

**A STUDY TO INVESTIGATE INTO THE APPLICATION OF RESOURCE
PLANNING TECHNIQUES BY SMALL AND MEDIUM SIZED
CONTRACTORS IN UGANDA.**

**A FINAL YEAR PROJECT REPORT SUBMITTED TO KAMPALA
INTERNATIONAL UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF A BACHELOR'S DEGREE OF
SCIENCE IN CIVIL ENGINEERING**

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SEPTEMBER 2019

DECLARATION

I declare that the information contained herein is to best of my Knowledge true in reference to the nine months I undertook in designing the project. Hence no part of this report unless or otherwise referenced has been presented to this school or any other institution for the same or related cause.

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APPROVAL

I humbly declare that this final year project Report has been prepared under my supervision.

Supervisor's name

Signature.....

Date.....

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

UNABCEC	Uganda National Association of Building and Civil Engineering Contractors
LCI	Local Construction Industry
LCC	Local Construction Company
SMC	Small and Medium sized Contractors
UACE	Uganda Association of Consulting Engineers
LSCF	Large Scale Construction Firm
GDP	Gross Domestic Product
UK	United Kingdom
USA	United States of America
PERT	Program Evaluation Review Technique
CPA	Critical Path Analysis
WBS	Work Breakdown Structure
PERT	Program Evaluation Review Technique
CPA	Critical Path Analysis
PM	Project Management
RH	Resource Histogram
G & M	Gates & Milestones
PID	Project Initiation Document
PPD	Project Planning Document
PMT	Project Management Technique
RII	Relative Importance Index
MSR	Mean Score Ranking
URSB	Uganda Registration Services Bureau

CHAPTER ONE: INTRODUCTION

1.1 Background

Uganda has got many Small and Medium Sized Contractors (SMSC) engaged in the construction business. Some of these (SMSC) change business name and scope within a short time because of the competitiveness pressures within the construction industry. Little is achieved by these struggling SMSC due to the level of development of the local construction industry (LCI). Recent studies show that the Local Construction Industry is not very competitive, undeveloped and faced with many problems. These problems range from lack of innovative management and technical capacity to lack of access to credit facilities and work altogether (Uganda Association of Consulting Engineers (UACE, 2008). This business environment poses a great challenge to the young Local Contracting Companies who may wish to become competitive by improving on their performance. The end result of such struggle is likely to be transferred to the Local Construction Industry thus rendering the LCI ill-equipped to take on large construction projects. What the Local Construction Industry continues to witness is total surrender of large construction projects to international construction contractors and consultants rather than to progressively build the local capacity in the construction industry. Factors that bring about changes in growth, competition, improved performance are closely linked to the organizational competitiveness which closely correlates to the composition and practice of the construction industry (Li-yin et al, 2007). If the industry is composed of uncompetitive players, the quest for growth, improvement in performance at the national level becomes a dream. The concept of competitiveness can be integrated into management, economic and operation research when all aspects of performance are embraced. Lu and Alum (2007) link competitiveness to management or economic idea that is superior to the traditional economic indicators such as profitability, productivity or market share, which are seen as being insufficient to enable continuous improvement of performance. The competitiveness of Small and Medium Sized Contractors (SMSC) in Uganda, especially those belonging to the Uganda Registration

Services Bureau (URSB), the umbrella that registers all construction contractors, formed the core of this study.

1.2 Problem statement

According to the Association of Building and Civil Engineering Contractors (UNABCEC), many construction projects are started in Uganda but indications are that some construction projects go through very difficult operations subsequently resulting into retarded progress, low productivity and failure (UNABCEC annual report of 2016).

However though very little work has been done about the application of resource planning techniques by small and medium sized contractors on site performance in Uganda.

Thus, the study seeks to investigate into the application of resource planning techniques employed on construction projects executed by small and medium sized contractors in Uganda.

1.3 Objectives of the study

1.3.1 The main objective

The study is aimed at investigating into the application of the resource planning techniques by small and medium sized contractors in Uganda.

1.3.2 Specific objectives

- To identify resource planning techniques most frequently adopted by small and medium sized contractors in Uganda.
- To identify the benefits of resource Planning Techniques in Project Success.
- To identify the challenges associated with adoption of the planning techniques by small and medium sized contractors in Uganda.
- To identify strategies to enhance the application of resource planning techniques by small and medium sized contractors in Uganda.

1.4 Justification

The available research on the application of resource planning techniques employed on construction projects has focused on large Contractors. The few publications on small and medium sized construction firms however mainly focus on organization in developed countries. This research focuses on small and medium sized construction organizations in a developing country using Uganda as a case study. The findings of this research will contribute to knowledge in resource planning and aid project management practitioners, researchers and investors in future proposals and selection of resource planning techniques for project management. The choice of Small to medium size class in the construction firms is due to their growing and Strategic role in the economy of developing countries like Uganda.

1.5 Scope of study

Small and medium sized Contractors within Kampala district were the main focus of the study. This area was decided upon because most of the construction firms are saturated within Kampala. These classes of contractors were chosen on the basis that they constitute the majority of construction companies in the country.

The study covers all the small and medium sized contractors based in Kampala and operating in Uganda, who are in good standing with the Uganda Registration Services Bureau (URSB). This was to enable the research to be conducted with qualified and functional firms in Uganda. All the classes of contractors were selected based on the fact that, these classes will cover a cross section of the various scales of projects executed in Uganda, thus provide relevant data needed for this study.

1.5.1 Geographical scope

Uganda is located in Eastern Africa, West of Kenya, South of South Sudan, East of the Democratic Republic of the Congo, and North of Rwanda and Tanzania. It is in the heart of the Great Lakes region, and is surrounded by three of them, Lake Edward, Lake Albert, and Lake Victoria. While much of its border is lakeshore, Uganda is landlocked with no access to the sea.

Uganda is located on latitude and longitude $1^{\circ} 00' N$ and $32^{\circ} 00' E$ respectively. The republic of Uganda covers a total area of 236,040 sq. km. Uganda's capital, **Kampala**, covers the **latitude and longitude** denominations of $0^{\circ}19' N$ and $32^{\circ}25' E$ respectively.



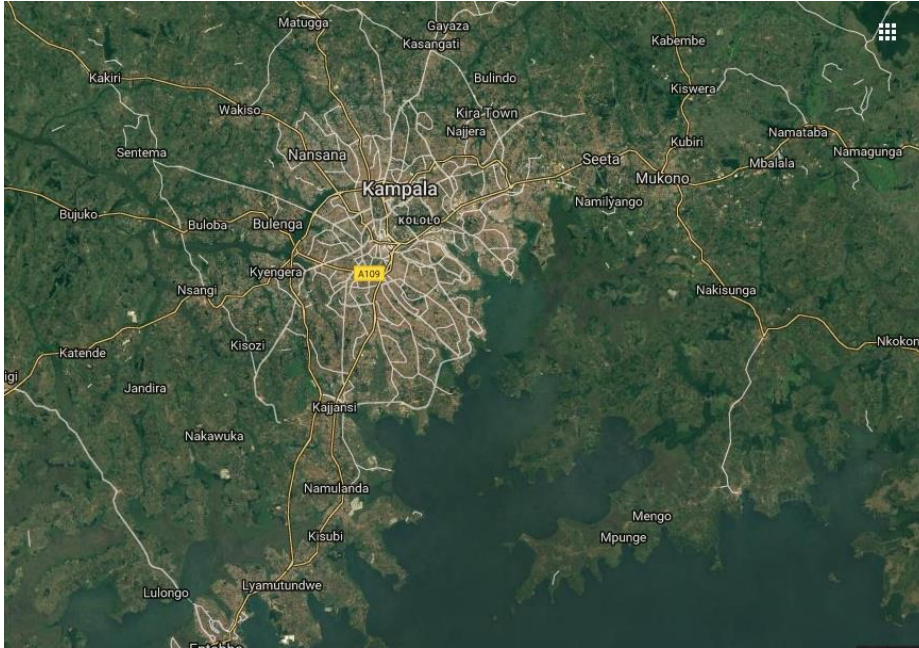


Figure 1.1: A map of the Republic of Uganda and Kampala (Source: Fact Monster Atlas, Google earth)

1.5.2 Time scope

The project was started in early September 2018 and ended in May 2019. Therefore, the project took 9 (nine) months until completion.

1.6 Significance

The issue of poor project performance in construction projects has been a long standing issue in the Uganda Construction Industry. This study seeks to:

- i. Identify critical factors in the whole construction process which lead to major project blockades and poor performance. This would thus inform stakeholders in the Uganda Construction Industry to pay particular attention to those factors when venturing into a construction contract with any party.
- ii. The knowledge gathered from this study would go a long way to help curb the canker of poor construction project performance which seems to be settling as an undisputed 'norm' in the Ugandan Construction Industry.
- iii. The outcome of this study would provide essential recommendations to stakeholders in the Ugandan Construction Industry in the construction and local

government sector, which would be driven at directives aimed at removing from the root-cause the causes of poor project performance on construction projects.

- iv. It would also enable key project stakeholders in the country to identify at early stages signs or indications that would suggest that the project is digressing from performance indicators.

CHAPTER TWO

2.0 Literature review

According to Abbas (2006), late completion of works as compared to the planned schedule or contract schedule is what is known as delay. Delay occurs when the progress of a contract falls behind its scheduled program. It may be caused by any party to the contract and may be a direct result of one or more circumstances. A contract delay has adverse effects on both the owner and contractor (either in the form of lost revenues or extra expenses) and it often raises the contentious issue of delay responsibility, which may result in conflicts that frequently reach the courts. A cost overrun occurs when the final cost of the project exceeds the original estimates (Azhar & Farouqi, 2008).

There is a relationship between schedule, the scope of work and project conditions. Changes to any one or more of these three can affect the compensation level and time of completion. It has been argued that it is necessary to create awareness of causes of project schedule delays, their frequency, and the extent to which they adversely affect project delivery (Al-Khalil & Al-Gafly, 1999). Kaliba et al. (2009) concluded from their study that the major causes of delay in road construction projects in Zambia were delayed payments, financial deficiencies on the part of the client or contractor, contract modification, economic problems, material procurement, changes in design drawings, staffing problems, equipment unavailability, poor supervision, construction mistakes, poor coordination on site, changes in specifications, labour disputes, and strikes. Agaba (2009) attributes delays in construction projects to poor designs and specifications, and problems associated with management and supervision. In their study, El-Razek et al., (2008) found that delayed payments, coordination difficulty, and poor communication were important causes of delay in Egypt. Sambasivan and Soon (2007) established poor planning, poor site management, inadequate supervisory skills of the contractor, delayed payments, material shortage, labor supply, equipment availability and failure, poor communication and rework, were the most important causes of delays in the Malaysian Construction Industry. Kouskili and Kartan (2004) identified the main factors

affecting cost and time overrun as inadequate/inefficient equipment, tools and plant, unreliable sources of materials on the local market, and site accidents. Le-Hoai et al., (2008) ranked the three top causes of cost overruns in Vietnam as material cost increase due to inflation, inaccurate quantity take - off, and labour cost increase due to environment restriction. Kaliba, et al (2009) conclude that cost escalation of construction projects in Zambia are caused by factors such as inclement weather, scope changes, environment protection and mitigation costs, schedule delay, strikes, technical challenges and inflation.

Bubshait and Al-Juwait (2002) listed the following as factors that causes cost overrun on construction projects in Saudi Arabia: effects of weather, number of projects going on at the same time, social and cultural impacts, project location, lack of productivity standards in Saudi Arabia, level of competitors, supplier manipulation, economic stability, inadequate production of raw materials by the country, absence of construction cost data. It can therefore be deduced that the most important factors vary from one region to another.

In recent years, there have been numerous studies on the identification of influencing factors of project time and cost overruns worldwide. Mansfield et al (1994) carried out a questionnaire survey amongst 50 contractors, consultant and client organizations in Nigeria and found out that the most important variables causing construction delays and cost overruns are poor contract management, financing and payment of completed works, changes in site conditions, shortage of materials, imported materials and plant items, design changes, subcontractors and nominated suppliers. While the top variables causing only cost overruns were revealed as price fluctuation, inaccurate estimates, delays, additional work. Kaming et al (1997) identified factors influencing construction time and cost overruns on high-rise building projects in Indonesia through a questionnaire survey administered on 31 project managers. A total of 11 variables (design changes, poor labour productivity, inadequate planning, material shortages, inaccuracy of material estimate, skilled labour shortage etc) were identified for time overrun and seven (materials cost increased by inflation, inaccurate quantity take-off,

lack of experience of project location, lack of experience of project type etc.) for cost overrun. Kumaraswamy and Chan (1998) conducted a more extensive study in Hong Kong using 400 questionnaires after which follow up interviews were held. The study revealed the top ten causes of construction delays from the contractors' point of view as delays in design information, long waiting time for approval of drawings, poor site management and supervision, mistakes and discrepancies in design documents, etc. Similar survey studies were reported by Frimpong et al (2003) in Ghana and by Assaf and Al-Hejji (2006) in Saudi Arabia. In addition to questionnaire surveys, other researchers adopted a case study approach. Al-Momani (2000) examined 130 public projects in Jordan and concluded that the main causes of delays include changes initiated by designers, client requirement, weather, site conditions, late deliveries, economic conditions, etc. Hsieh et al (2004) conducted a statistical analysis in 90 metropolitan public work projects in Taiwan and identified problems in planning and design as main causes of change orders. Yogeswaran et al (1998) scrutinised 67 civil engineering projects in Hong Kong and suggested that at least a 15-20% time overrun was due to inclement weather. Based on analysis of 46 completed building projects in the UK, Akinsola et al (1997) identified and quantitatively examined factors influencing the magnitude and frequency of variations in building projects.

2.1 Productivity and performance

Studies carried out on the UK and USA construction industry, revealed that high performance took into consideration the following aspects:

- (i) Complete self-contained pieces of work where possible. The activities should be
- (ii) Independent of each other and also be completely self-contained units of work, which make a complete contribution to the total growth of building works.
- (iii) Sizes of work volume to achieve consistency and high rates of production. The volume of work in each activity must be of size that will permit maximum utilization of the resources.
- (iv) Parallel activity working whereby designs should be identified to allow for more than one activity to be carried out at the same time.

2.1.1 Characteristics of Small Scale Construction Firms

According to Joseph S Lutwama, Senior Research Officer, Capital Markets Authority, small and medium sized companies or firms are mostly those companies with 5- 19 and 20-99 contractual employees respectively.

Table 1; showing how firms are classified. (source: Small & Medium Enterprises (SMEs) Financing in Uganda, By Joseph S Lutwama, Senior Research Officer, Capital Markets Authority)

Source	Definition	
World Bank since 1976	Firms with fixed assets (excluding land) less than US\$ 250,000 in value is a small scale enterprise	
Grindle et al (1989:9-10)	Small-scale enterprises are firms with less than or equal to 25 permanent members and with fixed assets (excluding land) worth up to US\$ 50,000.	
USAID in the 1990s	Firms with less than 50 employees and at least half the Output is sold.	
UNIDO's Definition for Developing Countries	Large :	firms with 100+ workers
	Medium :	firms with 20 - 99 workers
	Small :	firms with 5 - 19 workers
	Micro :	firms with < 5 workers
UNIDO's Definition for Industrialized Countries:	Large :	firms with 500+ workers
	Medium :	firms with 100 – 499 workers
	Small :	firms with ≤ 99 workers

2.2 Resource planning techniques

Planning is a comprehensive activity undertaken by management of organizations whether Small Scale Construction firms or Large since it accommodates the activities from the inception of the project to the commissioning of the project. Key activities concluded on at the planning stage of the project includes technological basis for the projects, scheduling of the project, controlling, monitoring and evaluating systems.

Kerzner (2009) outlined some of the functions of planning in perspective of construction projects as follows:

- (i) The identification of functional responsibility to ensure accountability of all activities
- (ii) The identification of milestones and deadlines on the project
- (iii) Evaluating the progress of work accomplished as against planned duration of work
- (iv) Assessing risks inherent in the project at an early stage
- (v) Estimating on project to ensure its credibility.

The resource planning techniques which are normally used are the; Program Evaluation Review Technique (PERT), Gantt Charts, Work Breakdown Structure (WBS), Cost Breakdown Structure (CBS), Critical Path Analysis (CPA), Resource Histogram (RH), Gates and milestones (G&M) and Reports

Program Evaluation Review Technique (PERT) – it is designed to define and control all the necessary tasks required for enabling of the successful completion of the project; this makes it an effective and efficient planning tool (PMT, 2002). The following has been outlined as the steps for PERT planning:

- The proper or logical sequence of all identified activities is determined
- A network showing the overall activities are shown in a network diagram
- Duration for each activity are estimated
- The progress of the project is then updated on the PERT chart regularly

PERT aids in identifying interrelationship between different tasks or activities; it is also used as a good communication and planning tool for time management (PMT, 2002).

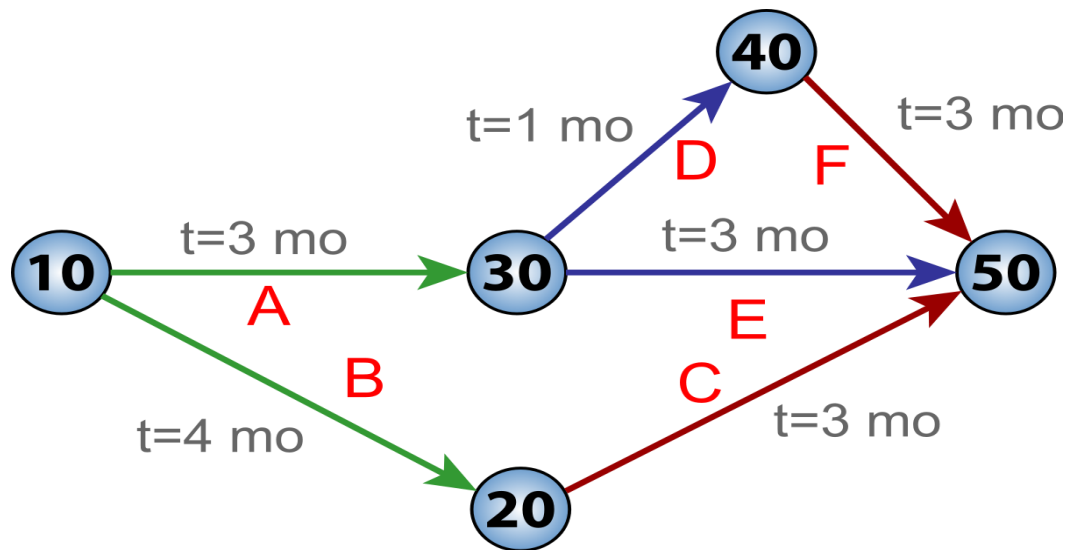


Figure 2: PERT network chart for a seven-month project with five milestones (10 through 50) and six activities (A through F). (Source: From Wikipedia, the free encyclopedia)

Gantt charts – it is the presentation of horizontal bars to show activities involved in a project. Each bar represents an activity and the performance of the project can be estimated as well as the progress of the work. All activities on the chart can show the overall process of the project, helps in allocating resources to the various activities, track project estimates and can help in the coordination of the project. In simple terms, it represents the time table for the projects which can help management to monitor the progress of the project (PMT, 2002). It is very easy and simple to understand which does not need any expertise to interpret its meaning.

	Wk. 1	Wk. 2	Wk. 3	Wk. 4	Wk. 5	Wk. 6	Wk. 7	Wk. 8	Wk. 9	Wk. 10	Wk. 11	Wk. 12
EXCAVATION												
Utility Clearance												
Surface Scraping												
Major Excavation												
Periodic Surveying												
Shoring (none expected)												
FOUNDATION												
Place Forms												
Tie Rebar												
Inspection												
Pour Concrete												
Test Concrete												
STEEL WORK												
Check Anchor Locations												
Complete First Level												
Complete Second Level												
Complete Roof Trusses												
Inspection												

Figure 3: A gantt chart (source: Ukashturk Construction Project Management Gantt Chart Scheduling Sof)

Critical Path Analysis (CPA) – The essential technique for using CPA is to construct a model of the project that includes the following:

- A list of all activities required to complete the project
- The time (duration) that each activity will take to completion
- The dependencies between the activities

Using this information, CPA calculates:

- The longest path of planned activities to the end of the project

- The earliest and latest that each activity can start and finish without making the project longer

This process determines which activities are "critical" (i.e., on the longest path) and which have "total float" (i.e. can be delayed without making the project longer).

In project management, a critical path is:

The sequence of project activities which add up to the longest overall duration

The critical path determines the shortest time possible to complete the project.

Any delay of an activity on the critical path directly impacts the planned project completion date (i.e. there is no float on the critical path).

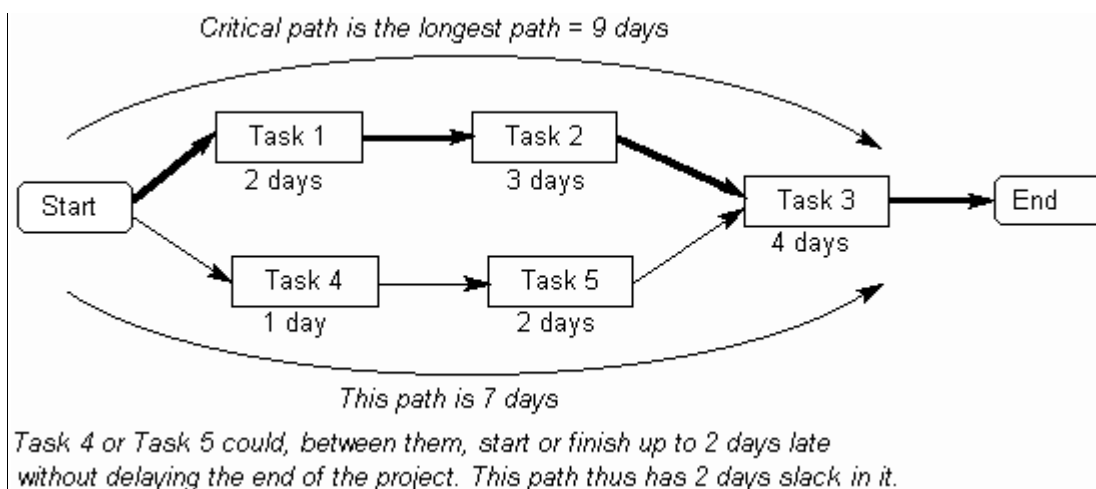


Figure 4: Critical path (source: Ukashturk Construction Project Management Gantt Chart Scheduling Sof)

WBS – A work breakdown structure (WBS) is a chart in which the critical work elements, called tasks, of a project are illustrated to portray their relationships to each other and to the project as a whole. The graphical nature of the WBS can help a project

manager predict outcomes based on various scenarios, which can ensure that optimum decisions are made about whether or not to adopt suggested procedures or changes.

Work breakdown structure helps;

- To define, organize and manage the project
- Improve the efficiency of the project
- Helps to estimate the resources required such as; time, cost, staff etc.
- Easy allocation of resources based on the importance of the task/sub task.

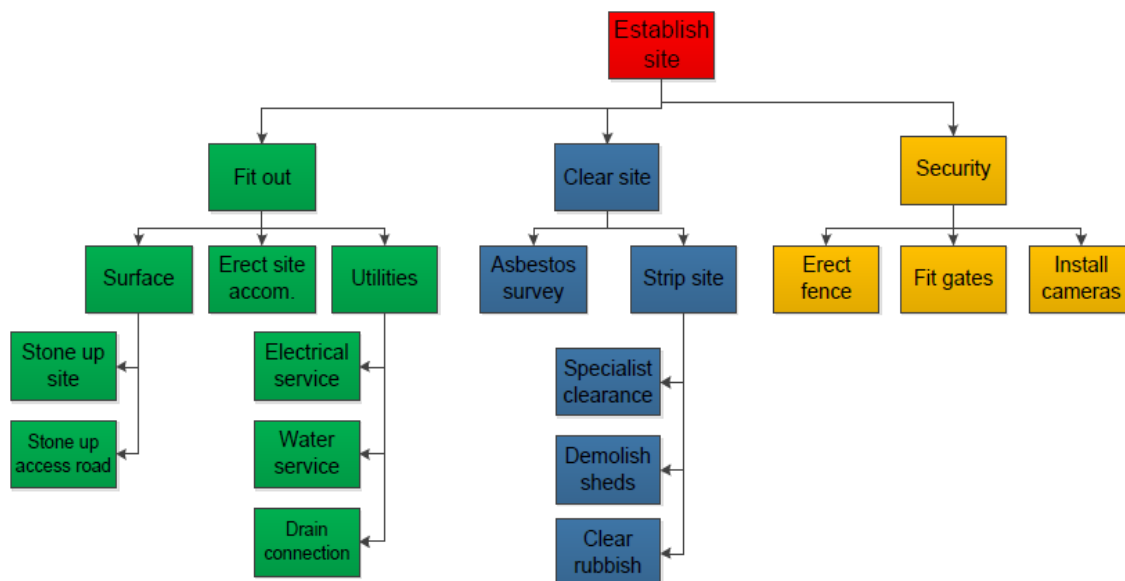


Figure 5: An illustration of a Work Breakdown Structure (WBS), (source: Stakeholder Analysis, Project Management, templates and advice, stackholdermap.com)

CBS – Cost Breakdown Structure (CBS) is a cost allocation to the lowest level of the Work Breakdown Structure (WBS). The CBS is a breakdown of the costs of the various components of the structure including all works or services done by the subcontractors. The CBS is used to continuously compare the actual costs with the budget, and integrate to the cost control system. The structure can be used as a basis of financial 'exception reporting' e.g. actual budget cost allowances, and also forecast more accurately the project costs.

Construction Cost Breakdown

Loan Number _____ Job Address _____
 Owner _____
 Builder _____ Lip Amount _____

Cost Items	Description	Budget	Pre-Paid	Net
GENERAL CONDITIONS				
1	Engineering & Survey			-
2	Excavation & Grading			-
3	Plans/Blueprints			-
4	Permits			-
5	Soil Testing			-
6	Temporary Facilities			-
7	Temporary Utilities			-
8	Water Meter			-
9	School Fee			-
10				-
OFFSITE WORK				
11	Civil			-
12	Geology			-
13	Blasting			-
14	Compaction			-
15	Sewer			-
16	Backfill-Sand			-
17	Water Mains			-
18	Utilities			-
19	Electric/Phone			-
20	Paving			-
20.1	Concrete			-
20.2	Asphalt			-
21	Curb & Gutter			-
22	Driveway Apron			-
23	Side walk			-
24	Sub drains			-
25	Slope & Erosion Control			-
26	Fencing			-
27	Equipment Rental			-
28	Fire Hydrants			-
29	Street Lights			-
30	Misc. Labor			-
31				-
32				-

Figure 6: A sample cost breakdown structure (source: Construction Cost Estimating, Global Associates, Canal Street, Kolkata, India)

5. **Resource histogram** – the resource histogram is specifically a bar chart that is used for the purposes of displaying the specific amounts of time that a particular resource is scheduled to be worked on over a predetermined and specific time period.

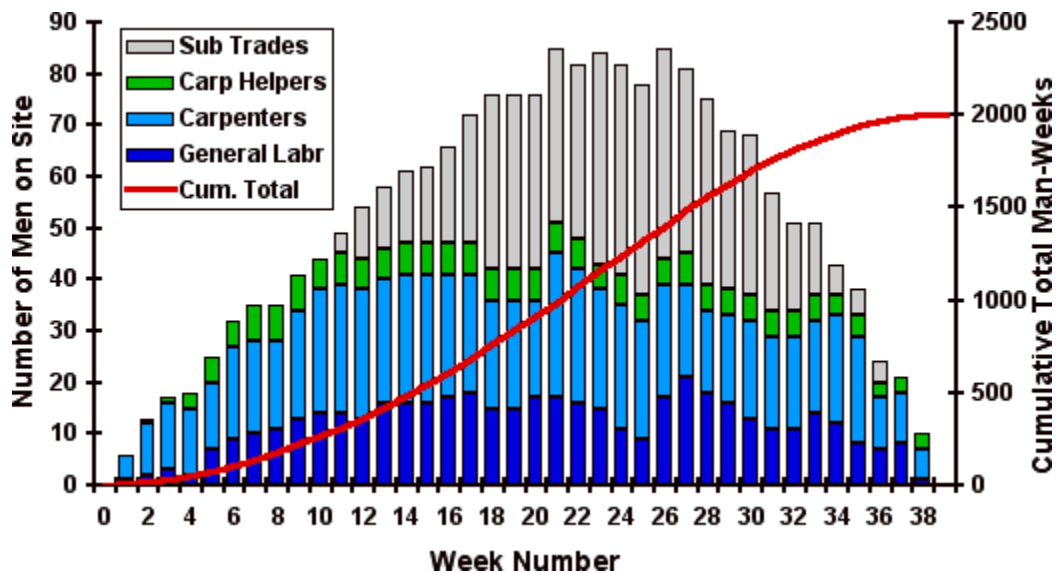


Figure 7: A sample resource histogram (Source: Canadian Journal of Civil Engineering, Vol. 21, 1994 pp 939-953, under the title "A Pragmatic Approach to Using Resource Loading, Production and Learning Curves on Construction Projects")

6. **Gates and milestones** – milestones are a completion of major interim goals for a project e.g. the key stages of a project from initiation to closure. Gates on the other hand are significant events or major objectives that have been accomplished at various stages of a project. They assess the key completion or quality of work achieved (Acorn, 2012). Gates are smaller milestones, but well defined into the project management process, a firm deliverable that can be realized and achieved.

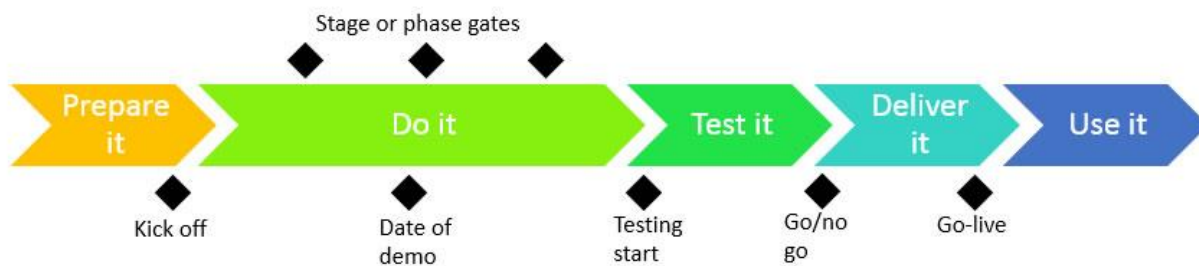


Figure 8: Showing the sequence of gates and milestones. (Source: Project Management and project planning; Stakeholdermap.com)

7. **Reports** – under this tool, there are three (3) different tools. **Project initiation document (PID)** is a report use for justifying a business case for a project, detailing the justification for undertaking it and for continuation of it. PID is used to define the financial and other benefits which the project is expected to deliver. It details the cost, timescale and other constraints within which the project is required to operate and against which performance will be evaluated (PMT, 2002). **Project planning document (PPD)** will normally consist of a project technical and resource plan at the beginning of a project and used as a reference tool throughout the project. **Progress (or exception reports)** on the other hand is used to monitor and control the project; it allows the project board or project manager to identify cost, scheduling or quality related problems earlier, and view the current status of progress.

8. Network Analysis

According to Neale and Neale (1994), network analysis is a powerful, logical and analytical technique that is most effective when used for complicated projects, especially those with external constraints and complex interrelationships. It is based on drawing the logical relationships between construction operations, and establishing which operations have the most crucial effects on the project duration.

2.2.1 The benefits of resource Planning Techniques in Project Success

As in the development of appropriate alternative techniques for facility design, choices of these techniques for construction are ill-structured yet they are very key ingredients in the success of a project. A decision between the different alternatives should take into consideration the relative costs, reliabilities, and availability of equipment for the planning tools and its techniques. Listed below by the researcher are the roles of these techniques which are considered significant in the phases of construction project.

- **Easy Planning**

The project planning process takes a lot of time as you have to map-out all the important steps. Resource planning techniques provides you the ability to easily establish a hierarchy of tasks for effective and efficient completion. It also lets you indicate which steps are sequential and which tasks are dependent on one another. In

turn, this makes it easier for the team to do their work. This is a time saver, because when the team leader knows which steps are the most important, he/she then knows which tasks to assign to whom.

- **Efficient Task Management**

Every project out there consists of numerous tasks that you, or your team, must complete. Writing notes about what your team members are doing is sometimes impossible, especially when it comes to ongoing projects that take a lot of time to complete. This is where resource planning techniques are very useful: assign all of the important tasks to employees and monitor how they are performing. Project management becomes much easier as you have access to this data and can follow who has which tasks. Through better task management, teams work in unity. Hence, achieving incredible results and benefiting the company.

- **Seamless Team Workflow**

Getting the whole team to work as one is often very hard to achieve, but project management software can make it much easier. Using this software solution gives a team leader a chance to always be able to see the tasks that his team is working on and which team members are involved in the task.

Furthermore, there are tasks which require more people. This is where a team leader can include several different people to collectively work on bigger tasks – while other members do smaller tasks simultaneously. Creating a seamless workflow is something very important to attain as it contributes to a company's sustainable future, as well as creating cohesion within a team.

- **Shared Documents, Calendars and Contacts**

Consider that resource planning techniques are useful as they support storage and organization of a variety of documents. This is extremely important as a majority of

projects have a high number of documents. By creating a centralized document storage plan, every team member can easily, and more quickly, edit and contribute. This feature is very important in cases where the work is outsourced to a person or a team. It is much easier to perform all the necessary tasks without sending thousands of emails with attached documents where, sooner or later, things become convoluted.

As well, having access to calendars of other team members is convenient because sooner or later, a meeting between team members has to be organized. So, having access to people's calendar makes coordinating much easier. Make sure to share a document containing every team members' contact information. This ensures remote team members can communicate with one other.

- **Precise Project Tracking**

Tracking the time spent on every task is of great value. It allows you to collect data about team members, to know their work pace. This will make planning future projects much easier. The team leader can then make much more precise time estimations. For example, a team leader can give different types of tasks to team members throughout a project to determine their strengths. This creates better performance and faster results.

2.3 Barriers to the Application of Resource Planning Techniques in Construction by Small and medium Sized Construction Firms

Below are some barriers identified from Small Scale Construction Firms with regard to the implementation of management of construction related projects and the application of resource planning techniques towards the infrastructure delivery.

a) **Management problems** – Small Scale Construction firms are run by management, implying that management can contribute to the problems it is facing. For instance, poor leadership can hinder the use of planning tools in an organization, problems with financing the activities of the enterprise, interference by family and friends, politics at workplace and replacing organizational goals with personal ambitions. When an

organization is not flexible as a result of the due diligence to organizational structures, it prevents the organization from taking new initiatives which does not contribute to the growth of the organization (Ihesiene, 2014).

b) **Limited finance** – The major setback of most construction organizations are unavailability of resources like finance, this actually applies to all manner of firms whether Small Scale Construction Firms or Large. Construction planning tools are Software based, which are purchased however this software are very expensive which becomes difficult for Small Scale Construction firms to procure because of their challenges in finance (Ihesiene, 2014).

c) **Limited project management (PM) knowledge** – most of Small Scale Construction firms' problems are Project Management related. Though understanding the concept of project management is very essential and useful for the enterprise however, because Project Management is very bureaucratic nature, time and resource consuming it has become a burden on Small Scale Construction firms to spend all resources on the implementation of Project Management principles in the organization.

d) **Environmental problems** – Projects are placed within the internal and external environment. Most at times, the influence on the project from the external environment becomes difficult to control by the stakeholders of the project. These include the influence of government agencies on the project such as permit and approval from various regulatory bodies, enforcement agencies and employment of unskilled labour from hosting communities. (Ihesiene, 2014). Furthermore, culture has influence on the project, unpleasant weather conditions, religion and other social related issues.

e) **Corruption** – According to Ihesiene (2014), the projects environment is fraught with irregularities and fraud. In reality these problems are encountered during the awarding of contracts stage where bribery becomes the order.

Moreover, fraudulent act from materials suppliers and fraudulent acts by workforce becomes an obstacle to large scale contractors, how much more the small scale contractors. These challenges affect the contractor in terms of cost, time and delay.

f) **Labour mobility problems** –an important resource for construction firms is human resource. Though other resources are of utmost importance to the project however, the

exploitation of these resources requires the service of qualified personnel. Contractors of late are involved in concurrent project which requires redeployment of personnel to projects however it creates problems for the personnel and the project at large (Ihesiene, 2014). Large contractors with adequate personnel can adequately function without challenges however; small contractors' inability to afford adequate personnel leads to delay in project.

g) Innovation and lack awareness – The concept of project management has emerged over time in the construction industry however, its integration into organizational policies has become an issue because organizations are conversant with the conventional ways of executing projects.

h) Policy implementation, ideally governments in developing countries are struggling with employment opportunities for their graduates since they lack the capacity to employ them. Therefore, governments rely on private businesses to address employment challenges. Conversely, according to Ihesiene (2014), policies formulated by governments have impeded the growth of these organizations especially small scale ones. In other vein, small scale organizations are struggling to penetrate the job market however government policies on tax, interest and inflation has become a major barrier to them.

2.4 Strategies to Enhance the Application of Resource Planning Techniques.

The challenges and problems related to Small and medium sized Construction firms disposition to construction management including its techniques vary and thus require urgent multifaceted and strategic methods to counter the disadvantaging side and as well enhance its application of planning techniques in the delivery of construction projects. Since the presence of Small and medium sized Construction firms is known among the developing world, strategies have been proposed to help them master the management skills of planning on construction projects. Small and medium Sized Construction firms cannot be eliminated from the economic contributors of a country. The under listed strategies can be adapted by Small and medium Sized Construction firms in using the planning tools and techniques for its operations:

- (i) Resource planning techniques ranges from simpler forms to sophisticated forms however, the choice of a specific one is dependent on the scope of project and the caliber of organization involved. The survival of Small and medium sized Construction firms requires the support and contribution of government, therefore it behooves on government to encourage professional bodies or establish them through an Act of Parliament to help develop and equip construction Small Scale Construction firms or regulate management practices of them.
- (ii) Most governments have a ministries dedicated for infrastructure development. Government should therefore, adequately fund these ministries to mentor these Small Scale Construction firms to sharpen their skills from planning to the operation stage of projects. It is crucial for government because most infrastructure developments are procured by government. Alternatively, government can collaborate with professional bodies to organize training, seminars and workshop sections for the Small Scale Construction firms.
- (iii) The legal framework of sole proprietorship should be reviewed to separate ownership from management of the organization. Most Small and medium Sized Construction firms fall in the category of sole proprietorship and a major setback to their operations is finance. Owners are overburdened due to difficulty in accessing financial support from financial institution.
- (iv) Ministries responsible in overseeing the performance of private organizations in the country should provide clear guidelines articulating how Small and medium Sized Construction firms can implement their projects. Furthermore, Monitoring units within these ministries should ensure that these workable steps are followed by the Small and medium sized Construction firms.
- (v) The introduction of Project Management has revealed different shades of acclaimed project managers. A noble profession of such nature requires qualified and credible individuals; governments are therefore entreated to formulate laws which prevent uncertified project managers from acting as such on projects.

Alternatives, such roles should be occupied by graduates with the technical know-how in the Project Management discipline.

- (vi) Small and medium Sized Construction firms are deficient in project planning technique practices, therefore Small and medium sized Construction firms should collaborate with project managers for assistance in the implementation stage of their projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter looks into the procedures that were adapted in the realization of the aim of the study. Also this chapter stresses on the research design, research method, questionnaire design, and size, how data was collected and prepared for analysis.

3.1 Research design

The method adopted to achieve the objectives of the research was that of a qualitative and quantitative research method. This is because the research concept gathers different views of various respondents towards the application of the resource planning techniques by small and medium sized contractors in Uganda. This strategy was adapted because the research seeks to narrow the study to the application of resource planning techniques by Small and medium sized Contractors in Uganda. This research helped us to; identify the resource planning techniques most frequently adopted by small and medium sized contractors in Uganda, identify the benefits of resource planning techniques in a project success, identify the challenges associated with the adoption of these planning techniques and propose strategies that should be adopted by these organizations in order to improve their performance.

The study was limited to only Local Construction Companies, registered with Uganda Registration Services Bureau (URSB) and are engaged in formal construction works which include among others; infrastructure construction, construction of water and sewerage facilities and construction of buildings.

3.2 Data Sources

The data collected was from primary and secondary sources. The primary sources consisted of administration of a questionnaire and interviews with a few personnel based on an interview schedule.

The secondary sources consisted of publications, articles and other written documents available in libraries; relevant documents from government departments; the news media; and the Internet.

3.3 Sampling Population

The study population comprised a total of 114 small and medium sized contractors participating in the Ugandan construction industry. The study population refers to the total collection of elements which one would like to study or make inferences. The population aspect however refers to the individual participant or object on which the measurement is taken. It is the unit of study (Cooper and Schindler, 2011).

Sampling Design

Sampling refers to the process by which part of the population is selected and conclusions are drawn about the entire population (Cooper and Schindler, 2001). The quality of a study is often better with sampling than with a census. Sampling possesses the possibility of a better interviewing (testing), more thorough investigation of missing, wrong or suspicious information, better supervision and better processing than is possible with complete coverage” (Deming, 1990, p. 26).

3.4 Sample Size

This refers to the number of elements selected from a given population. How large a sample should be, is a function of the variation in the population parameters under study and the estimating precision needed by the researcher. Some of the principles which influence sample size comprise: the greater the dispersion or variance within the population, the larger the sample must be to provide estimation precision, the greater the desired precision of the estimate, the larger the sample must be, the narrower the interval range, the larger the sample must be, the higher the confidence level in the estimate, the larger the sample must be, the greater the number of subgroups of interest within a sample, the greater the sample size must be, as each sub group must meet minimum sample size requirements, and if the calculated sample size exceeds five

percent of the population, sample size may be reduced without sacrificing precision” (Cooper and Schindler, 2001, p. 172).

As stated by Saunders et al., (2012), given the manageable size of some populations it is possible to collect data from the entire population and that sampling is only done when it is practically impossible to study the entire population. Sampling was done on 114 Civil Engineering contractors located in Kampala. The sample identified was assigned with a questionnaire, meanwhile construction managers, project managers, site managers, quantity surveyors and engineers were the ultimate respondents for the study.

A confidence interval of 95% was adopted, and within an error of ± 0.05

Slovins' formula was used to calculate sample size as;

$$n = \frac{N}{1 + N(e)^2}$$

Where;

n is the sample size; N is the population size (114)

e is the level of precision obtained (0.05)

$$n = \frac{N}{1 + N(e)^2} = \frac{114}{1 + 114(0.05)^2} = 88.70 \approx 89 \text{ companies.}$$

3.5 Data Collection Instruments

Data collection instruments included a questionnaire which was used to gather responses quantitatively. The questionnaire was structured to contain questions that address the four variables; (1) Resource Planning Techniques, (2) Benefits of Resource Planning Techniques, (3) Challenging Factors and (4) Strategies Adopted.

A Questionnaire was developed to be simple and easy to understand and it consists of two main sections, Parts A and B. The Part A primarily focuses on the demographics of

the respondents and as such requested the background information of the respondents. Studies demonstrates the significance of demographic variables or background information, particularly in quantitative studies.

The Part B is anchored on the research objectives and as such is based on the literature review in regards to resource planning techniques most frequently adopted by Small and medium sized contractors in Uganda, the benefits of resource planning techniques to the project success, the challenges associated with the adoption of these planning tools and techniques by the Small and medium Sized Construction firms in the Ugandan construction industry and strategies to adopted by these organizations to improve their productivity.

Pilot Studies

Pilot studies were carried out to ensure the clarity and relevance of the questionnaire to the contractors. Based on their feedback, amendments were made to the questionnaire and the second phase of the pilot study was conducted studies only. At the same time there was need for feedback from a set of contractors of small and medium size in Uganda. Based on the feedback from the contractors, minor amendments were again made to the questionnaire to remove any ambiguities and discrepancies. This pilot study was conducted to validate and improve the questionnaire, in terms of its format and layout, the wording of statements and the overall content. The draft questionnaire was revised to include the suggestions of these participants. In short, the questionnaire was validated through this process and provided the research with improvement opportunities before launching the main survey on 89 building contractors who participated in the survey.

3.6 Reliability and Validity

Validity

A high degree of construct validity was ensured in this research by the extensive review of questionnaires and interview structure by our Supervisor as well as comparing and referring to the literature available in the area of study. To ensure the appropriateness of the research instrument, Content Validity Index was determined. Content Validity refers to the degree to which the test actually measures or is specifically related to the traits for which it was designed. The content validity index was established at 0.847 hence the study was reliable since the validity was above the recommended value of 0.75. This indicated that the research instruments were valid to measure what they intended to measure

Table 2: Content Validity Index

Item	Total number of items	Number of items considered relevant	Content Validity Ratio (CVR)
Resource Planning Tools and Techniques	16	14	0.875
Benefits	7	5	0.714
Challenges	10	8	0.800
Strategies	5	5	1.00
CVI Average			0.847

Source: Field Survey, 2019

Reliability

Reliability is the degree to which an assessment tool produces stable and consistent results. The researcher squared the correlation and subtracted from 1.00 to produce the index of measurement error. The test had reliability (correlation of the test) of 0.809, there was 0.346 error variance (random error) in the scores ($0.809 \times 0.809 = 0.654$, $1.00 - 0.654 = 0.346$). In this case the Alpha value was high at 0.654; hence

the study was reliable since it was above the recommended value of 0.5. The Cronbach Alpha test was used to show reliability and reveals the effect of measurement error on the observed score of all respondents. It was used to calculate the effect of measurement error on the observed score of an individual respondent using the standard error of measurement. Further, Cronbach Alpha shows the correlation of items testing the same concept. Using the Cronbach Alpha model, the study was reliable since the correlation value was above 0.5 alpha coefficients as recommended by Tavakol (2011) at 0.644. Cronbach Alpha ranges in value from 0 to 1 was used to describe the reliability of factors extracted from the study.

Table 3: Reliability.

Item	Squared Correlation	Random Error	Alpha Value
Resource Planning Tools and Techniques	$0.892 \times 0.892 = 0.796$	$1 - 0.796 = 0.204$	0.796
Benefits	$0.782 \times 0.782 = 0.612$	$1 - 0.612 = 0.388$	0.612
Challenges	$0.714 \times 0.714 = 0.510$	$1 - 0.510 = 0.490$	0.510
Strategies	$0.846 \times 0.846 = 0.716$	$1 - 0.716 = 0.284$	0.716
Average Value	$0.809 \times 0.809 = 0.654$	$1 - 0.654 = 0.346$	0.654

Source: Field Survey, 2019

3.7 Data processing and analysis

Raw data collected was first sorted, edited, coded and then entered into a computer spreadsheet. The data was then analyzed using Microsoft Excel (spreadsheet) and Microsoft Access (database) computer programs. The response rate for each item in the questionnaire and site observation schedule and the overall percentage of returns from the sample size were also determined. Appropriate graphical and tabular representations were obtained as well. The analyzed data was finally presented using descriptive methods for easy interpretation and to enable comparisons and inferences to be drawn. This was supplemented with qualitative data obtained in form of verbal

responses from interviews. Furthermore, the Relative Importance Index (RII) using the Microsoft Excel software was used to identify the importance of the challenges associated with the adoption of these planning tools and techniques by the Small Medium Sized Construction firms in the Ugandan construction industry. The Relative Importance Index determines the importance or significance of a factor in relation others measuring the same construct. The RII is calculated using the formula:

$$\text{Relative Importance Index (RII)} = \Sigma W / AN$$

Where, W = weights given to each factor by the respondents and ranges from 1 to 5, where '1' is very low and '5' is very high.

A = the highest weight (i.e. 5 in this study)

N = the total number of respondents

Mean Score Ranking (MSR) was also used to compare sample mean to the known population.

Sample Mean

The sample mean is the average score of a sample on a given variable and is represented by:

$$\bar{x} = (\Sigma x_i) / n$$

The term " $\bar{x}$ " represents the sample mean. The symbol ' Σx_i ' used in this formula represents the sum of all scores present in the sample (say, in this case) x_1 x_2 x_3 and so on. The symbol ' n ' represents the total number of individuals or observations in the sample.

Sample Standard Deviation

The statistic called sample standard deviation, is a measure of the spread (variability) of the scores in the sample on a given variable and is represented by:

$$s = \sqrt{ \sum (x_i - \bar{x})^2 / (n - 1) }$$

The term ' $\sum (x_i - \bar{x})^2$ ' represents the sum of the squared deviations of the scores from the sample mean. The symbol ' n ,' represents the total number of individuals or observations in the sample.

CHAPTER FOUR

4.1 Descriptive Analysis of Data

The demographic information part of the questionnaire is analyzed in this section of the study. Information regarding the professional background of respondents were sought, experience of respondents in their respective organizations as well as the construction industry at large. Apparently, the conclusion made on the later part of the source can be limited to the caliber of personnel involved in the study; this makes it very important to understand the professional make-up of the respondents.

Professional Background of the Respondent

Figure 9 shows the role of the respondents in the organization. Roughly, 10.11% were Quantity surveyors (N = 9), 28.09% were construction managers (N = 25), 31.46% were project managers (N = 28), 8.99% were civil engineers (N = 8), 21.35% were site managers (N = 19). The respondent position is vital to ensure some degree of reliability of the data. The high representation of project managers, contractors and site managers was inevitable as these professionals are very key and usually engage in the planning of construction activities. This makes them credible and reliable source of information which is needed for this study.

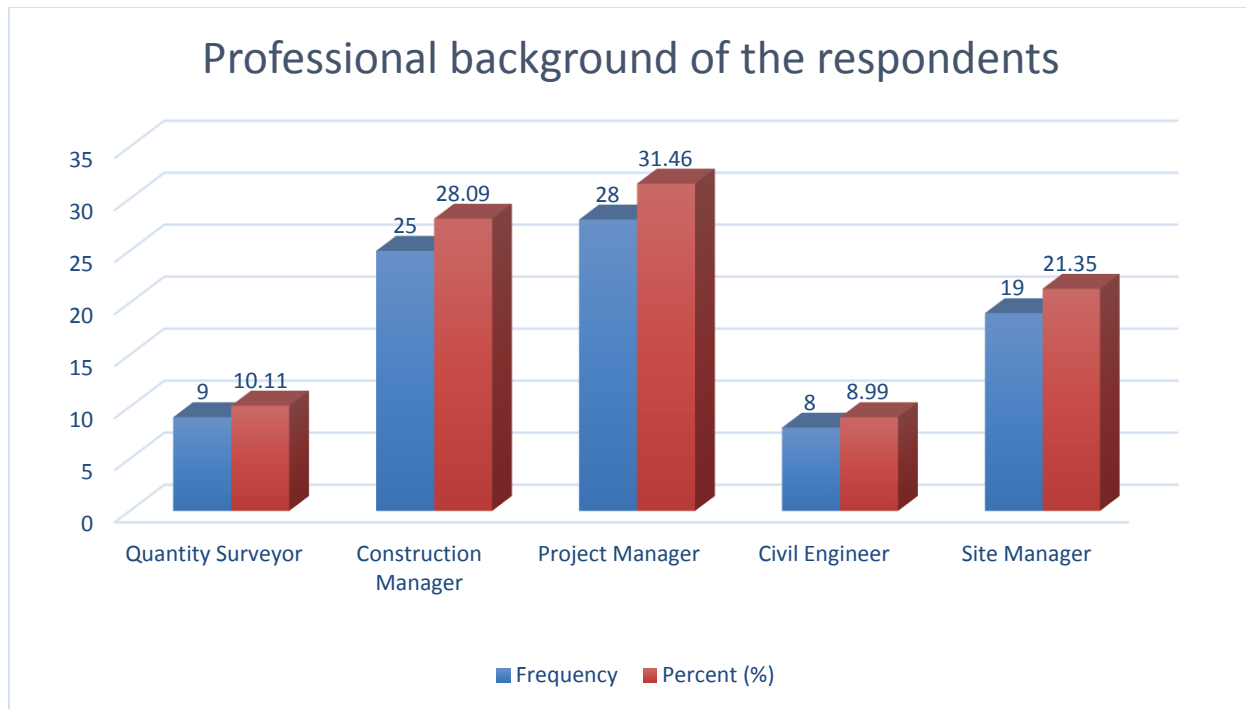


Figure 9: Professional background of the respondents

Source: Field Survey, 2019

4.1.1 Length of Experience of Respondents in their Sector

Respondents work experience is presented in table 3. Roughly, one-third of the respondents indicated they have been in the organization for between 6 to 10 years; representing 42.70%, a different group of approximately 21.35% have varied experience of 11 to 15 years in the organization. 22.47% of the respondents have worked for over 16 years and 13.48% have less than 5 years' work experience in the organization. Averagely, most of the respondents have been practicing within the last six (6) years in the construction industry, which is important to the study since it reveals the credibility and reliability of the results for the study. In a society where promotion and appointment to management of organizations are based on the years of experience an individual has had with the organizations, then all things being equal, the facts that many of the respondents in the contractors' organizations have spent an average of six (6) years suggest that the respondents have been involved in making decisions on planning of construction activities and construction management in general.

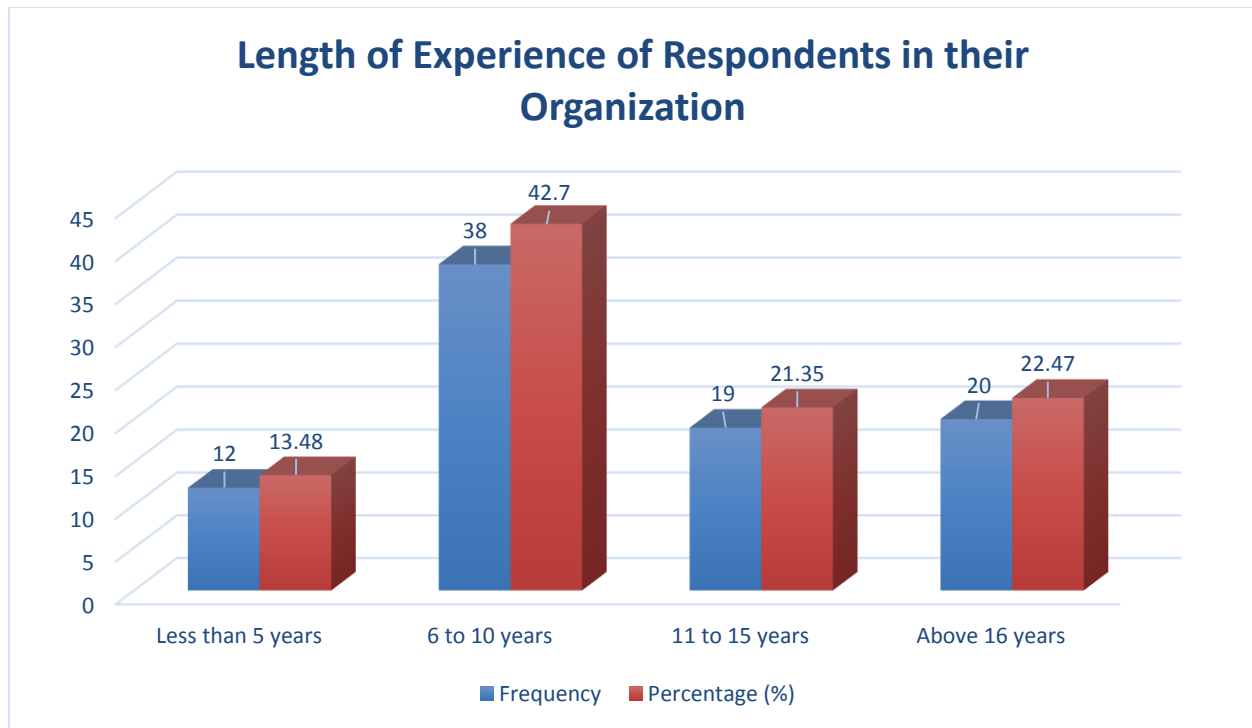


Figure 10: Length of Experience of Respondents in their Organization

Source: Field Survey, 2019

4.1.2 Length of Experience of Respondents in the Construction Industry

The experience of an individual in an organization cannot be directly proportional to the person's experience in an industry because there might be the probability of jumping jobs. It is based on that the study sought information on respondents' experience in the construction industry. Furthermore, this information will contribute to the study by getting quality information from respondents. From the table, bulk of the respondents have been in the construction industry for more than 11 years representing 78.65% ($N = 30+40$). Approximately, 11.24% and 10.11% indicated level of 6 to 10 years and Less than 5 years' experience in the construction industry. Consequently, it can be concluded that most of the respondents have experience in the construction industry and as a matter of fact, they are in the position to provide their in-depth experience on the subject of the study. Furthermore, the experience within the various categories is a tool in providing the study with varied views from respondents as far as the study is concerned.

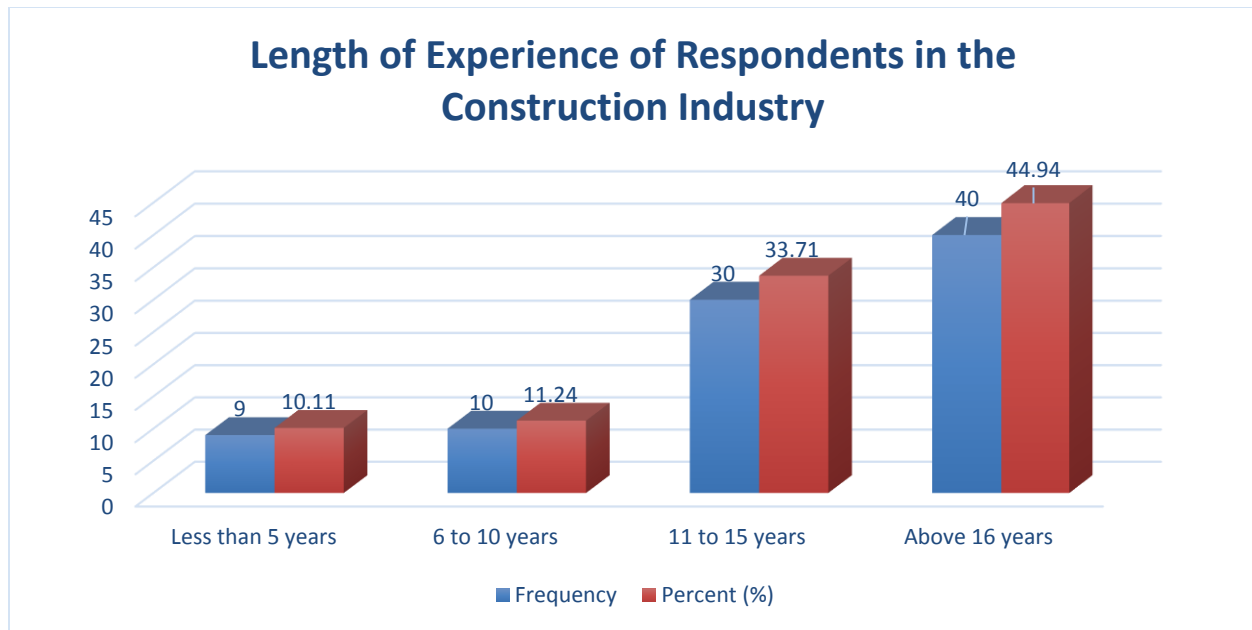


Figure 11: Length of Experience of Respondents in the Construction Industry

Source: Field Survey, 2019

4.1.3 Techniques for resource planning

Respondents were asked to identify the resource planning techniques that are widely recognized in their organization. From table 5, respondents indicated some level of awareness of all the planning tools and technique however, Work breakdown structure (WBS), Cost breakdown structure (CBS), Critical path analysis (CPA), Gantt Charts, PERT – Program Evaluation Review Technique, Network Analysis, and Training programmes were found to be the most famous resource planning techniques that are utilized in the construction industry. This clearly indicates that, the level of awareness of the resource planning techniques in the construction industry is still on the edge of improvement by small and medium firms. This as Ghobadian and Gallear (1997) described is as a result of the process, procedures, structure and the people in the planning of construction activities.

Table 4: Resource planning techniques

Resource planning techniques	Frequency	
Percentage (%)		
Gantt Charts	10	11.24
Work breakdown structure (WBS)	18	20.22
Cost breakdown structure (CBS)	14	15.73
Critical path analysis (CPA)	12	13.48
Resource histogram (RH)	5	5.62
Gates and milestones (G&M)	3	3.37
Training Programmes	6	6.74
Impact Assessment Technique	2	2.25
Stage Gate Process	1	1.12
Schedule crashing	3	3.37
Decision tree analysis	1	1.12
Option evaluation chart	1	1.12
PERT – Program Evaluation Review Technique	7	7.87
Network Analysis	6	6.74
Total	89	100.00

Source: Field Survey, 2019

4.1.4 Application of resource planning Techniques

On determining whether or not firms apply these construction planning tools and techniques in their construction implementation, majority of the respondents approximately 47.19% indicated that they neutrally utilized these planning tools in their operation. While, 40.45% of the respondents indicated that they often employ these resource planning techniques in their operation and 12.36% apply these planning tools very often. Irrespective of the awareness of these construction planning tools, majority of the respondents apply these tools in their operation.

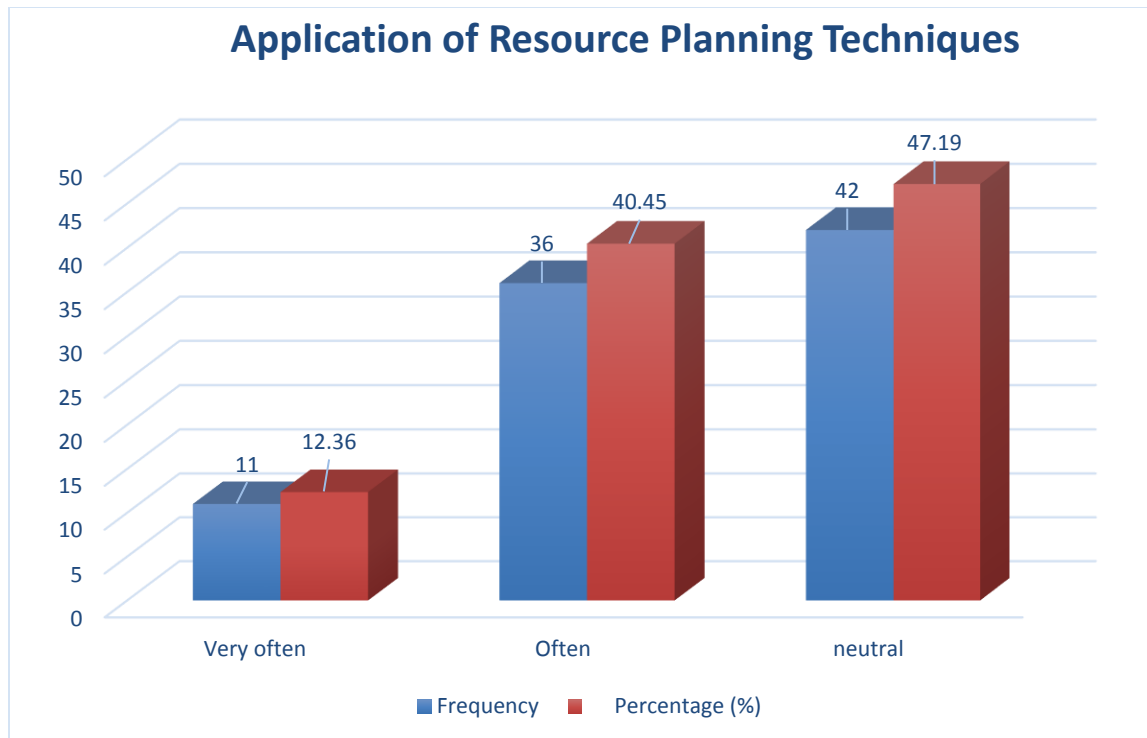


Figure 12: Application of resource planning Techniques

Source: Field Survey, 2019

4.1.5 The Extent of Utilization of Resource Planning Techniques

To determine the extent of utilization of the resource planning techniques in their various organizations, respondents were asked to rate them according to the extent of usage on a five-point Likert scale items. The adopted scale read as follows, *5= very high; 4= high; 3 = intermediate; 2 = low; 1= negligible*.

In analyzing the results of the extent of utilization of the resource planning techniques in their various organization, the mean score ranking was used. From table 7 below, all the planning techniques that were gathered from literature, the respondent responses indicated that all the tools are being utilized in the industry and are very influential. However, taking tools in order of relevance and most employed in operation, the most commonly used planning tools, as indicated by respondents, are Critical path analysis (CPA), Cost breakdown structure (CBS), Network Analysis and Work breakdown structure (WBS). These planning tools had a mean score value and a standard deviation value of more than 4.0 and less than 1.0 respectively. This is a clear indication that,

complex planning tools and techniques are more expensive and complicated for small and medium firms to invest in. consequently, the minimum level of skills and training required to implement these.

Table 5: The Extent of Utilization Resource Planning Techniques

NO	Resource planning techniques	Mean	Standard Deviation	Ranking
1	Critical path analysis (CPA)	4.45	0.759	1 st
2	Cost breakdown structure (CBS)	4.41	0.652	2 nd
3	Network Analysis	4.40	0.699	3 rd
4	Work breakdown structure (WBS)	4.17	0.699	4 th
5	Resource histogram (RH)	3.75	1.055	5 th
6	Gantt Charts	3.67	0.913	6 th
7	Gates and milestones (G&M)	3.55	1.036	7 th
8	PERT – Program Evaluation Review Technique	3.50	1.225	8 th
9	Training Programmes	3.46	1.506	9 th
10	Schedule crashing	3.29	1.113	10 th
11	Impact Assessment Technique	3.14	0.886	11 th
12	Decision tree analysis	3.00	1.000	12 th
13	Option evaluation chart	2.80	0.447	13 th
14	Stage Gate Process	2.25	0.500	14 th

Source: Field Survey, 2019

Planning tools has made it efficient and more reliable for firms to employ. Morris (1994) reported, complex planning tools and techniques were initially used in the heavy engineering industries. Owen (2006) added that, due to the inadequate funds to embark on effective and efficient planning tools and techniques as well as system in place to monitor and control project, they have ill-defined project plans. Hayford and Sarfraz (2013) opined that, only time among the three major project constraints would

be tracked in the projects in small and medium firms when they embark on simpler tools like Gantt Charts and the like. Other planning tools also had mean values of greater than 3.00 and standard deviation values greater than 1.0. This indicates that, there are differences as to how respondents understood the usage of these tools.

4.1.6 The benefits of resource Planning Techniques in Project Success

The benefits of resource planning techniques in the Ugandan construction industry were identified from literature, five (5) benefits were rated by the respondents by indicating the level of influence of each benefit on the scale on a five point Likert scale. In the analysis of the level of influence of the various planning tools, the Relative Important Index (RII) was used. From table 8 below, Efficient Task Management was ranked first (1st) with a mean and an RII value of 4.47 and 0.894 respectively. Every project out there consists of numerous tasks that you, or your team, must complete. Writing notes about what your team members are doing is sometimes impossible, especially when it comes to ongoing projects that take a lot of time to complete. This is where resource planning techniques are very useful: assign all of the important tasks to employees and monitor how they are performing. Project management becomes much easier as you have access to this data and can follow who has which tasks. Through better task management, teams work in unity. Hence, achieving incredible results and benefiting the company.

Easy Planning was rated second (2nd) with a mean and an RII value of 4.39 and 0.879 respectively. The project planning process takes a lot of time as you have to map-out all the important steps. Resource planning techniques provides you the ability to easily establish a hierarchy of tasks for effective and efficient completion. It also lets you indicate which steps are sequential and which tasks are dependent on one another. In turn, this makes it easier for the team to do their work. This is a time saver, because when the team leader knows which steps are the most important, he/she then knows which tasks to assign to whom.

Precise project tracking was ranked third (3rd), Seamless team workflow was ranked fourth (4th) and Shared documents, calendars and contacts fifth (5th) with mean and an RII values of 4.37, 3.66, 2.64 and 0.874, 0.733, 0.528 respectively. Precise Project Tracking is all about tracking the time spent on every task is of great value. It allows you to collect data about team members, to know their work pace. This will make planning future projects much easier. The team leader can then make much more precise time estimations. For example, a team leader can give different types of tasks to team members throughout a project to determine their strengths. This creates better performance and faster results.

Table 6: Benefits of resource planning techniques in project success

NO	Benefits of resource Planning Techniques in Project Success.	Mean	RII	Ranking
1	Efficient task management	4.47	0.894	1st
2	Easy planning	4.39	0.879	2nd
3	Precise project tracking	4.37	0.874	3rd
4	Seamless team workflow	3.66	0.733	4th
5	Shared documents, calendars and contacts	2.64	0.528	5th

Source: Field Survey, 2019

4.1.7 Challenges Associated with the Adoption of these Resource Planning Techniques

From the literature, eight (8) challenging factors were identified and respondents were asked to rate them to indicate the level of influence of each challenging factor associated with adoption of these planning tools on the scale on a five point Likert scale. In the analysis of the level of influence of the various planning tools, the Relative Important Index (RII) was used.

From table 9 below, Management problems was ranked first (1st) with a mean and an RII value of 4.36 and 0.872 respectively. According to Ihesiene (2014) management

problems relating to over bearing owner-financier influences, family interferences, poor organizational leadership, and lack of strategic planning, lack of initiatives, workplace politics, and alignment of organizational goal to owner personal goals are major influences that affect the planning of construction activities. Consequently, the organizational structure of some firms becomes a challenge in the application of resource planning techniques in the initiation, planning, execution, and handover phases of the construction project (Ihesiene, 2014). Limited project planning knowledge was rated second (2nd) with a mean and an RII value of 4.24 and 0.847 respectively. The project management knowledge gap problem in connection with project planning is a challenge in the planning of construction activities. Small and Medium Sized Construction Firms should employ Project Management since it is necessary for their operations, Project Management practices are specialized in nature, it consumes time and very bureaucratic nature, it becomes a major administrative burden, retards the growth of organizations and finally capital intensive in nature. These extend to poor knowledge of projects nature and lack of historical documentations about closed projects (Ihesiene, 2014). Awareness problems was ranked third (3rd), Limited finance fourth (4th) and Policy problems fifth (5th) mean and RII values of 4.15, 3.88, 3.87 and 0.829, 0.775, 0.773 respectively. According to Ihesiene (2014), awareness problems refer to the issues that hinder acceptance, adoption and diffusion of Project Management innovative practices such as lack of sufficient Project Management awareness, dearth of opinion leaders and PM success references. Limited finance includes issues relating to prohibitive cost of Project Management software and supporting ICT infrastructure, PM skill acquisition, cost of engaging PM experts, and inability to secure sufficient facilities from banks for projects hinders the implementation of construction planning tools and techniques.

Table 7: Relative Importance Index of the Challenges Associated with the Adoption of these Planning Tools and Techniques.

NO	Challenges	Mean	RII	Ranking
1	Management problems	4.36	0.872	1st
2	Limited project planning knowledge	4.24	0.847	2nd
3	Awareness problems	4.15	0.829	3rd
4	Limited finance	3.88	0.775	4th
5	Policy problems	3.87	0.773	5th
6	Labour mobility problems	2.91	0.582	6th
7	Corruption	2.61	0.521	7th
8	Environmental problems	2.55	0.510	8th

Source: Field Survey, 2019

Table 8: Mean Score Ranking of the Strategies to enhance the application of resource planning techniques.

NO	Strategies	Mean	Standard Deviation	Ranking
1	Ensuring qualified resource planning personnel on construction projects	4.80	0.678	1st
2	Government policy that mandate relevant agencies to champion Small and medium Sized Construction Firm re-orientation towards utilization of resource planning in their operations.	4.56	0.916	2nd
3	Policy reforms with regards to financial support and training Programmes for firms and staffs	4.49	0.895	3rd
4	Collaboration during construction	4.22	0.812	4th
5	Restructuring of resource planning methodologies	4.09	0.927	5th

Source: Field Survey, 2019

4.1.8 Strategies to enhance the application of resource planning techniques.

To determine the strategies to enhance the application of construction planning techniques, the mean score ranking was used. From the table above, ensuring qualified resource planning personnel on construction projects was ranked first (1st) with a mean value and standard deviation of 4.80 and 0.678 respectively. Government policy that mandate relevant agencies to champion Small and medium Sized Construction Firm re-orientation towards utilization of resource planning in their operations was ranked second (2nd) with a mean value and standard deviation value of 4.56 and 0.916 respectively. Policy reforms with regards to financial support and training Programmes for firms and staffs was ranked second (3rd) with a mean value and standard deviation value of 4.49 and 0.895 respectively.

According to Hayford and Sarfraz (2013) adequate fund from the Government and mandating relevant agencies such as National Orientation Agency to champion small and medium re-orientation towards utilization of construction planning in their operations. However, this could be carried out through seminars, symposia, conferences, and site visitations. Thus, this would go a long way to impact on the achievement of construction project objectives by firms. Collaboration during construction and Restructuring of construction planning methodologies appeared fourth and fifth with a mean and standard deviation value of 4.22, 0.812 and 4.09, 0.927 respectively.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter talks about the conclusions of how the various objectives of the study were attained and drawing the recommendations respectively.

5.2 Conclusions

This research was conducted to investigate into the application of resource planning techniques by Small and Medium sized Contractor firms in the Uganda. The achievement of each of the four research objectives is set out in the following subsections.

5.2.1 Resource planning techniques most frequently adopted by Small and Medium Sized Contractors in Uganda

From literature review about fourteen (14) resource planning techniques were identified the respondents were asked to rate the resource planning techniques that are utilized in the construction industry.

Using the mean score ranking, Critical path analysis (CPA) with mean 4.45 and standard deviation 0.759 was the most utilized resource planning technique in the construction industry. This indicated that the level of utilization of the resource planning techniques in the construction industry is still on the edge of improvement by Small and Medium Sized Construction Firms. It also indicated that only simpler techniques that requires less training to use were employed and complex planning techniques are more expensive and complicated for small Scale Construction Firms to invest in. Consequently, the minimum level of skills and training required to implement this planning techniques has made it efficient and more reliable for firms to employ.

5.2.2 The benefits of resource planning techniques in project success.

From literature we identified (5) resource planning techniques and the respondents indicated the level of significance of the benefits. Efficient Task Management was the most significant benefit with a mean of 4.47 and RII value 0.894. Every project out

there consists of numerous tasks that you, or your team, must complete. Writing notes about what your team members are doing is sometimes impossible, especially when it comes to ongoing projects that take a lot of time to complete. This is where resource planning techniques are very useful: assign all of the important tasks to employees and monitor how they are performing. Project management becomes much easier as you have access to this data and can follow who has which tasks. Through better task management, teams work in unity. Hence, achieving incredible results and benefiting the company.

5.2.3 Challenges associated with the adoption of these planning techniques by the Small and Medium Sized contractors in the construction industry

From responses, Management problems was the most challenging factor with a mean 4.36 and RII 0.872. Small Scale Construction firms are run by management, implying that management can contribute to the problems it is facing. For instance, poor leadership can hinder the use of planning tools in an organization, problems with financing the activities of the enterprise, interference by family and friends, politics at workplace and replacing organizational goals with personal ambitions. When an organization is not flexible as a result of the due diligence to organizational structures, it prevents the organization from taking new initiatives which does not contribute to the growth of the organization (Ihesiene, 2014).

5.2.4 Strategies to enhance the application of resource planning tools and techniques

The respondents were asked to indicate the level of significance of the strategies that can be employed to enhance the application of resource planning techniques. Respondents indicated that, ensuring qualified resource planning personnel on construction projects with mean 4.80 and standard deviation 0.678 was the most important strategic factors to enhance the application of resource planning techniques. The introduction of Project Management has revealed different shades of acclaimed project managers. A noble profession of such nature requires qualified and credible

individuals; governments are therefore entreated to formulate laws which prevent uncertified project managers from acting as such on projects. Alternatives, such roles should be occupied by graduates with the technical know-how in the Project Management discipline.

5.3 Recommendations

From the findings of this research, the following recommendations are therefore prescribed to enhance the application of resource planning techniques in the Ugandan construction industry.

1. The construction professionals should have some level of formal education which integrates the use of resource planning techniques, or otherwise organization should employ the services of certified resource planning professionals to undertake resource planning. Thus resource planning tertiary institutions should inculcate the use of resource planning techniques in their curricular to enhance the planning capabilities of Small and Medium Sized Construction Firms engaged in the construction industry.
2. Since the Private Sector in Uganda contributes to Gross Domestic Product, then it is recommended that, government through its relevant Ministries and in collaboration with other government agencies should undertake training programmes for Small and Medium Sized Construction Firms in Uganda as a means of boosting their performance.
3. A strong policy that prohibits noncertified project managers/planners from handling project must be enacted.

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APPENDIX I: QUESTIONNAIRE

A STUDY TO INVESTIGATE INTO THE APPLICATION OF RESOURCE PLANNING TECHNIQUES BY SMALL AND MEDIUM SIZED CONTRACTORS IN UGANDA

Dear Sir/Madam

Thanks for your participation. This questionnaire survey aims at investigating into the application of resource planning techniques by small and medium sized contractors in the Ugandan construction industry. Please fill in the questionnaire using the instructions, which will only take you about 10 to 15 minutes. Please be noted that all the information you provided is anonymous and will be only used for academic purpose. Thank you again for your valuable time. If you have any queries, please feel free to contact:

MUGISHA BENARD

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Section A: Background Information

Q1. Please indicate the name of your organization. (Optional)

.....

Q2. Please indicate your role in your organization.

☐ Quantity Surveyor

☐ Construction Manager

☐ Project Manager

☐ Civil Engineer

☐ Site Manager

Others (please specify)

Q3. Please indicate how long have you been working in your organization.

- ☐ Less than 5 years
- ☐ 6 to 10 years
- ☐ 11 to 15 years
- ☐ Above 16 years

Q4. Please indicate how long have you been working in construction industry.

- ☐ Less than 5 years
- ☐ 6 to 10 years
- ☐ 11 to 15 years
- ☐ Above 16 years

Section B: Considering main objectives

Q5. Which of these resource planning techniques are you familiar with? Please you can tick more than one.

- ☐ Gantt Charts
- ☐ Work breakdown structure (WBS)
- ☐ Cost breakdown structure (CBS)
- ☐ Critical path analysis (CPA)
- ☐ Resource histogram (RH)
- ☐ Gates and milestones (G&M)
- ☐ Training Programmes
- ☐ Impact Assessment Technique
- ☐ Stage Gate Process
- ☐ Schedule crashing
- ☐ Decision tree analysis
- ☐ Option evaluation chart
- ☐ PERT – Program Evaluation Review Technique
- ☐ Network Analysis
- Others (please specify)

Q6. Please indicate using the scale provided to what extent are the below resource planning technique does your organization utilize. *5= very high; 4= high; 3 = intermediate; 2 = low; 1= negligible.*

NO	FACILITIES	LEVELS OF INFLUENCE				
		1	2	3	4	5
1	Gantt Charts					
2	Work breakdown structure (WBS)					
3	Cost breakdown structure (CBS)					
4	Critical path analysis (CPA)					
5	Resource histogram (RH)					
6	Gates and milestones (G&M)					
7	Training Programmes					
8	Impact Assessment Technique					
9	Stage Gate Process					
10	Schedule crashing					
11	Decision tree analysis					
12	Option evaluation chart					
13	PERT – Program Evaluation Review Technique					
14	Network Analysis					
	Others (please specify)					
15						
16						
17						

Q7. How often do you apply these resource planning techniques in your organization?

☐ Very Often

☐ Often

☐ Neutral

☐ Not at all

Q8. The benefits of resource Planning Techniques in Project Success

Please kindly rate the following the benefits of resource Planning Techniques in Project Success on the scale 1-5.

5= extremely significant; 4=very significant; 3=moderately significant; 2=slightly significant; 1= not at all significant

NO	Benefits of resource Planning Techniques in Project Success.	LEVELS OF INFLUENCE				
		1	2	3	4	5
1	Easy planning					
2	Efficient task management					
3	Precise project tracking					
4	Seamless team workflow					
5	Shared documents, calendars and contacts					
	Others (please specify)					
6						
7						
8						

Q9. Challenges associated with the adoption of these planning techniques by the Small and medium sized contractors in the Ugandan construction industry

In your experience, indicate the level of influence of each challenging factor associated with the adoption of these planning techniques by ticking the appropriate boxes.

5= extremely challenging; 4=very challenging; 3=moderately challenging; 2=slightly challenging; 1= not at all challenging

NO	CHALLENGING FACTORS	LEVELS OF INFLUENCE				
		1	2	3	4	5
1	Management problems					
2	Limited finance					
3	Limited project planning knowledge					
4	Environmental problems					
5	Corruption					
6	Labour mobility problems					
7	Awareness problems					
8	Policy problems					
	Others (please specify)					
9						
10						
11						

Q10. Strategies that should be adopted by these organizations in order to improve their performance.

Please kindly rate the following strategies that can be adopted to enhance the application of resource planning techniques on the scale 1-5.

5= extremely significant; 4=very significant; 3=moderately significant; 2=slightly significant; 1= not at all significant

NO	STRATEGIES	LEVELS OF INFLUENCE				
		1	2	3	4	5
1	Restructuring of resource planning methodologies					
2	Government policy that mandates relevant agencies to champion small and medium construction firm re-orientation towards utilization of resource planning in their operations.					
3	Ensuring qualified resource planning personnel on construction projects					
4	Collaboration during construction					
5	Policy reforms with regards to financial support and training Programmes for firms and staffs					
	Others (please specify)					
6						
7						
8						

THANK YOU!

APPENDIX II: WORKING SCHEDULE

S/n	Activity	2018					2019			
		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	Problem identification and project conceptualization.									
2	Literature review and Proposal writing									
3	Proposal presentation									
4	Preparation of instrument and pre-testing instruments									
5	Data collection									
6	Analyzing and interpretation of data, conclusions and recommendations of findings									
7	Organizing the project report									
8	Presentation of the project									

APPENDIX III: BUDGET ESTIMATE

A detailed costing of the research study was clearly made outlining the funds used in each activity. In addition, a BOQ was prepared to give a cost estimate for the implementation of the proposed research.

SN	ITEM	QUANTITY	COST(UG SHs)
1	Data Collection	N/A	50,000=
2	Data Analysis	N/A	50,000=
3	Transport	Item	300,000=
4	Printing \$ Stationery	Item	5,000=
5	Miscellaneous	item	50,000=
		GRAND TOTAL	500,000=