons for research and this made the participation easier and open minded about the questions asked

Interviewing is considered as a technique used to understand the experience of others. Interviews are optimal for collection of data on individuals' perceptions and experiences and an added advantage for the researcher to capture emotions and expressions of the participants unlike questionnaires.

Interviews were more personal form of research. The researcher worked directly with the participant and as for questions that were open ended were redirected them according to how the participant answers the questions. At that same note questions were also rephrased according to the answers the participant gave causing the interviewee to open up and be able to express themselves freely.

It was also of paramount importance that the interviewer be a good listener and further more jotted down notes as the interview unfolded. Having recorded interviews allowed the interviewer to play it over again to capture those facts that he/she did not get during the interview. Recording also meant information can be reserved for future uses. The drawback of recordings is with technology ever changing it can be time consuming to change the storages to suit technology for instance the transfer of

information from computer disks or tapes to CD's of DVD to make the accessible using modern technologies

The researcher planned to make use of semi-structured interviews for this phase. The questions that will be contained in these interviews stem from the results of the questionnaires issued.

The semi-structured interviews also allowed the researcher to ask probing questions to gain a better understanding into the quantitative results of the questionnaire. The Head of the Project Management Office (PMO) of the bramch weree interviewed.

Furthermore, each interview was conducted at a convenient time and place for the respondents. All interviews were tape-recorded with the respondents' permission. Although the techniques for Qualitative research are time consuming the researcher conducted interview only with the PMO at all the branches

4.6 Data analysis process

Collis & Hussey (2003:17) assume that the choice of the methods and technique used for data analysis be influenced by on the type of data; quantitative or qualitative Floyd & Fowler (2009:145) outline that once data have been collected by the survey, no matter what the methods, the nearly always must be interpreted into a form suitable for analysis.

The researcher used the Software Program for social science (SPSS). SPSS is an integrated collection of quantitative analysis software that is particularly popular with social science researchers. In late 2009, IBM acquired SPSS and then changed the name to IBM SPSS.

SPSS is a comprehensive and flexible statistical analysis and data management SPSS is

- Easy to learn and use
- It includes a full range of data management system and editing tools
- It provides an in-depth statistical capabilities
- It offers complete plotting, reporting and presentation features

The advantages of using SPSS for the researcher is that the software:

- was user friendly thus easy to use.
- It coverered many tests of statistical analyses, filters and prepares data for an analysis, builds different charts, performs testing for two and more sample

hypotheses, analyses relationships between two and more variables, classifies data and creates clusters.

- Regression enabled researcher to predict categorical outcomes and apply a wide range of nonlinear regression procedures. It was effective where ordinary regression techniques are limiting or inappropriate, for example, studying consumer buying habits or responses to treatments, measuring academic achievement, and analysing credit risks

- It performed an analysis and drew conclusions more accurately when working with complex relationships in data; it offers powerful and sophisticated unilabiate and multivariate analysis techniques.

Categories were then examined more than once to review those categories that can me segmented together so the number of the categories were minimised. This had already been done in the questionnaire stage by dividing it into four phases: recruiting and attracting, compensation and rewarding, talent development and talent retention.

4.7 Delimiting the Research

This study focused on scope change on the iron triangle in project management and how these changes affect the effectiveness a project in different levels of project manager's involvement and decision making on changes made on the project. The study reviewed the scope change management procedures followed at Ergosystem Walling Solution.

4.8 Conclusion

Research is about finding a new angle to the current situation. It's about finding solutions and cover a new gap that has been identified. This chapter was the most important as it paved the and gave the "how" the researcher collected data to conclude the new findings as highlighted in Chapter 5. Research design and methodologies gave the researcher the roadmap they will use to conduct this research

As the target population was a very large pool of individuals that fell under category which the researcher needed to collect data from, which would have made it very difficult for the researcher to contact every single person within that pool. A sample

was derived from the target populations and the researcher used both Qualitative and Quantitative techniques to collect data. The questionnaires was used as a start and this was the quicker way to obtain data and after the researcher conducted interviews and observer as the project managers went about their work. All data was further processed to give the information with the use of SPCC that's collected all data and made it possible to conclude the findings in Chapter 5.

This chapter also identified the delineation of the research so that the researcher could control the collection of the data and give relevant to the field of study using that sample identified from the target population. The company used for this research as identified as Ergosystem also gave means of boundaries together with the criteria characteristics the participants had to match in order to justify the relevant of the study further more the findings to be as close to accurate.

CHAPTER 5
RESEARCH RESULTS, DATA REPORTING, ANALYSIS AND INTERPRETATION

5.1 INTRODUCTION

Raw data was collected through the use of a structured questionnaire from the relevant target population, this instrument is attached as Appendix A at the back of the dissertation. Random sampling was used in the identification of the respondents and they were informed from the onset that response was voluntary. Ethical guidelines were followed and observed as per university expectation (www.cput.ac.za, 2015: 2) and all the participants were work-shopped on this before participating. The objective of the study was to evaluate the impact of project scope change on project management success based on the triple and quadruple constraints (iron triangle and the square root) as standard measures for successful project management.

5.2 SECTION B: THE LIKERT SCALE

The Likert scale deals with ordinal data which shows that a scale is higher or lower than another and does not measure the distance between the scales. The scale shows the way the responses are scored within a range by indicating the extent of the agreement or disagreement on a symmetrical scale. The ranking measures the intensity of the feelings or perceptions about a phenomenon by using measurable values to quantify the level of intensity. A statement is used and is graded alongside by using 5 ordered responses on a scale with 2 positives and 2 negatives of equal distance revolving around the neutral or zero or ambivalent at the centre. The ordered responses of this Likert scale are, namely; Strongly agree = 1, Agree = 2, Neutral = 3, Disagree = 4 and Strongly Disagree = 5. The data here consists of rankings (answers) from respondents measuring their perceptions guided by a numerical value attached to a rank.

The questionnaire was structured with subtitles under which numerous statements to be ranked were constructed. These subtitles or categories are used here to indicate the focus of the research at that particular point, the statements follow in chronological order thereafter.

STATEMENT 1: The project manager's understanding of effective processes to be used is critical for effective scope change.

RESPONSE: Scope change brings about a sudden need for "re-planning" and this disrupts the working amongst the project executioners. The project manager sits at the helm of these changes in which adequate understanding of the processes means much to the team. Project processes are the different phases in the life of a project and are, namely; initiating, planning, executing, monitoring and controlling and closing. The response from the participants is illustrated in figure 5.1 below.
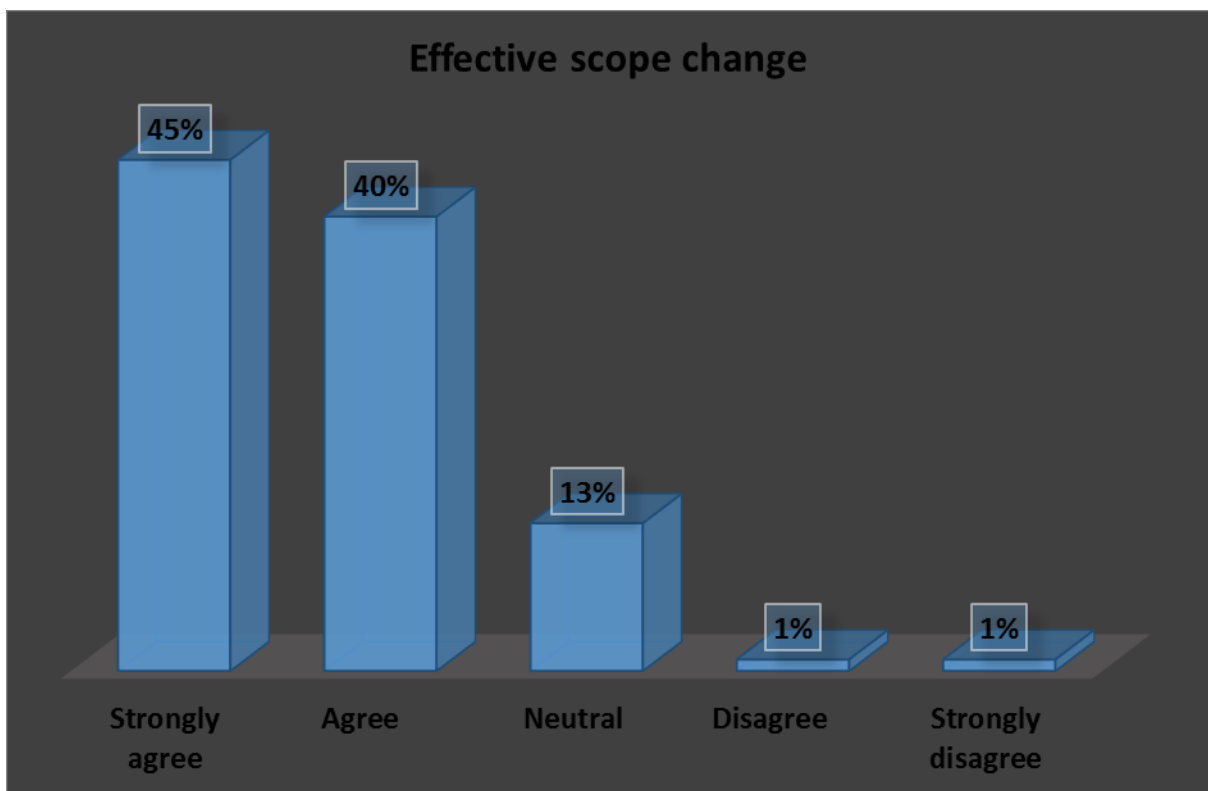
Source: Own construction

A resounding 85% of the respondents agreed that there was a need for the project manager to understand project processes. Neutral, though high at 13% but does not have much statistical significance, those disagreeing (disagree 1% and strongly disagree at 1%) scored very low. It can be generalized that the project manager's understanding will assist in giving direction at a time when there may be uncertainty in what is to be done.

Discussion

A project manager must be able to delegate tasks and plan the path to follow to be able to distribute work among his team members. Scope change can bring disruptions and confusion among the team and so the project manager needs to be

able to apply techniques and styles to execute change. If the project manager shows confidence in his work the team who rely on him to lave will trust any change that he suggests or that comes their way on a project. Execution of changes is an important task and the more the project manager involves the team and shoe then effective processes to follow to incorporate the changes.

Effective change processes is something a project manager can learn with time but team building with his team is also key to effectively execute changes on the project. Processes over time become a good ability to make use off. This couples with the leadership style that the project manager uses on the project

STATEMENT 2: The project manager's ability to manage the process of scope change is critical.

RESPONSE: Knowledge and understanding of the processes is one thing but being able to manage the processes is yet another. The management of the scope change processes involves among other things the knowledge of the five (5) project process groups since the scope change will take the same route of initiating, planning, executing, monitoring and controlling and closing. The respondents' views are expressed in figure 5.2 below.

Figure 5.2 Perceptions about manager's ability to manager as critical factor

Process of scope change is critical

Category	Value
Strongly disagree	0%
Disagree	2%
Neutral	5%
Agree	41%
Strongly agree	52%
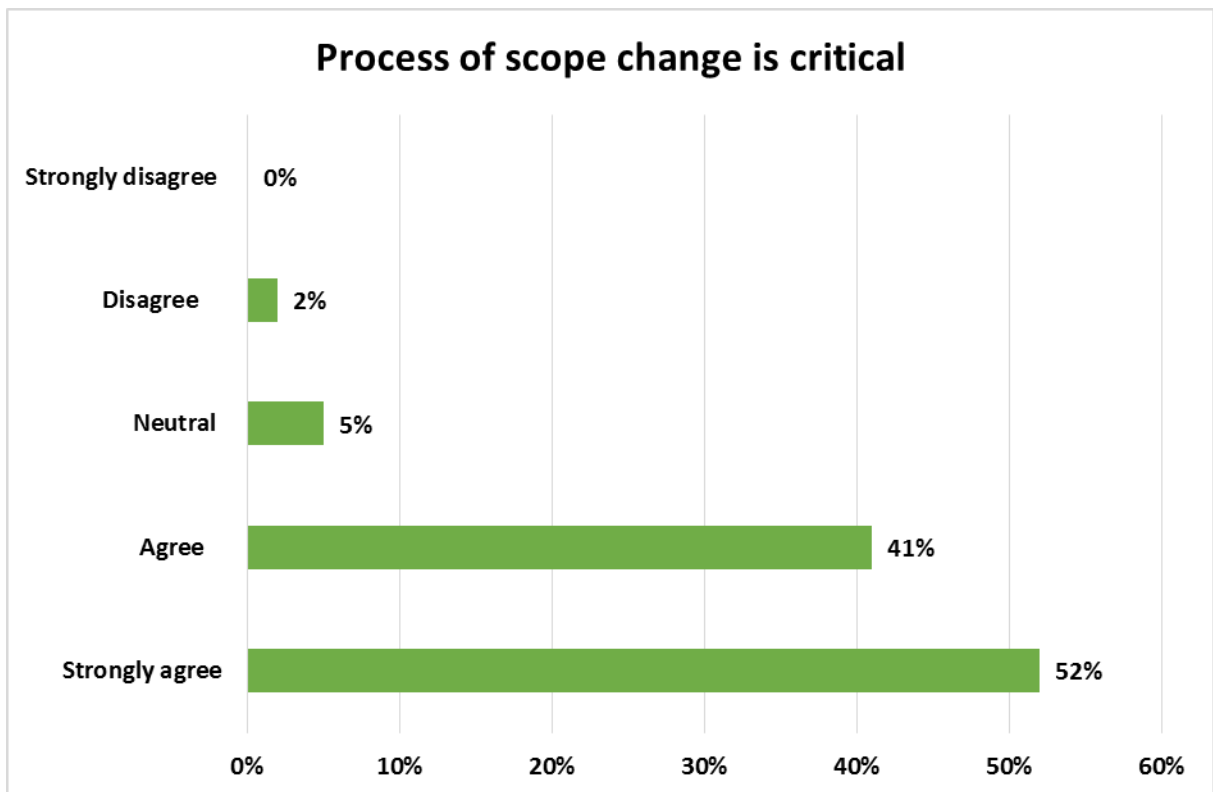
Source: Own construction

The role of a manager is essentially to organize resources (material, equipment and people), control (budgets, processes, and resources), plan (use of resources and operations) and to lead (bringing the people together and providing direction). The respondents scored a total of 93% in agreement with the statement. Of particular interest is that those strongly agreeing (52%) make the majority on their own without and or before including those agreeing at 40%. It can be generalized therefore that during scope change, the manager's ability to manage the project processes is of paramount importance.

Discussion

A project is temporary and does not belong to the project manager nor the organization that the project manager is employed. In this instance Ergosystem only offers these services in the construction industry and therefore at some point at the end the project will need to be handed over to the owner. From the beginning of the project a client will brief the project officers on their proposed project and this is all taken down in a project to the last detail, drawings are approved and by the time the project is handed over to the owner all the details covered in the scope will need to have been achieved and deliverables accepted by the owner of the project.

That being said when change happens it is not the project manager is is only affected but the team that he has. It is by nature that changes bring certain feelings to the team and if the project manager has an effective process to get his team on board to coordinate a lucrative process to implement this change for progress saks. The project manager's responsibility is to drive his team, and this is by far one of the biggest task because it directly links to getting work done. Although team competency has a huge impact on deliverables If is safe to say that the project manager being able to coordinate the skills, he has on the team could be a skill that can come in handy when distribution the task. Knowing the team members' strength also come in handy when going through the change process.

STATEMENT 3: The project manager's ability to understand the scope change document is called to account

RESPONSE: When scope change is to be effected, there should be a scope change request (document) that will be made. This results in the coming together of the stakeholders of the project, resulting in an agreement on what should be changed. The changes will be documented in a new scope change document outlining all the

aspects of the original document that need to be changed. The participants in the survey, who themselves have the experience and know how responded as reported in figure 5.3 below.

Figure 5.3 Importance of the manager's understanding the scope change document
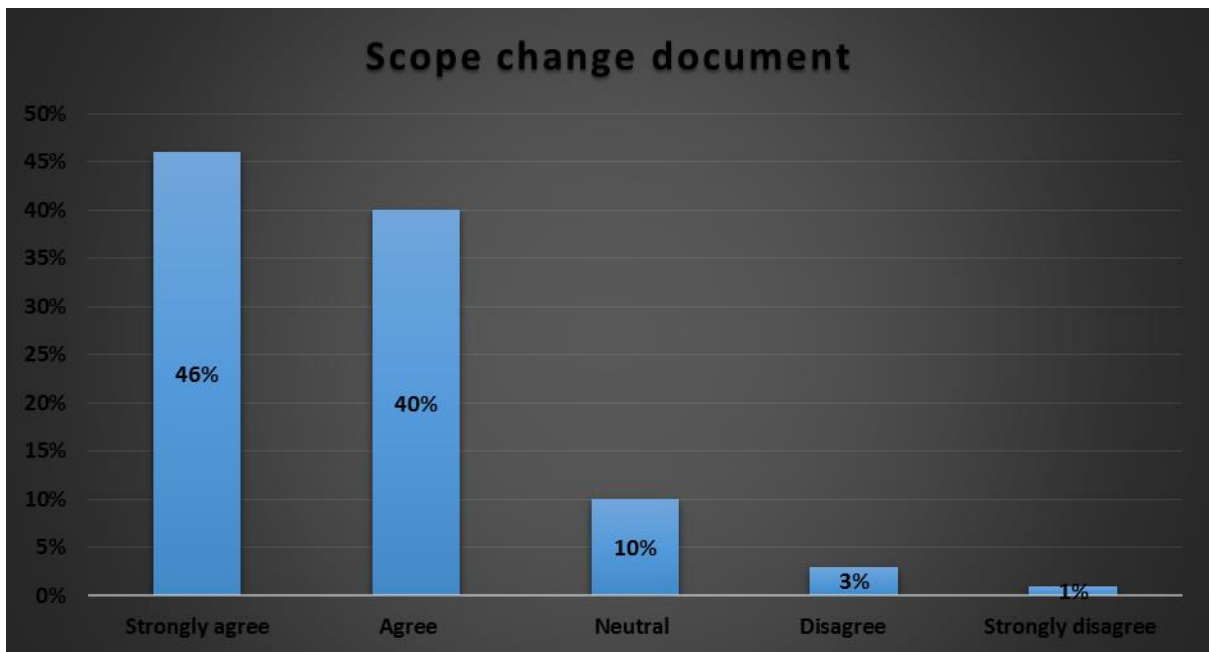
Source: Own construction

The project manager's understanding of the scope change would inevitably be vital in providing direction to the team members. This was alluded to by 86% of the respondents (46% strongly agreeing and 40% agreeing) allowing for a generalization that the project manager's understanding of the scope change document is necessary for effective scope change management. Neutral is low at 10% with those disagreeing insignificantly low 3% disagreeing and 1% strongly disagreeing.

Discussion

The researcher noted that most of the changes implemented originated from either client, management and/ sponsor. The project managers at Ergosystem are rarely involved in the change process if they are not the ones that have requested. This means that changes comes as instructions to them. The project manager however will need to perform the administration and implement the changes. Approvals for change are given to the project manager and it ids at this point that the project manager will need to compute all relevant paperwork for the change. The project manager will need t complete all scope change documents and it is important that

documentation be understood by him so that all the relevant and critical processes need to be done and followed before the change has been implemented, this can be time consuming but it is very necessary for future reference and the project manager needs to be able to document the change correctly so that they can update their schedule and also notify finance deportment, procurement and also get the correct human resource if the current team does not have the competency to execute the new changes and they can either train current tam members and or recruit more team members who have the competencies needed to implement change. And all this needs to be documented and it is important that the project manager understands the change document and understands its importance.

STATEMENT 4: The project manager's ability to work out the cost-benefit analysis is called to account.

RESPONSE; The cost-benefit-analysis (CBA) is considered as a determinant factor if an investment or decision is sound – verifying whether its benefits outweigh the costs, and by how much; To provide a basis for comparing investments or decisions comparing the total expected cost of each option against their total expected benefits. The statement was trying to establish the need for the project manager (from the respondents view and experience) to understand the CBA. The respondents' scores are recorded in figure 5.4 below.

Figure 5.4 Importance of the Cost-benefit analysis during scope change
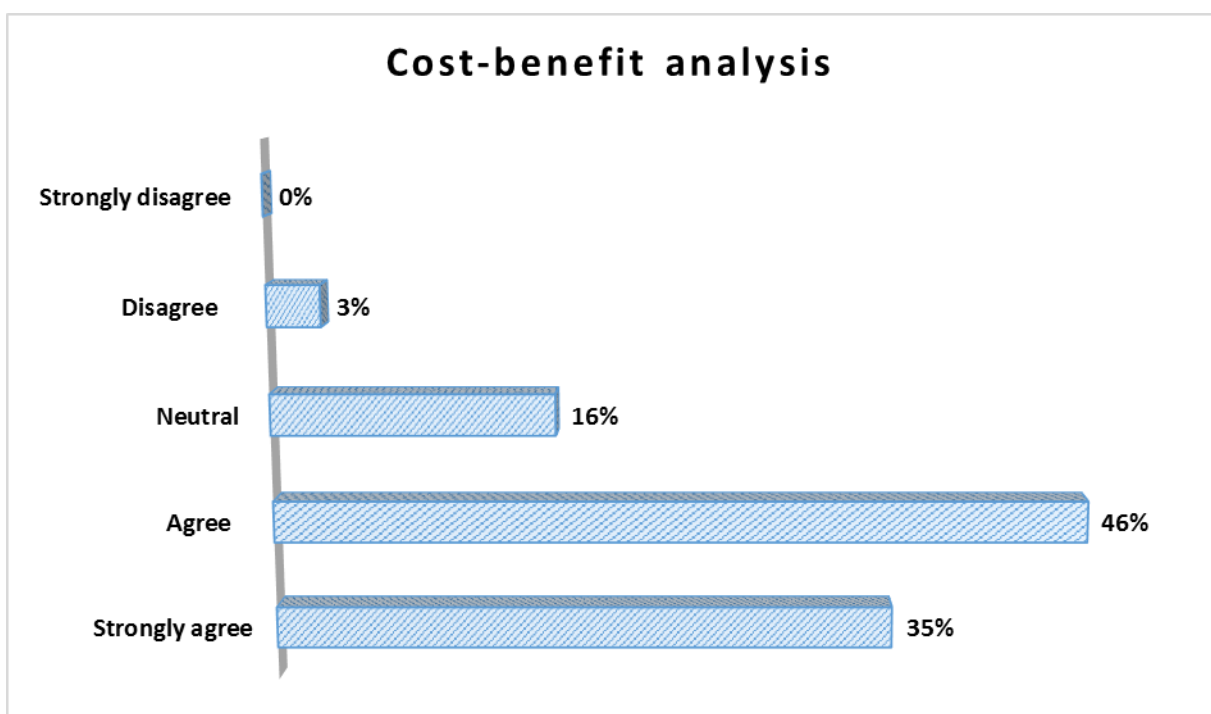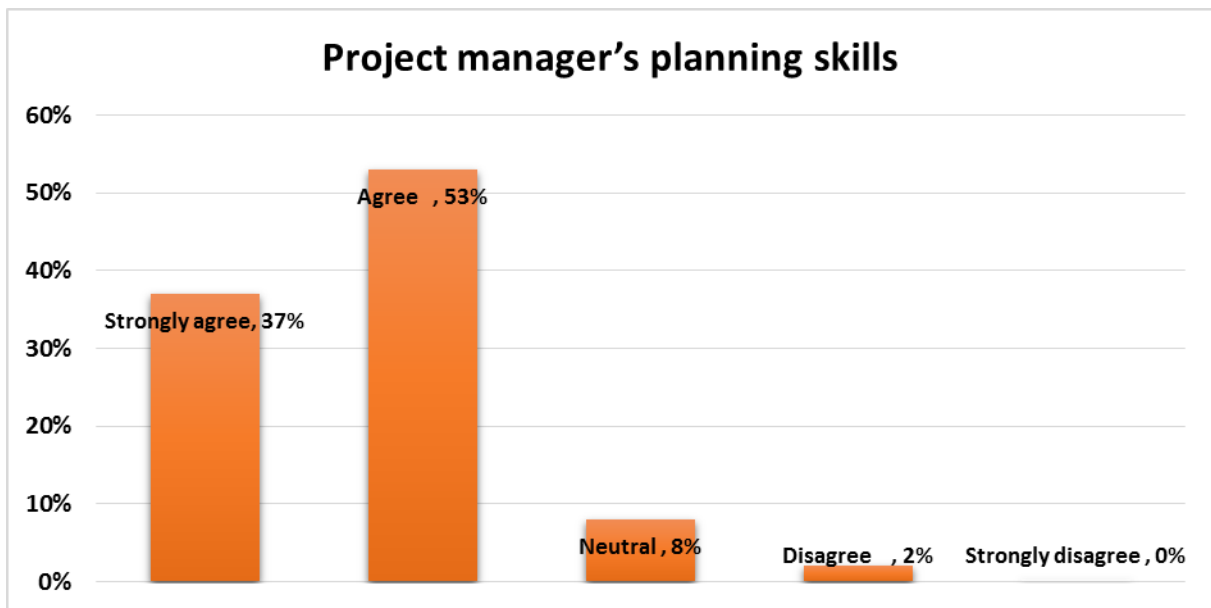

Source: Own construction

Discussion

The need for a proper understanding or ability to work out / calculate the CBA was positively identified as important by 81% of the respondents. This figure stands out and allows for a generalization, the CBA may actually be negative which may be used to decide if it is necessary to continue with the scope change. Neutral goes up to 16% with the remainder disagreeing significantly low at 3%. Part of the shifts in the cost or time to be taken may become a factor thereby impacting on the rational of continuing with the scope change. It can be generalized that knowledge of the CBA is considered important in scope change management.

When change is requested it means that a few pieces of the project puzzle might need to be shifted and that being a fact in most cases, it is important that cost and benefit analysis be clearly and accurately done, the cost of changes and the benefits of the client accepting the project deliverables. The triple constraints of project management are at most affected by any change that can be implemented therefore when conducting the CBA the project manager should taken into consideration as these elements which are highly dependent on each other in that a change in one of the constraints will affect the other.

STATEMENT 5: The project manager's planning skills are called to account because of the changes

RESPONSE: It becomes inevitable, at least on paper, that there is a need for the manager to have planning skills. Wikipedia defines planning as the process of thinking about the activities required to achieve a desired goal. It involves the creation and maintenance of a plan, such as psychological aspects that require conceptual skills. A well-planned project or scope change can enable the project team to identify possible risks and pre-empt them thereby avoiding project execution failure. Part of the failure of execution involves failing to meet the requirements or successfully implementing the scope within the stipulated iron triangle. The respondents aired their views in the figure 5.5 below.

Figure 5.5 Need for planning skills during scope change

Project manager's planning skills

Strongly agree, 37%
Agree , 53%
Neutral , 8%
Disagree , 2%
Strongly disagree , 0%

Source: from survey results

Discussion

A high score of 90% positively indicated that planning skills were a necessity for effective scope change management. Given the importance of planning in the execution of any undertaken, it is according to expectation that the respondents conceded to the view that planning is essential. Literature indicates that poor planning may lead to problems like, namely; under budgeting, failure to allocate resources accurately. Prior planning may therefore prevent project scope change execution failure, a well-planned project has higher chances of success.

Researcher noted that project manager was not involved in the initial planning stage of the project but when change needs to be implemented the project managers are responsible for updating the plans and restructuring the schedule to accommodate the changes that need to be implemented, therefore planning becomes the most important part of the change process because all documents need to be reviewed and updated accordingly. The project manager at this point will need to have a clear view of the project and the new direction he will lead his team towards.

Planning resources and schedules become important as this will determine the duration of the project and when deliverables will be made.

STATEMENT 6: The project manager's effectiveness is tested when there is scope change

RESPONSE: Effectiveness is the ability of the manager to manage the project from start to finish in time, within budget, motivate and coordinate the team and delivering a project which is of the right quality as per the requirement of the client/project owner. These qualities are therefore demanded of the project manager in that they enable the project leader to steer the execution process to desired deliverables. It is not always easy to navigate those impediments, has the need for a degree of effectiveness to successfully execute the project.   Figure 5.6 below illustrates the perceptions of the respondents over this issue.

Figure 5.6 Test for project manager's effectiveness
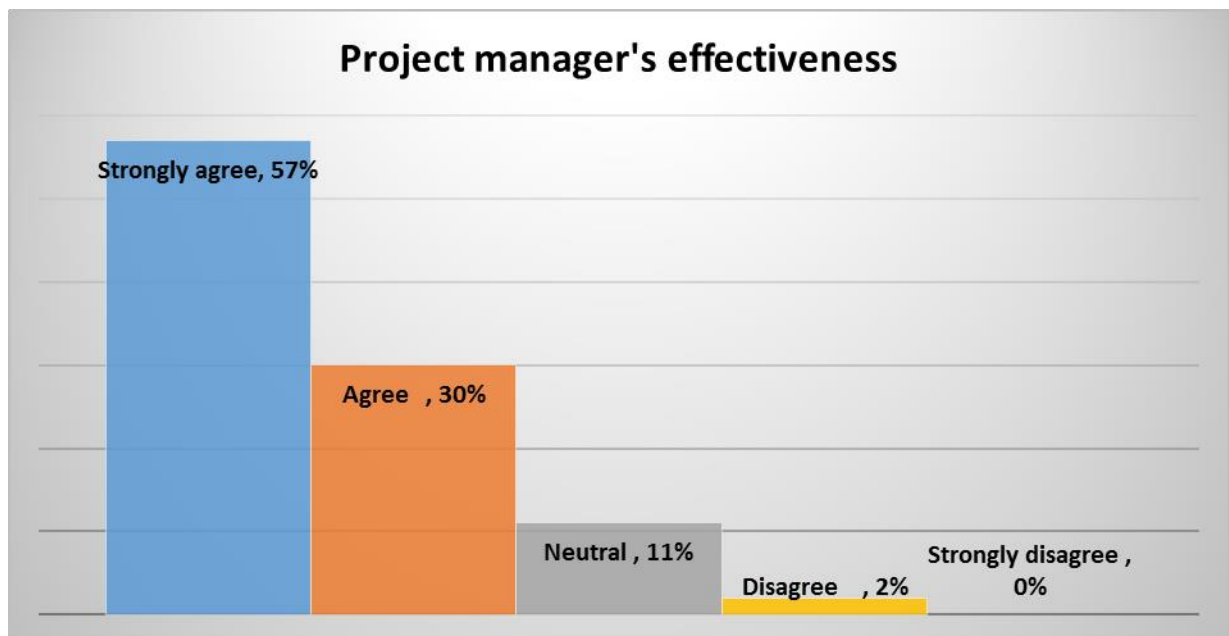
Source: findings from survey

Discussion

A high score of 87% is again realized with strongly agreeing (57%) exceeding the minimum 50+1 that would allow for the majority. Those agreeing are at 30%, this allows for a generalization in agreement with the statement that was ranked on the scale. Project manager effectiveness therefore is a requirement for successful scope change management, since this integrates all the processes during the execution of the project. Neutral is somewhat low at 11% with only 2% disagreeing.

Though more than three quarters agreed that manager's effectiveness is tested when there is scope change. There are a lot of factors that can be considered to measure the effectiveness of a project manager like deliverables, coordination of resources and distribution and monitoring the team, but yet again, yes change does bring out an element of the project manager's effectiveness but a project is bigger than just changes.

STATEMENT 7: To the extent there is need for external consultancy the project manager losses control

RESPONSE: The ability of the project manager to take full charge depends largely on the manager being the last voice, or at least has the full expertise. Once there are other people hired to assist in the management of the scope change, the manager loses a degree of control. Meaning therefore that other team members and participants may depend more or trust the consultants more on information they need. Figure 5.7 shows the perceptions of the respondents.

Figure 5. 7 Degree of loss of power by project manager when external consultancy is used
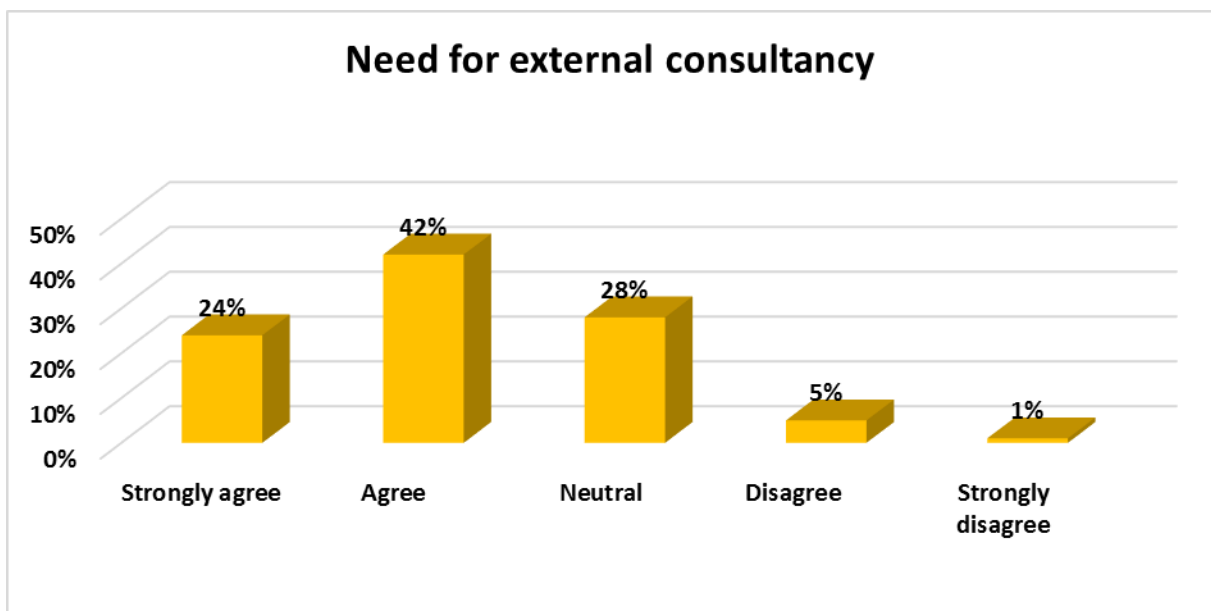
Source: Own construction

Discussion

Neutral is unusually high at 28% which is midway between ¼ and a ¹/₃ of the respondents (25% and 33% respectively) who are not clear as to what they had to say about this. Also of particular interest is the decline (inevitably) in the score for

those agreeing at 66% compared to previous scores in other rankings above? Even though, it can still be generalized that the invitation of external consultants (external to the project within the organization or external to the organization) results in the project manager losing a degree of control over the change management. Only 6% of the respondents disagreed with the statement.

It is bad enough already that there is authority gap for the project manager and he has limited authority on the project and making decision and when change is to be implemented and an outside (outsourced human resource) come to help on the project, the project manager will have less control of the project and this usually happens as a result of scope change and there is no one who has the expertise/ competency that is needed and training inhouse could lead to delays so management will consider taking on consultants. Project manager is usually the one who had the expertise to run the project and once an outside come in to take up that position, project manager's authority and power diminishes. How ever this can be overcome if managers informed the team and project manager the need for an outsider to come and the outsider coordinates with the project manager to give instruction to his team and they work as one.

STATEMENT 8: If the change is outside of the scope of the manager expertise may be needed

RESPONSE: Managers are assigned to projects with the understanding that they may have the expertise to manage both the hard skills aspects as well as the human aspects. Scope changes with requirements for expertise outside of the project manager's field of technical competency may mean the need for that expertise from outside of the project team and operations. The opinions of the participants in the survey, who themselves are practitioners, is recorded in figure 5.8 below.

Figure 5.8 Perceptions about need of external expertise where the manager does not have the expertise
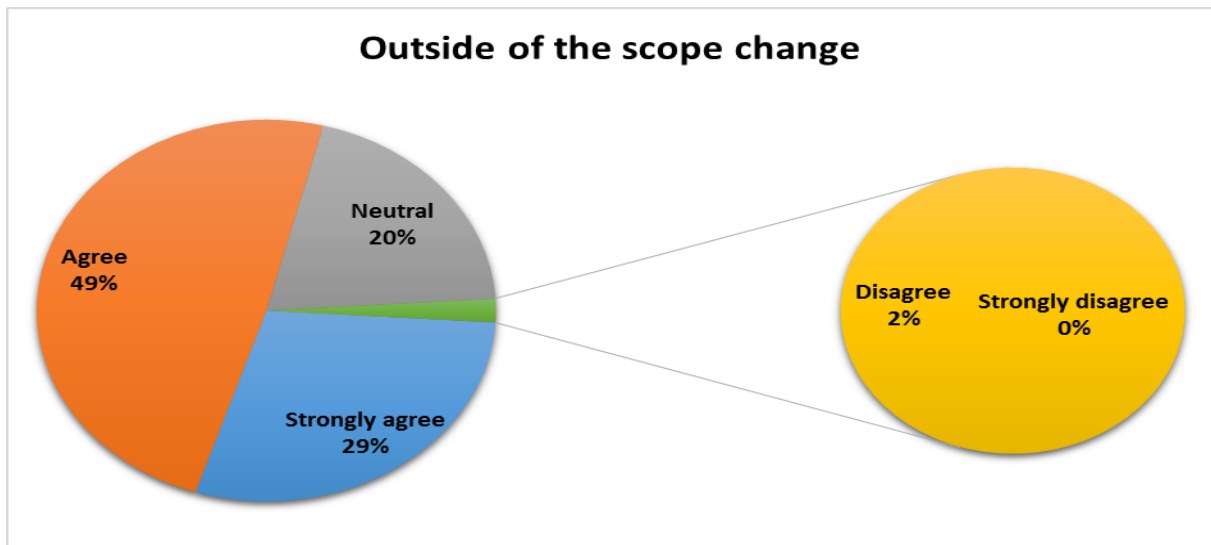
Source: Own construction

Discussion

Neutral is again high though it is just above 1/5 (21%) of the respondents, again this is not the best expected. However, 78% of the respondents agreed with the statement, confirming the need for external expertise where the project manager (or team members) do not have the expertise. It should be accepted that getting the "hired expertise" will involve more costs outside of the original budget. This therefore will affect the cost for the project, scope changing will therefore impact on the iron triangle. Only 2% of the respondents disagreed with the statement, it can be generalized that it is necessary to get external assistance where the project manager may not have the competency.

Once the project implementation begins the timeline and end date are at stake as the project will at the agreed date have to be finished. As this is also a fact about change, the timeline will need to be adjusted, resources reviewed and the budget be reviewed accordingly. As the progress is already in motion it could take longer to train someone on the skills the new change might require to be implemented and the next best thing to save time maybe and cost could be outsourcing. This might be expensive as it might be unforeseen adjustment but it could also be inevitable for quality and delivery dates for the client. Sometimes an outside can come as an additional resources to speed up the project and push towards achieving the handover date.

STATEMENT 9: The more complex and larger the project scope change the greater the need for competent project management

RESPONSE: The complexity of the project together with the size of the project bring in many interrelated operations that need to be integrated during the execution phase. Changes to the scope will immediately create new interrelatedness and a need for adjustments to the integration process. This involves among other things, technical expertise, human resources, and material resources together with leadership skills. The responses are illustrated in figure 5.9 below.

Figure 5.9 Perceptions on management competencies dependent on project size
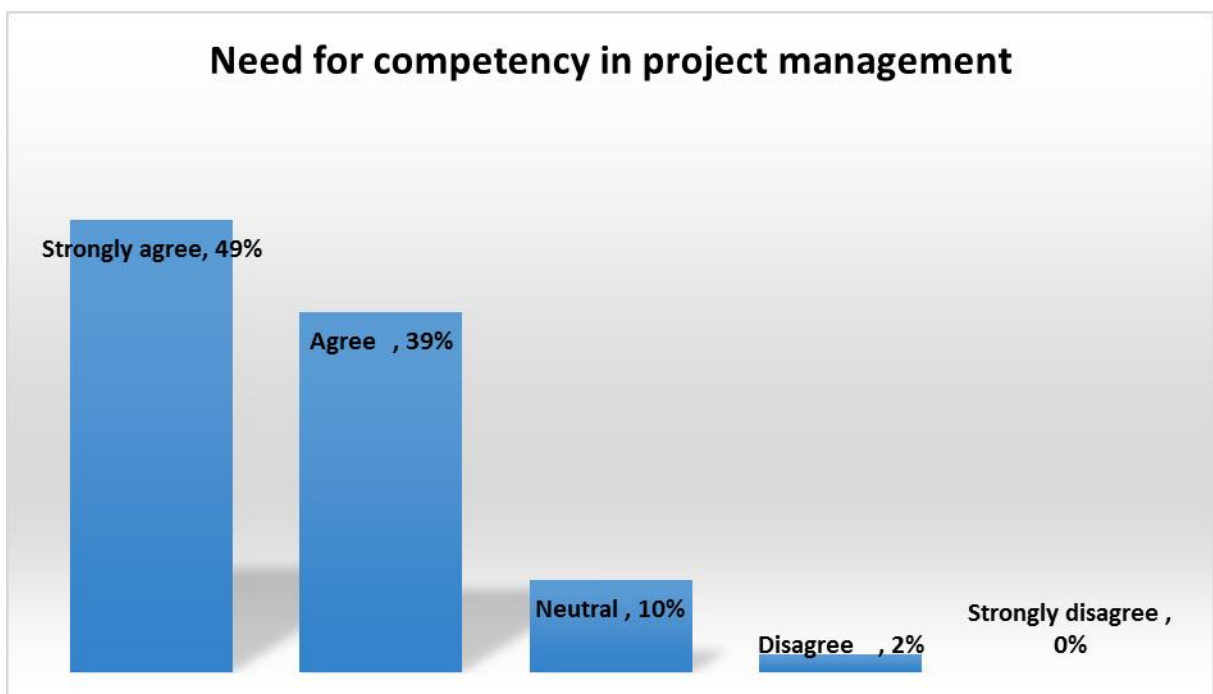
Source: Own construction

Discussion

It was overwhelmingly agreed on that the size of the project demanded amongst other things higher competencies of the project manager (88%). This allows for a generalization that communicating, coordinating and integrating a complex project requires much more. In a sense, the research findings indicate that there is a relationship between the size of a project (or the complexity thereof) and the degree of expertise and or competencies required to effectively management the scope change. Neutral is at 10% with those disagreeing at 2%.

There have been projects where 3 or more project managers are appointed to 1 big complex projects and work is divided almost them and teams also so that are not independent can be tackled separately to distribute the work so that the project manager can manage a chuck each of the complex project to dilute the risk of one project manager handling a huge team. This is also done so that a each project manager will lead a team under the tasks of the project where he is competent that he has to contribute to the project as a whole.

STATEMENT 10: The complexity of the project and the size of the scope change may affect the way the project manager would work

RESPONSE: As alluded to above the complexity and size of the project scope change call for more competencies and skills that may not be necessary for the other projects. Not only are the competencies tested, but the way work will be done, operational issues may also depends on the size and complexity of the scope change. Operational issues involve among other things strategic and tactical planning and overlapping the operations from different WBSs. Taking not that some tasks follow each other, others are independent of each other, then there is the CPM, PERT, etc. to be incorporated into the program. The understanding of the operational issues is better explained by the practitioners as seen in figure 5.10 below.

Figure 5. 10 Relationship between project complexity and project manager's modus operandi.

Effect of project complexity

- Disagree 2%
- Strongly disagree 0%
- Neutral 15%
- Strongly agree 25%
- Agree 58%
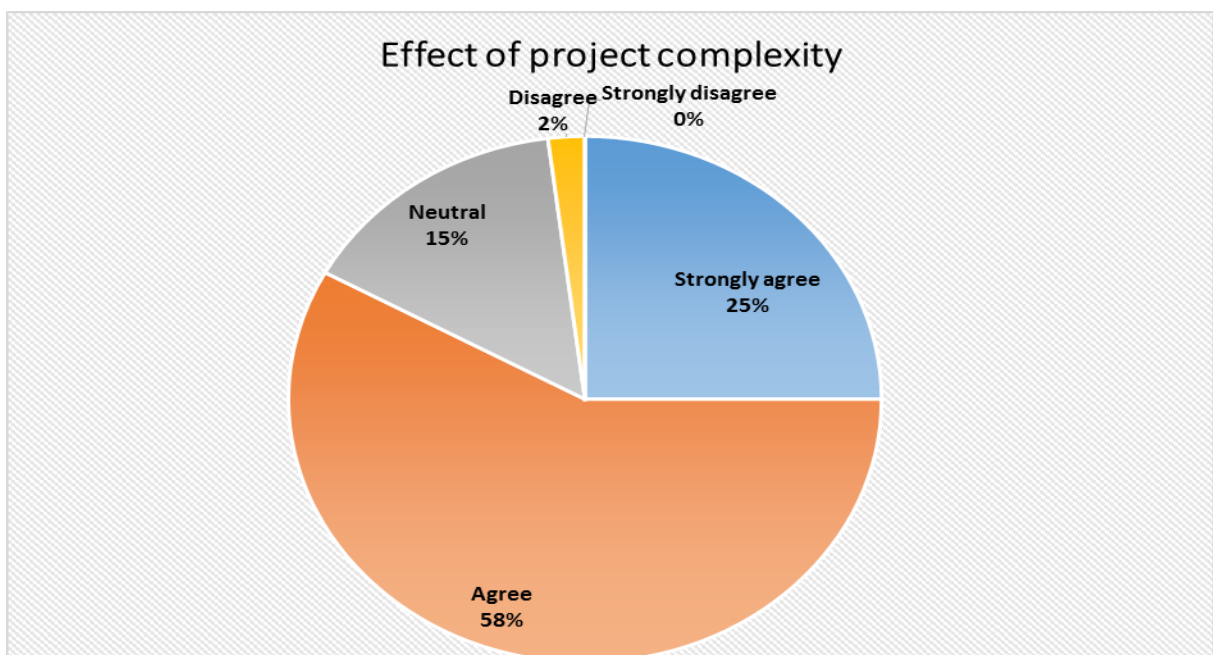
Source: own construction

Discussion

Even though neutrality is low at 15%, it still raises questions as to why project practitioners would be neutral or have no knowledge about certain issues. But those in agreement score 83%, thus it can be generalized that the complex nature and indeed the size (size does increase complexity too) informs how the execution will take place. More people, more tasks, more resources, more communication, and more of many other things including the risk will force a change in the way the execution will be managed. Though the disagreeing voice has always been low, in this instant there is zero percentage (0%).

The bigger or complex a project will definitely affect the way the project manager works as this calls for a new action plan extension on timeline are not always guaranteed. The client makes changes and still expect the project to be handed over on the date that was initially agreed upon and many at times management will agree with client without consulting the project manager on the time it will take to implement the complex changes, in this case the project manager has to adopt another leadership style on how to work with his team to meet deadlines, this will affect his work and how he interacts with his team to do the work. It usually builds up pressure on the project.

The difficult part will be keeping the team motivated to complete the project working under pressure and having all the course o f work changed.

STATEMENT 11: Scope change during project implementation may consume more resources dependent on the size of the change

RESPONSE: Scope change may mean reducing the size of the project as well as it can mean expanding the deliverables – the scope of the work. Contracting the scope may not be automatically mean less resources, as this is dependent on what will be put in place of the original project plan. Whichever way, scope change alters the original plan and may not keep the same balance between the time, the cost and the quality as agreed on in the initial charter. The responses are illustrated in figure 5.11 below.

Figure 5.11 Likely impact on resources during scope change
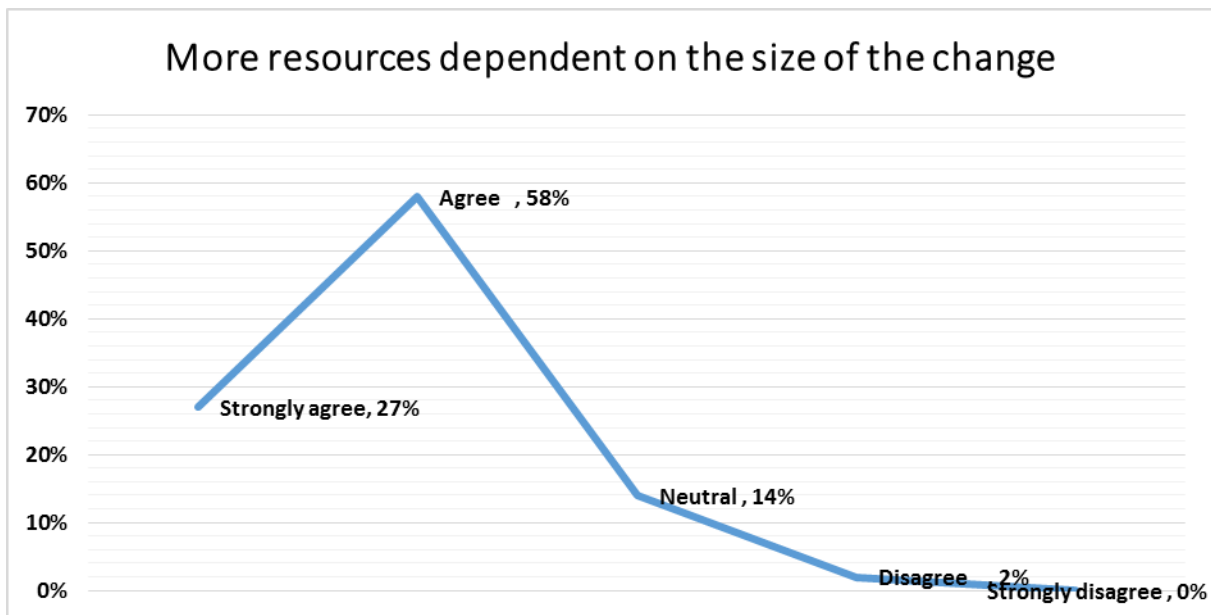
Source: Own construction

Discussion

Of those responding, the ambivalent remained essentially at the same level as from the preceding figure 5.10 (15% down to 14%). This resulted in 85% of the respondents agreeing that scope change implementation may consume more resources dependent on the size of the change. If more resources are to be used it will most definitely impact on the price (the cost) of procuring the resources which means a change in the cost. More time may be required to fit these new many resources into the project program, and that will also change the original time scheduled for the completion of the project. Quality will depend on whether the material resources remain of the same quality and whether there has been changes in the technical specifications of the project. It can be generalized therefore that scope change alters the resource structure which will also alter the triple and quadruple constraints.

STATEMENT 12: Scope changes during planning phase have no impact on the time set for the project.

RESPONSE: The project charter comes into existence after all the planning or the project square root has been confirmed and signed. The square root involves the iron triangle and the scope, meaning the time to be taken has been fixed, the cost for the project has been agreed on, the technical specifications are confirmed, and then the

deliverables (scope) is agreed on. The respondents' views are expressed diagrammatically in figure 5.12.

Figure 5.12 Perceptions about impact of scope change on time during planning phase
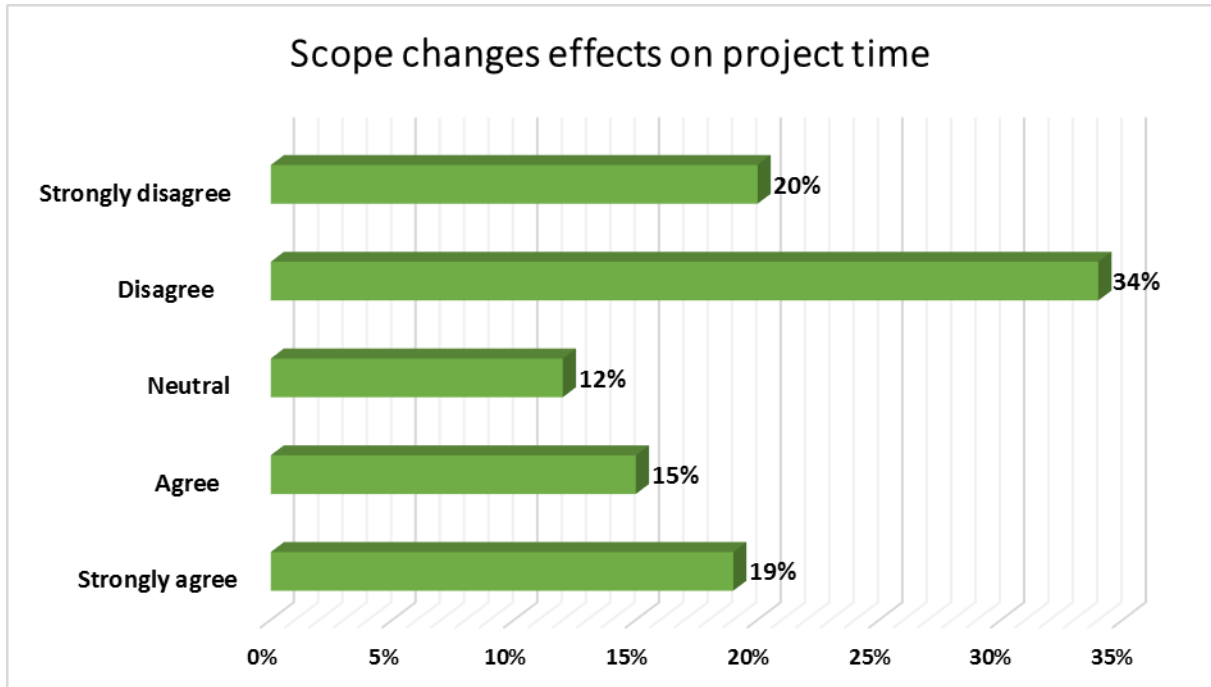
Source: Own construction

Discussion

There appears to be some misunderstanding and a degree of ambivalence on this, even though the score of the indifferent is low at 12%. At least 34% of the respondents agree with the statement and they believe that the scope change during planning has no effect on the time set for the project. On the other hand 55% of the respondents disagree, meaning they believe there is an impact since there will be likely changes to the initially intended deliverables. It can be generalized however that the majority of the respondents feel that scope changes during planning stage will affect the time set for the project.

Scope change that is made before project implementation will allow the management to incorporate the plan before the project starts. It is not necessarily true that changes made on the scope during the planning phase will not affect the time. This depends on the type of change for instance changing the technology to be used on the project will definitely change the times set in that if the technology is more advanced and works better then the project can be shortened but if the change is human resources

expertise that has been brought on to the team. The time set might not necessarily change.

STATEMENT 13: The manager needs to judge correctly the impact of the change to project benefits and deliverables

RESPONSE: When scope changes are suggested, it is in the interest of the project sponsors and other stakeholders to involve the project manager in the decision making processes. Of primary importance in the scope change decision should be the need to understand that the projects are undertaken with specific beneficiaries in mind. It is proper therefore to make a proper judgment (to be given as recommendation by project manager) showing an evaluation of the deliverables (after scope change) and how this impacts on the beneficiaries. The respondents' perceptions about this are registered in figure 5.13 below.

Figure 5. 13 Need for good judgment by manager on the impact of scope change
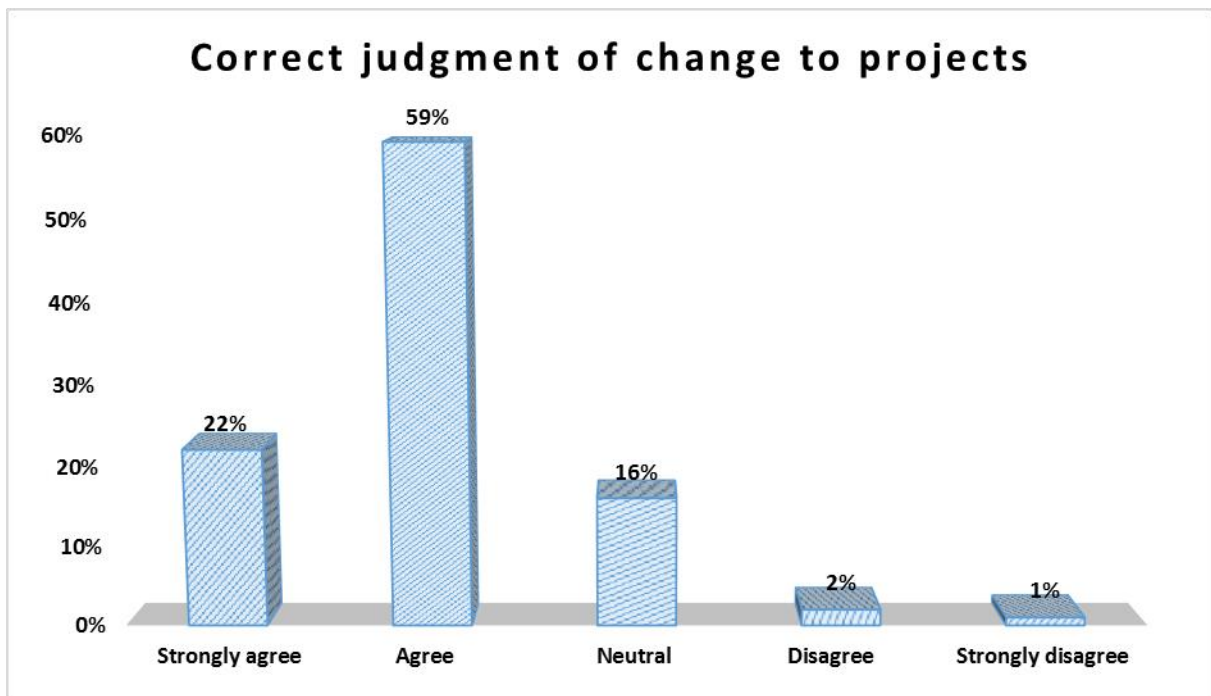
Source: Own construction

Discussion

81% of the respondents were of the view that there is a need for the project manager to assess and evaluate the changes against the intended project benefits. Project success (not project execution success) depends on the final users of the project and their experiences with the project. It can be generalized that an assessment of the

project benefits and the impact the deliverables will have should be scrutinized if possible before scope change is affected. Neutral is at 16% with only 3% disagreeing**.**

STATEMENT 14: Dependent on the new scope the team members help decide on new resources and the time, quality and cost

RESPONSE: Project execution is team work, and it should be treated as such if it is to succeed. The different WBS teams (their leaders) need to provide the project manager with projections of the resources required to effect the scope changes planned. These teams may need to construct activity based costing showing the type of personnel required, the resource materials required and the time required to complete the tasks. The informed opinions of the practitioners are recorded in figure 5.14 below.

Figure 5.14 Perceptions on the role of the team on making scope change decisions
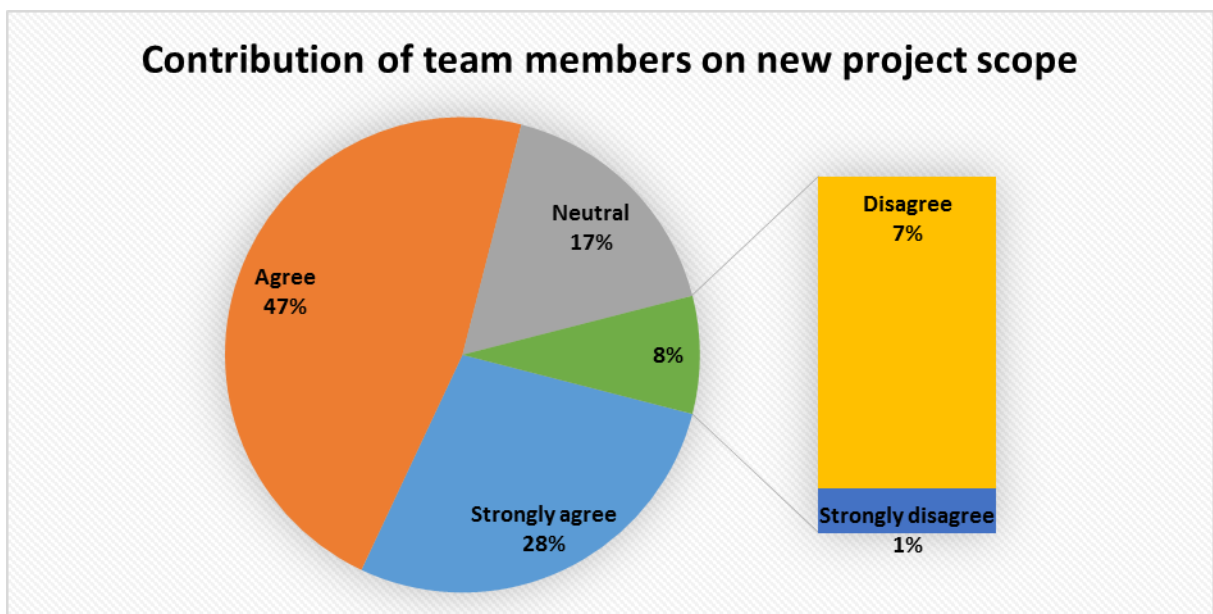
Source: Own construction

Discussion

75% of the respondents agreed with the statement (28% strongly agreeing and 47% agreeing) that team members do help with deciding on resources. Whatever decision is to be made will automatically impact on the iron triangle, hence the budget, the time and the quality need to be ascertained. To ascertain these, all other units (WBSs and cost centers) of the project need to participate. Neutral is at 17% with a total of 8% disagreeing. Dependent on the new scope the team members help decide on

new resources and the time, quality and cost. The problems comes in when the team has identified the resources they need to produce the desired deliverable. And they cost more and management and sponsor are not willing to make drastic changes to the budgets. Quality changes however need to need the requirements of the customers' and rarely does the team change the quality of the project deliverables though the quality of resources can be suggested and substitutes can be considered but the quality is dependent on the type of project.

STATEMENT 15: Team members are allowed to contribute or give suggestions on how to implement the changes

RESPONSE: This statement was based on the understanding of the nine principles (knowledge areas) of project management. Chief among them is the need for communication and integration of the different project components to try and harmonise the execution. From existing theory, if team members are not allowed to make suggestions, they may not cooperate leading to scope change failure. This theory is tested by requesting the opinion of the participants in the research (figure 5.15 below), most of whom are team members in the projects.

Figure 5.15 Perception on the need of team members suggesting scope change operations.

Source: Own construction

83
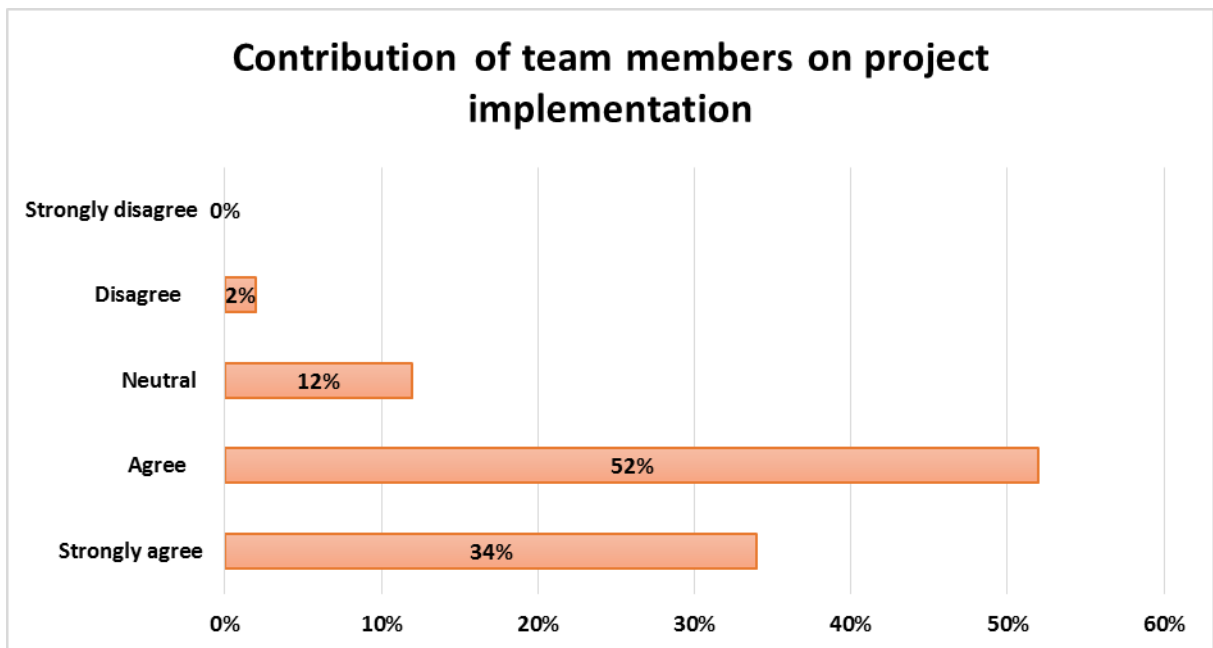
Discussion

As expected a large number of the respondents (86%) agreed with the statement allowing for a generalization that suggestions from team members are critical for the effective project scope change. It is of paramount importance that the different team members are experts in aspects of the different sections of the project. Consequently, they will most likely understand better operational issues pertaining to specialized areas of the project. Neutral is at 12% with only 2% of the respondents disagreeing.

Team members are allowed to contribute or give suggestions on how to implement the changes. The project managers let their teams suggest on how best to perform their tasks and in that the project managers always consult with their teams on how implement the work that needs to be done but on the other hand there are factors that can also prevent this from happening depending on certain barriers the team can be facing like limited resources and limited time. Limited resources mean that a tight budget is available and there is no room for errors thus they project manager can simply give exact instructions that need to be followed to do the work. Limited time will mean that the project manager has little time to discuss with his team and give alternative ways that do not delay the project as a hall as at times times are dependent on each other.

STATEMENT 16: The manager's effectiveness is measured on the ability to mobilize support from team members

RESPONSE: The synergy required amongst the team leaders and team members to work towards consolidating the operations is a direct measure of the ability of the project leader to mobilise people to work together. Scope change has special problems in that it derails people from what they had agreed to subconsciously, then new changes are generally resisted. To this effect, the project manager should show effectiveness in putting all processes in order. Figure 5.16 discusses the respondents' expertise on this issue.

Figure 5. 16 Impact on ability to mobilise support on the scope change process

Manager's ability to raise team members

Strongly agree: 25%
Agree: 55%
Neutral: 18%
Disagree: 2%
Strongly disagree: 0%
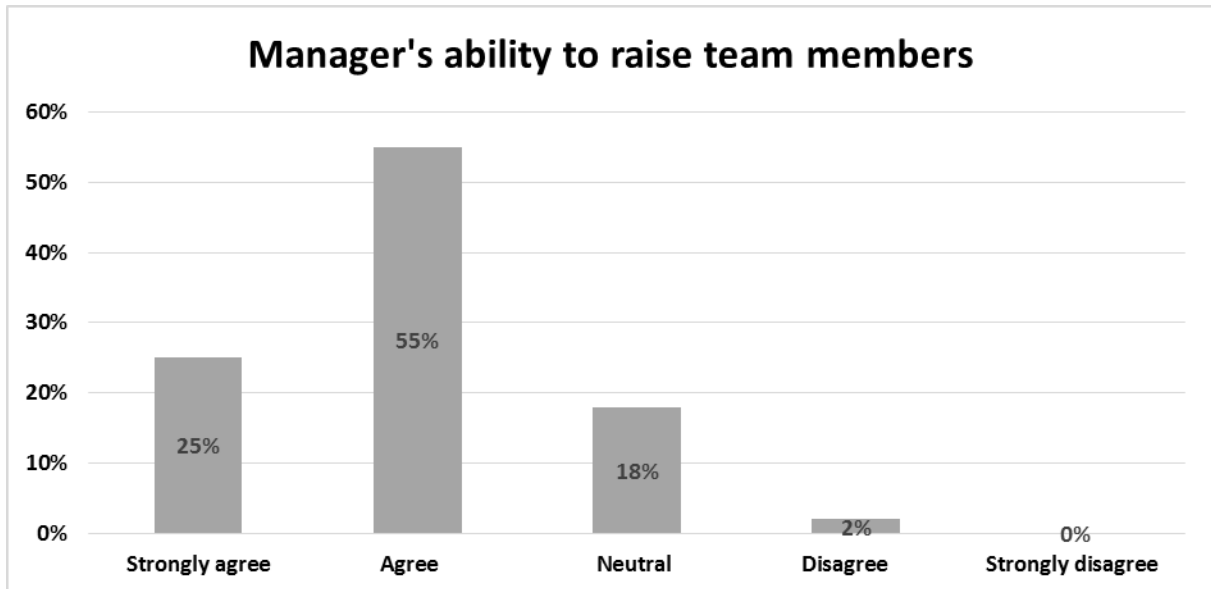
Source: Own construction

Discussion

Whilst ambivalence pitched at 18%, those responding positively to the assertion scored 80% on this issue allowing a generalization that "effectiveness" of the project leader is required. The strong showing against the statement (2% disagreeing) is evidence of the conviction amongst the team members of the need for effective project management. It can be generalized therefore that the effectiveness of a leader is seen in the leader's ability to bring the team to work together.

The manager's effectiveness is measured on the ability to mobilize support from team members. The way a manager handles and controls his team motivates the team and thus teamwork becomes easy and communication lines are well established.

STATEMENT 17: As long as senior management agrees team cooperation is guaranteed for all purposes

RESPONSE: An assumption is made here that when senior management has allowed something, everyone plays to the tune. Whilst this might work in certain instances, it may not work in others because of the demanding nature of the operations. If a team or section leader disagrees with certain orders from the top, which may bring about "delayed cooperation" which might itself cause scope change failure. The respondents expressed their views as illustrated in figure 5.17.

Figure 5.17 Perceptions about senior management and powers on operations

Impact of senior management on teams
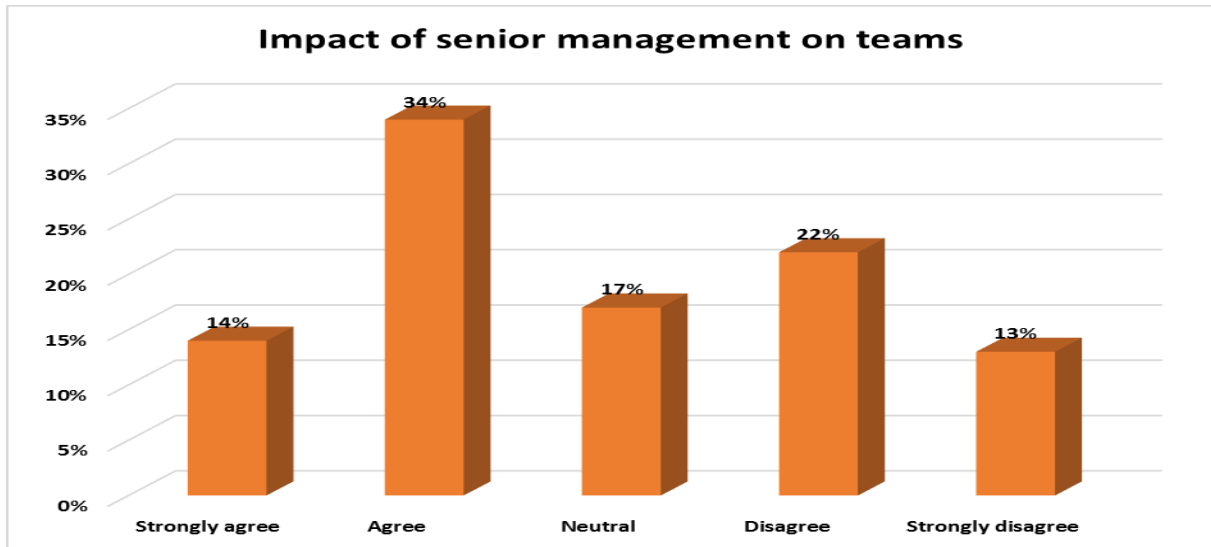
Source: Own construction

Discussion

It is interesting to note that there is serious indifference in this section or in regards to this assertion. Less than half of the respondents (48%) supported the idea or the statement compared to 35% who opposed the statement. This clearly indicates that there is no consensus on this issue, an indication that people do not simply do something because senior management has said "march on." This might also signify the importance of the project leader in that the presence of an effective leader is rated more important than the acceptance of an issue by senior management. Neutral is high at 17%.

STATEMENT 18: The manager has enough power to move and implement the changes without team permission

RESPONSE: Power is the ability to influence, and if that definition is used here this statement may be measuring the ability of the manager to influence people. Needless to indicate that the ability to influence is dependent on the type of power, the respondent to the power and the tasks at hand. The power of the project manager is not given freely at all times and without some exchanges, this might lead to conflicts which by their nature are known to disrupt the operations. The participants in this research made their judgment which is diagrammatically represented in figure 5.18 below.

Figure 5.18 The ability of the manager to change without approval from team

Power to make changes without team's approval

- Strongly agree, 18%
- Agree , 29%
- Neutral , 19%
- Disagree , 14%
- Strongly disagree , 20%
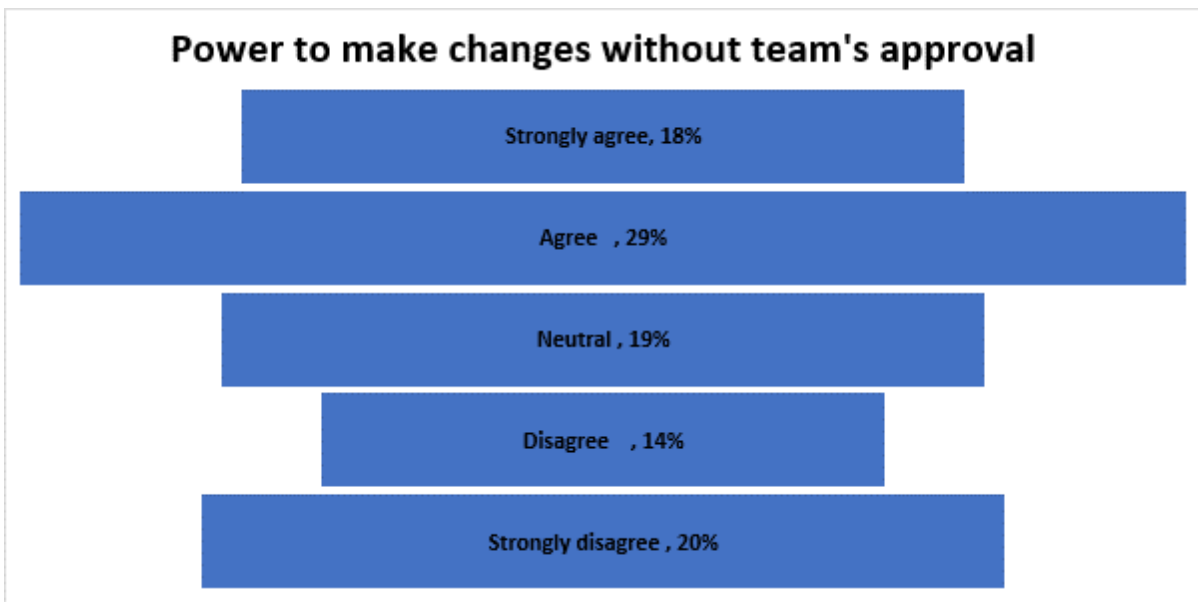
Contrasting project manager's power against that of team members

Source: Own construction

Discussion

The respondents were not without reservations, with the ambivalent at just below $\frac{1}{5}$ of the total (19%), those agreeing with the statement (total of 48%) and those disagreeing with the statement (at total of 34%). This gave no room for consensus on this view indicating a conflict on this assertion. It would appear that there are reservations about the "project manager wanting to do it alone." Such an approach is bound to create dysfunctional conflict which may derail the operations and further complicate the iron triangle structure.

STATEMENT 19: Effecting the changes depends on the relation between the manager and the team

RESPONSE: Increasing research shows that the relationship between the project leader (or any leader for that matter) and the followers is critical to loyalty and cooperation. Change has many changes but not important is how it is communicated and the recipient's ability to understand the need for the change and the team members understanding their responsibility and contribution. A good project managers will keep his team well informed and a close relationship with use of emotional intelligent to gain optimal support of the team. 50% of the participants strongly agreed and 34% agreed that a good relationship is necessary for the project manager and his team. Depending on the type of followers and the type of power the

project manager has, the project manager is better off involving all the other participants than dictating to them. Figure 5.19 below is an illustration of how the participants responded.

Figure 5. 19 Impact of relations between project manager and team during scope change
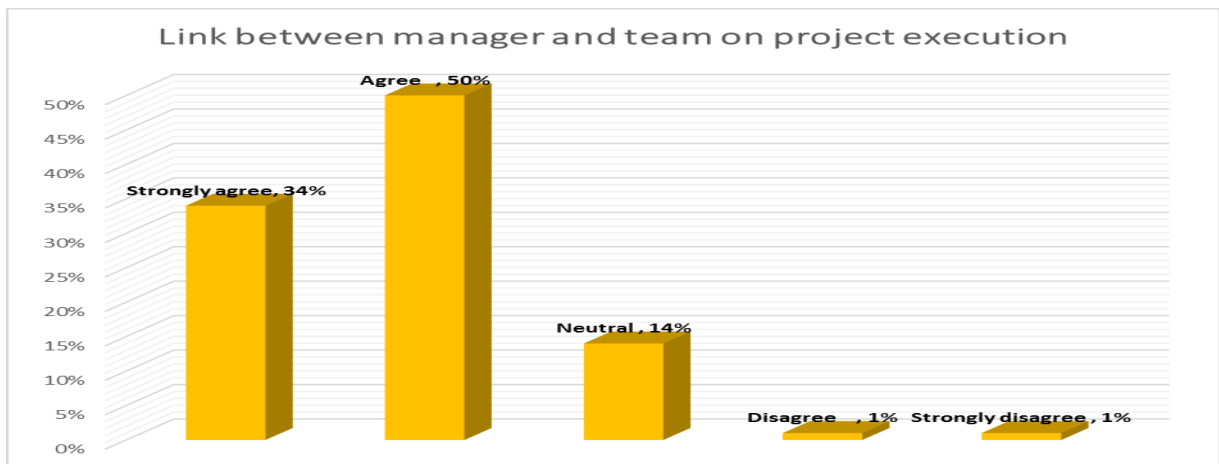
Source: Own construction

Discussion

A majority of 84% subscribe to the statement that cooperation with the team members and the project leader. This may be contrasted to the response in figure 5.18 where the respondents did not give the project manager the free reign to dictate to them. Clearly project scope execution is established as teamwork and based on the ability of the project leader to create a working relationship with the team members. Neutral is at 14% with those disagreeing at 2%.

It is important that the team have support and communicate well with the project manager. The more effective the communication is and a healthy working environment make it easy for the team work relationships amongst the project manger and the team. A good relationship with the team will make it easy for the team to be supportive to the project manager. There team needs to have confidence in the leaver and the leader needs to have trust in his team so that he trust them to perform well and this will motivate the team.

A project manager needs to be fully aware of the project and have the correct competencies and knowledge of the work to be done so that he can delegate and distribute tasks to the team. The project manger needs to show knowledge and gain the confidence of the team that he has the right knowledge to lead the project.

Therefore if the team has confidence in their leader it become easier for them to listen to him and approach him for insight and help. This will built a good relationship between the team and the manager and with open communication the project manager can openly communicate the changes with his team

STATEMENT 20: Communicating the proposed changes is not a guarantee that the sponsor will accept

RESPONSE: the project atmosphere is very complex, in as much as the project leader had power to lead his team, he need to get approval from other important stakeholders and when it comes to change to the scope of the project as projected that a change on the triple constraints may lead to changes on the budget. Change can be costly and getting the sponsor to accept the changes can become an issue on decision making. More than half strongly agreed and almost 75% agree that change is not always welcome by sponsor especially if there is budget stretching potential Figure 5.19 below is an illustration of how the participants responded.

Figure 5. 20 below is an illustration of how the participants responded.

Source: Own construction

Discussion

81% of the respondence agreed and with more than half of the participants agree that communicating the proposed changes is not a guarantee that the sponsor will accept. The researcher realized that not all on most instances the project owner is not the project sponsor, the sponsor will be usually a financial institution e.g an approved loan another is very little/no room for the budget to be adjusted and therefore the changes that have been proposed will not be accepted.
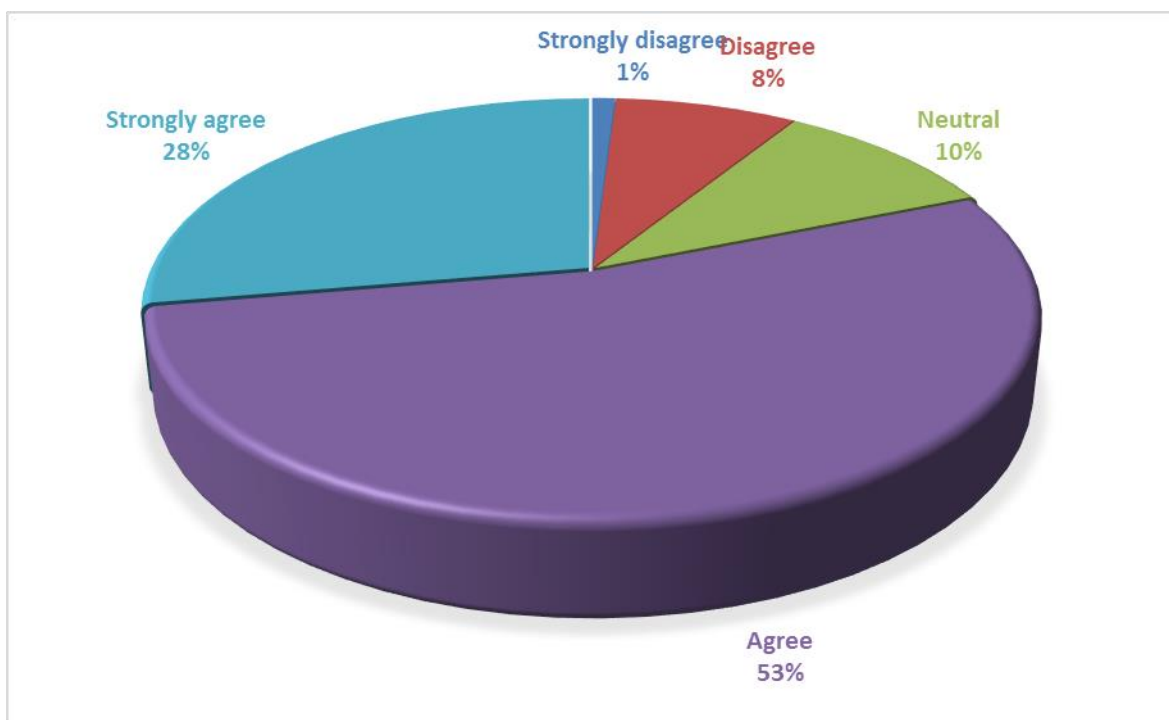
A project manager needs to be fully aware of the project and have the correct competencies and knowledge of the work to be done so that he can delegate and distribute tasks to the team. The project manger needs to show knowledge and gain the confidence of the team that he has the right knowledge to lead the project. Therefore if the team has confidence in their leader it become easier for them to listen to him and approach him for insight and help. This will built a good relationship between the team and the manager and with open communication the project manager can openly communicate the changes with his team.

STATEMENT 21: I have enough power to move the changes without consulting the team for permission.

RESPONSE: By nature of projects, once a project has been finished it is handed over to the owners who in turn accept the project to fit its purpose. The project manager is the driver of a project and has certain powers to make decisions on his own as per the graph below almost 46% agreed that the project manager does not have to consult his team for every decision, which is true, mainly because it saves time and also because sometimes the project manager being the expert knows better. On the other hand the team is also a driving force towards the success of the project thus 18% that disagree and they want to be engaged with.

Figure 5. 21 below is an illustration of how the participants responded.

Source: Own construction

Discussion

There seems to be a great divide with this statement as 46% agreed and 35 % disagreed, the main reason for being the context in which the answer was given, there is a condition to those who agreed and another for those who did disagree. The ones that agreed generalised to the type of change being made. How big of a change the project manager and team want to make. Changes of skipping one task to tackle another that might need more time is totally a change that can be implemented without the team but the change on swapping resources such as different project managers swapping team members then the project manager has to consult with the team. The bigger part of the agreed part pointed out that if the project manager has also been asked to make certain changes by management and superiors then there was no need for the project manager to consult team to make changes these are just instructions that even the project managers had to implement.

STATEMENT 22: As long as senior management has agreed, team cooperation is guaranteed for all purposes

RESPONSE: The graph illustrates the 36% participants disagree that team will cooperate to all decisions made by senior management. The honest truth is that the team manager suffer the authority gap in most instances and therefore will have to 48% agree to the decisions and implement the as dictated by senior management. Though the team may in some instances contest the decisions under if they have the

fact associated to the decision and how it can impact the project success or if team does not have the knowledge then they may contest the decision made

Figure 5. 22 below is an illustration of how the participants responded.
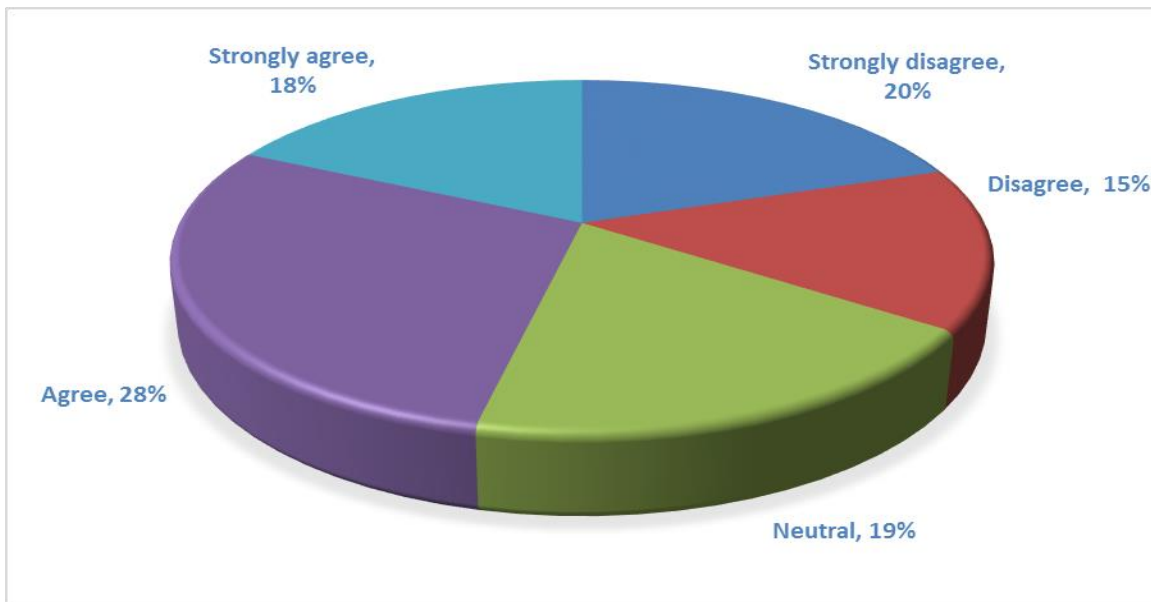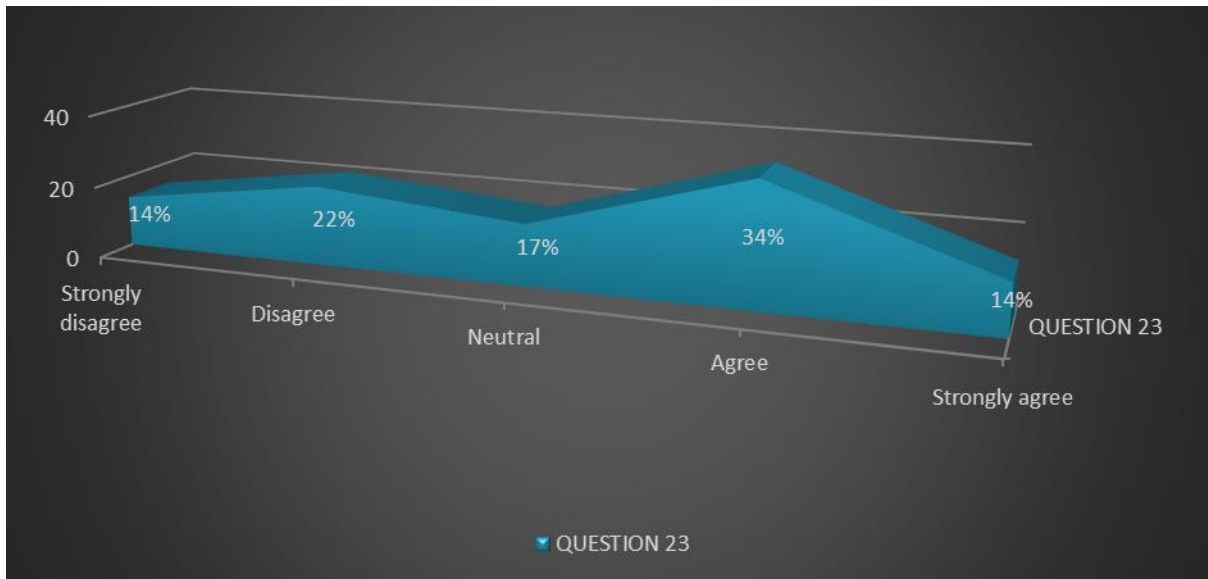

Source: Own construction

Discussion

With the authority gap there is on these projects and the team has no say in what tasks are given to them. The team and project manager have no say at most and are not decision makes 48 % agree on the statement that as long as management has issued orders, they need to be follow instructions and perform the tasks. Although the project manager can delegate and distribute the tasks and consult with the team that process will not affect the decisions made by senior management. It is just the team organising the tasks delegated to them by senior management and the project manager's duty is to control the tasks and delegate monitor and deliver results.

STATEMENT 23: My effectiveness is measured against my ability to mobilize support from my team members

RESPONSE: Though projects are temporary and have a specific life span it is the ability of the project manager that will determine the strength of his team. 79% of the participants agreed that an effective project manager will for the duration of the team be able to keep his team together. It is the strength and oneness of the team that will motivate the team and increase performance on the project if the project manager leads his team and makes sure that his team is in sync. 4% disagree mainly because

mobilizing and oneness of the team does not always translate to project success and even if the project manager has the team's full support.

Figure 5. 23: below is an illustration of how the participants responded.

Source: Own construction

STATEMENT 24: Team members are allowed to contribute or give suggestions on how to implement the changes

RESPONSE: Project by nature are unique and no 2 projects are ever exactly the same, that being said at times a project team may consist of experts from different disciplines therefore for this reason 86% agree that it is very much possible for the team to contribute on how changes can be implemented. However they may also not always be possible for health and safety reasons on certain projects and risk of time constraint to come up with the best resolution. The consultation will have a time costs disadvantage hence 3% disagree. Figure 5.19 below is an illustration of how the participants responded.

Figure 5. 24 below is an illustration of how the participants responded.
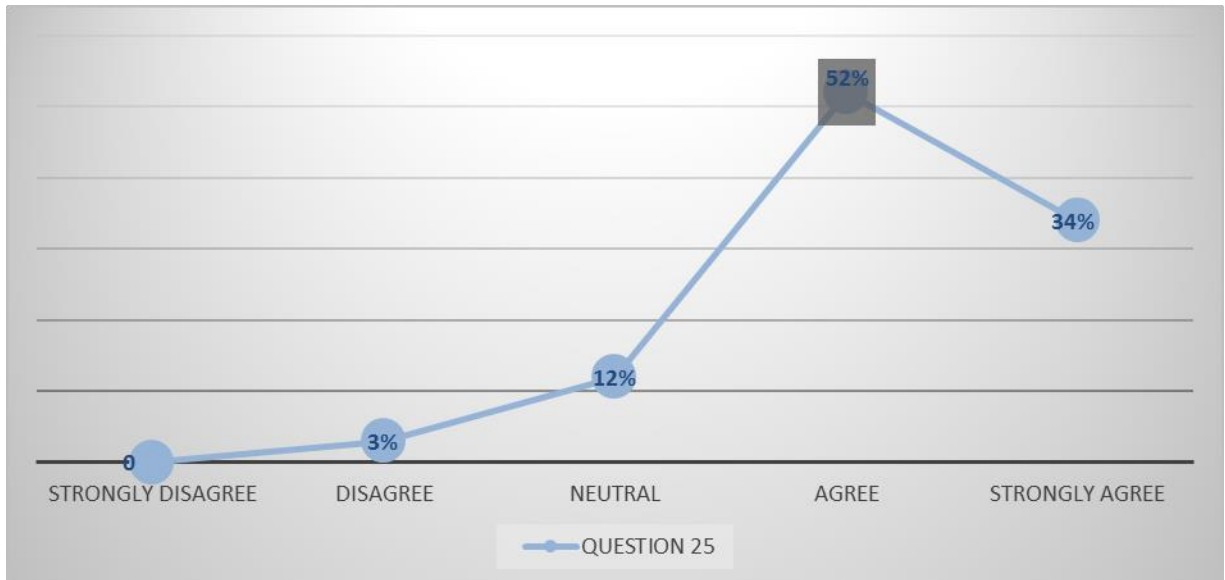
Source: Own construction

Discussion

The team is not involved in the process of change but once the change has been approved the project manager and team will then reschedule their work to accommodate the change and it is at this point where they can suggest to the project manager how they can go about implementing the changes and they can suggest.

STATEMENT 25: Dependent on the new scope the team members help decide on new resources as well as the time, quality and cost.

RESPONSE: The project team are the change implementers of a project thus 75% agree that once a change has been approve, it is the project manager and his team that decide on the steps that are needed to implement change and this will include identifying resources needed to implement the change and thus the cost and time associated to accommodate the changes. Figure 5.19 below is an illustration of how the participants responded.

Figure 5. 25 below is an illustration of how the participants responded.
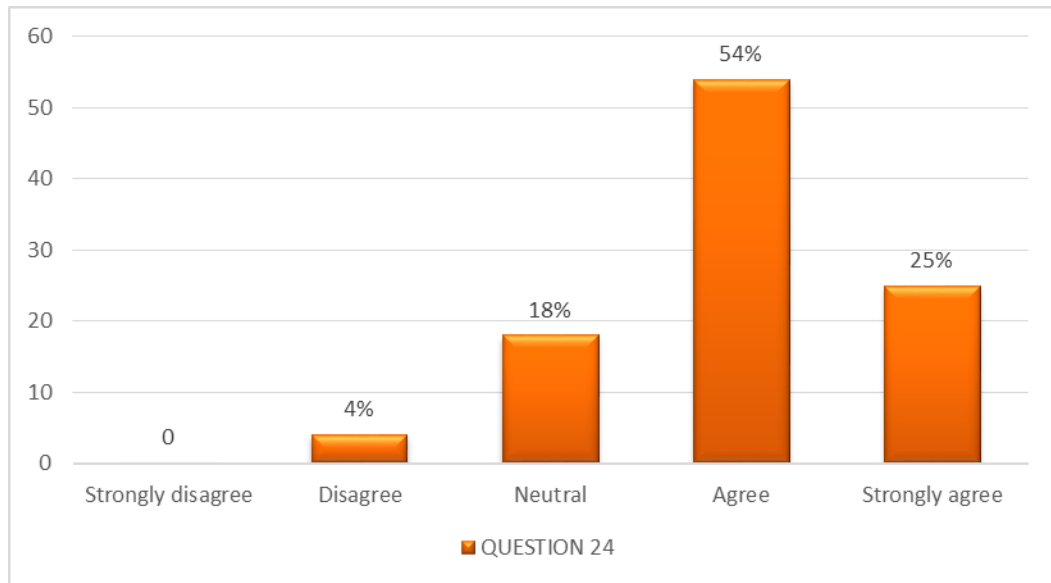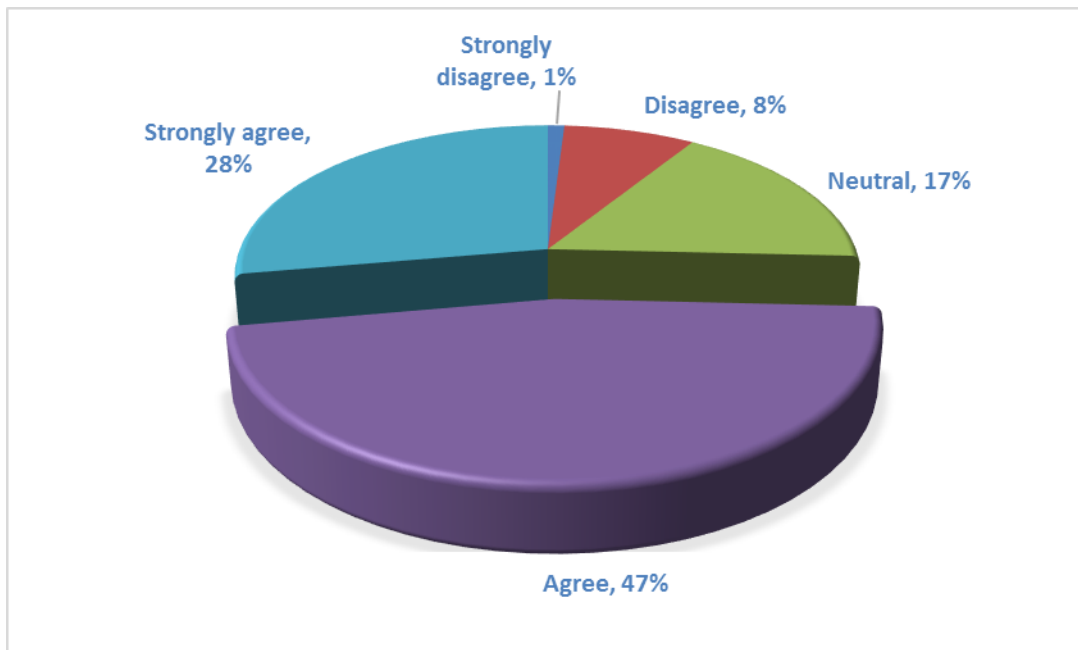

Source: Own construction

Discussion

The team only has no say or can not give suggestion during the scope change process and are not involved with the decision making but once the changes have been passed, together with the project manager the team can suggest how they want to perform their tasks

STATEMENT 26: Scope change will result in the change of the time, quality and cost requirements

RESPONSE: According to the project manager triple constraints change will definitely impact time, cost and money. The scope of a project is the basis of the budget with work breakdown structure showing cost involved for each activity to be undertaken. 88% of the participants agree that change impacts on time, quality and cost. Any change has to be revision on duration, the change process can delay the implementation, or continuation of the project. Change might need an expert to be outsourced which impact the time, then the expert need to be paid, which will impact on the an unbudgeted resources needed.

Figure 5. 26 below is an illustration of how the participants responded.

Bar chart titled QUESTION 27 with horizontal axis "Axis Title" and vertical "Axis Title":
- Strongly agree: 31
- Agree: 57
- Neutral: 12
- Disagree: 1
- Strongly disagree: 0

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
■ QUESTION 27	0	1	12	57	31

Source: Own construction

Discussion

Depending on the complexity of the changes to be made it is most likely that any change will disrupt the work in progress and once implementation has began and changes are usually made as the work is being progressed that is when project managers face difficulties and there is need for change or a new design has been found and client wants to make changes on a deliverable presented to them. In most cases as highlighted above scope change will affect one or 2, if not all elements of the iron triangle.

Figure 5. 27 below is an illustration of how the participants responded.

Line chart:
- STRONGLY DISAGREE: 5
- DISAGREE: 20
- NEUTRAL: 20
- AGREE: 39
- STRONGLY AGREE: 17
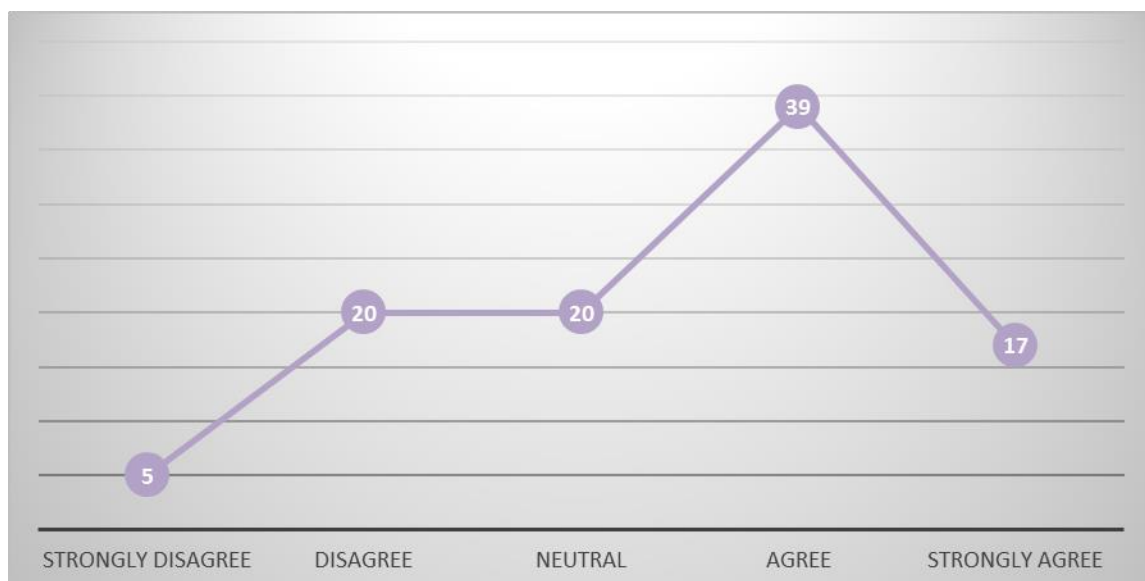
STATEMENT 28: Regardless of the type of change to the scope there will always be a change to the iron triangle

RESPONSE: The iron triangle shoes the relationship of the triple constraints of project management 67% agree that the change on the scope will impact the triple constraint. 12 % disagree under the circumstance of the change in processes that is reshuffling of tasks. Figure 5.19 below is an illustration of how the participants responded.

**Figure 5. 28 below is an illustration of how the participants responded.**
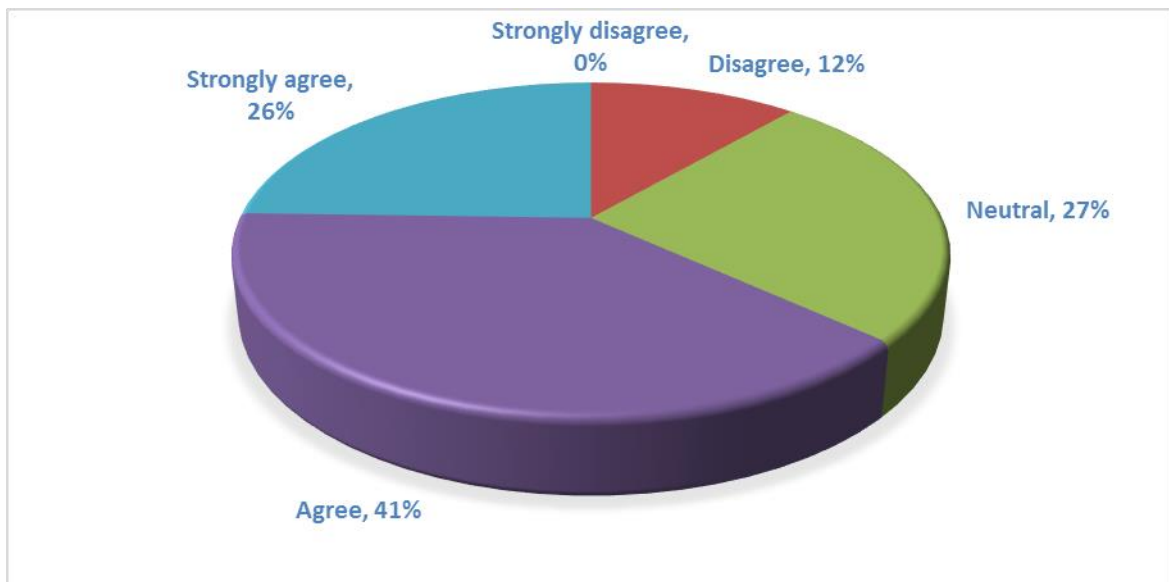
STATEMENT 29: Depending on the type of change to the scope it may actually take less time, less cost and same quality

RESPONSE: 69% agree that depending on change the iron triangle may be impacted on positively at times for instance reshuffling tasks to optimize time, concentration on critical path so that the float on others can be redirected. 10% disagree as change may compromise quality though time could be less and many hands on deck result in quality problem. Figure 5.19 below is an illustration of how the participants responded.

Figure 5. 29 Impact of relations between project manager and team during scope change

	QUESTION 30
	QUESTION 30
■ Strongly disagree	2
■ Disagree	10
■ Neutral	20
■ Agree	40
■ Strongly agree	29

Source: Own construction

Discussion

It is also evident that change is always not negative, at times resources are shifted and shared across the project to fast track some tasks and this can actually save time and resources are optimized and the project can be delivered before the end date. This will save cost and be a positive change to the project. Change can be technological, if a faster machine has been bought and is ready to use on projects that are already in the implementation stage and the machine produces faster that the current one, it will been that the contract will be shorter, resources and costs will be cut. With team being paid on the project if the project duration is cut, this will reduce resources

STATEMENT 30: The iron triangle is a function of the relationship between the triangle, the scope and the tasks to be performed

RESPONSE: the triangle show the relationship between the constraints and therefore 80% of the participants agree. Figure 5.19 below is an illustration of how the participants responded.

Figure 5.30 below is an illustration of how the participants responded.
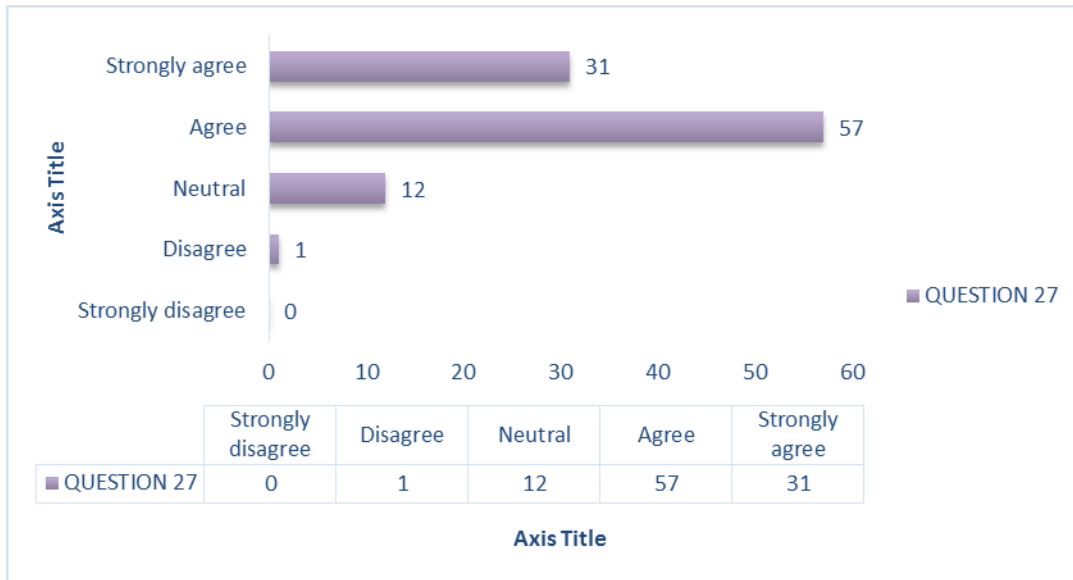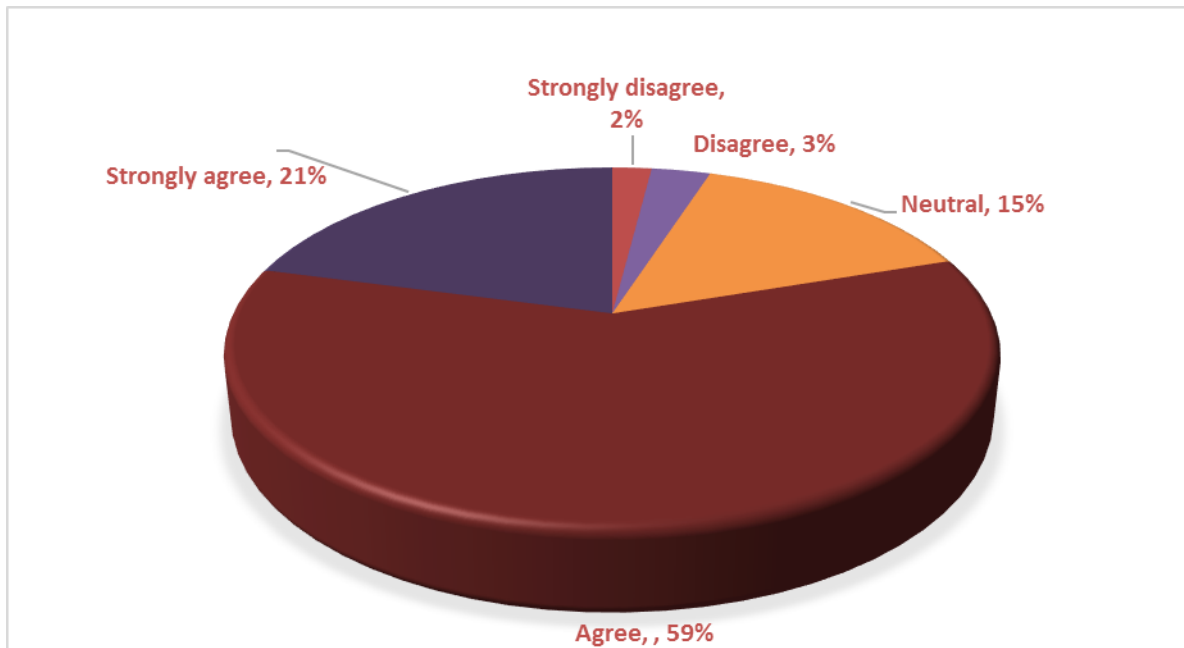

Source: Own construction

Discussion

The iron triangle was formulated as a measure for project success but over the years, researchers have opted to use the iron triangle as of the available success measure instrument, however it cannot be used in isolation to measure success. The iron triangle is also referred to as the triple constraints of project management. It shows how change on any of the following, cost, time and quality can easily be affected if one of them is changes. For instance an addition in resources will increase cost and depending on the how good the resource is then the quality should be taken into consideration.

STATEMENT 31: My challenge is therefore the ability to integrate these and draw a balance between them

RESPONSE: 66% of the participants agree that the challenge for most projects that fall are a result of the failure to balance the triple constraints especially when change has to be made. It is important when making a decision to factor the impact and realistically how the change will affect the constraint by showing the relationship and dependence of the triple constraints.3% disagreed. Figure 5.19 below is an illustration of how the participants responded.

Figure 5.31 below is an illustration of how the participants responded.
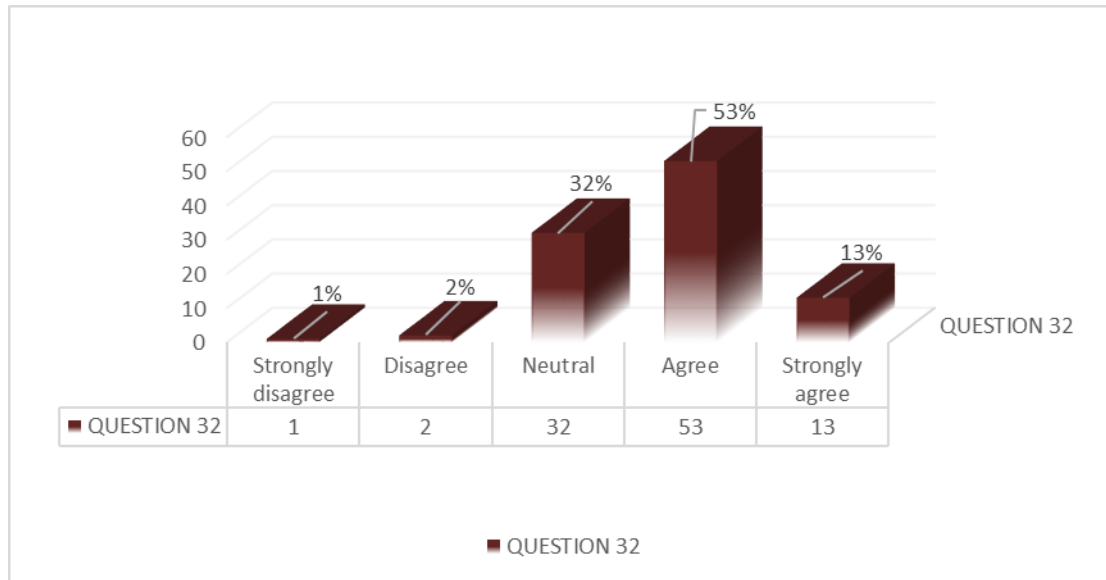
Source: Own construction
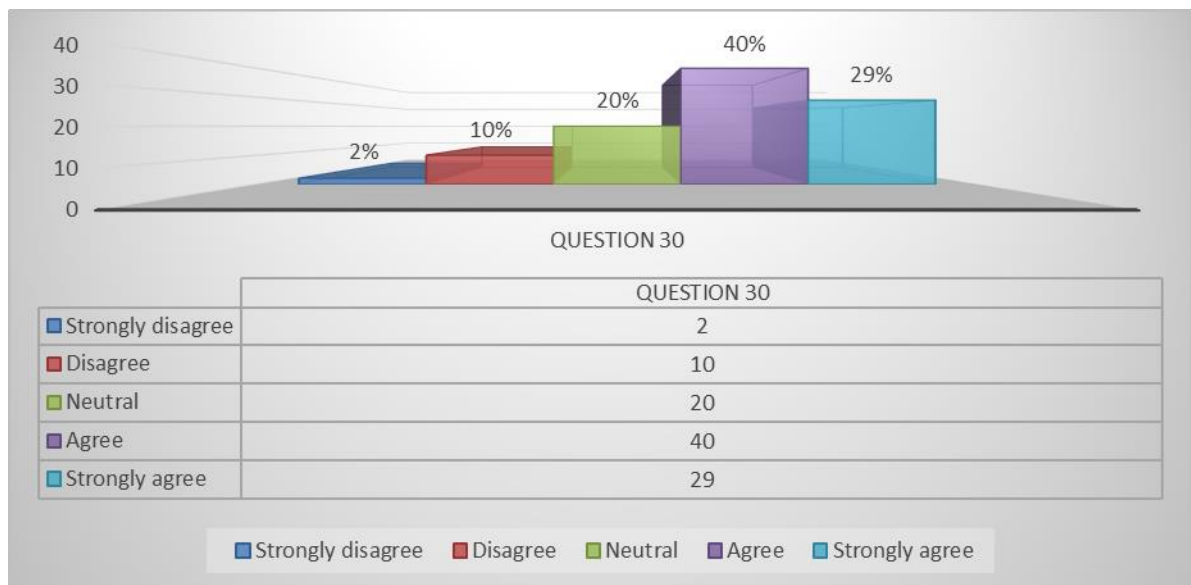
Discussion

One challenge of the authority gap and a huge disadvantage to project management is not involving te project managers in the decision making process on change. This usually makes it very difficult for project managers to balance off the triple constraints and stay on track in terms of schedules (time) while maintaining costs and quality at the same time

STATEMENT 32: The correct determinant of when there is reduction of increase is the nature of the scope change

RESPONSE: Increasing research shows that the relationship between the project leader (or any leader for that matter) and the followers is critical to loyalty and cooperation. Depending on the type of followers and the type of power the project manager has, the project manager is better off involving all the other participants than dictating to them. Figure 5.19 below is an illustration of how the participants responded.

Figure 5.32 below is an illustration of how the participants responded.
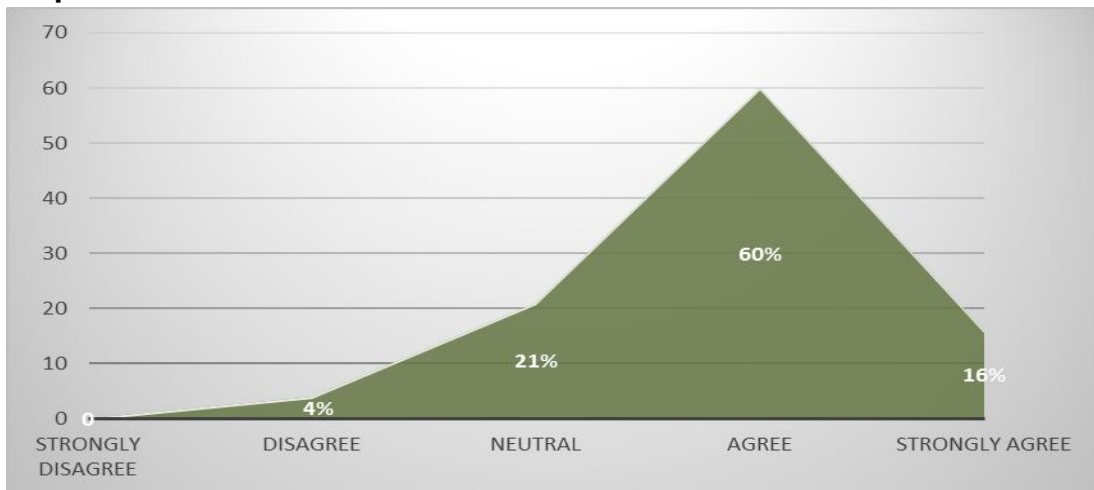
Discussion

Scope change can be avoided and at some point, needs to be controlled, design freeze is one element that can be used to limit changes. There needs to be some form of control as far as changes during project implementation. This is to control dates and cost and eventually the quality of the end product. Changes and increasing change can demotivate the team and this will affect their performance and moral to work.

STATEMENT 33: What is critical is my ability as a manager to manage the change and keep the people together

RESPONSE: It is the role of the project manager to lead by example to his team and implement communication channels for the team, resolutions and performance assessment so that the team stays glued together and share information freely. It is of paramount important that dispute among the team members are quickly resolved so that there are the team move as 1. 90% agreed.

Figure 5.33 below is an illustration of how the participants responded.
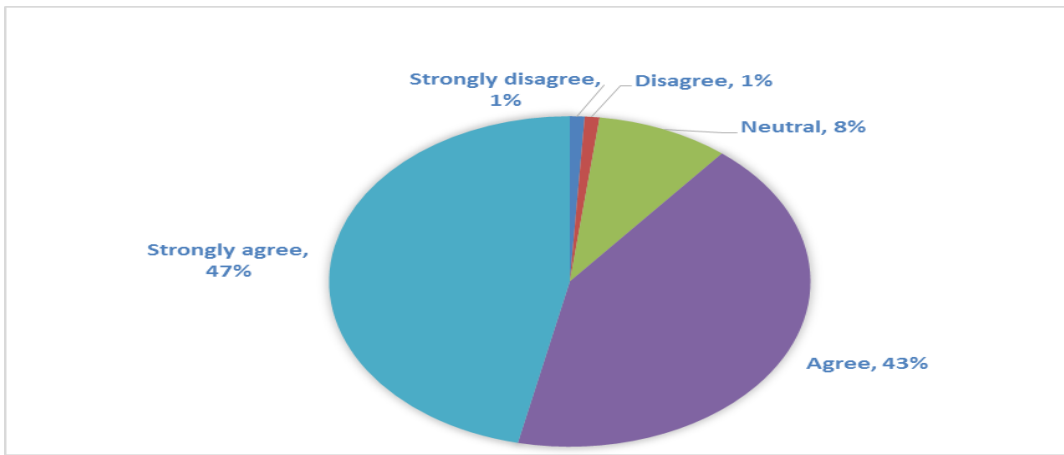
Source: Own construction

Discussion

As for the project manager is already under immerse stress and pressure to deliver the project. He is also responsible for the team's well being. The team needs to be motivated for them to perform. When their moral and motivation fall the pressure also fall on the project managers as he needs to closely monitor employees for mistakes. It make it difficult for the project manager to focus on the results because conflicts will arise when employees work frustrated or are unhappy.

5.3 SECTION C OPEN ENDED QUESTIONS

This section was made an open section to allow for interaction between the interviewer and the interviewees. This was submitted (as indicated in the questionnaire) as requests for the participants to air their views openly and open-endedly on specific matters relating to the study. The respondents listed numerous other problems encountered during scope change, which the most frequently stated ones are listed below.

REQUEST 1; Please state below any five (5) important issues that stand out to you during scope change in your experience with projects.

- Team members generally resent change after they have been told to do one particular task, and then they are instructed to change.

- Too often the resources are not within reach or create some inconveniences in the way people have to change from what they are used to.

- It is always difficult to bring people to the same level of thinking since they have other schedules and expectations for the tasks.

- The scope change document is always confusing and creates some delays as people start reading new information and following different instructions

- There are numerous conflicts amongst the different units which always leads to the disruption or delay of performance of certain tasks.

In all thirty seven (37) submissions were made which were condensed into the four (4) statements listed above. Largely, the responses border on the anti-changes attitude that prevails at the operational level. This brings about poor working morale, is referred to as demotivating and confusing to the subordinates who are the implementers of the changes.

REQUEST 2; Please list down five (5) ways the project manager may use to effectively implement scope change.

- Should provide adequate information to justify the need for the scope change and clearly show how it should be done.

- Provide adequate resources for the scope change in time including the materials, the money and the people to help.

- Be patient with the people on the ground as it is them that effect the change – they have to be consulted and persuaded.

- Allow people extra time to shift from one form of operation or another and should not stick on to old time schedules.

- Should not do the change on his / her own and allow people to state their views about the changes to be made.

- Must share the responsibilities and the accountabilities with the rest of the team members and operational staff at all levels.

- Must explain reasons why certain things have to be done the way the manager wants them done and avoid saying it is from the top.

- Depend and trust the people the manager works with and provide short training necessary before getting people from outside.

The respondents posted forty nine (49) different items which were grouped and put into eight (8) categories. The items essentially underscored the need for a leadership and not management orientation in the execution process. It would appear that the respondents give the impression that they should have a greater say and be treated the way they want to be treated if the operations are to be effective.

REQUEST 3; List the five (5) most common mistakes made by project managers during scope change.

- The team members are left behind in the process and do not know why they do what they do when they do it.

- Project managers rush the subordinates including team members through the changes to meet senior management instructions.

- Clarity is never provided to the different team levels to allow them a buy in and work from their hearts and not compulsion

- Team members at all levels need to be informed about the plans to bring about scope changes before they have been effected

- Very little information is provided to the subordinates and there is more rumours than there is official / authentic communication.

- Very little flexibility is provided to allow people the change process because everything should be done now as instructed by senior management.

The respondents focus much on poor communication, exclusion, being neglected and possibly treated as outsiders. There is a thought that says project managers do not communicate effectively to inform participants at all levels. This consequently causes confusion which demoralizes the workforce, possibly with an impact on how they perform. Inevitably this will become a risk factor, in that, processes may not be executed correctly thereby impacting on the triple and quadruple constraints. It also speaks to the need for the project manager to take charge for leading the followers at the implementation level and insists on an all-embracing work ethics.

REQUEST 4; Please list five (5) ways the iron and quadruple constraints can be affected by the introduction of scope change in a project under execution.

- There management must change the original time schedule unless if the scope change does not affect the total size of the original project.

- Always there will be shifts in the time and sometimes cost and quality with much time lost in meetings to discuss new programs.

- There will be an obvious shift from the previous scope and therefore new requirements changing the time and costs.

- The resources required are always affected because new things have to be constructed or other parts disregarded.

- The quadruple constraints is always affected because the scope will be changing from one state to another in the process.

There is an acknowledgement by the respondents that the scope change will definitely affect the project execution success factors, whether it be the triple or quadruple constraints. The quadruple are automatically affected because this is to do

with the scope of the project – the deliverables. The triple constraints have their own limitations of different factors, whichever way, they will be affected. A cut on the total number of deliverables may cut short the time, and may be reduce the time (if the changes don't bring about a more complicated requirement) which also impacts on the costs to do the project. It can be generalized therefore that the scope change in any project will likely bring adjustments to the iron triangle of the square root.

5.4 CONCLUSION

Evident from the findings, much is need to terms of good, effective leadership to enable a team to go through scope change. The general resistance to change by team members (common everywhere) may work negatively against the intended schedules for the project. It is clear that this should be managed correctly to avoid any unintended dysfunctional conflicts that may arise. Communication has been identified as a critical component in the implementation as information is needed for operational purposes. Of particular interest is the apparent role of the 10 knowledge management areas coming in handy for the scope change. Project integration management has been pointed out (in different words of cause) as indispensable if the change is to be effected with minimum problems.

CHAPTER 6
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The structure of the chapters from the beginning to this current chapter were all aimed at meeting the research objectives as stated in the title. "**The impact of scope change on the Iron Triangle and on the effectiveness of a project manager**." In project execution too often the project owner may change their mind about what they want in the middle of the execution. Chapter one; introduced the study by providing literature review leading to the establishment of a study gap – the problem statement. Once this was established it was followed by research objectives, research question, research design and methodology, data collection methods and ethical considerations. Chapter two; addressed theoretical aspects of scope management and scope change on a project. C**hapter three**: addressed theoretical aspects of the role and responsibility of a project manager and duties on the project scope change process. **Chapter four:** discussed the research design, methodology, data collection methods, construction of the research instrument, and data collection methods. **Chapter five:** covered data, editing, cleaning, coding, capturing and analysis and interpretation. **Chapter 6**: the current chapter; provides a summary of the research findings, conclusions and recommendations.

6.2 SUMMARY OF FINDINGS

The same format used in the previous chapter will be used to enable comprehensive coverage and both conclusions and recommendations per every question of statement. The research instrument, as alluded to in the preceding chapter was divided into three sections, this will be covered chronologically.

6.2.1 SECTION A – BIOGRAPHY

This section was included primarily to assist with the "qualifying" of the respondents and determining their suitability for the survey. It thus provides the necessary information needed to judge on the reliability and validity of the study in view of the intended objectives and research questions.

QUESTION 1; what is your position in the organisation? Please use box below for your response.

Conclusion: The objective of this question was to qualify the participant as to their involvement in project and the participant sample was specific to the qualities and experience at the workplace for the participant.

All participants were project managers and project portfolio officers. This was effective as project managers were the researchers target population for this research.

QUESTION 2; how long have you been a project manager or involved directly with project management?

Conclusion: Experience was crucial for the study thus the participant needed to have held the same position for at least 24 months minimum. The reason for this was to have the sample as close as possible to the real problem stated as the researcher needed to collect relevant data for the research. Having the participants experience with at least 2 years' experience within the company and within the field was for that reason that the participants had familiarized themselves with the project procedures and have had multiple teams and this was a great pool to get information from.

Recommendations: Experience was vital for the study and most recommendation is that the organization should have their project managers trained together with team members before the project commences

QUESTION 3; who does the planning [operational] for your project execution?

Conclusion: the idea behind this question was to establish how much participation do project managers have in the planning of the project and most project managers testifies that they were not really involved in the planning they are given planned documents to implement. Researcher found out that project plans are merely handed over to the project managers and the communication is vertical and from top to bottom. All decisions pertaining any projects are made by the management.

Timelines and schedules are all part of the project package a project manager receives including team members will be selected by management.

Recommendations: For project success rate for the organization to increase it is recommended that project managers be appointed as soon as a gap has been identified that is when the client presents their case/project to the so that it become easy for project managers to understand the need for the project and engage with stakeholders such as sponsors and the project owners so that it becomes very easy for the implementation of the project and also team selection. The project manager being the expect if included in the initiation and will be able to assess any possible risk that might lead to changes when project implementation has started. This might decrease the number of changes on the scope during implementation.

QUESTION 4; How many times did you get involved in scope change management during your life in project management?

Conclusion: This question was to establish the relevant of the study as participants needed to suit the criteria and also so that data collected was relevant to the study. Participants qualified this field and most gave highlight on how they are not involved in coming up with solution and no risk panning prior to implementation made it difficult to fit changes to ready planed schedule. Project managers are rarely involved in scope change unless they have requested the change for various reasons once they start implementation. This being said it was also highlighted that there was no design freeze implemented and clients could make drastic changes to the scope at any given time during the implementation and project managers will only be at the receiving end of instruction to act upon the scope changes. This demotivated the project manager and the team as this hindered progress and brought a degree of confusion and disruption to the completion of the project

Recommendations; Project managers and their team should be involved in – planning the project and assess possible risks to have in place contingency plans when scope change during implementation. Project managers and team should be consulted on any change so that he and his team being the experts may suggest the best way to implement the change. Thus is make the team and project manager mentally ready for the new changes that they are about to make. Being consulted in changes gives the project manager some knowledge as to why the changes are being made and he can clearly prepare his team to make the changes. This will increase productivity and cause less disruption, errors and demotivation. The project

manager feels in control and responsible for his work and this makes it easy for him to take ownership to steer his team

QUESTION 5; what was your role in the instances when you got involved in scope changes?

Conclusion: Most project managers are merely change implementers. Research results showed that changes where simply passed from senior management as instruction at minimum consultation

Recommendations; Involvement of project managers in scope change plans is recommended. Consulting the project managers is relevant as they are the experts working on the projects and they know the impact the changes will have on the cost, time and quality product they need to produce for their clients.

QUESTION 6; anything else you would want to include under this section
Conclusion; Scope change is a common phenomenon in all projects, and it is surprising that may project managers are caught unawares. It can be concluded that very few project execution processes will run smoothly to the end without a form of scope change along the way. Project managers do not feel important or valued as their opinion are never taken into consideration neither are they given the opportunity to voice the way in which they would want to implement the project that will give the results that the client is looking for, instead mistakes are made because the project manager has not really captured the clients' perception of quality.

Recommendations; project managers need to be trained thoroughly on scope change to avoid the panic response they always show. It may be important to coop team members in the training to you as they will be the ones to support the project manager through the difficulties of scope change management. Consulting the project managers

6.2.3 Section B GRAPHS

	When deciding on a scope change process a project manager's effectiveness is vitally important	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		%	%	%	%	%
1	The project manager's effectiveness is tested when there is scope change	58%	30%	11%	2%	0%
2	The project manager's planning skills are called to account because of the changes	37%	53%	10%	2%	0%
3	The project manager's ability to work out the cost-benefit analysis is called to account	35%	46%	17%	3%	0%
4	The project manager's ability to understand the scope change document is called to account	46	40%	11%	3%	1%
5	The project manager's ability to manage the process of scope change is critical	51%	41%	7%	2%	0%
6	The project manager's understanding of effective processes to be used is critical for effective scope change	45%	40%	14%	1%	1%
	Total average	**45%**	**42%**	**11%**	**2%**	**0%**

STATEMENT: The project manager's understanding of effective processes to be used is critical for effective scope change.

Conclusion: 85% of respondents agreed with the statement therefore it can be stated that the project manager's understanding of the project processes is critically important for effective execution.

Recommendations: It is recommended that project managers and team members be provided with adequate training in understanding the project processes. Proper understanding of this will enable effective project leadership and reduce the failure rates at all stages of the project execution process. Project managers need to be reassured that their position is vital and important for project success, therefore project managers should be heavily and work closely with management on the project that they are implementation and the project managers will be able to drive his team to success. A project manager needs to be motivated and driven in order to lead the team therefore they are required to be the one person on the project who has vast knowledge of the ins and outs of the project and should know procedures like the back of their hand. Training for project managers should be an ongoing

process within the company as projects that they lead come along it is important for project managers to have a brainstorm session to access who best to lead this project and training be recommended

STATEMENT: The project manager's ability to manage the process of scope change is critical.

Conclusion: It can be concluded that it is vitally important for the project manager to be able to manage the project processes adequately (93%) if he is to successfully steer the project through scope change turbulence.

Recommendation: Project leaders and team members must be trained in project processes and if possible be involved in the whole initiation and planning phases of the project. This will increase their understanding of the project and improve project execution efficiency and effectiveness. There are procedures that should be done before any changes can be implemented and at every stage the project manager should be part of it. It is highly recommended that the project manager be involved in the project planning phase. This will possibly reduce the chances of changes and mistakes during implementation. When project owner and project manager are in one accordance it is most likely that the project manager being the expert can tell any risks they will likely face and if these risks can be identified in the planning stages, this would save time on any changes, make use of contingency plan and a better plan be implemented. The process of making changes is vital when the project is already in motion because projects have set durations schedules, timelines, budgets and any change made will impact on these variables because of the close dependency they have on each other and in turn the impact on project completion and success therefore it is vital to involve the project manager so that plans be adjusted and cost mitigated to complete the project successfully.

STATEMENT: The project manager's ability to understand the scope change document is called to account

Conclusion: It can be concluded that there is a serious need for the project manager to understand the project scope change document (86%) as he/she will be directing team members on the scope change.

Recommendation: All team members and the project manager need both training and exposure (during process executions from the start) to enable them to have a full grasp of the scope change. It is important that changes be implemented

systematically and all documentation be provided and approved before any changes have been implemented. This is so that at the end of the project, all work and changes made be accepted by the client and also because scope change can result in costs that exceed the initial budget there change documents may be used to adjust the project budgets. Scope change can delay the project and if they are correctly documented the timelines can be reassessed and the project will be a success. Changes will impact on quality for the project and all changes must be approved by all relevant stakeholders as evidence and point of reference in the future.

STATEMENT: The project manager's ability to work out the cost-benefit analysis is called to account.

Conclusion: It is of paramount importance that the project manager (and team members) understand and know how to utilize the Cost Benefit Analysis (81%) to decide on the best course for the scope change

Recommendations: The team members must be trained and be made acquainted to the use of CBA for decision making to help improve their operational efficiency and effectiveness. . It is important that any aspect of change to be made have at least a few scenarios to approach the change. This will aid with the CBA so that the project manager and team can assess the best course to take to implement the changes knowing clearly the outcome of the option that they have selected to tackle the scope changes. Every scenario given should clearly state the cost and benefits associated with tackling change to be implemented. Cost and benefit on projects as depicted by the iron triangle cost, schedule and quality. The team and the project manager having to understand the changes and expected outcome will motivate them as they get to select the route to take to tackle the new changes that need to be implemented

SECTION: When deciding on a scope change process a project manager's effectiveness is vitally important

Conclusion: The role of a project manager and his effectiveness for successfully implementing change is very vital for project continuity post to changes being passed for implementation. (87% participants agree)

Recommendations: The project manager and 5team should be involved and consulted when there has been some form of scope change. This is highly recommended for continuity purpose post change and being effective after scope

change impacts to the success of the project. A project manager cannot be effective in isolation without the cooperation and willingness of the team. That being said the team needs to be briefed of the changes and explanation as to why the change has taken place this will help then gain confidence in their work and also help then realise their role is important for the success 9of the project.

2.

	Classifying the type of change has an impact on the success and the effectiveness of the project execution process	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		%	%	%	%	%
7	The manager needs to judge correctly the impact of the change to project benefits and deliverables	22%	59%	16%	4%	1%
8	Scope changes during planning phase have no impact on the time set for the project	19%	15%	12%	35%	20%
9	Scope change during project implementation may consume more resources dependent on the size of the change	27%	58%	14%	3%	0%
10	The complexity of the project and the size of the scope change may affect the way the project manager would work	25%	58%	15%	4%	0%
11	The more complex and the larger the greater the need for competent project management	49%	39%	11%	2%	0%
12	If the change is outside of the scope of the manager expertise may be needed	29%	49%	21%	2%	0%
13	To the extent there is need for external consultancy the project manager losses control	24%	42%	28%	6%	1%
	Total average	**28%**	**46%**	**17%**	**8%**	**3%**

STATEMENT: the manager needs to judge correctly the impact of the change to project benefits and deliverables

Conclusion: A project success is evaluated according to the deliverables and the functionality of the project outcome or product being able to benefit the clients in the way intended. Deliverable's quality is as perceived by the clients therefore the project manager needs to be able to translate the project scope to make the necessary changes to be able to deliver the acceptable product or project outcome

Recommendations: The project managers should be able to translate the desires of the client from a project brief. Therefore be able to translate it into the scope of the

project. Project manager's involvement in the planning phase is vital so that they have a clear understanding when there is request for the project scope to change. When the client and project manager have a great foundation of understanding it give the project manager a feel for responsibility and ownership to fulfill the client's wishes. The project manager can easily communicate the tasks to his team because he has a clear understanding of the deliverables and has been involved in formulation the critical path to complete the projects. This increase the effectiveness of a project manager.

STATEMENT: If the change is outside of the scope of the manager expertise may be needed

Conclusion: A project success is evaluated according to the deliverables and the functionality of the project outcome or product being able to benefit the clients in the way intended. Deliverable's quality is as perceived by the clients therefore the project manager needs to be able to translate the project scope to make the necessary changes to be able to deliver the acceptable product or project outcome. If the change requested is outside the scope of the project manager, he/she feels like they have lost control of the project and their position with his team. A project manager is usually an expert on the project and steers the whole team and the moment someone from outside is requested to come on board and assist, by nature the project manager feels small and questions his position and power for his team. Once one feels belittled or challenged their focus diminishes and this will affect all other deliverables.

Recommendations: Management should try to identify tasks that might need outsourcing in the beginning of the project and the project manager should be made aware of this need so that he can prepare his team that an outside will be coming on board to offer their services. This will help build confidence with his team. Management should also consider training in-house experts so that it cost less for the project rather than outsourcing this when it comes with change during project implementation will increase the costs. The effectiveness of a project manager is based on their confidence and knowledge of the project as they steer their and once one of these elements are disturbed their sources of motivation diminishes and will not be able to lead the team with confidence nor will they have that sense of leadership and control. Researcher recommends that the project manager and the team be trained and management tries to minimize or eliminate outsourcing tasks

and if it is inevitable then management should notify the project manager so that they still have to steer the team even if there is an outsider expert that is joining the team. With the team and project manager being aware of this helps to accept the help coming from outside and the team will be ready to accept and assist the expert as one of them and not view them as an outsider.

SECTION: Classifying the type of change has an impact on the success and the effectiveness of the project execution process

Conclusion: It is vital that the change being requested is assessed on how it will impact the project as a whole this includes testing the triple constraint of project management against all possible solutions and adopt the solution with minimum risk toward project success. Depending on how complex the change is, the extent there is need for external consultancy the project manager losses control and once the project manager losses control over the project, he does not transfer the responsibility to deliver the project to any outsourced expert. Therefore the changes being made to any project if not enough responsibility is taken into consideration and transferred will affect the project success. Scope change during project implementation may consume more resources dependent on the size of the change.

Recommendations: The source of change should be established with clear reasons for the change. All changes made on the project should be approved signed and then implemented so that the stakeholders are aware of the changes and their originality. This helps when the project has finished, and closure documents need to be consolidated for final reports. This will enable the project manager to execute changes effectively and knowing that all has been approved and stakeholders are satisfied of the change and have the knowledge of how the change will impact the project. Design freeze should be implemented for every project, this will limit the type of changes made to the project once implementation has begun. The more complex the change is, the more the deliverables will shift further from the main scope and this will affect not only the triple constraints of the project but the moral of the team as they will take time for them to see progress when major changes are being made to the project. Design freeze will eliminate complex changes and the impact of these changes therefore will be assessed. Change procedure should be followed although this can be time consuming, but the types of changes made will be known and documented and lastly approved. The triple constraints should therefore be reviewed after change has been approved so that the project will continue smoothly and the constraints taken into consideration and any adjustments to time cost and quality are

made and catered for so that the deliverables of the project can be successfully accepted at the end of the project

3.

	Communicating the scope change guarantees the effectiveness of the execution of the change	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		%	%	%	%	%
14	As project I need to communicate scope change to all stakeholders	51%	40%	9%	1%	0
15	It may take time for stakeholders to buy in to the scope change	27%	52%	11%	7%	9%
16	Much time may be lost in communicating the scope change	18%	48%	11%	11%	2%
17	Failure of stakeholders to understand the change affects my effectiveness	35%	50%	4%	8%	4%
18	The more complex the project and the scope change the more difficult it is to communicate.	29%	47%	13%	9%	3%
19	I am only as effective as I will be able to convince stakeholders to accept the proposed changes	22%	52%	16%	8%	3%
20	Communicating the proposed changes is not a guarantee that the sponsor will accept	28%	54%	10%	8%	1%
	Total average	**30%**	**49%**	**11%**	**7%**	**3%**

Statement: Communicating the proposed changes is not a guarantee that the sponsor will accept

Conclusion: Project scope change originate from different stakeholders. The sponsor of the project may not be the owner and the vise versa. As the definition of a project states that resources are allocated to each project from start to finish, sometimes resources become scarce or price may increase. This can be a call for change. Researcher noted that most project owner were not the sponsors, therefore even if the project owners were in support of the changes or they requested the changes the sponsor were caution of the cost and tracking the approved the budget and any changes that increased or exceeded the budget approved would hinder progress and the channel of communication consumed time and this impacted on deliverable dates. Most sponsors were financials institutions that have their own inhouse change procedures to fund any changes and this proved to be tedious and very time consuming.

Recommendations: Researcher recommends a float or budget reserve be requested in the initiation stage when the feasibility study is undertaken. A reserve will give allowance to accommodate moderate ranges that may arise once a project start. A project may be on of a kind and because all projections are never accurate a reserve will allow progress to happen without having to wait for the sponsor to prolong the wait for scope change to be approved inhouse. A representative of the sponsor can be appointed for every project and this representative should have the power to approve budgets. Naturally change is not easily accepted and at times it would be effective if project manager was allowed to make changes deemed necessary with minimal impact on the project deliverables, for instance a change to put another human resource on the project. The organization that the researcher conducted the field study from has a matrix structure were team members are from different projects and project managers should swap around the expertise of their team members without restrictions. This could speed up if resources that did not impact the progress negatively could be shared among projects.

SECTION: Communicating the scope change guarantees the effectiveness of the execution of the change

Conclusion: Change can come from any stakeholder who is involved or impacted/concerned with the project. Therefore change can come from within the organisation, government, environmentalist, team members, sponsors or the project owner. Documentation of the change request is vital as it will establish who initiated the change the reasons for the change and the new task or modification that need to be done and at all stages the project manager needs to have the relevant stakeholder sign in on an agreement to the changes and noting the impact of the change. The project manager will then have to produce new plans that accommodate the change so that stakeholders can assess the documents and give the project manager and hi9ois team the approval to implement the change

Recommendations: It is important that the project manager be well informed of the changes being made to the scope so that he can assess the nature of change. The team will need to be communicated with in the change process so that they understand what is being required for then to do and also that they understand the reasons for change. This will motivate team and enhance the effective ness of the project manager

4.

	Scope change requires team work	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		%	%	%	%	%
21	Effecting the change depends on the relationship between me and the team	34%	50%	14%	2%	1%
22	I have enough power to move the changes without consulting the team for permission.	18%	29%	19%	15%	20%
23	As long as senior management has agreed, team cooperation is guaranteed for all purposes	14%	34%	17%	22%	14%
24	My effectiveness is measured against my ability to mobilize support from my team members	18%	48%	11%	11%	2%
25	Team members are allowed to contribute or give suggestions on how to implement the changes	35%	50%	4%	8%	4%
26	Dependent on the new scope the team members help decide on new resources as well as the time, quality and cost.	29%	47%	13%	9%	3%
	Total average	**25%**	**43%**	**13%**	**11%**	**7%**

SECTION: Scope change requires teamwork

Statement: My effectiveness is measured against my ability to mobilize support from my team members

Conclusion: A project success is evaluated according to the deliverables and the functionality of the project outcome or product being able to benefit the clients in the way intended. The effectiveness of the project manager is also recognized by their ability to steer the project team to work effectively therefore, it the project manager's responsibility to motivate and drive his team throughout the duration of the project. Project success does not directly speak to the effectiveness of the project manager as far as the project is concerned but the end result which is the product to be produced and what the client has asked for that will really translate to how effectiveness the project manager was. Getting the work that needs to be done. There are different leadership styles depending on the scope of the project that a project manager can adopt to be able to mobilize the team and get the work done. His ability to get things done will determine the quality of work for the project.

Recommendations: Project managers should be trained on leadership skills, qualities and characteristic. This will enable them to make certain decisions with

regards to how to drive the different projects. This will enable the project manager to know which leadership to adopt for any projects according to the content of work or scope of work that needs to be accomplished to complete the project successfully.

Statement Team members are allowed to contribute or give suggestions on how to implement the changes

Conclusion: Once the changes have been approved, it is now the duty of the project manager to implement the changes with the team. Though they might not be involved in deciding on the changes the project manager has authority to consult his team on how they may implement the changes they have been assigned to. Project managers gain the support of their team when they consult them on any changes to be made. The 'how' part of implementation is entirely on the project manager and his/her team

Recommendations: The project manager should mostly consider his team when making decisions on how to execute the changes that have been approved. Allowing his team to make their decision on the team will assist them to gain a sense of trust and belonging. As human like to identify with something and they identifying to the team will motivate them and trust that their leader has confidence with their work and will be motivated to do better and work better as one unit.

SECTION: Scope change requires team work

Conclusion: When a team for a project is selected, they are briefed on the project and are given all documentation regarding the tasks and activities they should undertake to complete the project. Once implementation starts they have a road map communicated to them by the manager therefore if change has to be made the team needs to be on board

Recommendations: Team members of a project should be notified of any changes being made to the original scope plan they has. It is important that the team be given full information on the changes being made and the team needed to know why the changes have been made, this will boost their confidence to undertake and recourse their plan as they are the change implementers

5.

	The iron triangle is affected by the scope change	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		%	%	%	%	%
27	Scope change will result in the change of the time, quality and cost requirements	31%	57%	12%	1%	0
28	Depending on the type of change to the scope, the iron triangle may never be affected	17%	30%	20%	20%	5%
29	Regardless of the type of change to the scope there will always be a change to the iron triangle	26%	41%	27%	12%	0
30	Depending on the type of change to the scope it may actually take less time, less cost and same quality	29%	40%	20%	10%	2%
31	The iron triangle is a function of the relationship between the triangle, the scope and the tasks to be performed	21%	60%	15%	3%	2%
32	My challenge is therefore the ability to integrate these and draw a balance between them	13%	53%	32%	2%	1%
33	The correct determinant of when there is reduction of increase is the nature of the scope change	16%	60%	21%	4%	0
34	Scope change may take place without alterations to the stipulated the iron triangle	14%	46%	22%	19%	0
35	What is critical is my ability as a manager to manage the change and keep the people together	47%	43%	9%	1%	1%
		24%	48%	20%	8%	1%

SECTION: The iron triangle is affected by the scope change

Statement: Scope change will result in the change of the time, quality and cost requirements

Conclusion: Work breakdown structure (WBS) and critical paths diagrams are derived from the project scope and costs are usually attached to every task that is on the (WBS) and from that with the use of the budget to consider the total cost of the project. The triple constraints elements are independent on each other. A change in one will affect the other for instance a change in time will affect time and quality, a change in quality will affect cost and time to implement the change. These constraints can not be dealt with in isolation. The challenge is therefore the ability to integrate these and draw a balance between them

Recommendations: Management and project managers should consider to a conduct a mini feasibility study for the changes that are being proposed, more of a

cost benefit analysis so that they have a clear understanding of the impact the proposed changes will have on the deliverables of the project and how the changes will affect the cost, time and quality of the project and if the changes have been approved there is need to make adjustments to the schedules and the budget to accommodate the change and also to include these in the project report for reference for instance if the project goes past the deadline as per the initial project documentation.

Statement: Scope change may take place without alterations to the stipulated the iron triangle

Conclusion: Not all changes made would affect the iron triangle, changes such as change in the project managers. There were times when a project manager would resign or the assigned to another project and another was appointed to take over. The handover process would be smooth and not affect the iron triangle. Not all changes made would affect the iron triangle.

Statement: What is critical is my ability as a manager to manage the change and keep the people together be performed

Conclusion: Change can cause confusion and especially to the tea who have not being involved in the scope change process. This will demotivate the team as it may seem as if they are not progressing when changes are being made without them being unaware. They began to doubt their abilities on the work in progress as changes were being made without their knowledge or consultation. It was the manager who was solemnly responsible to keep the team motivated to work and implement the changes made by management.

6.3 CONCLUSION

Evident from the findings, much is need to terms of good, effective leadership to enable a team to go through scope change. The general resistance to change by team members (common everywhere) may work negatively against the intended schedules for the project. It is clear that this should be managed correctly to avoid any unintended dysfunctional conflicts that may arise. Communication has been identified as a critical component in the implementation as information is needed for operational purposes. Of particular interest is the apparent role of the 10 knowledge management areas coming in handy for the scope change. Project integration

management has been pointed out (in different words of cause) as indispensable if the change is to be effected with minimum problems. The effectiveness of a project managers is not solemnly affected by scope change alone there are other elements in project management that will affect his ability to perform such as communication and participation of his team in any new developments pertaining the project and constant progress appreciation and reports.

As per the findings scope change has a huge impact on the iron triangle as the project and the other conclusions above its clear that scope change is at times inevitable but the process should run smoothly if the elements of the iron triangle are considered and altered accordingly to accommodate change. Though it is clear that the triple constraints alone can not me used to measure success of a project, it is critical that these elements are the basis of projects as project have schedules, start to end timelines that need to be respected and considered every step of the way. Time is a also a huge factor as there needs to be control as to when delivery of the project will be done for the client to continue operation especially in construction where renovations and building can disrupt the day to day running of the business. Clients need to resume work in order to be operational and time is of the essence.

Authority gap has been an issue on many projects and especially with a Matrix organizational structure, power is distributed across all levels of the organisation but management remains constant to make decisions on projects that they are not directly involved in and are ignorant to give the project managers the authority to deal with their projects and make decisions and this not only demotivates the project managers but is also inconveniencing the decisions and changes that are made without the project manager's knowledge. The communication is top down and the management are not involved in the day to day running of the projects and their judgement is usually clouded as they have no/little first hand information of the project. Communication is very important and constantly controlling the aspects of the timeline plans to reality, the schedules to the actuals and at the same time motivate the employees. The major constraint with most matrix organisation is that as teams are formed from deferent departments and that puts more pressure on them as they have their other obligations to fulfil as well as the project administration to add on that. Project managers need the support of the management and team to be effective. They have the pressure to please management and on the other hand the pressure to motivate their team to be effective and deliver the project.

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Source: Project Management Triangle - Time, Cost and Quality - Iron Triangle
https://www.stakeholdermap.com/project-management/project-triangle.html

FACULTY OF BUSINESS: CAPE TOWN CAMPUS (FT)

M-TECH BUSINESS ADMINISTRATION IN PROJECT MANAGEMENT:

Dear Respondent

This questionnaire is an academic exercise investigating **the Impact of Scope Change on the Iron Triangle and the Effectiveness of a Project Manager**. Please respond to ALL the questions by putting an X in the respective boxes [numbers] corresponding to each statement. Use the following scale: 1= Strongly Disagree, 2 = Disagree, 3=Indifferent, 4= Agree and 5= Strongly Agree.

Please take note of the instructions given per section on the questionnaire

This is purely an academic exercise, do not write your name or that of your firm. No information will be passed on to any authorities, you are safe and protected.

NB: All information gathered will be held with highest privacy and confidentiality as it is for academic purpose only. No information will be passed on to any authorities

Name of Researcher: Docus Nyasha Zenda

Student Number: 210258411

Institution: Cape Peninsula University of Technology

Your co-operation will be highly appreciated.

QUESTIONNAIRE

Section A: Please tick box to answer.

SECTION A: BIOGRAPHY

1. **What is your position in the organisation? Please use box below for your response.**

PROJECT MANAGER	FINANCE MANAGER	TEAM MEMBER	Other

2. **If other, please specify ………………………………………………………………………………………………**
How long have you been a project manager or involved directly with project management?

0-5 years	6-10 years	11 – 16 years	16 years plus

3. **Who does the planning [operational] for your project execution?**

I get complete plan	I plan with the team	I plan on my own	Other

4. **If other, please specify**
   …….

5. **How many times did you get involved in scope change management during your life in project management?**

Never been	<5 times less than 5 x	6-10 times	11 times plus

6. **What was your role in the instances when you got involved in scope changes?**

Deciding and what to change	The planning of execution	Interpreting the new plan	Other

7. **If other, please specify your responsibilities in the space provided.**
……

……..

8. **Mention below anything you may find to be important for this study in regards to the above.**

   a. ……….

   b. ……….

   c. ……….

   d. ……….

   e. ……….

SECTION B

SECTION B: Please respond to the questions below using the Likert scale provided, the scale should be understood / interpreted thus; 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

	The Impact of Scope Change on the Iron Triangle and the Effectiveness of a Project Manager.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	DECIDING ON A SCOPE CHANGE PROCESS					
1	Project manager's effectiveness is tested when there is a scope change	1	2	3	4	5
2	The project manager's planning skills are called to account because of the changes	1	2	3	4	5
3	Project manager's ability to work out the cost-benefit analysis is called to account	1	2	3	4	5
4	The project manager's ability to understand the scope change document is called to account	1	2	3	4	5
5	The project manager's ability to manage the process of scope change is critical	1	2	3	4	5
6	The project manager's understanding of effective processes to be used is critical for effective scope change	1	2	3	4	5
	CLASSIFYING THE TYPE OF CHANGE	1	2	3	4	5
7	I need to judge correctly the impact of the change to the project benefits and deliverables.	1	2	3	4	5
8	Scope changes during planning phase have no impact on the time sat for the project	1	2	3	4	5
9	Scope changes during project implantation may consume more resources depended on the size of the change	1	2	3	4	5
10	The complexity of the project and size of scope change may affect the way the project manager would work	1	2	3	4	5
11	The more complex and the larger the greater the need for competent project management	1	2	3	4	5
12	If the change is outside of the scope of the manager expertise may be needed	1	2	3	4	5
13	To the extent there is need for external consultancy the manager losses the control	1	2	3	4	5
	COMMUNICATING SCOPE CHANGE; TO BE EFFECTIVE	1	2	3	4	5
14	As project I need to communicate scope change to all stakeholders	1	2	3	4	5
15	It may take time for stakeholders to buy in to the scope change	1	2	3	4	5

	The Impact of Scope Change on the Iron Triangle and the Effectiveness of a Project Manager.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
16	Much time may be lost in communicating the scope change	1	2	3	4	5
17	Failure of stakeholders to understand the change affects my effectiveness	1	2	3	4	5
18	The more complex the project and the scope change the more difficult it is to communicate.	1	2	3	4	5
19	I am only as effective as I will be able to convince stakeholders to accept the proposed changes	1	2	3	4	5
20	Communicating the proposed changes is not a guarantee that the sponsor will accept	1	2	3	4	5
	SCOPE CHANGE IS TEAM WORK					
21	Effecting the change depends on the relationship between me and the team	1	2	3	4	5
22	I have enough power to move the changes without consulting the team for permission.	1	2	3	4	5
23	As long as senior management has agreed, team cooperation is guaranteed for all purposes	1	2	3	4	5
24	My effectiveness is measured against my ability to mobilize support from my team members	1	2	3	4	5
25	Team members are allowed to contribute or give suggestions on how to implement the changes	1	2	3	4	5
26	Dependent on the new scope the team members help decide on new resources as well as the time, quality and cost.	1	2	3	4	5
	FACTORS THAT AFFECT THE IRON TRIANGLE					
27	Scope change will result in the change of the time, quality and cost requirements	1	2	3	4	5
28	Depending on the type of change to the scope, the iron triangle may never be affected	1	2	3	4	5
29	Regardless of the type of change to the scope there will always be a change to the iron triangle	1	2	3	4	5
30	Depending on the type of change to the scope it may actually take less time, less cost and same quality	1	2	3	4	5
31	The iron triangle is a function of the relationship between the triangle, the scope and the tasks to be performed	1	2	3	4	5
32	My challenge is therefore the ability to integrate these and draw a balance between them	1	2	3	4	5

	The Impact of Scope Change on the Iron Triangle and the Effectiveness of a Project Manager.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
33	The correct determinant of when there is reduction of increase is the nature of the scope change	1	2	3	4	5
34	Scope change may take place without alterations to the stipulated the iron triangle	1	2	3	4	5
35	What is critical is my ability as a manager to manage the change and keep the people together	1	2	3	4	5

SECTION C

OPEN ENDED QUESTIONS

1. **Are there any particular problems you would want to discuss as a project manager / team member as they relate to project scope change, please discuss in point form in the sections that follow.**

a. **What are the traditional difficulties you come across during scope change?**

- ………
- ………
- ………
- ………

b. **List below the 4 most effective ways of handling scope change from your experience in the project management arena.**

- ………
- ………
- ……
- ………

2. **What are the 4 most common mistakes made by project managers / team members during project scope change management**

- ………

- ……

- ……

- ……

3.   **Finally what suggestions/recommendations can you give in relation to how scope change in the organisation can be handled and explain why.**

- ……

- ……

- ……

- ……

THANK YOU FOR THE COOPERATION