

**FACTORS INFLUENCING THE COMPLETION TIME OF WATER
PROJECTS IN WATER SERVICE BOARDS IN KENYA: A CASE OF
ATHI WATER SERVICES BOARD, KIAMBU COUNTY.**

BY

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DECLARATION

This research project report is my original work and has not been presented for award of a degree in any other University.

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DEDICATION

This research proposal is dedicated to my husband Stephen, my children Philip and Mercy for their prayers, support and encouragement during my pursuit of this degree and to Rahab who has been my mentor.

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ABBREVIATIONS AND ACRONYMS

AWSB	Athi Water Service Board
GoK	Government of Kenya
MDGs	Millennium Development Goals
MEWNR	Ministry of Environment ,Water and Natural Resources
NWSS	National Water Services Strategy
SPSS	Statistical Package for Social Sciences
WASREB	Water Services Regulatory Board
WSB	Water Services Board
WaSBIT	Water Services Board Investment Tool
WSS	Water Supply and Sanitation

ABSTRACT

This study sought to investigate on factors influencing completion time of water projects in Water Service Boards in Kenya from contractor, client and consultants' perspectives during the construction phase. The study was a case of water projects implemented by AWSB in Kiambu County and examined how and to what extent financing, monitoring, contractor's capacity and contract variations as important parameters in a project's construction phase influence the completion time of water projects in Kenya. The study was descriptive survey in nature. Self-administered questionnaires and interviews were used to collect primary data while content analysis of relevant project implementation documents from AWSB was used to collect secondary data. Questionnaires were administered to persons purposively drawn from contractors, consultants and clients (AWSB personnel), involved in the implementation of the nine projects in the study. Descriptive statistics, correlation and regression analysis through Statistical Package for Social Science (SPSS) version 20 was used to analyse data and present the findings of the study. The findings indicated that the four variables studied were significant in explaining 96% of the variations in the completion time of water projects in WSBs in Kenya. Multiple regression analysis of the variables at 1% level of significance and 99% level of confidence showed that, financing had a 0.003 level of significance; monitoring 0.002, contractor's capacity 0.001 level of significance while contract variations had a 0.004 level of significance implying that the most significant factor is contractor's capacity followed by monitoring of projects. The level of financing of a project's construction activities and its timeliness was found to be a determinant of its completion time, and that effective monitoring partially depends on adequacy of supervisory personnel as well as timeliness in decision making and taking of actions to alleviate significant project target deviations that exist. Contractor's incompetence that can be attributed to inadequate equipment and personnel with required skills as well as financial difficulties among others is a key factor contributing to time overruns in the water projects, while contract variations are common among the water projects and they impact negatively on the projects' completion time. To improve on the completion time of water projects in WSBs, It is important that WASREB emphasizes on a comprehensive feasibility based investment and financing plan from all WSBs as a prerequisite for funding of proposed projects in order to ensure adequacy of projects' budgets and timely payments of contractors certificates. All WSBs should adopt a comprehensive result based monitoring system with which every implementing agent should comply so as to enhance effectiveness in monitoring of ongoing projects. WSBs should also ensure that the contractors they procure will have successfully executed similar projects in the past as an assurance of adequacy of the contractor's capacity in construction management. To mitigate on the negative impact of contract variations, WASREB and WSBS should ensure that adequate forecasting mechanisms are included in the implementation plans to enable identification of potential threats early enough. It is expected that the study findings are useful to the government and Water Service Boards in formulating strategies aimed at improving completion time of water projects and other public infrastructure project implementers.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The objective of any effort in project formulation is to have a project that can be implemented in order to solve a given problem for the social-economic well-being of the society. In this regard, the successful completion of a project is of utmost importance to both the sponsors as well as the intended beneficiaries as it helps realize the intended benefits and alleviate the suffering of the beneficiary community. Further, delay in completion of public sector investments can raise the capital-output ratio in the sector thereby bringing down the efficacy of investments (Morris, 1990). A project is considered successful if it is delivered on time, within budget and acceptable quality; (Mbamali, 2005). Unfortunately, most projects are never completed on time (Sambasivan and Soon 2007). While it is the construction planners who determine the sequence of activities necessary to complete a project, project managers are responsible for the overall successful implementation of projects. Project managers therefore have to develop a plan for directing and controlling resources in a coordinated and timely fashion so as to deliver a project within allocated time. This has limitations in that there is no certainty in factors causing delays in project activities (Jeffrey et. al. 1997). As a result, the identification of factors influencing the completion time of public sector projects becomes essential.

Infrastructure Projects are implemented in order to provide economic services from utilities (like electricity, telecommunication and water) and transport (roads, bridges, seaport, and airports) and are central in promoting economic development (Chandra, 2002). Unsuccessful

implementation of such projects therefore means that the enjoyment of such services and the corresponding economic benefits are delayed or never achieved.

Over 1.2 billion people worldwide lack access to safe drinking water (World Bank 2010). In this regard, providing access to clean, affordable and accessible water is therefore a top global priority, World leaders at United Nations Millennium Summit in the year 2000 committed to Millennium Development Goals (MDGs); one of them being to halve the proportion of people without access to safe drinking water and sanitation by 2015. While worldwide access to clean drinking water has progressed enough to reach the MDG target, 780 million people remain without access to clean drinking water. Only 61% of the population in Sub-Saharan Africa has access to improved water supply sources. People lack proper services because systems fail, often because not enough resources are invested to appropriately build and maintain them, and also because of the stress that the fast growing population places on the existing infrastructure (World Bank, 2010).

The African continent faces the most difficult challenge for achieving the water and sanitation MDG targets. Recent projections show that Sub-Saharan Africa would only reach the MDG targets for water services by 2040, and those for sanitation by 2076 (United Nations Development Programme (UNDP, 2006) if the current pace of expansion is not increased. Increasing efficiency in the existing systems for example by reinforcing adequate execution of activities like professional investment planning and structured reporting on planned, ongoing and realized investments would unlock the potential in the African water sector. In the 1990s, many governments sought to implement policy, regulatory and institutional reforms of urban water supply and sanitation (WSS) services, in order to improve water services provision. By then

reforms were badly needed: millions of people lacked access to piped water and sanitation services; and for millions of others, services were often poor. Deteriorated infrastructure, fast urban growth, and large investment needs coexisted with scarce fiscal resources. Water sector reforms emphasize the need for consumers' access to efficient, adequate, affordable and sustainable services (Hukka & Katko, 2004). Many African governments have therefore in the past two decades reformed their WSS systems so as to provide better services to their citizens.

Kenya like other countries in Sub-Saharan Africa has its socio-economic development goals highly dependent on the availability of clean water (Water and Sanitation News, 2007). In this regard therefore, the government's long-term objective is to ensure that all Kenyans have access to portable water and that water is available in adequate quantities for domestic use and other key economic activities like agriculture, irrigation and industrial use. In addition, the government recognizes that for the country to meet its poverty-reduction strategies and achieve the Millennium Development Goals (MDGs), water has to be made available, accessible and affordable, especially to the poor. This is based on the fact that all the eight MDGs are directly or indirectly related to access to water. Striving to avail water to all would hasten the achievement of the target set by the United Nations of ensuring that the proportion of people living without adequate and clean water is halved by the year 2015 (United Nations Millennium Declaration 2000).

Like other African countries, Kenya is water-scarce with its renewable water per capita at 1990 m^3 (Annual Water Sector Review 2011/12) just slightly above the United Nations recommended minimum of 1,000 m^3 (Kenya Vision 2030). The government has however taken up the

challenge of the UN Millennium Water Declaration by envisioning availability of water and access to all by the year 2030 (Kenya Vision 2030). To enable achieve this long term goal, the government has identified a number of flagship projects and initiatives to be undertaken in the water sector in order to increase the national water coverage. The establishment of eight Water Service Boards (WSBs) by the water sector reforms in the year 2002 is in line with these initiatives.

The WSBs are directly responsible for planning and developing water and sewerage infrastructure in order to increase water and sewerage coverage in their areas of jurisdiction. The aim of this initiative is to strengthen the water sector to enable it offer better water and sanitation services to all water users. WSBs therefore have the responsibility to identify, design and timely implement water projects that will appropriately contribute to the government's long-term objective of ensuring that all Kenyans have access to portable, adequate and clean water both for domestic and economic use. Unfortunately, WSBs have not been able to discharge their mandate effectively mainly due to their failure to submit to their regulator (WASREB); investment plans that are sufficiently detailed to enable further development and financing plans. The consequences have been poor impact of investments and unacceptably low investment realization despite continuously rising budgetary allocation towards water supply and sanitation infrastructure development (WASREB IMPACT Report, 2012). In 2010/11 for example, development budget increased to KSh 32.8 billion from KSh 23.3 billion allocated in 2009/10, accounting for 85% of the total approved sector budget. Of the total development budget, KSh 25.4 billion was allocated to water supply and sanitation (MWI, Annual Water Sector Review Report 2012).

Though the government has made various other efforts towards extending water and sanitation services to all since the beginning of water sector reforms in the year 2002, the sector's progress in achieving Vision 2030 Medium Term Plan goals for 2012 has been rather slow. On access to safe water for example; the total urban population with access to safe water in 2011/12 was 60 % which was below the target of 72% envisaged in the vision 2030 goal for 2012. In addition, only 45% of the rural population had access to safe water which fell below the target of 59% as per the vision 2030 flagship projects' goal for 2012 (MWI, Annual Water Sector Review Report 2012).The report cited inexperienced project managers, inadequate monitoring of ongoing projects, inefficient resource utilization, and delayed disbursement of project development funds as some of the key challenges hampering progressive improvement in water supply coverage.

Since construction of new water supply infrastructure as well as rehabilitation and expansion of already existing ones is among the efforts the government is making towards extending access to safe water; there is need for WSBs (the government's water infrastructure implementing agencies) to understand the factors influencing the completion time of their water supply projects in order to ensure that the projects are completed within the specified time frames. The focus of this study will be limited to those factors that are involved in the construction or implementation phase of the projects. The construction phase is when the work activities of the project plan are executed, resulting in the completion of project deliverables and achievement of the project objective(s). The contractor's capacity for effective construction management is paramount during the implementation stage if the project's stipulated targets are to be achieved. During this stage, money is spent to finance the activities and time is expended. At the same time,

monitoring and control should continuously be carried out to ensure that the project remains on course (Kezner 2002).

Development of water supply infrastructure in Kiambu County is the mandate of Athi Water Services Board. In the year 2011/12, overall access to safe water in the Board area reduced to 61% from 83% reported in the previous year while access in rural settings decreased to 48% from 81%. Rural investment realization was also below the Board's investment plan for the year (MWI, Annual Water Sector Review Report 2012). The Constitution of Kenya 2010 (CoK) recognizes access to water as a human right. Investments such as kilometres of pipeline laid, number of boreholes and wells drilled and treatment plants constructed among others within a given time frame are suitable indicators of the progress the sector is making towards recognition of the human right to water. WSBs must therefore ensure that they accelerate the speed of completion of investments in their areas of jurisdiction to enable expansion of water supply to the growing population.

1.2 Statement of the problem

Delays in completion of infrastructure development projects during implementation continue to pose great challenges to developing countries (Sambasivan & Soon, 2007).

The Kenya Government has invested heavily and continues to invest in infrastructure projects. Despite the importance of infrastructure and the huge financial resources committed to it, the intended benefits are partly or never realized due to many unsuccessful or delayed project completions (Mwandali 1996, Talukhaba 1988, and Musa 1999). Consequently, this has a negative effect because delayed completion of projects results to; cost overruns, disputes,

litigation and sometimes complete abandonment of important projects. Secondly, project beneficiaries are deprived of the benefits that would have otherwise accrued from timely completion of the projects.

Delays in completion of water projects in WSBs in Kenya are a common phenomenon. According to AWSB's year 2013 achievement report to WASREB For example; 9 of 16 (57%) completed projects in the board's area were completed late while 12 of 14 (86%) ongoing projects were behind schedule. According to MWI, Annual Water Sector Review Report 2012; poor site management and supervision of projects, lack of elaborate monitoring system to inform on the status of ongoing projects, financing challenges and contract variations are key contributory factors to this phenomenon. While overall national water supply coverage despite this phenomenon has steadily increased over the recent years reaching a level of 60% and 45% in urban and rural areas respectively (MWI, Annual Water Sector Review Report 2012), a gap of 20% and 30% respectively needs to be closed to reach the sector's National Water Services Strategy target coverage of 80% in urban areas and 75% in rural areas by 2015 (NWSS, 2004). Efforts to increase access to safe and adequate water in Kiambu County that is in AWSB's area and the country as a whole can be reinforced through professional implementation and monitoring of planned water supply projects in the WSBs in order to ensure that they are completed within the specified time.

It is in this context that the researcher intended to identify the factors that were significant in influencing the completion time of water projects in AWSB with particular focus on projects in

Kiambu County. Key factors involved in the construction phase of the projects namely; financing, monitoring, contractor's capacity and contract variations were the focus of this study.

1.3 Purpose of the study

The purpose of this study was to identify the factors influencing the completion time of water projects in WSBs in Kenya with particular focus on projects in Kiambu County.

1.4 Objectives of the study

The objectives of this study are:

1. To determine how financing influences the completion time of water projects.
2. To establish how the monitoring process influences the completion time of water projects.
3. To examine how the contractor's capacity influences the completion time of water projects.
4. To establish the extent to which contract variations influence the completion time of water projects.

1.5 Research questions

1. How does financing influence the completion time of water projects?
2. How does the monitoring process influence the completion time of water projects?

3. How does the contractor's capacity influence the completion time of water projects?
4. To what extent do contract variations influence the completion time of water projects?

1.6 Significance of the study

The findings of this study may be useful to the following:

The study may provide useful insights to the government and the development partners on the factors that impede on the timely completion of projects and therefore help in formulating strategies to address these factors.

To the regulator (WASREB) the study may provide useful information on the key factors influencing the completion time of water projects and thus help in formulating better strategies and regulatory tools to enhance efficiency and effectiveness in the implementation of water projects.

Project contractors and clients may find the findings of this study a useful source of information on what factors they need to closely focus on in order to ensure delivery of projects within the stipulated time.

For future researchers and academicians the findings of this study may provide useful material for other related researches as well as providing reference material on what factors need to be considered for successful implementation of water projects in Kenya.

1.7 Delimitation of the study

The research study only focused on the influence of Financing, monitoring, contractor's capacity and contract variations on the completion time of water projects in WSBs in Kenya. The study was the case of both completed and ongoing water supply projects undertaken by AWSB in Kiambu County within the last five years. Late completion of projects was characteristics of some of the water projects in the study area. The area was also easily accessible to the researcher which enabled faster collection of data and hence timely completion of the research project.

1.8 Limitations of the study

Some of the pertinent issues that this study encountered include:

- (i) The study was limited to only those factors involved in the construction phase of the projects. Yet there were other factors influencing completion time of water projects in the WSBs that for purposes of this study were ignored.
- (ii) Different WSBs have different implementing environments and hence the need to generalize the findings of this research with caution.

1.9 Assumptions of the study

- (i) There are many factors that may influence the completion time of water projects that were not covered in this study. These include: political factors, basic infrastructure such as transport networks, and project appraisal methods among others. For the purpose of this study, these were assumed to have had minimal influence on the completion time of water projects.

(ii) All respondents involved in this study gave accurate and reliable data and that any secondary data used was also accurate and reliable.

1.10 Definitions of significant terms

Completion time influencing factors: events and activities that impact either positively or negatively on project delivery time.

Contract variations: Changes/deviations admissible in a construction project

Contractor's capacity: Ability to plan, allocate and Control available resources in order to achieve the objectives of the project within agreed schedule and budget.

Delay: A prolonged construction period beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project.

Financing: Provision of funds for the implementation of a project's planned activities.

Monitoring: Continuous assessment of project implementation in relation to what is planned with the intention of identifying actual / potential success/problems early enough to facilitate timely adjustments to project operation in order to ensure timely achievement of set targets.

Project completion time: Project's set duration of contract within which the project deliverables in the state described in the construction contract should be completed.

Project management: The application of knowledge, skills, tools and techniques to project activities to meet the project requirements (PMI, 2008).

Project: A set of activities which must be implemented in a logical sequence in order to achieve specified objectives which usually address the needs of a community or a society within a given time span using specified resources and with required quality specifications.

Project's construction phase: Period from awarding the contract to when the actual construction is completed.

Water projects: Water supply infrastructure planned and developed by Athi Water Services Board.

1.11 Organization of the study

Chapter One which is the introduction to the study covers the following sections; Background to the study, Statement of the problem, purpose of the study, research objectives and the corresponding research questions, Significance of the study, Scope and delimitations of the study, assumptions of the study and definitions of significant terms.

Chapter two titled literature review will explore what has been done in relation to the study by examining the existing literature on factors that influence the completion time of construction projects in the world and particularly in Kenya. It will lay emphasis on four variables; financing monitoring, contractor's capacity and contract variations. The chapter will consist of the following sections; an introduction, project completion time, financing, monitoring, contractor's capacity, and contract variations, theoretical framework, conceptual framework, summary of literature and research gap.

Chapter three will deal with the research design and methodology and will comprise of an introduction, research design, target population, sampling procedure, data collection method, validity and reliability of the research instruments, methods of data analysis, ethical considerations and operational definitions of the study variables.

Chapter four presents findings of the study discussed under thematic areas and sub-sections in line with the study objectives while chapter five covers summary of findings, discussions, conclusion, recommendations and suggestions for further study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature relating to the research problem outlined in the previous chapter with particular focus on the main variables in the study which if addressed would lead to completion of water projects as scheduled. The parameters to be investigated will be financing, monitoring process, contractor's capacity and contract variations. The theoretical framework the study is based on and the conceptual framework illustrating the relationship between different variables in the study are also outlined.

2.2 Project Completion Time

By its basic definition, a project comprises a defined time frame to completion, a limited budget, and a specified set of performance characteristics (Kerzner and Harold, 2002). Construction contract time of a project is defined as the time allocated to complete the actual project construction starting from the time of tender award to the time of delivery of the project in the state described in the contract (Rendon & Garrett, 2005). The project time frame as a variable is fixed by consideration of time required to procure various materials and equipment used in the project, labour deployment and capability, Finance flow, Predictable weather and managerial ability to drive the project (Porters & Michael, 1985).

A project is said to be complete when its deliverables and objective(s) are achieved. This is realized through execution of the project's work activities which occurs during a project's implementation/construction stage. Project construction then requires that materials and resources necessary for the work activities are procured, the project is produced, and its performance capabilities verified (Kerzner and Harold, 2002). The project's execution phase therefore demands that all project management disciplines be brought together for a product or service that meets the project deliverable requirements and the customers need(s) is produced (Giridhar and Ramesh, 1998).

Project management involves managing the resources: workers, machines, money, materials and methods used (Giridhar and Ramesh, 1998). Management requires that resources be planned for and procured, coordinated/organized for efficient use, activities carried out by people who require to be directed through communication of what needs to be done and motivated towards attainment of objectives. Control through continuous result-based monitoring and reporting should always be the basis of communication in management. Further, Frimpong et al. (2003) revealed that project management tools and techniques play an important role in the efficient and effective completion of a project. Activity schedules and monitoring frameworks are typical management tools. While some projects are effectively and efficiently managed others are mismanaged leading to failure to meet their set deadlines for completion (Jagboro and Aibinu, 2002).

Though completing projects on time is an indicator of efficiency in project management, project successes are not common in the construction industry especially in developing countries and Kenya is no exception (Assaf, 2006). This has motivated Professionals and scholars to take steps

to meet this challenge by trying to identify delay factors and the best ways to mitigate them. Chan and Kumaraswamy (2002) remarked that studies in various countries appear to have contributed significantly to the body of knowledge relating to time performance in construction projects over the past three decades and that construction time is becoming increasingly important because it often serves as a crucial benchmark for assessing the success of a project and the efficiency of the project organization.

Studies conducted in developed economies like UK/USA/Australia (Ireland, 1987), China (Kumaraswamy and Chan, 1997; 1998), Florida (Ahmed et al. 2002), revealed a trail of time overruns on building and infrastructure projects in public and private sectors, attributable to numerous factors that come into play during the projects' implementation. Similar observations have been made in developing countries, such as Ghana (Frimpong et al. 2003), Nigeria (Jagboro and Aibinu, 2002), Saudi Arabia (Assaf, and Al-Hejji, 2006), Vietnam (Long et. al. 2007), and Singapore (Ling et. al., 2004) revealing factors ranging from inflation, project complexity, inaccurate material estimation, financing, change orders, design changes, late submission of drawing, poor specification, incorrect site information, poor contract management among many others as major sources of overruns.

Specific research undertaken to investigate what ails implementation of projects in some public sector projects in Kenya, provide an insight to what has been the major causes of projects time overruns, failure to meet specifications and stakeholders expectations. Musa (1999) conducted a study on factors influencing delays in water projects in Kenya funded by the Government. A similar study by Karimi (1998) focused on factors contributing to cost overruns in projects under the Ministry of Water. Talukhaba (1988) investigated on time and cost performance of

construction projects. Mwandali (1996) did an analysis of major factors that affect project management in Kenya Railway projects. Their findings showed that, poor communication, inexperienced project managers, contract variations and inadequate resources as being some of the major contributors to poor time performance of public sector projects. As a result, many major projects fail to meet scheduled deadlines. In a construction project, in which time truly equals money, the management of time is critical (Duran, 2006). Predicting a likelihood of schedule delay thus plays a key role in overall project success (Luu et al., 2009).

Any construction project comprises of two distinct phases: the preconstruction phase (the period between the initial conceptions of the project to awarding of the contract) and the construction phase (period from awarding the contract to when the actual construction is completed) (Sambasivan and Soon, 2007). There are many underlying factors that influence the timely completion of projects in both phases. However, the factors that have major impact on project completion time occur in the construction phase (Frimpong et al., 2003) and is of primary concern to contractors, owners and consultants – the parties involved in the implementation of projects (Koushki & Kartam, 2004). The main role of the construction project manager is thus to simultaneously manage the four basic elements of a project: resources, time, money, and most importantly, scope to avoid delayed completion of the project as well as ensure overall project success (Porters & Michael, 1985).

According to Zimconsult study on Economic and Financing of the water sector in Kenya (20011), water is essential for life and is the basis for economic development. In this regard, one objective in the NWSS is to increase the rural water supply from the current access rate of 45% to 75% by the year 2015 in line with the Millennium Development Goals (MDGs) access target

of 50% to all by 2015. This is based on increasing the available water from 60 liters per person per day to 80 liters per person per day for individual house connection and increasing the available water at standpipes from 15litres per person per day to 20 litres per person per day while decreasing maximum distance to nearest public standpipe to 2000 metres (NWSS 2007-2015). However, at an average annual increase in access of 6.4% points (WASREB IMPACT Report, 2012), attaining the 75% the NWSS target will not be feasible as this requires closing a gap of 30% points in just three years. Moreover, the demand for water for various uses has continued to increase rapidly outstripping supply and resulting in unreliable water availability and conflicts. This poses a threat to Kenya's development blueprint-Vision 2030 goal of ensuring adequate water and sanitation as a primary driver of other economic sectors.

Efforts by WSBs (the government's water infrastructure implementing agencies) to contribute towards this goal by increasing access to safe water and sanitation services in their areas of jurisdiction through infrastructure development remain a big challenge which calls for a concerted effort to address (WASREB Impact Report, 2009). Professional planning, implementation and monitoring of water projects would accelerate the achievement of this goal by ensuring that the projects are completed within the allocated time, cost, quality and scope. While WSBS have been able to implement several investment projects under the umbrella of vision 2030 their investment realization level is still below par (Wasreb Impact Report, 2009). The objective of this study was therefore to identify the factors influencing the completion time of water projects.

2.2.1 Financing and project completion time

Financing provides the monetary resources required to meet the project construction budget as represented by the project's bill of quantities. When the funds allowed for the project are short the contract time is extended, or scope decreased, or both. It is then imperative that investment and financing plans based on feasibility studies are made to enable adequate funding. Devarpiya & Ganesan 2002 obtains that poor financing arrangements, inadequate construction funding and budgets, bad cash flow that may be occasioned by contractor's and client's financial difficulties, and inaccessibility to formal structured finance have a heavy bearing on the project smooth running leading to delayed completion of a project. Thomas (2002) also identified financing as a major success criterion of construction projects.

At present capital investment in water is almost entirely financed from public funds. WSBs access funds to execute infrastructure investment projects from the treasury in form of loans and grants. Though the public sector is charged with the responsibility of providing public services, the numerous competing demands from the different sectors of the economy make it difficult for available fiscal resources to match investments required in water services infrastructure (Wasreb Urban Water Financing Report, 2011). Further, the constitution recognizes the human right to water and sanitation which impacts the development, organization and management of water services provision in the country. This has made partnership with the private sector critical in plugging the finance gap for infrastructure development. The Kenya Water sector should then continue making efforts to attract financial support from development partners and develop its commercial financing potential. This can only be achieved on the basis of sound management practices and adequate financial planning.

According to WASREB IMPACT Report 2012, the biggest weakness of WSBs is the absence of investment plans sufficiently detailed (to pre-feasibility quality), for further development through feasibility studies and financing plans. The consequence has been low value for money and unacceptably low investment realization. There is therefore urgent need to have a comprehensive sector investment plan indicating the investment necessary to achieve the progressive realization of the right to water and sanitation that is based on prioritized demands. This investment planning would guide investments in the water service sector and would be easy to sell to development partners.

The researcher therefore intended to determine the influence of financing on the completion time of water projects.

2.2.2 Monitoring and project completion time

Monitoring and reporting is a component of project control and is also a management function in any project carried out through the duration of every phase of the project. It entails systematic collection of data on specified indicators to provide management and other stakeholders of an ongoing intervention with indications of the extent of progress and achievement of objectives and progress in the use of all allocated resources (Kerzner and Harold, 2002). Navon (2005) obtained that a control system is an important element to identify factors affecting construction project effort and that one or more Project Performance Indicators (PPI) is needed for each of the project goals to help guide the control process.

Effective project monitoring helps the project manager ensure that the project is on track to completion by certain deadlines by comparing actual performance with planned performance and

taking timely corrective action to yield desired outcomes when significant deviations exist. Making allowances for adequate monitoring and feedback mechanisms therefore gives the project manager the ability to anticipate problems, to oversee corrective measures, and to ensure that no deficiencies are overlooked. Monitoring therefore informs forecasting and planning during the implementation phase of a project. The plans are then communicated to the workers for execution (Navon, 2005).

The WSBs' monitoring of investment implementation continues to be inadequate. A telling example in this respect is the futile effort by the Ministry of Water and Irrigation (MWI) to streamline WSBs' investment planning and monitoring through the Water Services Board Investment Tool (WaSBIT). The WaSBIT was specially designed to help WSBs to direct investments towards progressively increasing water and sanitation coverage. Further, lack of a comprehensive monitoring framework to inform on changes pertaining to service delivery and status of ongoing projects adversely affects the attainment of Vision 2030 and NWSS targets. It also affects the planning and targeting of resources and misinforms on coverage (MWI, Annual Water Sector Review Report 2012).

The researcher therefore intended to establish the influence of the monitoring process on the completion time of water projects.

2.2.3 Contactor's capacity and project completion time

Projects are fulfilled through the efforts and skills of people, with the help of systems. The contractor's capacity for effective construction management is paramount during the construction stage if the project's stipulated targets are to be achieved. Construction management

is the overall planning, coordination and control of project activities from the beginning to the completion (Barbara J., 2010). The contractor should have capacity to carry out construction management functions which typically include: (1) Specifying project objectives and plans including delineation of scope, budgeting, scheduling, setting performance indicators and selecting project participants. (2) Maximizing the resource efficiency through procurement of labour, materials and equipment. (3) Implementing various operations through proper coordination and control of planning, design, material estimation and sub-contracting in the entire construction process. (4) Developing effective communication and mechanism for resolving conflict an aspect of directing and motivating people towards attainment of project objectives Chris Hericksson (2008). Xiao and Proverbs (2003) and Sambasivan and Soon (2007) conclude that contractor's construction management capacity ranks among the ten most common factors influencing successful completion of projects. As such; Contractor's incompetence/inadequacy attributed to problems such as lack of contractor experience, poor methods of construction and delayed procurement of equipment and materials, contractor's cash flow problems, labour shortages or engaging inadequate labour skills and unrealistic budget fronted by the client is a key factor contributing to time overruns in construction projects globally (Chan and Kumaraswamy, 2002).

It is in this background that the researcher intended to examine how the contractor's capacity influences the completion time of water projects.

2.2.4 Contract variations and project completion time

Construction projects are one-off endeavours with many unique features, such as long time spans, complicated processes, extremely challenging environments, financial strain and dynamic organisation structures (Zhou, Zhang and Wang, 2007). As such; problem areas exist in almost every implementation regardless of how carefully the project was initially planned due to the fact that it is impossible to foresee every trouble area or problem that could possibly arise. Similar observations were made by Chan and Kumaraswamy (1998), who found that unexpected problems arise during the construction phase leading to contract variations and that poor site management, unforeseen ground conditions and low speed of decision making involving all project teams were the three most significant factors causing delays in completion of building works. Such factors will conspire against the project and may impact negatively on the project targets of time, cost, quality and scope (Fugar and Agyakwah-Baah, 2010). As a result, it is important that the project manager makes adequate initial arrangements for forecasting mechanisms to be included in the implementation plan to enable identification of any potential threats early enough so that appropriate action is taken to minimize their impact on the project (Soon, 2010).

The researcher therefore intended to establish the extent to which contract variations influence the completion time of water projects.

2.3 Theoretical Framework

This study will be based on Henri Fayol's administrative theory of management. The theory mainly focuses on the personal duties of management.

In today's construction industry, it is vital to have concrete management plans so that projects are completed on time. Henri Fayol's management theory is said to be the most relevant in relation to the construction industry (Jarvis 2004). The theory purports that management is a practical skill that falls into patterns that can be identified and analyzed. The theory also suggests that management is not a personal talent but is a skill that can be taught and learnt. According to Fayol; management is the coordination of all resources through the process of planning, organizing, directing and controlling in order to attain a given stated objective. Fayolism is therefore concerned with how an organization should be managed in order to make the best use of its resources to achieve its goals and is based on five management principle roles.

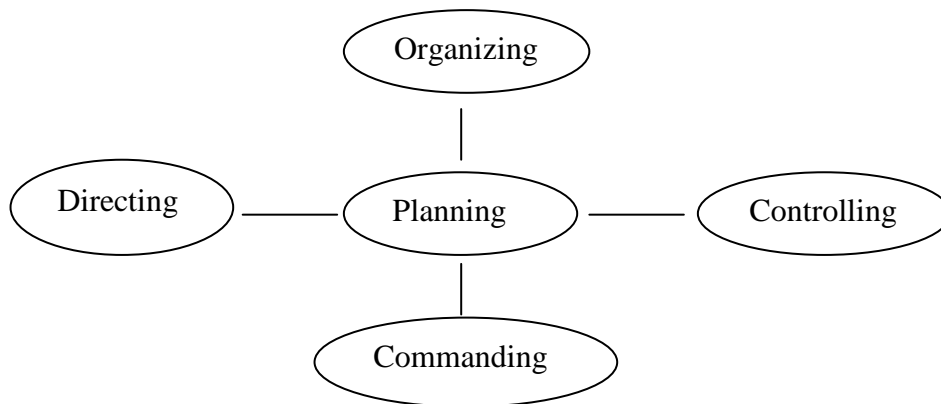
The five principles and how they relate to project management are: to forecast and plan, to organize, to direct, to co-ordinate, and to control. Forecasting and planning was the act of anticipating the future and acting accordingly. Organizing was the act availing the resources, both human and non-human required for planned organization activities. Directing was maintaining momentum and activity among workers. Co-ordination was the alignment and harmonization of the group's efforts. Finally, to control meant seeing to it that everything happened in accordance with established rule and expressed command.

Fayol developed fourteen principles of administration to go along with management's five primary roles. These principles are: specialization/division of labor, authority with responsibility, discipline, unity of command, unity of direction, subordination of individual interest to the general interest, remuneration of staff, centralization, scalar chain/line of authority, order, equity, stability of tenure, initiative, and esprit de corps(team work). Fayol clearly believed personal effort and team dynamics were part of an "ideal" organization.

Fayol's five principle roles (Plan, Organize, Direct, Co-ordinate, and Control) of management are still actively practiced today. The concept of giving appropriate authority with responsibility is also widely commented on and is well practiced. Unfortunately, his principles of "unity of command" and "unity of direction" are consistently violated in "matrix management", the structure of choice for many of today's organizations.

Figure 1 is a model illustrating the relationships among Fayol's five principle roles of management. It indicates that all the five principals are interdependent.

Figure 1: Interdependence among Management Principles



Source: Henri Fayol, (1916)

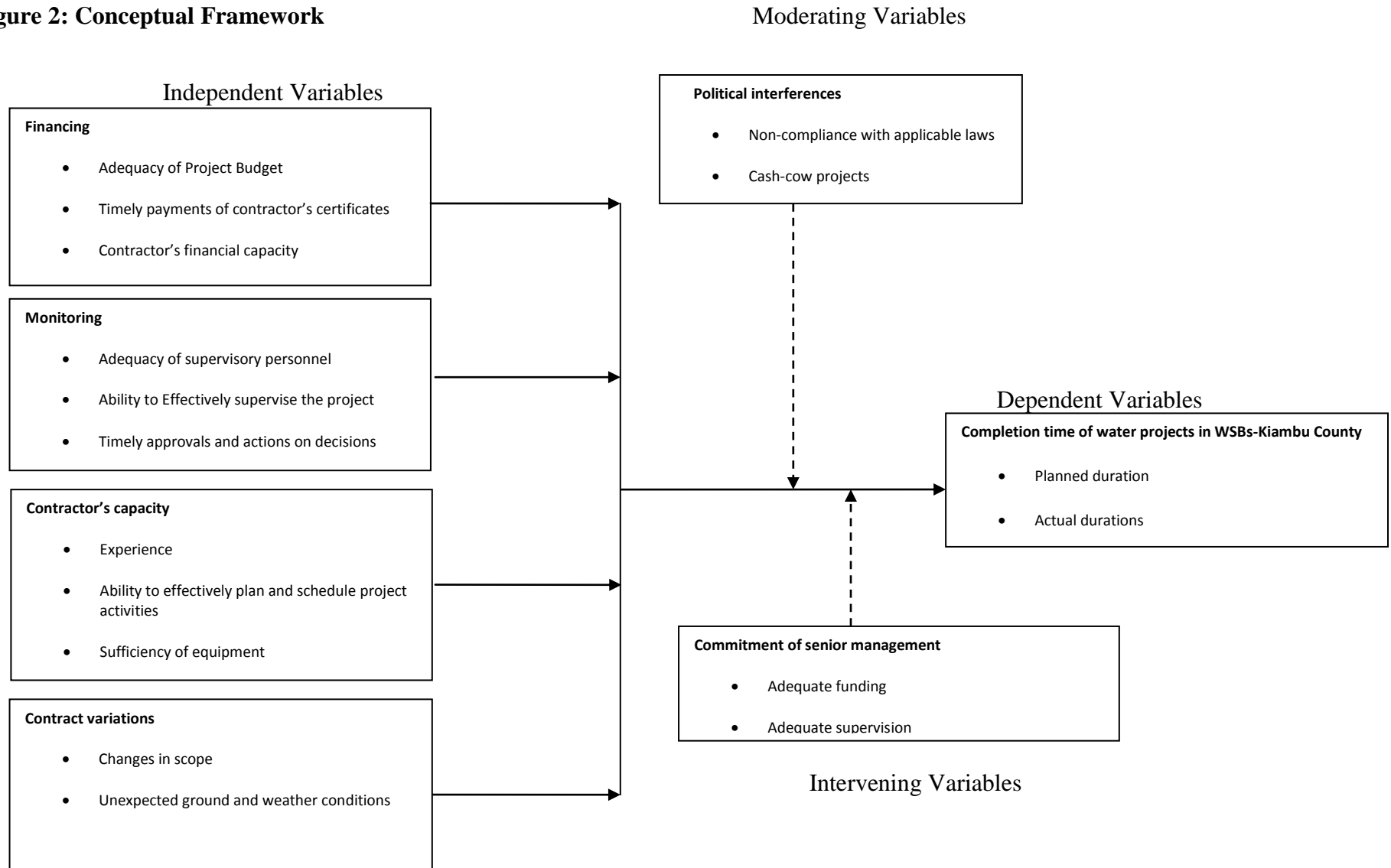
Attempts to validate Fayol's administrative theory have been both empirical and comparative. Carroll and Gillen in 1987 reviewed numerous studies of managers at work and concluded Fayol's management functions still represent the most useful way of conceptualizing the manager's job. Donald Reid in 1995 used Fayol's unpublished papers to show his experiences in managing coal miners and his struggle to gain recognition and acceptance from the firm's board of directors. Wren in 2001 studied the history of Commentary - Fourchambault, the iron and

steel industry in France, and the actions taken during Fayol's 30 years as the chief executive. He concluded that Fayol's actions were consistent with what today would be called "strategic management".

2.4 Conceptual Framework

A conceptual framework is a representation of the main concepts or variables under study and their presumed relationship with each other. It is a scheme of variables/concepts the researcher will operationalise in order to achieve the research objectives. The conceptual framework will be based on factors affecting completion time of water projects in Kiambu County. The dependent variable completion time of water projects is affected by independent variables: Financing, monitoring, contractor's capacity and contract variations. This study will be based on the conceptual framework shown in Figure 2.

Figure 2: Conceptual Framework



2.5 Explanation of relationships of variables in the conceptual framework

The dependent variable - project completion time (project's construction contract period) is anchored on the fact that completion times of various activities in the independent variables actualize it and timely completion is a matter of interest to all stakeholders.

The independent variables have the properties of changing and the change in them will have an effect on the dependent variable. Financing of the project budget has to be sufficient and timely so as to sustain the project requirements within the designed project period. The contractor has to have ability to effectively plan, allocate and control available resources in order to achieve the project's objectives within the agreed time. Close monitoring and trouble shooting of the implementation process accompanied by prompt appropriate actions helps ensure that actual performance is according to the set targets.

2.6 Summary of the literature and research gap

It is evident from the many studies carried out in relation to project success that delay in project execution is a major problem in the construction industry both in developed and developing countries. The literature also reviews that there are many underlying factors contributing to this phenomenon; among them financing, contract variations, poor construction management and inadequate control systems most of which occur during the construction phase.

There are no studies that have been conducted in Kenya to try and document the success or failure to meet completion time targets of water projects implemented by WSBs since the beginning of reforms in the water sector in the year 2002. Yet implementation of water infrastructure projects require huge capital investment and poor management of the process leads to huge financial loss in the sector reducing the value for money of the investments. Moreover,

successful implementation of water projects by WSBs is a matter of public interest and all stakeholders.

This study intended to bridge the knowledge gap of lack of documentation of factors influencing completion time of water projects in Kenya, with particular focus on Kiambu County under the jurisdiction of AWSB. The researcher envisioned filling this research gap by investigating how and to what extent Financing, the monitoring process, contractor's capacity and contract variations influence the completion time of water projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives an explanation and justification of the methods that will be used in order to answer the research questions posed. It also outlines the systematic research procedures to be used in the collection and analysis of data. These include the project's research design, target population, sample and sampling procedure, data collection instruments and finally how the data collected will be analyzed.

3.2 Research Design

According to Cooper and Schindler (2008) a research design is a statement of the essential elements of a study and constitutes the plan for the collection, measurement and analysis of data. It refers to the systematic prepared structure of an enquiry that directs a research study (Shajahan, 2005). Its function is to ensure that the evidence obtained enables the researcher to answer the research question as unambiguously as possible. The aim of this study will be to investigate the effect of financing, monitoring, contractor's capacity and contract variations on the completion time of water projects in Athi Water Services Board and in particular Kiambu County.

This study adopted a descriptive survey research design where interviews, desk study of documents relevant to the projects and self-administered questionnaires were used for data collection. Kothari (2004) describes descriptive surveys as fact-finding enquiries, involving asking questions (often in the form of a questionnaire) to a large group of individuals; whose

major purpose is to describe the state of affairs as it exists at present and represent the findings/information statistically. Similarly, Mugenda and Mugenda (2003) states that a descriptive survey design determines and reports the way things are or answers questions concerning the current status of the subjects in the study, while Cooper & Schindler, 2003 obtains that a descriptive study is concerned with establishing the what, where and how of a phenomenon.

3.3 Target Population

The study population consisted of both completed and ongoing water supply projects undertaken by Athi Water Service Board within the last five years in Kiambu County. As at June 2013, 6 projects had been completed and 3 projects were ongoing (AWSB, 2013). A total of 9 projects were to therefore be studied.

3.4 Sample size and sampling procedure

A sample is a subset of a study's target population on which information is obtained for generalization to the target population while sampling is the process of selecting the individuals of a sample which ensures that the sample is representative of the target population.

3.4.1 Sample Size

The sample size depends on factors such as research design and size of target population (Kasomo, 2006). Krejcie and Morgan (1970) in their table of sample size determination for a given population size suggest a sample size of ten cases, individuals or subjects for a population size of ten at 95% confidence interval within plus or minus 1.0% error margin. Therefore, all the 9 projects targeted in this study were therefore studied. Besides; examining every member of a

population would give the most accurate information all other factors being equal (Kasomo, 2006). The researcher therefore expected the study of all the 9 targeted projects to give a clear indication of the factors influencing the completion time of water projects in Athi Water Services Board area and particularly Kiambu County. The survey sample of respondents used in carrying out the study was purposively drawn from persons involved in the implementation of each of the 9 projects in this study as per the projects' implementation teams; that is, the Clients (AWSB personnel), Contractors and Consultants. A purposive sample of 27 respondents was used.

3.4.2 Sampling Procedure of Respondents

Sampling procedure may be defined as a systematic process of identifying individuals for a study to represent the larger group from which they are selected (Mugenda and Mugenda, 2003). To obtain the sample population of respondents, the target population was first stratified. Stratification involves dividing the population into homogeneous subgroups (strata) and then taking a sample from each stratum independently of each other. It is generally used when the population is heterogeneous, or dissimilar or where certain homogeneous, or similar, sub-populations can be isolated (Patton, 1990). According to Mugenda and Mugenda (2003), the goal of stratified sampling is to achieve desired representation from various subgroups in the population. This method was the most appropriate method to use because the study population formed clear strata in form of the three project implementation teams which required adequate representation in the sample so as to increase accuracy level.

The sample of 27 respondents was then purposively obtained by nominating the team leaders of each of the three implementation groups as study subjects. Project engineers represented the client-AWSB, site agents/engineers the contractor and resident engineers the consultant. Three persons from each of the 9 projects giving a total of 27 subjects to be used in the study were

therefore nominated. This is as shown in table 3.1. According to Mugenda and Mugenda (2003), purposive sampling allows a researcher to use the cases that have the required information with respect to the study objectives. Cases of subjects are therefore handpicked because they are informative or have the required characteristics. In this study the researcher picked the leaders of the implementation teams because they had practical experience in the construction of the projects. Their experiences thus serve as suitable indication of the key factors influencing the completion time of water projects from owners, contractors and consultants' perspectives.

Table 3.1: Respondents Sample Population

Population Strata	Category of Respondents	Number of Nominees
Clients	Project Engineers	9
Consultants	Resident Engineers	9
Contractors	Site Engineers	9
Total		27

The 27 nominees formed the study sample of respondents whose responses were expected would give views representative of the clients', consultants' and contractors' perceptions of the factors influencing the completion time of water projects in the WSBs in Kenya since they represented the three groups.

3.5 Data Collection instruments

The study used questionnaires and unstructured interviews to collect primary data while content analysis of documents relevant to the implementation of the projects from the Water service Board were used to provide the required secondary data.

Questionnaires were chosen because they are easy to administer, gives the respondent sufficient time to arrive at a well thought out response and are free from the researcher's bias. Open and close ended questions will be used to get information on completion time of the projects and the factors influencing their completion time. Interviews were used to help clarify issues that may not have been dealt with satisfactorily by the respondents through the questionnaire while content analysis enabled the researcher gain deeper insight of the activities that had taken place during the implementation of the projects and the underlying factors involved in the activities that had an influence on the completion time of the projects.

3.5.1 Pilot testing of the instruments

Conclusions made by researchers are based on the information obtained from the research instruments used. It is therefore important to ensure that the instruments are reliable and valid. This is achieved by conducting a pilot test of the instruments before the commencement of data collection for the full study in order to collect data that is used to test the validity and reliability of the research instruments.

Pilot study of the questionnaire was conducted in Nairobi County that is also within Athi Water Service Board's area in three projects similar to the study projects. Self-administered questionnaires were distributed to personnel heading the three project implementation teams (clients, consultants and contractors) of the pilot study projects. To achieve a high questionnaire return rate, respondents' willingness to participate in the study was sought before administering the questionnaires.

3.5.2 Validity of Research Instruments

Mugenda and Mugenda (2003) define validity as the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. To achieve this, both internal and external validity of research instruments has to be ensured. Internal validity refers to the instrument's ability to measure what is intended to be measured while content validity refers to the extent to which the questions provide adequate coverage of the subject matter. According to Mugenda and Mugenda (2003), determination of validity is primarily judgmental and intuitive. It can also be determined by using a panel of persons who shall judge how well the measuring instrument meets the standards, but there is no numerical way to express it.

Validity of this study was verified using experienced professionals in research who assessed and reviewed the suitability of the instrument in measuring the intended variables and its comprehensiveness in content using Best and Kahn's two-step method of demonstrating evidence of validity. The method requires that, first the universe of content that could be included in the test be defined followed by ensuring that the test items are representative of the universe.

3.5.3 Reliability of Research Instruments

Mugenda and Mugenda (2003) define reliability as a measure of the degree to which a research instrument yields consistent results or data on repeated trials. The aim of reliability is to minimize the errors and biases in a study.

Split-half technique was used to determine the coefficient of internal consistency or reliability coefficient. Reliability coefficient expresses the relationship between scores of the same

individual on the same instrument at two different times or between two parts of the same instrument. In this study, the research instrument was split into two subsets for each person in the pilot study, one consisting of odd numbered questions and the other of even numbered questions. The score of responses of all odd and even numbered questions in the pilot study were then computed and the correlation coefficient of the two scores calculated. A correlation coefficient was then computed. If the correlation became greater than 0.8, it was described as strong, whereas a correlation less than 0.5 was described as weak.

3.6 Data Collection procedures

The researcher collected both primary and secondary data. The primary data was collected through self-administered survey questionnaires to project implementation team leaders and personal interviews of members of AWSB management team. The questionnaires comprised of six parts. Part A sought to capture information on the respondents' demographics, part B the projects' compliance to schedule while part C to F sought to capture information on the influence of the four study independent variables; financing, monitoring, contractors' capacity and contract variations on the completion time of the water projects. The questionnaires were sent via e-mail to the respondents for self administration, who then sent their responses back to the researcher for data analysis.

Secondary data was collected from contract documents, site records, financial statements and project completion reports of the projects from the WSB. Content analysis of those documents enabled the researcher gain deeper insight of the activities that had taken place during the implementation of the projects and how and to what extent financing, monitoring, contractor's capacity and contract variations influence the completion time of the projects.

3.7 Data Analysis

Data analysis methods depend on the research design used, nature of data collected and measurement methods. This study was descriptive survey and hence descriptive data analysis method was suitable. Descriptive analysis describes a phenomenon in statistical terms as it happens or in an ex-post-facto sense. Data was quantitative and qualitative; measured on ratio and nominal scales. It was therefore analyzed both qualitatively and quantitatively using the Statistical Package for Social Scientists (SPSS) version 20.

The received questionnaires were first be checked for completeness and then coded as per the research questions. Qualitative data analysis was used to summarize Information gathered from interviews and secondary data into relevant themes according to the research questions. The mass of words generated by the open ended questions in the questionnaires were also qualitatively analyzed and added into the summary of themes.

Quantitative data was analyzed using descriptive statistics calculated as proportions, frequencies and percentages. Pearson correlation was used to determine the strength and direction of association, and linear regression analysis to establish cause and effect of relationships between the variables and to help indentify significant predictors of completion time.

3.8 Ethical Considerations

Ethical issues related to the study will be addressed by maintaining high level confidentiality of the information volunteered by the respondents and not using the information for other purposes other than drawing the conclusion of the study. The names of the respondents were not a requirement and if known to the researcher were not disclosed to protect their identities. All personal details were limited to general information. Permission was sought from the Chief

Executive Officer to collect data from the respondents and a letter of introduction to respondents attached to each questionnaire.

3.9 Operational Definition of Variables

Operational definition is a description of a variable, term or object in terms of the specific process or set of validation tests used to determine its presence and quantity. Variables described in this manner must be publicly accessible so that persons other than the definer can independently measure or test for them at will (Kish, 2011). Operationalization refers to the translation of concepts into tangible indicators of their existence (Saunders et al, 2009).

Table 3.2 summarizes the operational definitions of variables that were used in this study.

Table 3.2: Operational Definition of Variables used in the Study

Objective	Variable	Indicator(s)	Measurement	Scale	Study design	Type of analysis	Tool of Analysis
To determine how financing influences the completion time	<u>Independent Variable</u> Financing	a) Adequacy of project budget	a) Number of projects whose budgets were adequate	Nominal Ratio	Descriptive	Quantitative Qualitative	SPSS
		b) Timely payments of contractor's certificates	b) Number of projects in which contractors were paid on time	Nominal Ratio	Descriptive	Quantitative Qualitative	
		c) Contractor's financial capacity	c) Number of Projects in which contractors had no financial difficulties	Nominal Ratio	Descriptive	Quantitative Qualitative	
		d) influence of timely payments of contractor's certificates on the schedule/completion time	d) Perception of the influence of timely payments of contractor's certificates on the schedule/completion time	Nominal Ratio	Descriptive	Quantitative Qualitative	

To examine how the contractor's capacity influences completion time	<u>Independent Variable</u> Contractor's capacity	a) contractor's ability to effectively plan and schedule project activities	a) Perception of the contractors' ability to effectively plan and schedule project activities	Nominal Ordinal	Descriptive	Quantitative Qualitative	SPSS
		b) Contactor's experience	b) Number of projects whose contractors had adequate experience	Nominal Ratio		Quantitative Qualitative	
		c) Sufficiency of equipment	c) Number of projects whose contractors had sufficient equipment	Nominal Ratio		Quantitative Qualitative	
		d) Labor supply	d) Number of Projects whose contractors had/have adequate personnel and of required experience	Nominal Ratio		Quantitative Qualitative	
		e) Influence of contractor's capacity on project's schedule/	e) Perception of the influence of contractor's capacity on project's	Nominal Ordinal		Quantitative Qualitative	

		completion time	schedule/completi on time				
To establish the extent to which contract variations influence completion time	<u>Independent Variable</u> Contract variations	a) Frequency of variations in the project b) Extent of influence of variations on project's schedule or completion time	a) Number of projects in which variations were minimal b) Perception of the effect of variations on schedule or completion time	Nominal Ratio Ordinal Nominal	Descriptive Descriptive	Quantitative Qualitative Quantitative Qualitative	SPSS
To identify the number of water projects that were completed on time or were on schedule	<u>Dependent Variable</u> Project completion or schedule time	Actual project/milestone duration	Number of projects completed on time Number of ongoing projects that are on schedule	Nominal Ratio Nominal Ratio	Descriptive Descriptive	Quantitative Quantitative	SPSS

Table3.2: Operational Definition of Variables Used in the Study

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the findings of the study in which factors influencing the completion time of water projects undertaken by AWSB within the last five years were examined. The findings of the study have been discussed under thematic areas and sub-sections in line with the study variables and objectives. The thematic areas include: study demographics, projects' compliance to schedule, Financing, monitoring, contractor's capacity and contract variations.

4.2 Questionnaire Response Rate

A questionnaire with open and close-ended questions was administered to 27 project implementation team leaders of 6 completed and 3 ongoing water projects implemented by AWSB in Kiambu County within the last five years. The team leaders were selected on the basis of their practical experience in the construction of the projects in this study. They were also expected to have had sufficient experience in project management. It was therefore expected that their experiences would provide accurate information on the key factors influencing the completion time of water projects in WSBs from the clients', contractors' and consultants' perspective.

All the questionnaires distributed to 27 implementation team leaders of the projects; clients, consultants and contractors in the 9 study projects were completed and returned. This represented a 100% response rate which was ideal for the purpose of this study.

The collected data was then edited to ensure consistency across the respondents and locate any omissions or errors and clarifications sought from the members of AWSB management team on issues that were not clear. The data was then summarized, coded and analyzed using descriptive statistics using the Statistical Package for Social Science (SPSS) version 20. Linear regression analysis was used to establish cause and effect of relationships between the variables and to help indentify significant predictors of completion time while Pearson correlation was used to determine the strength and direction of variable associations. The findings are presented in tables which form a suitable basis for arriving at important findings and conclusions.

4.3 Demographic Characteristics of Respondents

The demographics of respondents were as categorized in the following sections:

4.3.1 Distribution of Respondents by Project Implementation Teams

Respondents were requested to indicate the organisations that they worked in so as to gauge the extent to which the three project implementation teams were represented.

Table 4.1: Respondent's Organizations

Type of Organisation	Frequency	% Frequency	Cumulative % frequency
Client	9	33.33%	33.33%
Consultant	9	33.33%	66.66%
Contractor	9	33.34%	100%
Total	27	100%	100%

As shown in Table 4.1, the resulting distribution of the 27 respondents among the three organisations was (33.3%) clients, (33.3%) consultants and (33.4%) contractors indicating adequate representation of views from the three groups of respondents.

4.3.2 Distribution of Respondents by job title

Respondents were also requested to indicate their job titles.

Table 4.2: Job Titles of the Respondents

Job Title		%	Cumulative
of respondent	Frequency	Frequency	% frequency
Project Engineers	9	33.33%	33.33%
Site Agents	9	33.33%	66.66%
Resident Engineers	9	33.34%	100%
Total	27	100%	100%

The resulting distribution of the 27 respondents among the three organisations was (33.33 %) clients, (33.3 %) consultants and (33.4 %) contractors indicating adequate representation of views from the three groups of respondents.

Project engineers represented the client-AWSB, site agents the consultants and resident engineers the contractors. These categories of respondents had had practical experience in the construction of the projects under study. It was therefore expected that the information they gave was valid and reliable.

4.3.3 Summary of respondents' years of experience

Respondents were asked to state their years of experience in the field of construction.

Average number of years of experience of clients' respondents was 17 Years

Average number of years of experience of consultants' respondents was 16 Years

Average number of years of experience of contractors' respondents was 17 Years

All the respondents therefore had experience of more than 10 years which was deemed to be adequate in infrastructure project management.

4.3.4 Other Similar projects executed by the respondents

Respondents were required to indicate the number of similar projects that they had executed in the past. Their responses are summarised in table 4.3.

Table 4.3: Number of Similar Projects Executed

Similar		%	Cumulative
Projects executed	Frequency	Frequency	% Frequency
1 to 10	2	7.4%	7.4%
11to 20	12	44.5%	52.9%
21 to 30	11	40.7%	92.6%
More than 30	2	7.4%	100%
Total	27	100%	100%

The results in this table indicated that 92.6% of all the respondents had implemented more than 10 similar projects; a good indication of their wealth of experience. It was therefore expected that their experiences provided reliable information on factors influencing the completion time of the water projects from the perspective of the clients, consultants and contractors.

4.4 Projects' completion time

This part of the study aimed at establishing the completion and schedule timelines of the complete and ongoing projects respectively.

4.4.1 Projects' current status

Respondents were required to first indicate whether the projects were complete or ongoing.

Table 4.4: Current Status of Projects

Current status of the projects	Frequency	% Frequency	Cumulative % frequency
Complete	18	66.7%	66.7%
Ongoing	9	33.3%	100%
Total	27	100%	100%

66.7% of the projects were complete while 33.3% were ongoing as shown in the table. This by proxy indicated that 6 of the studied projects were complete while 3 were ongoing.

4.4.2. Completion timeliness of projects

Of the completed projects, the respondents were asked to indicate whether they were completed as per the initial schedule (time). The responses are given in table 4.5.

Table 4.5: Project's Completion Timeliness

Project's completion was timely	Frequency	% Frequency	Cumulative % frequency
Yes	9	50.0%	50.0%
No	9	50.0%	100.0%
Total	18	100.0%	100.0%

The results showed that 50% of the projects were completed as per the initial schedule while 50% were not completed on schedule.

4.4.3 Schedule status of the ongoing projects

Of the ongoing projects, respondents were required to indicate whether they were on schedule.

Table 4.6: Ongoing Project's Schedule Status

Project was on		%	Cumulative
Schedule	Frequency	Frequency	% frequency
Yes	0	0.0%	0.0%
No	9	100.0%	100.0%
Total	9	100.0%	100.0%

The results showed that all the ongoing projects were behind schedule. All other factors remaining constant, it was most likely that those ongoing projects behind schedule would be completed late. From the results in tables 4.5 and 4.6 it is clear that; only 3 (33.3%) of the studied projects had achieved timely completion while 6 (66.7%) had delayed completion indicating that delay in completion Of water projects in Kiambu County is a big challenge.

4.5: Financing and project completion time

The first objective of this study was to determine how financing influences the completion time of water projects in WSBs.

Financing provides the monetary resources required to meet the project construction budget as represented by the project's bill of quantities. Inadequate construction funding and budgets, and bad cash flow that may be occasioned by contractor's and client's financial difficulties, have a heavy bearing on the project smooth running leading to delayed completion of a project.

4.5.1 Adequacy of the Projects' budgets

Respondents were requested to indicate whether the projects' budgets were adequate.

Table 4.7: Adequacy of Project's Budgets

Project's budget			Cumulative
Was adequate	Frequency	% frequency	% frequency
Yes	18	66.7%	66.7%
No	9	33.3%	100%
Total	27	100%	100%

The results indicated 66.7 % projects had adequate budgets while in 33.3% the projects budgets were inadequate.

4.5.2 Timeliness of payments of contractors' certificates

Respondents were requested to indicate whether payments of contractors' certificates were made on time. Timely payment of contractors' certificates ensures contractors have funds to enable them adequately finance construction activities within the required time frame.

Table 4.8: Timeliness of Payments of Contractors' Certificates

Payments of			
Contractors			
Certificates were		%	Cumulative
made on time	Frequency	Frequency	%frequency
Always	2	7.4%	7.4%
Often	8	29.6%	37.0%
At times	6	22.3%	59.3%
Rarely	11	40.7%	100.0%
Total	27	100.0%	100.0%

The results showed that only 37% of respondents indicated that payments of contractors' certificates were always or often made on time while 63% of respondents indicated that payments of contractors' certificates were at times or rarely made on time even though majority of the respondents (66.7%) indicated that project budgets were adequate. It is possible that this high level of delay in making payments to the contractor contributed to the high percentage (66.7%) of delayed project completions observed in this study. Project clients (WSBs) will have to thus make efforts to pay contractors' certificates on time to enable timely execution of projects construction activities if the projects are to be completed as initially scheduled.

4.5.3 Contractor's financial capacity

In order to gauge the contractors' financial capacity, respondents' opinion of the contractors' financial difficulties was sought. Contractor's financial difficulties contribute to inadequate construction funding leading to contract's time extension among other negative effects. Their responses are summarised in table 4.9.

Table 4.9: Contractor's Financial Capacity

Contractor had no		%	Cumulative
Financial difficulties	Frequency	Frequency	% Frequency
Strongly agree	4	14.8%	14.8%
Agree	8	29.6%	44.4%
Disagree	10	37.1%	81.5%
Strongly disagree	5	18.5%	18.5%
Total	27	100.0%	100.0%

44.4% of the respondents agreed that the contractor did not have financial difficulties while 55.6% disagreed. Financial difficulties of the contractor may be occasioned by the client's failure to honor contractual payment agreements made between them and the contractors and / or contractor's inability to effectively manage the project finances.

4.5.4 Influence of timely payments of contractors' certificates on projects' completion time

Respondents' opinion of the influence of timely payments of contractors' certificates on projects' completion time was also sought.

Table 4.10: Influence of Timely Payments to Contractors on Project's Completion Time

Influence of timely		%	Cumulative
Payments to contractors	Frequency	Frequency	% Frequency
Much influence	27	100.0%	100.0%
Total	27	100.0%	100.0%

All the respondents were of the opinion that timely payments of contractors' certificates had much influence on the completion time of the projects as shown in table 4.10.

4.6 Monitoring and project's completion time

The second objective of this study was to establish how monitoring influences the completion time of water projects in WSBs.

Effective project monitoring helps project managers ensure that projects are on track to completion by certain deadlines by comparing actual performance with planned performance and taking timely corrective actions to yield desired outcomes whenever significant deviations occur.

To achieve this, the supervisory personnel should be enough and of the required skills

4.6.1 Adequacy of supervisory teams

Respondents were required to indicate their opinion of the adequacy of the projects' supervisory teams.

Table 4.11: Adequacy of Supervisory Teams

Adequacy of supervisory	%	Cumulative	
Teams	Frequency	Frequency	% Frequency
Strongly agree	2	7.4%	7.4%
Agree	4	14.8%	22.2%
Disagree	12	44.5%	66.7%
Strongly disagree	9	33.3%	100.0%
Total	27	100.0%	100.0%

Only 22.2% of the respondents were of the opinion that supervisory teams were adequate while the remaining 77.8% disagreed.

4.6.2 Ability to effectively supervise the projects

This section of the study aimed at gauging the effectiveness of the projects' monitoring process by asking the respondents to indicate their opinion of the supervisors' ability to effectively supervise the projects.

Table 4.12: Supervisor's Ability for Effective Supervision

Supervisor's ability for effective supervision	%		Cumulative
	Frequency	Frequency	% Frequency
Very good	0	0.0%	0.0%
Good	6	22.2%	22.2%
Poor	13	48.2%	70.4%
Very poor	8	29.6%	100.0%
Total	27	100.0%	100.0%

As shown in table 4.12, the ability of the supervisor to effectively supervise the projects was rated as good in only 22.2% of the projects. This percentage was the same as that of the projects in which supervision teams were adequate while in the other 77.8%; supervisory ability was rated poor.

4.6.3 Timeliness in making of approvals and decisions

Whenever deviations from planned targets are detected; decisions on appropriate actions should be made immediately to avoid to the deviation getting to an unmanageable level. At the same time, approvals to execute construction activities should be obtained before engaging the contractor in order to avoid conflicts during implementation. This helps ensure that the project's planned scope and / or contract duration is achieved. To gauge the timeliness of approvals and

decisions making, respondents were requested to indicate whether decisions and approvals were made on time.

Table 4.13: Timely Making of Approvals and Decisions

Approvals and decisions		%	Cumulative
Were made on time	Frequency	Frequency	% Frequency
Always	4	14.8%	14.4%
Often	7	25.9%	40.7%
At times	14	51.9%	92.6%
Rarely	2	7.4%	100.0%
Total	27	100.0%	100.0%

The results showed that approvals and decisions were always or often made on time in only 40.7% of the projects. In the remaining 59.3%, decisions and approvals were made on time only at times or rarely.

4.6.4 Timeliness in taking actions on decisions made

Respondents were requested to indicate whether actions to decisions made were taken on time.

Actions were taken on time in only 33.3% of the projects.

Table 4.14: Timely Action Taken

Actions		%	Cumulative
were taken on time	Frequency	Frequency	% Frequency
Strongly agree	0	0.0%	0.0%
Agree	9	33.3%	33.3%
Disagree	14	51.9%	85.2%
Strongly disagree	4	14.8%	100.0%
Total	27	100.0%	100.0%

Timely action taking was indicated in only 33.3% of the projects. From the results obtained in tables 4.11 to 4.14, it was clear that monitoring of majority of the projects (70.3%) was ineffective. Since effective monitoring of projects contributes to timely completion of projects; it is possible that the high percentage of delayed completions observed in this study was partially occasioned by poor monitoring processes. Project managers should therefore strive to ensure that monitoring which is an important project control component is reinforced throughout the project cycle.

4.6.5 Influence of the monitoring process on project's completion time

The extent of the influence of the monitoring process on the projects' completion time was sought from the respondents. As indicated in table 4.16, Majority (92.6%) of them affirmed that it had much influence.

Table 4.15: Influence of Monitoring Process on Projects' Completion Time

Influence of monitoring on projects' completion time	Frequency	% Frequency	Cumulative % Frequency
Much influence	25	92.6%	92.6%
Little influence	2	7.2%	100.0%
Total	27	100.0%	100.0%

4.7 Contractor's capacity and project completion time

The second objective of this study was to examine how the contractor's capacity influences the completion time of water projects in WSBs.

The contractor's capacity for effective construction management which entails planning and scheduling project activities and maximizing of the resource efficiency through procurement of sufficient equipment, materials and personnel is paramount during the project's construction stage if the project's stipulated targets are to be achieved. Such capacity improves through experience in the construction field acquired through regular undertaking of projects.

4.7.1 Contractor's experience in undertaking similar projects

Respondents were asked to indicate whether the contractors had enough experience in undertaking similar projects. Their responses are summarised in table 4.16

Table 4.16: Contractors' Experience in Similar Projects

Contractor had adequate		%	Cumulative
Experience in similar projects	Frequency	Frequency	% Frequency
Strongly agree	11	40.7%	40.7%
Agree	13	48.2%	88.9%
Strongly disagree	3	11.1%	11.1%
Disagree	0	0.0%	100.0%
Total	27	100.0%	100.0%

89.9% of the respondents agreed that contractors in their projects had adequate experience in undertaking similar projects while the other 11.1% disagreed. These results were consistent with the findings in this study (table 4.3) indicating that majority of the respondents (92.6%) had executed more than 10 other similar projects.

4.7.2 Contractor's Planning and Scheduling Capacity

Respondents were asked to rate the contractor's ability to effectively plan and schedule project activities. Their responses are summarised in table 4.17

Table 4.17: Contractors’ Planning and Scheduling Capacity

Contractor’s ability for effective planning and scheduling	Frequency	% Frequency	Cumulative % Frequency
Very good	0	0.0%	0.0%
Good	8	29.7%	29.7%
Poor	10	37.0%	66.7%
Very poor	9	33.3%	100.0%
Total	27	100.0%	100.0%

Planning and scheduling was rated good in only 29.7% of the projects while it was rated as being poor or very poor in 70.3% of the projects.

4.7.3 Equipment sufficiency

Respondents’ opinion of the contractors’ equipment capacity was sought and their responses summarised in table 4.18.

Table 4.18: Contractors’ Sufficiency of Equipment

Contractor had sufficient equipment	Frequency	% Frequency	Cumulative Sufficient
Strongly agree	0	0.0%	0.0%
Agree	10	37.0%	37.0%
Disagree	7	26.0%	63.0%
Strongly disagree	10	37.0%	100.0%
Total	27	100.0%	100.0%

The results showed that contractors in only 37.0% of the projects had sufficient equipment while contractors in 63.0% of the projects did not have sufficient equipment.

4.7.4 Contractor had enough personnel and of required skills

Respondents were also requested to indicate their opinion of the contractor’s capacity for sufficient personnel.

Table 4.19: Contractors' Sufficiency of Skilled Personnel

Contractor had enough personnel Of required skills	% Frequency	Frequency	Cumulative % Frequency
Strongly agree	0	0.0%	0.0%
Agree	12	44.0%	44.0%
Disagree	7	26.0%	63.0%
Strongly disagree	8	29.6%	100.0%
Total	27	100.0%	100.0%

Respondents agreed that contractors had sufficient personnel of the required skills in 44.4% of the projects while in 56.6% of the projects the contractor did not have sufficient personnel.

From the findings in this section; it is evident that though the contractors' experience in undertaking similar projects was adequate in 89.6% of the projects; their capacity in construction management was highly deficient.

4.7.5 The extent to which contractors' capacity influences projects' completion time

Respondents were requested to indicate the extent to which contractor’s capacity influences a project’s completion time. Table 4.20 indicates their responses.

Table 4.20: Influence of Contractor's Capacity on Projects Completion Time

Influence of contractor’s capacity		%	Cumulative
On a project’s completion time	Frequency	Frequency	% Frequency
Very Large extent	8	29.6%	29.6%
large extent	19	70.4%	100.0%
Total	27	100.0%	100.0%

The results in the table indicate that all the respondents were of the opinion that it did to a large extent.

4.8 Contract variations and project completion time

The fourth objective was to establish the extent to which contract variations influence project completion time.

Contract variations are admissible deviations in contractual agreements that may be occasioned by unforeseen problem areas such as unexpected weather and ground conditions that occur during project implementations. Such problem areas impact negatively on a project’s targets of time, cost, quality and scope.

4.8.1 Frequency of variations in the projects

Respondents were asked to rate the frequency of variations in the projects.

Table 4.21: Frequency of Variations in the Projects

Frequency of variations	Frequency	% Frequency	Cumulative % Frequency
Very many	1	3.7%	3.7%
Many	10	37.0%	40.7%
Few	14	51.9%	92.6%
None	2	7.4%	100.0%
Total	27	100.0%	100.0%

Variations were rated very many or many in 40.7% of the projects and few or none in 59.3% of the projects as shown in table 4.21.

4.8.2 Most influential variation on the completion time of the projects

The respondents were requested to identify from a list of three variations the one they thought was most influential on the completion time of their projects. Their responses are as shown in table 4.22

Table 4.22: Most Influential Variation on the Completion time of the Project

Most influential	%	Cumulative	
Variation	Frequency	Frequency	% Frequency
Unexpected ground	12	44.4%	44.4%
Conditions			
Adverse weather	9	33.3%	77.7%
Scope changes	6	22.3%	100.0%
Total	27	100.0%	100.0%

From table 4.22, it was evident that most of the respondents were of the opinion that the most frequent variation was unexpected ground conditions (44.4%) followed closely by adverse weather (33.3%).

4.8.3 Extent to which variations influence the project completion time

Respondents were further asked to indicate the extent to which variations influenced the completion time of their projects. Their responses are shown in table 4.23

Table 4.23: Extent of Influence of Variations on Projects' Completion Time

Influence Variations on completion time	Frequency	% Frequency	Cumulative % Frequency
Very large extent	3	11.9%	11.9%
Large extent	12	44.5%	55.6%
Little extent	8	29.6%	85.2%
Very little extent	4	14.8%	100.0%
Total	27	100.0%	100.0%

55.6% of the respondents indicated that variations influenced the completion time to very large or large and 44.6% indicated that variations influenced completion time to little or very little extent. It is then important that project managers make adequate arrangements for forecasting mechanisms to be included in the implementation plans to enable identifications of potential threats early enough to enable timely mitigation in order to minimise their negative impacts on project targets.

4.9 Correlation analysis of the variables

To determine the strength of the independent variables in predicting the dependent variable (completion time of water projects) and the direction of their relationship with the dependent variable, a bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.01 (1%) significant level. The results of the analysis are summarised in table 4.24

Table 4.24: Correlation Coefficients of Variables

		Project completion Time total value	Financing total value	Monitoring total value	Contractors' capacity total value	Contract variations Total value
Project Completion time Total value	Pearson correlation Sig. (2-tailed) N	1 27	0.432 0.178 27	0.448 0.173 27	0.702 0.001 27	-0.282 0.617 27
Financing total value	Pearson correlation Sig. (2-tailed) N	0.432 0.178 27	1 27	0.443 0.066 27	0.120 0.617 27	0.079 0.156 27
Monitoring total value	Pearson correlation Sig. (2-tailed) N	0.448 0.173 27	0.443 0.066 27	1 27	0.179 0.476 27	0.217 0.046 27
Contractors' Capacity total value	Pearson correlation Sig. (2-tailed) N	0.702 0.001 27	0.120 0.637 27	0.179 0.476 27	1 27	0.195 0.660 27
Contract Variations Total value	Pearson Correlation Sig. (2-tailed) N	- 0.282 0.617 27	0.079 0.156 27	0.217 0.046 27	0.195 0.660 27	1 27

Correlation is significant at the 0.01level (2-tailed)

Results from table 4.24 showed the following relationships.

A moderate positive relationship ($r = 0.432$) between financing and project completion time which was statistically significant at 1% level because $p=0.178$. A coefficient of determination (r^2) computed to determine the influence of financing on the completion time of the water projects showed that 19% of variations in project completion time can be attributed to financing, all other factors remaining constant.

A moderate positive relationship ($r = 0.448$) between monitoring and project completion time which was statistically significant at 1% level because $p=0.173$. The coefficient of determination (r^2) showed that 20% Of variations in project completion time can be attributed to financing, all other factors remaining constant.

A statistically significant moderate positive relationship ($r = 0.702$) between contractor's capacity and project completion time at 1% level because $p=0.001$. The coefficient of determination (r^2) showed that 49% Of variations in project completion time can be attributed to contractor's capacity, all other factors remaining constant.

A low negative relationship between contract variations and project completion time ($r = - 0.289$) which was statistically significant at 1% level because $p=0.617$. The coefficient of determination (r^2) showed that 8% Of variations in completion time can be attributed to contract variations, all other factors remaining constant.

The four independent variables that were studied account for 96% of the completion time of the water projects. This therefore means that other factors not studied in this research contribute 4%

of variance in the dependent variable. Further research should therefore be conducted to establish the factors influencing the completion time of water projects in AWSBs Kiambu County and in the other WSBs in Kenya.

4.9 Regression of variables

In order to get the importance of each of the four independent variables (Financing, monitoring, contractor’s capacity, contract variations) and their contribution to the completion time of the projects, a multiple regression analysis was carried out. The beta coefficients computed indicate the slope of the regression line while t-test is at 1% significant level. This is illustrated in table 4.25 below.

Table 4.25: Beta Coefficients of Regression of Variables

Model	Unstandardized	Standardized		T	Sig. (@ 1%)
	Coefficient	coefficients	Beta		
	B	Std error	Beta		
Constant	2.721	0.77		5.654	0.000
Financing	0.453	0.241	0.534	0.256	0.003
Monitoring	1.967	0.656	0.323	0.198	0.002
Contractor’s capacity	2.254	0.437	0.356	0.199	0.001
Contract variations	0.233	0.296	0.237	0.567	0.004

The regression model generally assumes the following equation.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where;

Y = Project completion time – The dependent variable

β_0 = this is the Y – intercept which is a constant not a variable

X_1 = financing

X_2 = monitoring

X_3 = contractor's capacity

X_4 = contract variations

e = error; variable which represents all the factors that affect the dependent variable but were not included in the model either because they were difficult to measure or not known.

From the regression findings, the substitution of the equation ($Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$) becomes:

$$Y = 2.721 + 0.256 X_1 + 0.323 X_2 + 0.356 X_3 - 0.237 X_4 + 0.77$$

$$y = 2.721 + 0.256 \text{financing} + 0.323 \text{montoring} + 0.356 \text{contractor's capacity} - 0.237 \text{variations} + 0.77$$

According to the equation, taking all factors (Financing, monitoring, contractor's capacity, contract variations) constant at zero, timely completion of the projects will be 2.721.

The data findings also showed that a unit increase in financing effectiveness will lead to a 0.256 increase in timely completion of projects; a unit increase in monitoring effectiveness will lead to a 0.323 increase in timely completion of the projects; a unit increase in contractor's capacity will lead to a 0.356 increase in timely completion of the projects; and a unit increase in contract

variations will lead to a 0.237 decrease in timely completion of the projects. This means that the most significant factor is contractor's capacity followed by monitoring.

At 1% level of significance and 99% level of confidence, financing had a 0.003 level of significance; monitoring 0.002, contractor's capacity 0.001 level of significance while contract variations had a 0.004 level of significance implying that the most significant factor is contractor's capacity followed by monitoring of projects.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes and discusses the findings of the study and presents conclusions, recommendations and suggestions for further research. The purpose of this study was to investigate factors influencing the completion time of both complete and ongoing water projects in AWSB, Kiambu County. The variables examined were Financing, monitoring, contractor's capacity and contract variations during the implementation phases of the projects. The study used a purposive sample of respondents all of whom were project engineers representing the clients, contractors and consultants and who were involved in the implementation of the projects.

5.2 Summary of Findings

Nine projects; 6 complete and 3 ongoing were studied. Completion was timely in only three of the complete projects while all the ongoing projects were behind schedule. Most of the respondents indicated that the completion time of the projects was greatly influenced by the four factors and that these factors remain critical and continue to affect the completion time of the projects. This was also supported by the regression model which showed that the four independent variables accounted for 96% of the project's completion time.

The research findings per the study objectives were as follows:

5.2.1 Influence of financing on the completion time of water projects

According to the findings, payments of the contractors' certificates were made on time in only 7.4% of the projects and that 55.6% of the contractors had financial difficulties although budgets in majority of the projects (66.7%) were adequate. All the respondents were of the opinion that completion time of the projects was greatly influenced by the time payments of contractors' certificates were made. This was also supported by the bi-variate analysis which showed a moderate positive relationship ($r=0.432$) between financing and completion time of the projects.

5.2.2 Influence of monitoring on the completion time of water projects

From the findings, the supervisor's ability to effectively supervise the projects was rated poor in 77.8% of the projects which was consistent with the findings that supervisory teams were inadequate in the same percentage of projects, and that actions on observed deviations in project targets were not taken on time in majority (66.7%) of the projects. 92.6% of the respondents indicated that monitoring had much influence on the completion time of the projects. The bi-variate analysis showed a moderate positive relationship ($r=0.448$) between monitoring and the completion time of the projects.

5.2.3 Influence of contractor's capacity on the completion time of water projects

From the study findings, 92.6% of the contractors had executed more than 10 similar projects and that all had on average an experience of more than 10 years in the field of construction. This was confirmation that they had sufficient experience in construction management. Their ability to effectively plan and schedule project activities was however rated poor in 70.3% of the projects and most of them (89.6%) lacked sufficient equipment and personnel. All the

respondents were of the opinion that the contractors' capacity had a big influence on the completion time of the projects. This was supported by the bi-variate analysis which showed a high positive relationship ($r=0.702$) between contractor's capacity and completion time of the projects.

5.2.4 Influence of contract variations on the completion time of water projects

According to the research findings contract variations were indicated in 92.6% of the projects with unexpected ground conditions being rated the most frequent variation. 55.6% of the respondents were of the opinion that completion time of the projects was to a large extent influenced by contract variations. The bi-variate analysis showed a negative relationship ($r=-0.282$) between contract variations and completion time of the projects meaning that the more the variations the lower the probability of timely completion of the water projects would be.

5.3 Discussion of Findings

The following section presents discussion of findings under the various thematic areas.

5.3.1 Influence of Financing on completion time of water projects

The first objective of the study was to determine how financing influences the completion time of water projects. The findings showed a positive relationship between financing and completion time of the projects. The findings also showed that although a significant percentage of the respondents indicated that budgets in their projects were adequate, payments of contractors' certificates in majority of the projects were only at times or rarely made on time and that 55.6% of the contractors had financial difficulties. Additionally there was delay in completion of 6 out

of the 9 projects studied implying delay in completion of water projects in Kiambu County is a big challenge.

These findings relate with the literature review where Devarpiya & Ganesan (2002) stated that inadequate construction funding and budgets as well as bad cash flow that may be occasioned by contractor's and client's financial difficulties have a heavy bearing on a project's smooth running leading to delayed completion of a project, while Thomas (2002) obtained that financing is a major success criterion of construction projects.

It is therefore important that clients and contractors avail adequate funds and at the required time to enable timely facilitation of project activities and by extension timely completion of projects.

5.3.2 Influence of monitoring on completion time of water projects

The second objective of the study was to establish the influence of monitoring on the completion time of water projects. From the findings, project supervision was rated poor in most of the projects. Poor supervision was also evidenced by the high percentage of projects in which supervisory teams were inadequate and actions to decisions were not taken on time.

This finding relates with the literature review in which WASREB in its annual report observed that monitoring of investment implementation in the WSBs continues to be poor despite the effort by the ministry of water and irrigation to streamline WSBs' investment planning and monitoring, while Chan and Kumaraswamy (1998) found that low speed of decision making involving all project teams was one of the most significant factors causing delays in completion of construction works.

Effective project supervision is a monitoring strategy that enables the project manager to detect deviations in project targets and implement corrective measures before they go out of hand and impact negatively on project targets of schedule.

5.3.3 Influence of contractor's capacity on completion time of water projects

The third objective of the study was to examine how contractor's capacity influences the completion time of water projects. The study found that most of the respondents indicated that though most of the contractors had adequate experience in undertaking similar projects, most of them had incompetence attributed to inadequate personnel and equipment, and inability to effectively plan and schedule project activities. All the respondents were of the opinion that contractor's capacity influenced completion time of the projects to a large extent.

These findings relate with the literature review where Chan and Kumaraswamy (2002) concluded that Contractor's incompetence/inadequacy attributed to problems such as delayed procurement of equipment and materials, labour shortages or engaging inadequate labour skills is a key factor contributing to time overruns in construction projects globally, While Xiao and Proverbs (2003) and Sambasivan and Soon (2007) assert that contractor's construction management capacity ranks among the ten most common factors influencing successful completion of projects.

The contractor's capacity for effective construction management which is the overall planning, coordination and control of project activities and resources from the beginning to the completion is paramount for timely completion of the project.

5.3.4 Influence of contract variations on completion time of water projects

The fourth objective of the study was to establish the influence of contract variations on the completion time of water projects. The study found that there were contract variations in majority of the projects and that unexpected ground conditions was the most frequent variation.

These findings relate with literature review where Chan and Kumaraswamy (1998) found that unexpected problems arise during the construction phase leading to contract variations and that unforeseen ground conditions are among the most significant such problems causing delays in completion of projects.

It is therefore important that the project manager makes adequate initial arrangements for forecasting mechanisms to be included in the implementation plan to enable identification of any potential threats early enough so that appropriate action is taken to minimize their impact on the project.

5.4 Conclusion

From the above findings the researcher can conclude that:

The level of financing of a project's construction activities and its timeliness determines its completion time. When project financing is adequate and timely, the project's contract schedule will be adhered to and hence its completion will be timely. The high percentage of contractors' financial difficulties observed in this study can be attributed to the high percentage of delayed payments of contractors' certificates, leading to the high percentage of delayed project completions of the water projects. Financing is thus a significant predictor of the completion

time of water projects that has a strong positive relationship with timely completion of the projects.

It is therefore important that the contractors and clients of the water projects make projects financing plans that are feasible to enable their adequate and timely funding.

Effective monitoring partially depends on adequacy of supervisory personnel and timeliness in making of decisions and taking of actions to alleviate significant project target deviations that exist. This was attested by the finding that the percentage of the projects in which monitoring was indicated as being poor was the same as that in which respondents felt supervision teams were inadequate. This by extension meant that decision making and action taking to alleviate deviations were not timely culminating to a big percentage of delayed completions of the water projects. There is therefore direct positive relationship between monitoring and timely completion of water projects.

It is hence important for WSBs to reinforce monitoring of their projects to help identify factors affecting construction efforts of projects in order that they can be mitigated before they impact negatively on the project s' completion time.

Contractors experience in the construction field is not a guarantee that they would successfully execute new projects. This was attested by the findings that though all the contractors had sufficient experience in executing other similar projects, there was a very high percentage of completion delay in the water projects. Contractor's incompetence that can be attributed to inadequate equipment and personnel with required skills as well as financial difficulties among others is a key factor contributing to time overruns in the water projects. Contractor's capacity is

therefore a very significant predictor of timely completion of the water projects that has strong positive relationship with timely completion.

WSBs should therefore reinforce effective construction management practices that entail effective overall planning coordination and control of project activities from the beginning to the completion of the water projects.

Contract variations occasioned by unpredicted physical conditions and /or necessary changes in scope occur in almost every implementation. Variations will conspire against the project and impact negatively on the project targets of time. This can explain the finding in this study that it was only in 7.4% of the projects that there were no variations, yet the percentage of completion delays among the projects was much higher. There is therefore a negative relationship between variations and timely completion of the water projects.

As a result, it is important that WSBs make adequate initial arrangements for forecasting mechanisms to be included in the implementation plan to enable identification of any potential threats early enough so that appropriate action is taken to minimize their negative impact on the completion time of water projects.

5.5 Recommendations of the Study

In light of the key findings of this study, the following recommendations are proposed to address completion time of water projects in WSBs:

- (i) WASREB should emphasise on a comprehensive sector investment plan sufficiently detailed (to pre-feasibility quality), for further development through feasibility studies

and financing plans be submitted by all WSBs for use as a criterion for the allowing funding of project budgets. This would ensure that project budgets are adequate and be sufficient reference points for the appropriate time of making progress payments during the project's construction period to avoid financial difficulties.

(ii) Monitoring is a factor that was positively influencing the completion time of the water projects as it provided the project implementers and other stakeholders of the projects with indications of the extent of progress and achievement of objectives and progress in the use of all allocated resources, helping them ensure that the projects were on track to completion by certain deadlines by comparing actual performance with planned performance and taking timely corrective action to yield desired outcomes when significant deviations existed. All WSBs should therefore adopt a comprehensive monitoring and reporting system that is result based to be adopted by all implementing agents to motivate implementers effectively supervise ongoing projects.

(iii) To ensure that contractors have the required capacity to deliver projects as per the initial schedules, WSBs should demand for prove of past successful executions of similar projects from contractors before procuring them. This is because contractor's capacity was found to be a very strong determinant of completion time of the water projects.

(iv) Since contract variations impacted negatively on the completion time of the water projects WASREB and WSBs should ensure that adequate forecasting mechanisms are

included in the implementation plan to enable identification of any potential threats early enough so that appropriate action is taken to minimize their impact on the project.

5.6 Suggestions for Further Research

- (i) Further research should be conducted to establish other factors determining completion time of water projects in WSBs in Kenya since the four variables that were studied accounted for only 96% of variations in completion time of the water projects.
- (ii) The study focused on factors involved in the construction phase of the projects. The scope of the study should be widened to include factors in the whole project cycle.
- (iii) A study should be carried out on value for money for water projects in WSBs in Kenya in order to gauge whether the implementation of the water supply and sewerage projects use the available resources optimally, and to assess the projects' outcomes and impacts.

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APPENDICES

Appendix 1: Letter of Introduction

I am carrying out a research on “**Factors influencing the Completion Time of Water Projects in Athi Water Services Board, Kiambu County.**” This is in partial fulfillment of the requirement for the award of a Master of Arts degree in Project Planning and Management.

I kindly request you to assist me by responding to all questions in this questionnaire frankly and precisely. All information given will be treated confidentially and for the purpose of the research project only.

Thank you for your cooperation.

Yours Sincerely,

Ndungu Rosemary Wangari

Appendix 2: Questionnaire to Water Projects' implementation team leaders

The aim of this questionnaire is to gather information about the **factors influencing the completion time of both completed and ongoing water supply projects undertaken by AWSB, in Kiambu County within the last five years.** This questionnaire is required to be filled with exact relevant facts as much as possible. All data included in this questionnaire will be used only for academic research and will be strictly confidential. After all questionnaires are collected and analyzed, interested participants of this study will be given feedback on the overall research results. Please respond to each question by adding a tick in the appropriate response or filling in the relevant information.

Name of project.....

Part A: General Information:

1. Respondent's Organisation:

Client Consultant Contractor

2. Job title of the respondent:

Project Engineer Site Engineer/ Agent Resident Engineer

3. Years of experience of the respondent:

Number of years of experience of the respondent is..... Years

4. Number of similar projects that you have executed:

- 1 to 10 11 to 20 21 to 30 More than 30

Part B: Project's completion time

5. What is the current status of the project?

- Complete Ongoing

6. If complete; was the project completed as per the initial schedule?

- Yes No

7. If ongoing; is the project currently on schedule?

- Yes No

Please respond to the questions in part C to F with respect to the current status of the project; whether complete or ongoing.

Part C: Financing of the project

8. Was / is the project's budget adequate?

- Yes No

9. Are / were payments of contractor's certificates made on time?

- Always often at times rarely

10. The contractor did not / does not have financial difficulties.

Strongly agree agree disagree strongly disagree

11. What was / is the influence of timely payments of contractor's certificates on the project's completion time?

Much influence little influence very little influence no influence

Part D: Monitoring

12. The project's supervision team was / is adequate.

Strongly agree agree disagree strongly disagree

13. How would you rate the supervisor's ability to effectively supervise the project?

Very good good poor very poor

14. Are / were approvals and decisions made on time?

Always often sometimes rarely

15. Actions to decisions made were / are taken on time.

Strongly agree agree disagree strongly disagree

16. What influence did / does the monitoring process have on the completion time / schedule of the project?

Much influence little influence Very little influence No influence

Part E: Contractor's capacity

17 The contractor had / has adequate experience in undertaking similar projects.

Strongly agree agree disagree strongly disagree

18 How would you rate the contractor's ability to effectively plan and schedule project activities?

Very good good poor very poor

19 The contractor had / has sufficient equipment.

Strongly agree agree disagree strongly disagree

20 The contractor had / has enough personnel and of required skills.

Strongly agree agree disagree strongly disagree

21 To what extent did / does the contractor's capacity influence the completion time/schedule of the project?

Very large extent large extent little extent no effect

Part F: Contract variations

22 How would you rate the frequency of variations in the project?

Very many many few none

23 In your own opinion, which of the listed variations was/is the most influential on the completion time / schedule of the project? Put a tick to indicate the extent to which you agree on a scale of 1 to 4 where 1=Strongly agree, 2=Agree, 3= Disagree and 4=Strongly disagree.

	Strongly agree	Agree	Disagree	Strongly disagree
	1	2	3	4
Changes in scope				
Adverse weather				
Unexpected ground conditions				

24 To what extent did / do variations influence the completion time / schedule of the project?

Very large extent large extent little extent Very little extent

25 State other factors in order of importance that had / have had significant influence on the completion time / schedule of the project.

.....
.....
.....
.....

26 Kindly give suggestions on how the project's completion time could be improved.

.....
.....
.....
.....

Thank you