CONSTRUCTION DELAY AND COMPLETION OF DAM PROJECTS IN KITUI COUNTY KENYA

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A Research Project Presented in Partial Fulfilment of the Requirements for the Award of Master of Arts in Project Planning and Management,
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DECLARATION

This project is my origination and that it has never been submitted for assessment for any award in any institution.

Signature  _____ Date: **29-11-2023**

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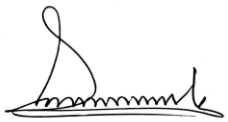
L50/10140/2018

The project has been submitted for assessment with my approval as the university appointed supervisor.

Signature  _____ Date_____ **29th November, 2023**

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DEDICATION

This research is dedicated to my husband, Kennedy Okiro, my daughter Mya Okiro, My son, Gavin Okiro, parents Nick and Jeddy Arum, siblings Clifford and Philip Arum for their unconditional love, encouragement and immense support during my studies.

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ABBREVIATION AND ACRONYMS

GDP	Gross Domestic Product
GST	General Systems Theory
ICOLD	International Commission on Large Dams
M & E	Monitoring and Evaluation
NSE	Nairobi Securities Exchange
RVWSB	Rift Valley Water Services Board
SEM	Structural Equation Modelling
WCD	World Commission on Dams

ABSTRACT

The research project purposed to find out construction delay and completion of dam projects in Kitui County Kenya. The research was carried out in Kitui County Kenya, located approximately 160 kilometres from Nairobi on the eastern part of Kenya. This study's four specific objectives were to determine how design changes affect completion of dam construction projects in Kitui County Kenya, to examine how delay in payment affects completion of dam construction projects in Kitui County Kenya, to assess how planning affects completion of dam construction projects in Kitui County Kenya and to examine how site management affects completion of dam construction projects in Kitui County Kenya. This research thus focused on both contingency theory and general systems theory. A descriptive survey research design was utilized. Population comprised of project managers, contractors, consultants, and the project employees on site from the material department, site supervisor, finance department and Design department in charge of the dam projects. This study targeted 24 dams in Kitui County. The study's unit of analysis was 168 respondents comprising of project managers, contractors, consultants, and the project employees on site from the material department, site supervisor, finance department and design department in charge of the dam projects. The study sample size was 118. The respondents for the research were chosen using stratified random sampling. The questionnaire was the study's chosen instrument or technique for data gathering. Pilot research was undertaken to pre-test and verify the questionnaire. The study was descriptive in nature using mean, frequency, and percentages to assess quantitative data obtained. The narrative approach was used to analyse open-ended questions. A correlation was employed in establishing the strength of the link between the dependent variable and independent variable. Multiple regressions were done to establish how construction delay affects completion of dam projects in Kitui County Kenya. The study found that design changes significantly affect completion of dam projects in Kitui County, Kenya (B=0.567; p=0.000). The study established that delay of payment significantly affects completion of dam projects in Kitui County, Kenya (B=0.962; p=0.000). The study also revealed that project planning and scheduling significantly affect completion of dam projects in Kitui County, Kenya (B=0.639; p=0.000). The study found that site management and supervision significantly affect completion of dam projects in Kitui County, Kenya (B=0.709; p=0.000). The study concluded that delay of payment had greatest effect on completion of dam projects in Kitui County, Kenya followed by site management and supervision then project planning and scheduling while design changes had the least effect on completion of dam projects in Kitui County, Kenya. Recommendation is made that project managers and contractors of dam projects in Kitui county should conduct robust initial planning. The study also recommends that recommends that county government of Kitui in collaboration with projects managers should foster collaboration and communication among project stakeholders, including government agencies, contractors, consultants, and local communities. The recommendation made was that county government should invest in training and skill development for site managers, supervisors, and construction workers involved in dam projects.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Completion of a dam project is the successful accomplishment of the project goal. It covers the dam project's last phases, which include product acceptance, analysis, experience assurance, and the final completion of the dam. Only after all of the operations associated with the dam project have been completed will the project be considered complete. If the real aim is not met, this is referred to as project termination. Construction delay is regarded as time lag in projects from its specified duration in the contract which directly affects construction cost (Ford & Lyneis, 2020).

Delay is among the crucial challenge that construction companies face. A wide range of negative consequences are caused by delays including disputes between contractors and owners, lost productivity, contract termination and higher expenses. Despite the fact that several researches have been conducted to investigate the reasons of delays, these studies seldom highlight common and general causes of delays in building projects (Abera, 2022). As a result, a thorough investigation into these delays was considered necessary.

Because the issues are more contextual, the study focused on both specific and common reasons of delay, such as Delay in payment which is failure of remitting payment within the term specified in the contract for the honouring of certificates. After a contract is issued, omissions, design changes comprise any additions or revisions effected to the initial scope of work of the dam project (Bajjou & Chafi, 2020). Project planning include selecting and developing suitable policies and techniques accomplish project objectives. Project scheduling entails assigning tasks and apportioning essential resources to fulfil them within an expected budget and time period, the management of physical barriers and

measures, as well as non-physical mechanisms, to restrict human and environmental exposure to pollution at and/or emerging from the project site is referred to as site management. The project steps are checked and supervised to ensure compliance with the contract papers, authorized plans, building regulations, code standards, building specifications and compliance with any municipal rules and ordinances (Yogi, Kumar Mishra & Aithal, 2022).

Man has engaged in some type of building work since the beginning of civilisation. Construction activity records 6-9 percent of global GDP and more than half of fixed capital creation as infrastructure and public utilities essential for economic development in most nations (Lopes, 2022). The majority of construction projects across the world face delays, which result in disagreements, arbitration, litigation, and, in other instances, the complete abandonment of the project. The phrase "delay" in construction is something happening at a later period than anticipated or not the way the contract states mainly after the stipulated timeframe for completion (Carvalho, Maués, Moreira, & Reis, 2021).

Timely project delivery within stipulated budget and to the degree of quality standard stipulated by the customer denotes a successful project delivery and completion (Wideman, 2022). Because the construction business is one of the key sources of income for many nations throughout the world, construction delays and their effects on building projects are a major subject of worry among many industry professionals and intellectuals (Tam, da Costa Moura, Oliveira, & Varajão, 2020). According to Ingle and Mahesh (2022), construction projects are considered successful if they are finished on time or some instances ahead of schedule or under budget, and having anticipated advantage and benefits to owners. As a result, there will be a lot of expectations when a building project begins, therefore work should be completed by carefully arranging all stages. Any variation from

the plan and timeframe may result in lost productivity and project completion (Lees, Rutschmann, Santure & Beggs, 2021).

In the United Kingdom (UK), Musick, Bea and Gonalons-Pons (2020) stated that 70 percent of construction projects done by governmental departments and agencies are delayed. According to Building Cost Information Service, roughly 40 percent of dam building projects surpass the initially negotiated contract time. Similarly, in Canada, Hussain and Jergeas (2021) discovered a total of 16 factors leading to project delays and cost overruns, with some of the critical risk factors being poor contract management, financial arrangements for payment, material shortages, price fluctuation and inaccurate estimation.

Idrees and Shafiq (2021) discovered that main cause of cost overruns is a rise in material costs owing to the rapid expansion of residential properties. Inflationary pressures made it impossible for contractors to purchase supplies at the prices that they had previously calculated at the start of the project, and this also hindered their ability to sell their goods at the predicted rates. This was regarded as the most significant cause of expense overruns. Other causes for the cost overruns and project delay included a lack of resources, changes in design specifications, and financial issues.

Ammar, Abdel-Monem and El-Dash (2022) suggest that the major causes of delay among road construction projects in Egypt were a lack of materials, a paucity of highly experienced and trained workers, poor equipment quality, limited raw materials, and a lack of talented senior managers in a project. Other researchers in the Malaysian construction sector identified labor shortages, improper contractor planning, lack of experience in contractors, poor site management, lack of funds from clients, disputes with subcontractors, poor means of conveying information among parties involved, and errors during construction work as causes of delays.

The topmost causes of dam construction delays in Oman, according to Pareto's law of 80/20, are: change orders, poor weather conditions, uncertainty experienced in ground condition, executive bureaucracy within the organization, poor site management, mistakes made in soil investigation, feasibility study failed to discuss all aspects, natural factors during construction process, difficulty in defining project requirements, and slowness in the process of making decision (Dula, 2021). In India, Shah, Dixit, Kumar, Jain, and Anand, (2021) investigated causes of delay in slum project. They demonstrated some of the reasons most responsible for delays such as lack of finances, poor project scope and limited skill in managing working capital. Their consequences were explored, and some recommendations given to limit and control delays in slum upgrade projects.

In Pakistan, Sardar Ahsen, Memon, Memon and Ahmed (2021) made it clear that the most predominant cause of delay in construction projects in public sector include influence from government, cost and management expertise. Tariq and Gardezi, (2022) found that in Australia's construction sector, the main factors causing delay in construction projects were financial related, lack of proper communication and variations in order, whereas the most influential factors in Ghana are payment certificate delays, underestimating project costs, and project complexity. However, in Malaysia, the most common causes are poor contractor planning, inappropriate site management, and a lack of contractor expertise. It was discovered that there are many groupings of delay causes that vary from nation to country, producing project delays and cost overruns.

In Nigeria, Egwim, Alaka, Toriola-Coker, Balogun, Ajayi and Oseghale (2021) discovered that the main causes of delays are contractor inexperience, client financial difficulties, poor site management and supervision, while conducting a study on causes and effects of delays in construction projects. Elong (2020) discovered that the following factors were the main causes of delays in land acquisition on road construction in Uganda: delay in

evaluating changes in anticipated scope by the consultant; dishonest dealing by contractors/ financial indiscipline; errors and omission made by designers; insufficient contractor experience; and insufficient site evaluation by the consultant. Identification of potential delay factors which are likely to impact project delivery on time can help to reduce extra expenses incurred as a result of disputes and claims that may arise among parties whenever delays occur.

According to Adino (2020), proper identification of project affected persons and their meaningful engagement on compensation and benefit sharing arrangement contributes to sustainable development and successful implementation of the project. Moreover, 51.3 percent of resident income may be elucidated by reclamation of land alleged to be possessed by people residing near the Thiba dam, Kirinyaga County. Research findings revealed further that only 15.3 percent of household standards of living are attributed by the aspect of compensation given out to households by dam constructors, 1.4 percent of household livelihoods may be explained by aspect of social amenities developed by Thiba dam construction project implementers, and 36.4 percent of household livelihoods can be elucidated by social disruption brought by construction of Thiba dam.

Dam construction has been one of Kenya's key rural construction projects, which has been progressing at an increasing rate. The majority of dams are single-purpose, although there are an increasing number of multifunctional dams (Speckhann, Kreibich, & Merz, 2021). According to the most current World Register of Dams publication, irrigation is by a far the most predominant use of dams. Amongst the single-use dams, 48percent are for irrigation, 17 percent are for hydropower generation, 13% are for water supply, 5% are for recreation, 10% are for flood control, and less than 1% are for fish farming and navigation (Perera, Smakhtin, Williams, North, & Curry, 2021). With considerable population expansion predicted in the next coming decades, irrigation ought to be enhanced to promote

food production capability. It is anticipated that irrigated land would be required to provide 80 percent of new food production by 2025 (Rosegrant, Cai & Cline, 2020).

The paucity of water in Kenya, in relation to the rising population, is a key impediment to development. About 75 percent of Kenya is classed as semi-arid, with the majority of the population located in the wetter parts. Nevertheless, as the population grows, severe land pressure forces the development into semi-arid areas (Scholes, 2020). As a result, in order to fulfil the rising population's water demands, Kenya has commenced on the construction of multifunctional reservoirs along the major rivers. Tana River, for example, has around 20 percent of the national population, a significant potential in agriculture, and the biggest hydroelectric power generating potential in the country (Zaniolo, Giuliani, Bantider, & Castelletti, 2021).

In the Kitui region, over 650 dams have been built by the government and local NGO in the last 10 years, with some still under construction or in the process of being constructed in the area (Cassin & Ochoa-Tocachi, 2021). Kitui County is situated in semi-arid and arid climate zone hence reliability of water sources is a vital issue for the County. Umaa dam is a dam project in Kitui County. The project was to serve people in Kitui town and its environs by providing a live storage of 890,000m3 which could sustain production of 2,300m3/day for 8 months at a contract sum of Kshs 824,457,120.49 with 24months implementation period. During project implementation, variations amounting to 312,240,265.68 (38% contract sum) were awarded to the contractor by the supervising consultant due to the changes in site conditions that resulted in justified increase of quantities under grouting works (Omonge, Herrnegger, Gathuru, Fürst, & Olang, 2020).

This led to the request of time extension of 9months by the contractor of which he was granted conditional 11 weeks' extension. The contractor disputed the award of conditional 11 weeks 'extension of time that resulted to stoppage of works having achieved 57%

physical project completion. Thwake dam in Kitui County, bordering Kitui and Makueni counties is stalled at 65 percent where date of completion is still unknown (Rotich, 2021). According to the contractor (China Ghezouba Company Group (CGGC) this is due to the delay in payments and the land acquisition process which is a design omission as the government disclosed it is in the last phases of securing another 60 acres of land that costs 45 million shillings to boost spillway, dam expansion and employees' camp (McDermot, Agdas, Rodríguez Díaz, Rose & Forcael, 2020).

Since the inception of county government in 2013, Kitui County Government in partnership with the National government and donors have been in the process of constructing mega dams to alleviate the perennial water shortage in the county (Ngugi, Gichaba, Kathumo & Ertsen, 2020). The dams are to be constructed in each of the six constituencies to provide water to residents for both irrigation and domestic use. Despite the effort put by the national government, the county governments and the partners most the construction work in these dams have often been delayed, hence affecting the completion and actualization of the vision to alleviate the perennial water shortage in the county. It is contrary to this background that the researcher sought to establish how construction delay affects completion of dam construction projects in Kitui County Kenya.

1.2 Statement of the Problem

A dam project is considered to be successful if the goals are achieved within the given timeline (project period) and within the estimated budget as per the contract. However, dam projects tend to be complex in nature, and they are prone to delays and cost overruns, particularly during the building period. Dam building delays arise due to a variety of factors. There is also a lack of agreement on the primary reasons of delays. Mbatha, Alkizim and Mbiti (2022), for example, contend that inadequate planning is the primary source of delay. Poor risk management, according to Olala and Kinoti (2021) is to blame,

however Dindi (2022) posits that fundamental issue is a lack of intellectual competence and expertise among contractors. Bad organizational culture (Njuguna, Alkizim & Njuguna, 2022), as well as poor government policy direction, have been identified as other factors (Oyieyo, Rambo & Ndiritu, 2020). Delay in completion of project result in more than 40 percent of projects failures in Kenya that result in litigation. Delays would have effect on project's cost and schedule, as well as the overall project productivity and required field operations, as well as the project completion term. To protect this sector, it is necessary to limit the causes of delays and preserve economic development in their construction (Matu, Kyalo, Mbugua & Mulwa, 2020).

Delays in dam construction are instigated by factors such as the project's uniqueness, the speed with which decisions are made, poor/unrealistic scheduling, labor productivity, a lack of information, the availability of resources, limited finances, third-party dependencies, poor working conditions and weather, among others. Dams have been touted as a significant way of satisfying perceived water and energy demands, as well as long-term, strategic investments with several additional advantages (Njora, & Yilmaz, 2021). Some of these extra advantages are common to all big public infrastructural projects, whereas others are unique to dams and project-specific. As a result, delays in dam building possess a detrimental effect to growth and economy of the country.

The increased incidence of project delivery delays is a key complaint encountered by the Kenya construction sector (Rivera, Baguec Jr & Yeom, 2020), as it is in most developing nations such as Nigeria, Libya, and Malaysia. Most researchers recognized causes in as building projects and road projects, but there was little research done on dam projects due to either a lack of data or because they were categorized as challenging projects. This is one of the reasons the research sought to fill the gap by establishing how construction delay affects completion of dam projects in Kitui County Kenya.

Construction delay causes Increased interest rates and carrying costs, Loss of income, Increased overhead or additional costs. Kitui County Government own two water and sanitation companies, Kiambere-Mwingi Water & Sanitation Company (KIMWASCO) and Kitui Water and Sanitation Company (KITWASCO). WASREB licenses and regulates these WSPs in order for them to deliver water services in the county in compliance with a set of rules and quality requirements by WASREB. Nevertheless, setting up several restrictions such as limited infrastructure coverage, insufficient water supplies, inefficient operations, urbanization, and extraordinary demand or population increase, the two WSPs now service around a third (390,000) of the entire county population (1,221,001) (Nzau, 2021).

According to county estimates, about 42 percent of Kitui's population can access at least a basic water service (that is, duration for a return trip to point of collection is like 30 min or less). The rest of the population (58%) has to walk a distance of at least 5km to access water. Umaa dam in Kitui county that is yet to be completed was to sustain a production of 2,300m^3 a day (2,300,000 litres) for 8 months, that would sustain a population of approximately 153,000 people (12% of Kitui Population) these calculations are based on (Wanyama, 2021) whereby Kitui county is considered as a medium potential area 15l/head/day.

1.3 Purpose of the Study

This research purposed to establish how construction delay affects completion of dam projects in Kitui County Kenya.

1.4 Research Questions

1. How does design change affect completion of dam construction projects in Kitui County Kenya?

2. How does payment affect completion of dam construction projects in Kitui County Kenya?
3. To what extent does planning affect the completion of dam construction projects in Kitui County Kenya?
4. How does site management affect the completion of dam construction projects in Kitui County Kenya?

1.5 Hypothesis

This research was anchored on the following hypothesis;

1. **H_1:** There is significant relationship between design change and completion of dam construction projects in Kitui County Kenya

   H_0: There is no significant relationship between design change and completion of dam construction projects in Kitui County Kenya
2. **H_1:** There is significant relationship between payment and completion of dam construction projects in Kitui County Kenya

   H_0: There is no significant relationship between payment and completion of dam construction projects in Kitui County Kenya
3. **H_1:** There is significant relationship between planning and completion of dam construction projects in Kitui County Kenya

   H_0: There is no significant relationship between planning and completion of dam construction projects in Kitui County Kenya
4. **H_1:** There is significant relationship between site management and completion of dam construction projects in Kitui County Kenya

   H_0: There is no significant relationship between site management and completion of dam construction projects in Kitui County Kenya

1.6 Significance of the Study

This study may be of importance to the:

Construction companies: The study sought to highlight and understand construction delay on completion of dam construction projects. Consequently, the study outcomes would contribute to the knowledge body about the commencement, planning, execution, and termination of dam construction projects. This particular information is especially crucial in the construction industry, which is continually seek improved methods to execute projects on time, within budget, and within agreed-upon performance limits. Understanding the root reasons of delays would be critical in how Kitui dam projects are envisioned, planned, and implemented. They may be able to come up with methods to handle delay factors. This would improve the completion of dam construction projects.

Government and policy makers: The study findings are likely to give understanding on the delays hindering completion of dam projects. It might be of importance to the government in developing construction industry policies and implementing them. An educated policy assures beneficial recommendations to the industry, reducing project failures, risks, and enabling order in the construction sector.

Researcher and academicians: it's expected to provide insight on the factors influencing construction delay on completion of dam projects. It might contribute to the body of knowledge on delay factors on construction. Researchers and academicians may base future research on this study and become a reference to others future studies.

1.7 Basic Assumptions of Study

The research assumes that the participants were available and had willingness to retort to the questionnaire. The study also assumed that the selected variables influence completion

of dam construction projects. It is also assumed that the participants shared truthful information

1.8 Delimitations of the Study

This research purposed to establish how construction delays affect completion of dam projects in Kitui County Kenya. The research aimed to establish the how design change, delay in payment, planning and scheduling, and site management and supervision affect the completion of dam construction projects in Kitui County Kenya. The research was delimited to dam construction projects in Kitui County Kenya. Kitui County being within the arid/semi-arid area the government launched some dam construction projects and are yet to be fully completed, that is, past their completion date. This study targeted project managers, contractors, consultants and the project employees on site from the material department, site supervisor, finance department and Design department in charge of the dam projects. The research was conducted in 5 months.

1.9 Limitations of the Study

This research was limited by reluctance of the respondents to participate. This was curbed by assuring participants that the study was only for academics and that their information was held confidentially. Consent was acquired from the participants to explain the study purpose and its confidentiality in data management.

1.10 Definition of Significant Terms Used

Completion of dam projects: This implies that all construction work and title transfer of the dam project have been terminated. This was measured by the following variable indicators: Timely completion, Beneficiaries' satisfaction, Quality of water and Customer Satisfaction.

Construction delay: It is the lagging of time in completion of projects from its specified duration as per contract directly affecting construction cost. This was measured by the following variable indicators:

Delay in payment: It is the challenge encountered by pay master to settle payments within specified duration of honouring certificates in line with contract. This was measured by the following variable indicators: Delay in interim payment, Delay in advance payment and Delay in completion pay.

Design change: These are additions, adjustments or omissions made on the initial scope of the dam project after a contract is awarded. This was measured by the following variable indicators: Design additions, Design omissions and Design adjustments.

Project Planning: Entails designing and choosing effective policies and methodologies to achieve project objectives. This was measured by the following variable indicators: Policy design and techniques.

Site management: Is the administration of physical barriers and procedures, as well as non-physical means, to restrict human and environmental exposure to pollution at and/or resulting from the project site. This was measured by the following variable indicators: Project coordination and Environmental management.

1.11 Organization of the Study

The research covers five chapters. The first chapter covers the background, problem statement, study purpose, study objectives, research questions, significance, basic assumptions, delimitations and limitations, then definition of significant terms. Chapter two covers the literature review on how construction delay influences completion of dam projects, completion of dam projects, design changes and completion of dam projects, delay in payment and completion of dam project, planning and scheduling and completion of dam

project, site management and supervision and completion of dam projects, construction delay and completion of dam projects, theoretical framework, contingency theory, general systems theory, conceptual framework, literature summary, knowledge gaps. The third chapter discusses the methodology, research design, target population, sample size and sampling procedure, research instruments, pilot testing of instruments, validity of instruments, reliability of instruments, data collection procedure, analysis techniques, ethical considerations in research, operationalization of the variables. The fourth chapter entails analysis and presentation of findings. The fifth chapter entails discussions, highlight on conclusion and also recommendations for future studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter captures the literature review on completion of dam projects, design change and completion of dam projects, delay in payment and completion of dam project, planning and scheduling and completion of dam projects, site management, supervision and completion of dam projects and construction delay and completion of dam projects, theoretical framework, the conceptual framework, summary of reviewed literature and knowledge gaps.

2.2 Completion of Dam Projects

Dam projects are of relevance in terms of on-time completion and allocated finances due to their importance in terms of operation scale, large investment, difficult nature, and numerous uncertainties, such as subsurface conditions, natural catastrophes, and high construction costs (Baird, Manorom, Phenow & Gaja-Svasti, 2020). Many factors influence project completion. Every investor wants to be certain about the project's scope, costs, timeliness and quality because obstacles associated with completion of project tend to have substantial consequences, eventually impacting on the interest of the owners (Santoso, & Gallage, 2020). In global research conducted in the US, owners are scaling down or eliminating risks associated with industrial construction projects such uncertainty over costs, poor collaboration and integration by management, and potential delays that may affect the feasibility basis of the project (Barutha, Jeong, Gransberg & Touran, 2021).

According to a Columbian study by Lagos and Alarcón (2021), projects are highly impacted by uncertainty and variability in project planning and implementation. Moreover, only a half of all projects are concluded on schedule, 30 percent of dam projects face delays

for about one to two years, and four dam projects encounter delays in more than ten years. The primary reasons of project delays include financial issues, inept contractor as well as construction management ineptitude, unrealistic time schedules, worker unhappiness, legal and constitutional objections, and challenges.

Shirazi and Toosi (2023) investigated the reasons of time overruns or among Iran's dam projects. In addition, the fuzzy theory and technique of application are discussed, and the true value of time overrun and cost in several Iranian dams is computed, followed by unclear evaluation and identification of cost, causes and time overrun in these projects.

According to Mahdi and Soliman (2021), delays are witnessed due to time overruns that occurs beyond the completion date indicated in a contractual document or after the date agreed upon by the parties for project delivery. Moreover, the delays may be brought by government regulation, management incompetence or limited resources. A project delay is one in which there is a gap in the construction period in which there are variations between the actual in-progress site work and the work scheduled. Failure to beat deadlines, meet estimated quality and intended costs can have a wide range of adverse consequences. Whenever building projects are delayed, they may be expedited or extended which incurs more expenditures (Baird, et al., 2020).

Rivera, Baguec and Yeom, (2020) on causes generating delays in Ghanaian projects discovered that the primary delay drivers were: inadequate planning and scheduling, management inefficiencies and poor stakeholder engagement. According to Tshidavhu and Khatleli (2020), empirical analysis in South Africa discovered change in scope on site, issues of incomplete design, contractual claims, lack of initial plan and monitoring of finances, delay in costing variations and additional works as significant overrun factors. According to Samboma (2022), time and expense overruns are a serious issue in Botswana's local governments.

The leading causes are lower productivity of the workforce, inefficient contractor management and lower productivity of the equipment, limited client responsibility and design errors by consultants. In Kenya, the government launched more than 60 dam projects in different counties. After the government put aside more than Sh300 billion for water projects around the nation, there is nothing to show on the ground as project delays, financial issues, and contractor sluggishness undermine the plan. As a result, some dam projects have been cancelled. The Itare Dam, a project of the Rift Valley Water Services Board (RVWSB), was in a state of dormancy. The dam, which has a daily capacity of 100,000m3/day, is now in limbo after the contractor applied for conservatory orders in the hope of being declared bankrupt. The halted project, which was around forty percent complete, has been waiting for the previous four months, prompting concerns that it would follow in the footsteps of the Umaa dam in Kitui and the Badassa dam in Marsabit, both of which are now blocked. The Badassa dam reached a halt nine years ago. The project was halted due to architectural designs and significant foundation grouting work discrepancies (Roba & Odollo, 2022)

2.3 Design Changes and Completion of Dam Projects.

Design entails coming up with descriptions of anticipated /new facility, which is often characterized by comprehensive plans and specifications; while construction planning entails determining the activities and required resources to create a physical reality from the design (Jiménez, Afonso & Fernandes, 2020). Changes in design in construction may be triggered by a variety of factors on varying phases of the project. The causes on changes might internal or external in nature which arises during development phases, that is, design stage to construction. According to Al Amri and Marey-Perez (2021), the main hurdles of consultants include changes in designs, poor performance by consultants, readiness and

authorization of drawings, bad site research, inefficient contract management, and irresponsiveness and assessment.

Li, Lu, Moran and da Silva (2020) investigated the effects of design modifications on performance of dam construction projects. The goals were to examine the link between design modifications and the ensuing rework, as well as to detect the effects on project performance in the Brazilian Amazon. According to the data, design modifications are significant contributors to project delays and expense overruns. Elagib and Basheer (2021) investigated the effect of design modifications on the world's largest hydropower dam at the river Nile basin. The goals were to identify the reasons and effects of design modifications on project performance. According to the report, design modifications tend to be significant contributor to time and expense overruns.

Wang and Liu (2020) investigated the seven-dimensional building model for improvement of construction projects. Findings revealed that the redesign influence on cost and time performance of a project design in China. The data utilized was both primary and secondary. Primary data were gathered using questionnaires issued to project manager, while secondary data were gathered through a review of literature pertaining to the current challenges. To develop a suitable regression model, correlation and inter-correlation analysis, factor analysis, analysis of decision variables, regression model, and testing validation were used. The analysis discovered that adjustments to the electrical installation work, changes to the backfilling and excavation, changes to interior finishing work, and changes to building supports all had a negative link with project performance.

Afelete and Jung (2021) did research on power projects to investigate various factors that affect design change in Ghana. As per the literature, 36 viable causes were unveiled which were narrowed down to 30 by experts. Power projects in the study were divided into three groups: distribution and transmission, renewable energy, and power plants. According to

the findings, owner-related financial issues were the most substantial factor in each of the three project types, followed by errors and omissions in design and problems or unforeseen site conditions within power plant projects, low quality and quantity of resources, inflation, and changes in interest and exchange rates in renewable project types, and unforeseen challenges in site conditions in power plant projects, respectively. As per the results, stakeholders in the power project may better gain knowledge in the dynamics of design change and create impact-reducing design management techniques.

Bassa, Reta, Alyew and Tora (2020) investigated the causes and impacts of design changes in building construction projects in three Southern Ethiopian Zones. The goal was to look at the causes and impacts of design changes in building construction projects. A questionnaire survey with fifty-one (51) questions was used in the study approach, and it was delivered to the project managers, client, and engineers. The relative relevance index was employed in examining the questionnaire results. As per the findings, the most common causes of design change were omissions and errors in design, lack of design review during the design process, client plan changes, contract documents that are incomplete, unappealing site conditions, a lack of experience for design evaluation during the phase of design period and an obstacle to prompt decision making. The data also revealed that the most significant implications of design modification were a delay in project completion, waste of material in the rework, an increase in project cost, productivity deterioration and overtime hours to beat deadlines.

2.4 Payment and Completion of Dam Projects

Construction projects are distinguished by significant investment, extended transaction cycles and riskier. Because of these qualities, the traditional transaction mechanism of payment on delivery or timely payments do not suit building projects. Most construction project owners employ payment delays to mitigate transaction risks in the construction

sector (Fertilia & Ayuningtias, 2020). In particular, the owner often includes a specific portion of retainer and payment time periods in the contract to guarantee that the contractor fulfills the contract faithfully, so safeguarding its own interests (Mirzaee, Hossieni & Martek, 2022).

Equally, the contractors of the building projects include comparable delays of payment terms in their contract with respective subcontractors, that helps to relieve cash flow pressures and enhances control of subcontractors. Wages given to construction employees, on the other hand, needs to be settled on time, irrespective of whether subcontractors have been paid by the main contractor. Furthermore, many subcontractors see late payments as a big concern.

Perera and Dewagoda (2021) investigated the impact of payment delays on building projects in Sri Lankan Government building construction projects. The study's goal was to determine the causes and consequences of payment delays. A questionnaire was utilized to gather data from Sri Lankan contractors, owners, and consultants. This study determined the most important reasons for payment delays in government-funded construction projects, the most important effects of these delays, and the best strategies clients, consultants, and contractors can use to lessen the effects of payment delays. Additionally, it demonstrated the tactics that customers, consultants, contractors, and other stakeholders might use to lessen the negative effects of such late payments.

Owusu (2020) investigated the reasons and consequences of client delays on construction projects in Ghana. The purpose of this research uncovered causes and consequences of late payments for work done in Ghana's construction industry The study focussed on Prime Questionnaires were utilized in gathering data for processing during Ghana projects. According to research, the real causes of project delivery delays are clients' insufficient financial resources, slow payment of completed work, underestimation of project duration,

poor communication channel among parties in contract, complexity, clients' difficulty obtaining bank credit, and change orders during construction. Employers' poor financial management, dispute among contract parties, and certification delays were all potential reasons for late payment. Delaying or withholding payment causes financial difficulties for construction , and the consequences are often so severe that some businesses are forced to collapse.

Oyieyo, Rambo and Ndiritu (2020) investigated the consequences of contractor late payment on completion of infrastructure projects in Kenya. This study looked at the implications of contractor payment delays on completion of an SMHP project in Kisumu, Kenya. A causal-comparative design was used, and primary data was gathered from thirty-nine (39) senior management personnel from contractual partners. The relative importance index (RII) was employed to evaluate the relative status of the contractor's perceived effects of payment delays, while Kendell's coefficient of concordance assessed the degree of agreement amongst participants concerning their perceived effects of delayed payment. Contractor payment delays impacted on the project causing: re-sequencing and re-scheduling of works, reduction in productivity and efficiency, an increase in time-related costs, an impediment to early completion, an extension of time, and acceleration.

2.5 Planning and Completion of Dam Project.

According to Yang, Yu and Zhu (2020), planning primarily aims to ensure that processes go as anticipated. This entails the coming up with objectives, tasks identification, and tracking of progress. A plan act as a foundation for monitoring project progress, and also for frequent evaluation and update of the plan. Project planning from a project management standpoint, contain interconnected inputs and precise outputs that must be implemented in accordance with their assigned objectives. For successful project performance,

these objectives must be defined effectively and controlled earlier in the planning process and throughout execution (Kakar, Hasan & Jha, 2020).

Yang, Yu and Zhu, (2020) investigated the manner in which project planning impacted the incorporation of knowledge in construction projects. The 301 project members were surveyed within Chinese construction sector, partial least squares structural equation modelling was utilized to objectively assess the relationships between project planning, knowledge integration, and project success. The research's conclusions showed that project planning has ability to promote knowledge integration and at the same time facilitate the success of construction projects where knowledge integration serves as a mediating factor.

Kapogiannis, Fernando and Alkhard (2021) examined how the usage of integrated collaborative spaces in construction projects could improve project managers' proactive behavior in a project planning. As per the research, a proactive attitude helps construction project manager in attaining "accurately" project time and cost estimates, as well as project culture, collaboration tactics, and project dangers. Moreover, it has been revealed that voicing quality concerns in a project is impacted by co-worker trust as a proactive behavior antecedent.

Kabiti and Kikwatha (2022) studied ways in which project planning methods impacted the success of a building project in Meru, Kenya. A questionnaire and an interview schedule was used as the instruments for gathering data for this investigation. The results showed that project resource, scheduling, communication, and scope planning have a substantial impact on successful construction of projects in Meru County. The precise project activities are all outlined, and the activities are grouped in the projects according to what must be done first for a smooth project undertaking.

2.6 Site Management and Completion of Dam Projects

Site management is a vital integrating process used to create ordered and effective results where building or construction work is being performed, whether within, adjacent to, or distinct from an existing occupied facility (Lin, Ning, Shi, Liu, Chen and Tan, 2021). The process of ensuring that the project is built in compliance with the requirements of the contract papers, specifications, authorized plans, building codes, building code standards, and required municipal rules and regulations is termed as project supervision (Ngugi, Gichaba, Kathumo, & Ertsen, 2020).

Site management procedures and supervision are a collection of operations that transform raw materials into a finished product. This can range from the management of materials, labor, and other resources on the site to the supervision of information, quality, and finance flows. define site management as a set of four interconnected components: preparatory works, site organization, site layout, and welfare supply (Harris, McCaffer, Baldwin & Edum-Fotwe, 2021).

Eze, Awodele, Adegboyega, Onyeagam and Guto (2020) conducted research on inefficient site management techniques and how they affect project outcomes in Nigeria. They set out to determine the key elements contributing to poor site management, to evaluate the effects of inefficient site management techniques, and to provide the best site management techniques that would improve project performance. A questionnaire survey was used to collect data for the study, and data was also searched through available document archives. Analysis was done by frequency distribution, the average index approach, and content analysis. The findings demonstrated that key aspects contributing to bad site management are challenges brought by poor inventory management, unfit coordination, and communication issues, as well as poor characteristics of the site management itself. The

leading factors of inefficient site management techniques are increased construction costs, inability to complete projects on schedule, and subpar building quality.

Tengan and Aigbavboa (2021) researched on factors affecting site supervision in the Ghanaian Construction Industry. The study's goal was to investigate the elements influencing construction site supervision in Ghana. To extract information from respondents, the study used a qualitative Delphi approach to validate the factors influencing supervision in the Ghanaian construction industry. The information was analyzed descriptively, and the findings tabulated. According to the study, the most important aspects influencing project supervision were favorable working circumstances, dedication of all project participants, site layout arrangement, top management support, and project participants' indecisiveness.

Ondiek (2020) researched on the impact of project supervision on road building project performance in Uasin Gishu County. The primary goal was to uncover the impact of project supervision on the of road building projects in Uasin Gishu County. In this study, a descriptive survey design was used. Targeted population was 108 people. There were 10 KeNHA engineers, 7 KURA engineers, 23 supervisors, 13 County Roads Engineers, 8 KERRA engineers and 47 contractors in the accessible population. Because the target population is small and controllable, the study employed a census technique in which all respondents were included. Respondents' main data were collected via semi-structured questionnaires. Descriptive statistics were employed. Inferential statistics were employed to demonstrate the links between the study's independent and dependent variables. The research discovered a link between project supervision and the performance of road building projects.

2.7 Construction Delay and Completion of Dam Projects

Rashid (2020) analysed delay in construction projects in Pakistan. The study's goal was to findout the reasons behind and consequences of delays in Pakistani construction projects. A survey of 172 professionals and data from 37 construction companies were collected empirically. The results showed that significant delay reasons are related to and ordered as contractor, client, consultant, material, and equipment, respectively; nevertheless, delay has little impact on factors like labor and the general environment. The analysis's finding that delays in construction projects considerably raise the risk of schedule and cost overruns, project abandonment, and legal action is its conclusion.

Fashina, Omar, Sheikh and Fakunle, (2021) researched the causes and consequences of construction delays among Hargeisa construction projects looking at the reasons, impacts, and strategic steps that might be taken to reduce the occurrence of construction delays on construction projects. This study investigated construction delays on Hargeisa construction projects by analyzing four cases of construction projects in Hargeisa and conducting a questionnaire survey of nineteen contractors, eight construction consultants (including quantity surveyors, civil engineers and architects), and four project owners. An examination of the literature yielded twenty-two reasons for building delays. The field study revealed the primary reasons for construction delays, which include the client's financial challenges, variances, the contractor's financial problems, and late submission of payment. The findings also revealed that construction delays gave rise to cost overruns, adverse impact on company's reputation, poor contractual relationships, and project suspension, among other things.

Rashid (2020) conducted a study on factors causing delays and how they affect construction projects and find out the reasons behind and consequences of delays in Pakistani construction projects. Data was collected from 37 construction sites using an

empirical methodology, and 172 experts were issued with questionnaires. The findings showed that the contractor, client, consultant, material, and equipment are the ordered and substantial drivers of delay; however, labor and the general environment are not affected by delays. Finding revealed that delays in construction projects substantially increases the likelihood of expense and schedule overruns, project abandonment, and legal action.

Shirazi and Toosi (2023) researched on causes, effects, and techniques of decreasing delays in construction projects. A review of literature and a questionnaire survey were utilized to conduct this investigation. The questionnaire survey was provided to the targeted participants on the construction site. The top three most critical issues that led to delays were late revision and approval of design papers, delays in subcontractor work, and poor communication and coordination of modification orders by the owner throughout construction. Contractor-related delays were placed first, followed by client-related delays and then consultant-related delays. Delays in building projects frequently resulted in time and expense overruns. It has been determined that the major three effective strategies of avoiding delay in construction are: site management and supervision, good strategic planning, and clear information and communication channels.

2.8 Theoretical framework

Theories are adopted expound occurrences and in many cases, to question and widen current knowledge within the confines of crucial confining assumptions (Kar & Dwivedi, 2020). The framework provides a scholarly foundation for all interpretations of the meaning inherent in the research. This research was anchored on contingency theory and general systems theory.

2.8.1 Contingency Theory

It was proposed by Fiedler in (1964) emphasising on significance of the leader's personality as well as the circumstances in which the leader acts. Managers ought to analyse all aspects

under the current situation and act on those that are relevant to the issue at hand while deciding.

Each construction project is unique and bear its own set of challenges; therefore, it ought to be managed in accordance with its current features and surroundings (Safari & Saleh, 2020). This aspect is addressed by contingency theory, which seeks to develop techniques that best satisfy the requirements of various projects. Because of the wide range of management contexts, this theory challenges the notion that there is a single best way to manage projects. Csaszar and Ostler (2020) postulated that contingency theory emphasizes the interaction and interplay between the organization and the environment. This approach emphasizes that there are a variety of contextual elements, often known as risk factors, that impact project objectives in various ways. External environment, technological matters, organizational structure and scale, cost, culture, people engaged, and strategy are some of these variables. The theory is critiqued in that it is unable to provide reasons for leadership effectiveness in various situations.

In relations to the study leaders in a project which include consultants, contractors and clients ought to make critical decisions about the project and should also be able to handle all the situations in the project process. This would promote the completion of dam projects.

2.8.2 General Systems Theory

Ludwig von Bertalanffy came up with general systems theory (GST) (1968). A system, according to the notion, is a collection of pieces that work together to achieve a common purpose. A system is also defined by the interactions of its components, as well as the nonlinearity of those interactions. Knowing one aspect of a system allows us to learn about another. von Bertalanffy (1968), considers a system to be a pool of unified elements that are open to and act together with their environment. Additionally, they can acquire

qualitatively new properties because of emergence, meaning that they are always developing.

Reynolds and Holwell (2020) stated that the systems approach fell out of favor because it did not function effectively enough, particularly when it came to issue resolution. Ida Hoos, a sociologist, critiqued systems theories extensively in the early 1970s, particularly their role in planning, administration, and governance. Hoos chastised systems for their indiscriminate use of quantitative models, that is, for employing techniques that may not be suited for the scenario at hand. She also argued that algorithms left little room for the 'human factor,' or actual people responding in ways that the system did not expect.

A project may be portrayed as a system. This is because it comprises different components which work together to achieve a certain goal. A project system is made up of inputs, processes and finally outputs. Because the success of every project is contingent on the harmonic interplay of its pieces, the project team must be able to put this into perspective. As Hansen, Vaagen and Van Oorschot (2020) suggest, incapability of diverse parties to a project to cooperate fluidly leads to infighting, which eventually derail the completion of a project.

2.9 Conceptual framework

This is a postulated model that identifies the topics under investigation and their relationships. It is a framework that is often constructed by researchers to highlight the interdependence of variables. Conceptual framework in this study demonstrated the link between construction delays on completion of dam projects.

Independent variables

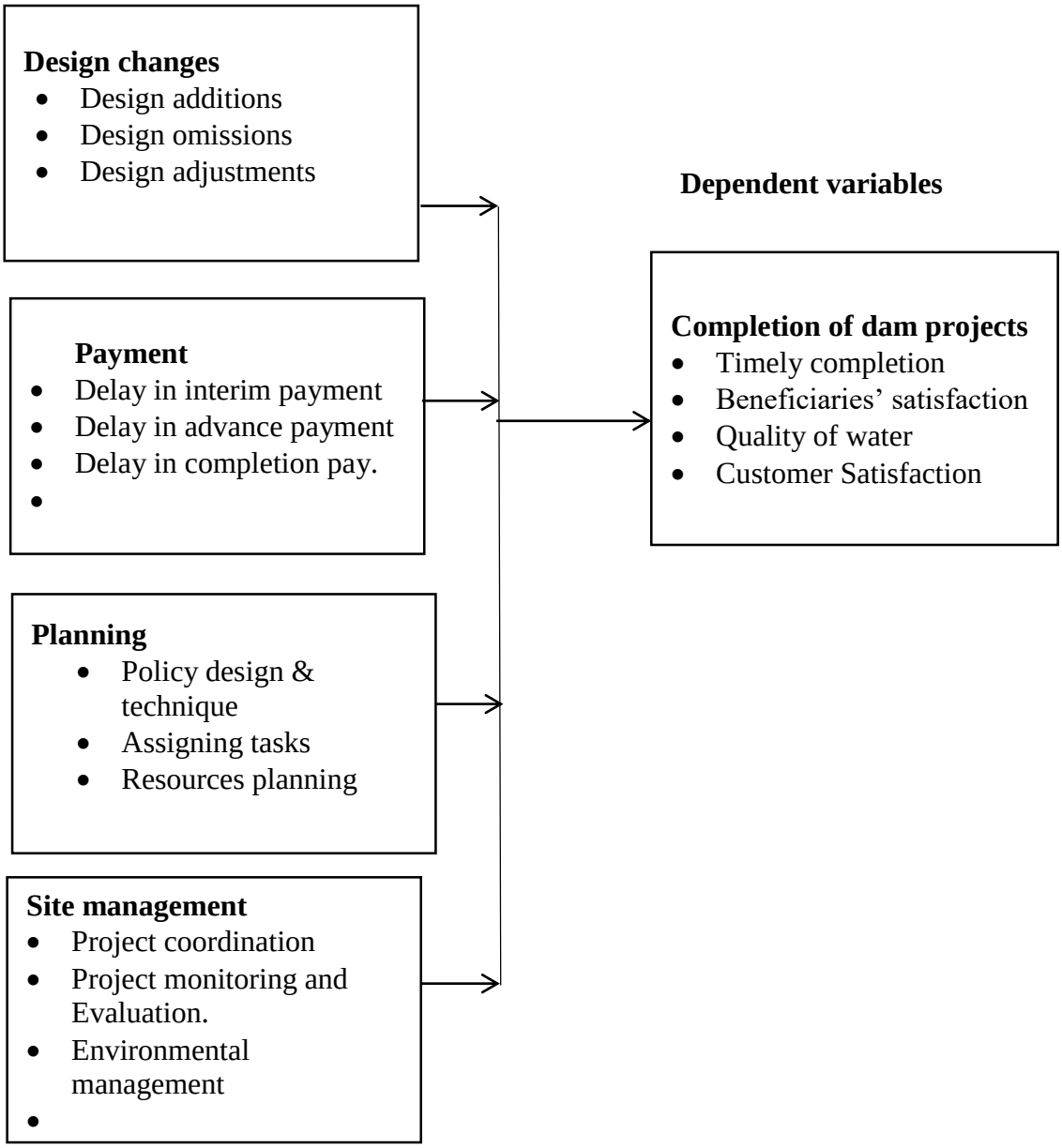

Figure 1:Conceptual Framework

2.10 Summary of Literature Review

Studies reviewed show that completion of projects helps in meeting some of the needs of communities. Further project completion is also important because it involves investments of large amounts of funds. When such funds are wasted then it affects the economic development of the country. The review from different countries shows the rate of

completion of projects is very low. Most of the projects are stalled due to the wrong choices of contractors.

The literature also shows that design changes affect completion of projects. Regular additions, omissions and adjustments to the design would delay the completion of the project. More delay in payment also has an impact on completion of projects. Delay in making interim, advance and completion payments can result in delays in the completion of project. Planning also affect the completion of projects. There should be a set policy, tasks should be properly assigned and a plan for resource utilization needs to be in place to ensure success of the projects. Site management also influence the completion of projects. These include project coordination, monitoring, and environmental management. Most of the reviewed studies have focused on different construction projects. The study has also reviewed the theories explaining the factors influencing construction delays on completion of dam projects. These include the contingency theory and the general systems theory.

2.11 Knowledge gaps.

Table 2. 1 Knowledge Gaps

Variable	Author (year)	Title of the study	Methodology	Findings	Knowledge gaps
Design change	Li, Lu, Moran and da Silva (2020)	The impacts of design changes on construction of Madeira River in the Brazilian Amazon	Questionnaire/ Case study.	Design changes are identified as vital factors leading to project delays and cost overruns.	This study generally focused on construction of Madeira, Brazilian Amazon. The current study focus was on delays on completion of dam projects in Kenya (Kitui county)
	Elagib and Basheer (2021)	Impact of design changes on the world's largest hydropower dam at the river Nile basin	Observation/ interview	Design changes originate mostly from the owner side are identified as important causing factors to time overruns and cost overruns.	This study generally focused on construction of the world's largest hydropower dam at the river Nile basin. The current study focused on completion of dam projects
	Wang and Liu (2020)	Seven dimensional building model for improvement of construction projects in China	Questionnaire/ Literature Review	Factors that had a negative correlation to the performance of the project were change in the electrical installation work, changes to the excavation and backfilling.	This study focused on time and cost performance of projects. The current study focused on completion of dam projects

Variable	Author (year)	Title of the study	Methodology	Findings	Knowledge gaps
Delay in Payment	Perera and Dewagoda (2021)	Iimpact of payment delays on building projects in Sri Lankan Government building construction projects	Questionnaire/ Survey	The study found the substantial factors that contribute to delayed payments and the numerous suitable strategies the clients, consultants and contractors can adopt to mitigate the consequences of such delayed payments.	This study generally focused on government construction projects in Sri Lanka. The current study focused on completion of dam projects
	Owusu (2020)	The reasons and consequences of client delays on construction projects in Ghana.	Questionnaire/ Survey	Employers' poor financial management, conflict among parties in the contract, and delay in certification were among the major causes of delayed payment.	This study looked at construction projects in Ghana. Its findings cannot be generalized to Kenya
	Oyieyo, Rambo and Ndiritu (2020)	The consequences of contractor late payment on completion of infrastructure projects in Kenya.	Questionnaire /Case study.	The study found that payment delays impacted the project causing: re-sequencing and re-scheduling of works, reduction in productivity and efficiency, an increase in time-related costs, an impediment to early completion, an extension of time, and acceleration.	This study emphasised on completion of SMHP project in Kisumu. The current study focus was on completion of dam projects

Variable	Author (year)	Title of the study	Methodology	Findings	Knowledge gaps
Planning and Schedul-ing	Yang, Yu and Zhu, (2020)	Impact of project planning on knowledge integration in Chinese construction projects	Questionnaire / Case study.	Findings revealed that project planning can improve knowledge integration and, in turn, facilitate construction project success in which knowledge integration plays a mediating role.	This study focus was on project planning on knowledge integration. The current focus was on completion of dam projects
	Kapogian nis, Fernando and Alkhard (2021)	how project managers' proactive behaviour could be enhanced in a project planning by the use of integrated collaborative environments.	Questionnaire / Survey	Findings revealed that by developing a proactive personality, the construction project manager is more likely to pre-identify "accurately" project time and costs, and in identifying project culture, collaboration strategy and project risks.	It emphasised on construction projects. The current focus was on completion of dam projects.
	Kabiti and Kikwatha (2022)	influence of project planning techniques on performance of construction project in Meru, Kenya	Questionnaire /interview	Findings unveiled that there is a substantial effect of project resource, schedule, communication and scope planning on performance of construction projects.	It focused on performance of construction projects. The current focus was on completion of dam projects in Kenya.

Variable	Author (year)	Title of the study	Methodology	Findings	Knowledge gaps
Site Management and Supervision	Eze, Awodele, Adegboyega, Onyeagam, & Guto (2020).	Assessment of triggers of inefficient materials management practices by construction SMEs in Nigeria.	Interview/ focus group/ Question naires.	Essential factors leading to poor site management are characteristic of the site management itself, poor inventory management, poor coordination, and poor communication.	This study generally focused on project performance. The current focus was on completion of dam projects in Kenya
	Tengan and Aigbavboa (2021)	Factors affecting site supervision in the Ghanaian Construction Industry.	Interview/ focus group	Findings revealed that the most important aspects influencing project supervision were favorable working circumstances, dedication of all project participants, site layout arrangement, top management support, and project participants' indecisiveness	This study focused only site supervision. The current focus was on completion of dam projects

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter covers methodology and details the research design that was used, target population, sample size and sampling procedure, instruments, data collection procedure, data analysis technique, ethical considerations and operationalization of variables.

3.2 Research Design

A descriptive survey research approach was employed in the investigation. The descriptive survey research design is intended to collect information about persons' or objects' present state (Hennink, Hutter & Bailey, 2020). Information is gathered without causing any changes to the environment; these investigations are termed as observational studies. It might be either qualitative or quantitative. This strategy was ideal since it allows the researcher to conduct a wide range of observations on the phenomena under investigation. Furthermore, it gives a precise descriptive examination of the characteristics of a sample population facilitates coming up with conclusions about it. The study purposed to establish and understand construction delay on completion of dam projects in Kitui County Kenya.

3.3 Target Population

This study targeted 24 dams in Kitui County. The study's unit of analysis was 168 respondents comprising of project managers, contractors, consultants, and the project employees on site from the material department, site supervisor, finance department and design department in charge of the dam projects.

Table 3. 1:Target Population

Category	Frequency	Percent
Project Managers	24	14.3
Contractors	24	14.3
Consultants	24	14.3
Project Employees	96	57.1
Total	**168**	**100**

Source: Water infrastructure audit report (Kitui County 2021)

3.4 Sample size and Sampling Procedure

This section details the sample size and procedure of sampling that was utilized to conduct the research as covered in the subthemes below: -

3.4.1 Sample Size

A sample size is a portion of the population selected for a survey or experiment. It is the part of the study population that helps to draw inferences about an entire population (Hennink, Hutter & Bailey, 2020). The research intended to utilize Yamane (1967) approach.

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

Where n= the required sample size

N = is the Target Population (168)

e = accuracy level required. Standard error = 5%

Sample calculation

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

$$n=\frac{168}{1+(168-1)0.05^2}$$

$$n=\frac{168}{1+(167)0.05^2}$$

$$n=\frac{168}{1.4175}$$

n = 118 Respondents

3.4.2 Sampling Procedure

The sample size was 118 out of 168 employees, using proportionate method propounded by Pandey and Pandey (2021).

Table 3.2 Sample procedure

Category	Frequency	Proportion	Sample size
Project Managers	24	$\frac{24}{168}$x118	17
Contractors	24	$\frac{24}{168}$x118	17
Consultants	24	$\frac{24}{168}$x118	17
Project Employees	96	$\frac{96}{168}$x118	67
Total	**168**		**118**

Newman and Gough (2020) underline the need of using a sampling frame to pick a representative sample. The sampling frame was used to pick the required number of subjects, respondents, components, or companies to form a sample. The respondents for the research were selected by stratified random sampling. The separation of a population into smaller type of groups known as strata is the method used in stratified random sampling. The strata in stratified random sampling or stratification are generated on the basis of the common traits or characteristics of the members. The study utilized stratified sampling to limit the possibility of biasness in the choosing of cases to be utilized in the

sample. Hence, the stratified random sample produces a highly representative sample of the population.

3.5 Research Instrument

The questionnaire was the chosen technique for data gathering. A questionnaire, according to Rinjit (2020), is described as a measuring instrument whose principal function is to convey to the researcher what is needed and to elicit desirable responses in terms of empirical data from participants to achieve the intended objectives. The questionnaire was created with the study objectives in mind. Researcher made use of both open-ended and closed-ended questions. Closed-ended questions elicit more organized replies, allowing for more concrete recommendations and it was utilized in assessing the rating of various traits, which aids in restraining the number of similar replies to achieve more diverse results. The open-ended questions gave extra information that the close-ended questions may not have gathered.

The questionnaire contained five sections: first one contains questions on demographic information, the second one included Likert questions about design changes, the third section included questions about payment delays, the fourth section covered questions about planning, the fifth one included question about site management, and the sixth section included questions about project completion dates.

3.5.1 Pilot Testing Instrument

To pretest and validate the questionnaire, pilot research was done. The pilot study's goal was to assess the reliability of the questionnaires. A pilot of 12 people was chosen from the population targeted to assess the instrument’s reliability. This group represented 10 percent of the study population. As per Nayak and Singh (2021), a pre-test sample of 10 percent is appropriate for pilot research. The pilot group included the project manager, consultant,

contractor, and project personnel in charge of the Umaa dam in Kitui County. The pilot data was not incorporated into the main research.

3.5.2 Validity of Instruments

The issue of validity is whether an instrument achieves what it measures in reality (Sürücü & Maslakçi, 2020). Major problems with validity, according to Aginako, Peña-Lang, Bedialauneta and Guraya (2021), are whether data being assessed is relevant and exact, and the amount to which is generalized from those results. In this research, it was addressed if the interviewer is measured correctly and ascertain whether all of the interview questions are appropriate and aligned with the research's purpose. Consequently, the study distributed questionnaires to 12 respondents, who assisted the researcher in gauging if the important feature from required information was supplied by the respondents via the questionnaire.

The study determined content validity of the questionnaire. Content validity estimates level to which a measure denotes each and every aspect of a construct. To ascertain the content validity, the researcher sought experts' opinion in this field to know whether the questionnaire has measured the required construct. This helped in the adjustment of the questionnaire.

Construct validity was utilized in determining the validity of the questionnaire. Construct validity was confirmed by comparing the research measure to other measures with comparable properties to evaluate how closely the two measures are connected.

3.5.3 Reliability of Instruments

According to Pandey and Pandey (2021), dependability is a measure of how well research tools provide consistent outcomes or data after several trials. The pilot study allowed the research tools to be pre-tested for dependability. The inclusion of many comparable items

on a measure, evaluating a wide sample of persons, and utilizing standard testing processes all improved reliability.

The questionnaire was pretested to the pilot group at intervals of one week. The results from pretesting and retesting were analysed using SPSS. Internal consistency of the research tools was assessed by Cronbach's Alpha. For reliability analysis, Cronbach's alpha was determined using SPSS. The alpha coefficient is denoted by a value between 0 and 1 and were utilized to describe reliability of components retrieved from dichotomous or multi-point structured surveys or scales. A higher number shows a more dependable produced scale. Pandey and Pandey (2021) determined that a reliability value of 0.7 is acceptable.

3.6 Data Collection Procedure

The questionnaires were administered individually to all participants. The questionnaires were also issued with the help of research assistants. The surveys were distributed via the drop and pick later and emailing methods. The study took care as well as control to ensure that all questionnaires administered to research assistants are received, and to that end, the researcher kept a record of which questionnaires are delivered to each research assistant and which are returned. The participants were given one to complete the questionnaires.

3.7 Data Analysis Technique

Data was analysed by SPSS version 27.0 and all feedback from questionnaires returned and interview guide was referenced and items coded to simplify data entry where data cleaning was done by verifying errors in entry, descriptive statistics like percentages, frequencies, mean score and std. deviation were evaluated for all the quantitative variables and information tabulated. Qualitative data from open-ended questions were analysed by content analysis and presented in narrative form.

Inferential data analysis was done by correlation and multiple regression analysis. Correlation was performed in the research to unveil the strength of association between dependent and independent variables. Multiple regressions were used to establish how construction delay affects completion of dam projects in Kitui County Kenya.

Multiple regression model was as follows;

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

Where: -

Y= completion of dam construction projects

β_0=constant

$\beta_1, \beta_2, \beta_3 \beta_4$ = regression coefficients

X_1= design change

X_2= delay in payment

X_3= planning and scheduling

X_4= site management and supervision

ε=Error Term

3.8 Ethical Consideration in Research

An introduction letter was obtained from the University thereafter a permit further from NACOSTI. The participants voluntarily took part. The information obtained for the study was kept confidential. The anonymity of the respondents was ensured since the name of the respondents was not written in the study instrument. The collected information was stored in the University databases and only authorized persons were allowed to access.

3.9 Operationalization of the Variables

This section covers the operationalization of the variables.

Table 3. 3: Operationalization of Variables

Objectives	Indicators	Measurement scales	Tools of analysis	Type of analysis
Dependent variable				
Completion of dam construction projects	♦ Timely completion ♦ Beneficiaries' satisfaction ♦ Quality of water ♦ Customer Satisfaction	ordinal scale	Mean score	Descriptive statistics Correlation analysis Regression analysis
Dependent variables				
Construction Delay				
Design changes	♦ Design additions ♦ Design omissions ♦ Design adjustments	ordinal scale	Percentages Mean score	Descriptive statistics Correlation analysis Regression analysis
Delay in payment	♦ Delay in interim payment ♦ Delay in advance payment ♦ Delay in completion payment	ordinal scale	Percentages Mean score	Descriptive statistics Correlation analysis Regression analysis
Planning and scheduling	♦ Policy design ♦ Assigning tasks ♦ Resources planning	ordinal scale	Percentages Mean score	Descriptive statistics Correlation analysis Regression analysis
Site management and supervision	♦ Project coordination ♦ Project monitoring and Evaluation. ♦ Environmental management	ordinal scale	Percentages Mean score	Descriptive statistics Correlation analysis Regression analysis

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATIONS

4.1 Introduction

The study purposed to establish how construction delay affects completion of dam projects in Kitui County, Kenya. Data analysed was collected using questionnaires. Hence, this chapter covers the findings on questionnaire return rate, reliability analysis, demographic information, design changes, delay of payment, project planning and scheduling, site management and supervision as well as completion of dam projects. Finally, the chapter highlights inferential statistics including correlation and multiple regression analysis.

4.2 Questionnaire Return Rate

The data was obtained from project managers, contractors, consultants and project employees. The findings for questionnaire return rate are represented in Table 4.1.

Table 4. 1: Questionnaire Return Rate

		Response Rate
Response	93	78.8%
Non-response	25	21.2%
Total	**118**	**100**

As per the findings, the study targeted 118 participants out of which 93 questionnaires were filled and returned. This gave a questionnaire return rate of 78.8% which was significant for undertaking a statistical analysis as per recommendations by Hennink, Hutter and Bailey (2020).

4.3 Reliability Analysis

The internal consistency of the research tools was assessed by Cronbach's Alpha as presented in Table 4.2.

Table 4. 2: Reliability Analysis

	Cronbach's Alpha	**Number of items**
Design changes	0.718	3
Delay of Payment	0.816	6
Project planning and scheduling	0.719	3
Site management and Supervision	0.731	5
Completion of Dam projects	0.792	6

As per the study results, design changes had a Cronbach's Alpha of 0.718, delay of payment recorded a Cronbach's Alpha of 0.816, project planning and scheduling had a Cronbach's Alpha of 0.719, site management and supervision had a Cronbach's Alpha of 0.731 and completion of dam projects had a Cronbach's Alpha of 0.792. Since every variable had a Cronbach's Alpha that is above 0.7, the research questionnaire was deemed to be reliable.

4.4 Demographic Information

It entails the general data about the participants which includes gender, age bracket, the highest educational level, period working in dam projects, name of department, current position and number of dam projects they have worked on in Kitui county.

4.4.1 Gender of the Participants

The participants were required by the researcher to specify their gender as represented in Table 4.3.

Table 4. 3: Gender of the Participants

	Frequency	Percent
Male	66	71
Female	27	29
Total	**93**	**100**

As per the results in Table 4.3, most of the participants were male as represented by 71% while the rest were female as denoted by 29%. This is an implication that the study targeted all the respondents regardless of their gender to collect data on the subject under study.

4.4.2 Age Bracket of the Participants

The participants were required to specify their age bracket. The results are represented in Table 4.4.

Table 4. 4: Age Bracket of the Participants

	Frequency	Percent
Below 25 years	17	18.3
25-30 years	37	39.8
31-40 years	27	29
41-50 years	9	9.7
Above 50 years	3	3.2
Total	**93**	**100**

As per the results in Table 4.4, the participants specified that their age was 25-30 years as represented by 39.8%, 31-40 years as represented by 29%, below 25 years as represented by 18.3%, 41-50 years as represented by 9.7% and more than 50 years as represented by 3.2%. This imply that the study covered all age groups and hence the data collected for the subject under study was from a wide scope. This contributes to deduction of valuable

insights and a more comprehensive understanding as to how construction delay affects completion of dam projects in Kitui County.

4.4.3 Highest Level of Education

The participants were as well required to specify their highest educational level. Highest level of education was collected because it allows the researcher to assess the expertise and technical knowledge of the participants involved in dam construction projects. This is crucial for researchers in crucial for drawing meaningful conclusions and making informed generalizations about the subject under investigation. Findings are presented in Table 4.5.

Table 4. 5: Participants Highest Level of Education

	Frequency	**Percent**
Certificate	38	40.9
Diploma	31	33.3
Undergraduate	18	19.4
Postgraduate	6	6.5
Total	**93**	**100**

In regard to Table 4.5, most of those who took part specified that their highest level of education was certificate as represented by 40.9%. Other participants specified that their highest level of education was diploma as represented by 33.3%, undergraduate as represented by 19.4% and postgraduate as represented by 6.5%. This implies that every participant was learnt enough to be in position to give credible information on the subject matter.

4.4.4 Period Working in Dam Project

The participants were requested to specify how long they have been working in their current position in dam projects. The duration of time that respondents have been working on the dam project provides insight into their experience and expertise in the construction

industry and insights may lead to a more comprehensive understanding of how construction delay affects completion of dam projects and presented in Table 4.6.

Table 4. 6: Period Working in Dam Project

	Frequency	Percent
1-5 years	20	21.5
6-10 years	49	52.7
Above 11 years	24	25.8
Total	**93**	**100**

As per the results in Table 4.6, most of the participants specified to have worked in dam projects for 6-10 years as represented by 52.7%. Other participants indicated to have worked in dam projects for more than 11 years as represented by 25.8% and for 1-5 years as represented by 21.5%. This implies that every participant had worked at dam projects for long enough to provide credible information regarding the subject under study.

4.4.5 Participants Department

The participants were also requested to specify their departments and results presented in Table 4.7.

Table 4. 7: Participants Department

	Frequency	Percent
Finance	7	7.5
Material	51	54.8
Supervision	17	18.3
Design	18	19.4
Total	**93**	**100**

From the results in Table 4.7, the participants specified that they belong to material as represented by 54.8%, supervision as represented by 18.3%, design as represented by 19.4% and finance as represented by 7.5%. This implies that every participant was involved in dam projects to be able to give credible information regarding the subject under study. The main participants were project managers, contractors, consultants and the project employees and they had worked in many dam projects in Kitui county to be able to provide credible information about how construction delay affects completion of the projects.

4.5 Design Changes and Completion of Dam Projects

The partakers were to give their views on how design changes affect completion of dam projects in Kitui County Kenya and results presented in Table 4.8.

Table 4. 8: Statements on Design Changes

	SD %	D %	M %	A %	SA %	Mean	Std. Dev.
Design changes/variations are inevitable in a dam project.	0.0	3.2	17.2	58.1	21.5	3.979	0.722
All design changes have cost variations and implications.	9.7	54.8	24.7	10.8	0.0	2.366	0.805
Many projects in Kitui have stalled due to design changes or impacts of design variations.	0.0	2.2	8.6	48.4	40.9	4.280	0.713

As per the results on statement that design changes are inevitable in a dam project, 3.2% of the participants disagreed, 17.2% were moderate, 58.1% agreed and 21.5% were in strong agreement. The mean was 3.979 which lies between 3.5 and 4.5 representing agreement in 1-5 Likert scale. This implies that most participants agreed that design changes are inevitable in a dam project.

Further regarding the statement that all design changes have cost variations and implications, 9.7% of the participants were in strong disagreement, 54.8% disagreed, 24.7%

were moderate while 10.8% were in agreement. The mean of the statement was 2.366 which lies between 1.5 and 2.5 represented a disagreement in 1-5 Likert scale. This implies that majority of participants disagreed that all design changes have cost variations and implications.

Finally, regarding the statement that many projects in Kitui have stalled due to design changes or impacts of design variations, 2.2% of the participants disagreed, 8.6% were moderate, 48.4% agreed while 40.9% were in strong agreement. The mean was 4.280 which lies between 3.5 and 4.5 representing agreement in 1-5 Likert scale. This shows that most participants agreed that many projects in Kitui have stalled due to design changes or impacts of design variations.

The participants also specified that other aspects of design changes affecting the completion of dam projects in Kitui County were changes in the hydrological data and analysis, evolving regulatory frameworks, technological advancements and ongoing analysis and optimization during the design phase.

4.5.1 Correlation analysis for Design Changes and Project Completion

The correlation was performed in the research to establish the strength of association between design changes and completion of dam projects. The results are presented in Table 4.9.

Table 4. 9: Correlation Analysis for Design Changes and Project Completion

		Design changes	Completion of Dam projects
Design changes	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	93	
Completion of Dam projects	Pearson Correlation	.846**	1
	Sig. (2-tailed)	.000	
	N	93	93

As per Table 4.9, there is significant and positive association between design changes and completion of dam projects in Kitui County, Kenya (r=0.846; p=0.000).

4.5.2 Simple Regression Analysis for Design Changes and Project Completion

The simple regressions analysis was used to establish how design changes affects completion of dam projects in Kitui County, Kenya. The results are presented in Table 4.10, 4.11 and 4.12.

Table 4. 10: Model Summary for Design Changes and Project Completion

Model	R	R Square	Adjusted R Square	Std. Error
1	.846[a]	.715	.712	.151

a. Predictors: (Constant), Design changes

As per the results in Table 4.10, the R^2 was 0.715 which implies 71.5% of the variations in completion of dam projects in Kitui County, Kenya is explained by design changes.

Table 4. 11: **ANOVA for Design Changes and Project Completion**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.215	1	5.215	228.693	.000[b]
	Residual	2.075	91	.023		
	Total	**7.290**	**92**			

a. Dependent Variable: Completion of Dam projects
b. Predictors: (Constant), Design changes

As per Table 4.11, the sig. value was 0.000 which was less than 0.05. Hence, the study concludes that the regression model was statistically significant in predicting the completion of dam projects by use of design changes.

Table 4. 12: Regression Coefficients for Design Changes and Project Completion

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.055	.134		7.887	.000
	Design changes	.567	.038	.846	15.123	.000
a. Dependent Variable: Completion of Dam projects						

From the findings, the regression equation is

$\mathbf{Y} = 1.055 + 0.567\ \mathbf{X_1}$

Where: **Y** = Completion of dam projects; $\mathbf{X_1}$ = Design changes

As per the results in Table 4.12, design changes significantly affect completion of dam projects in Kitui County, Kenya (B=0.567; p=0.000). This implies that design changes contribute significantly to completion of dam projects in Kitui County.

4.6 Delay of Payment and Completion of Dam Projects

The partakers were to show their level of agreement with various aspects on how delay of payment affects completion of dam projects in Kitui County Kenya and results presented in Table 4.13.

Table 4. 13: Statements on Delay of Payment

	SD %	D %	M %	A %	SA %	Mean	Std. Dev.
Steady cash flow is crucial to the completion of a dam project.	0.0	1.1	5.4	62.4	31.2	4.237	0.597

Progress payment help the contractors and the client track the work progress of the project.	0.0	2.2	9.7	61.3	26.9	4.129	0.663
Late payment affects all departments in the dam project.	0.0	0.0	16.1	55.9	28	4.118	0.657
Payment on time is a great motivator in the completion of a dam project.	3.2	24.7	58.1	14	0.0	2.828	0.701
Delay and dispute in payment is a major reason for contractors to pause or stop works.	0.0	0.0	17.2	57	25.8	4.086	0.654
Incentive payments contribute greatly to the completion of a dam project by the contractor.	0.0	2.2	21.5	57	19.4	3.936	0.704

Regarding the statement that steady cash flow is crucial to the completion of a dam project, 1.1% of the participants disagreed, 5.4% were moderate, 62.4% agreed and 31.2% strongly agreed. The mean was 4.237 and the std. deviation was 0.597. This means that most participants agreed that steady cash flow is crucial to the completion of a dam project.

Concerning the statement that progress payment helps the contractors and the client track the work progress of the project, 2.2% of the participants disagreed, 9.7% were moderate, 61.3% agreed, 26.9% strongly agreed. The mean was 4.129 and std. deviation was 0.663. This shows that most participants agreed that progress payment helps the contractors and the client track the work progress of the project.

On statement that late payment affects all departments in the dam project, 16.1% of the participants were moderate, 55.9% were in agreement and 28% strongly agreed. The mean was 4.118 and the std. deviation was 0.657. This shows that most participants agreed that late payment affects all departments in the dam project.

Further on statement that payment on time is a great motivator in the completion of a dam project, 3.2% of the participants strongly disagreed, 24.7% disagreed, 58.1% were moderate while 14% agreed. The mean was 2.828 and the std. deviation was 0.701. This

implies that majority of participants were moderate that payment on time is a great motivator in the completion of a dam project.

Further on statement that delay and dispute in payment is a major reason for contractors to pause or stop works, 17.2% of the participants were moderate, 57% agreed and 25.8% strongly agreed. The mean was 4.086 and the std. deviation was 0.654. This shows that most participants agreed that delay and dispute in payment is a major reason for contractors to pause or stop works.

Finally, on statement that incentive payments contribute greatly to the completion of a dam project by the contractor, 2.2% of the participants agreed, 21.5% were moderate, 57% agreed and 19.4% strongly agreed. The mean was 3.936 and the std. deviation was 0.704. This implies that most participants agreed that incentive payments contribute greatly to the completion of a dam project by the contractor.

4.6.1 Correlation analysis for Delay of Payment and Project Completion

The correlation was performed in the research to establish the strength of association between delay of payment and completion of dam projects. The results are presented in Table 4.14.

Table 4. 14: Correlation Analysis for Delay of Payment and Project Completion

		Delay of Payment	Completion of Dam projects
Delay of Payment	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	93	
Completion of Dam projects	Pearson Correlation	.816**	1

	Sig. (2-tailed)	.000	
	N	93	93

As per the results in Table 4.14, there is a significant and positive relationship between delay of payment and completion of dam projects in Kitui County, Kenya (r=0.816; p=0.000).

4.6.2 Simple Regression Analysis for Delay of Payment and Project Completion

The simple regressions analysis was used to establish how delay of payment affects completion of dam projects in Kitui County, Kenya. The results are presented in Table 4.15, 4.16 and 4.17.

Table 4. 15: Model Summary for Delay of Payment and Project Completion

Model	R	R Square	Adjusted R Square	Std. Error
1	.816[a]	.666	.663	.163

a. Predictors: (Constant), Delay of Payment

As per the results in Table 4.15, the R^2 was 0.666 which implies 66.6% of the variations in completion of dam projects in Kitui County, Kenya is explained by delay of payment.

Table 4. 16: **ANOVA for Delay of Payment and Project Completion**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.858	1	4.858	181.735	.000[b]
	Residual	2.432	91	.027		
	Total	**7.290**	**92**			

a. Dependent Variable: Completion of Dam projects
b. Predictors: (Constant), Delay of Payment

As per Table 4.16, the sig. value was 0.000 which was less than 0.05. Hence, the study concludes that the regression model was statistically significant in predicting the completion of dam projects by use of delay of payment.

Table 4. 17: Regression Coefficients for Delay of Payment and Project Completion

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.678	.278		2.437	.017
	Delay of Payment	.962	.071	.816	13.481	.000
a. Dependent Variable: Completion of Dam projects						

From the findings, the regression equation is

$\mathbf{Y} = 0.678 + 0.962\ \mathbf{X_2}$

Where: **Y** = Completion of dam projects; $\mathbf{X_2}$ = Delay of payment

As per the results in Table 4.17, delay of payment significantly affects completion of dam projects in Kitui County, Kenya (B=0.962; p=0.000). This implies that delay of payment contributes significantly to completion of dam projects in Kitui County.

4.7 Project Planning and Completion of Dam Projects

Those who took part were to show the level of agreement about some aspects on how project planning affects completion of dam projects in Kitui County Kenya and results were tabulated in Table 4.18.

Table 4. 18: Statements on Project planning.

	SD %	D %	M %	A %	SA %	Mean	Std. Dev.
Project planning ensures that the contract is executed as per the	0.0	1.1	4.3	77.4	17.2	4.108	0.499

contract drawings hence timely completion of a project.							
Good work programs cross checks whether the project is on schedule and advise management accordingly.	0.0	0.0	17.2	66.7	16.1	3.989	0.580
Due to the diversity of dam projects an experienced project supervisor is required for successful completion of the project.	0.0	0.0	14	61.3	24.7	4.108	0.616

Regarding the statement that project planning ensures that the contract is executed as per the contract drawings hence timely completion of a project, 1.1% of the participants disagreed, 4.3% were moderate, 77.4% agreed and 17.2% strongly agreed. The mean was 4.108 and the std. deviation was 0.499. This shows that most participants agreed that project planning and scheduling ensures that the contract is executed as per the contract drawings hence timely completion of a project.

Concerning the statement that good work programs cross checks whether the project is on schedule and advise management accordingly, 17.2% of the participants were moderate, 66.7% agreed while 16.1% strongly agreed. The mean was 3.989 and the std. deviation was 0.580. This implies that most participants agreed that good work programs cross checks whether the project is on schedule and advise management accordingly.

Finally on the statement that due to the diversity of dam projects an experienced project supervisor is required for successful completion of the project, 14% of the participants were moderate, 61.3% agreed while 24.7% strongly agreed. The mean was 4.108 and the std. deviation was 0.616. This shows that participants agreed that due to the diversity of dam projects an experienced project supervisor is required for successful completion of the project.

4.7.1 Correlation analysis for Project Planning and Project Completion

The correlation was performed in the research to establish the strength of association between project planning and completion of dam projects. The results are presented in Table 4.19.

Table 4. 19: Correlation Analysis for Project Planning and Project Completion

		Project planning	Completion of Dam projects
Project planning	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	93	
Completion of Dam projects	Pearson Correlation	.831**	1
	Sig. (2-tailed)	.000	
	N	93	93

As per the results in Table 4.19, there is a positive and significant relationship between project planning and scheduling and completion of dam projects in Kitui County, Kenya (r=0.831; p=0.000).

4.7.2 Simple Regression Analysis for Project Planning and Project Completion

The simple regressions analysis was used to establish how project planning affects completion of dam projects in Kitui County. The results are presented in Table 4.20, 4.21 and 4.22.

Table 4. 20: Model Summary for Project Planning and Project Completion

Model	R	R Square	Adjusted R Square	Std. Error
1	.831[a]	.691	.687	.157

a. Predictors: (Constant), Project planning and scheduling

As per the results in Table 4.20, the R^2 was 0.691 which implies 69.1% of the variations in completion of dam projects in Kitui County is explained by project planning.

Table 4. 21: **ANOVA for Project Planning and Project Completion**

Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	5.036	1	5.036	203.253	.000[b]
	Residual	2.254	91	.025		
	Total	**7.290**	**92**			

a. Dependent Variable: Completion of Dam projects

b. Predictors: (Constant), Project planning and scheduling

As per Table 4.21, the sig. value was 0.000 which was less than 0.05. Hence, the study concludes that the regression model was statistically significant in predicting the completion of dam projects by use of project planning.

Table 4. 22: Regression Coefficients for Project Planning and Project Completion

		Unstandardized Coefficients		**Standardized Coefficients**		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	.463	.183		2.529	.013
	Project planning and scheduling	.639	.045	.831	14.257	.000

a. Dependent Variable: Completion of Dam projects

From the findings, the regression equation is

$\mathbf{Y} = 0.463 + 0.639\ \mathbf{X_3}$

Where: **Y** = Completion of dam projects; $\mathbf{X_3}$ = Project Planning

As per the results in Table 4.22, project planning significantly affects completion of dam projects in Kitui County, Kenya (B=0.639; p=0.000). This implies that project planning contributes significantly to completion of dam projects in Kitui County.

4.8 Site Management and Completion of Dam Projects

Those who took part were to state their level of agreement concerning various aspects on how site management and supervision affects completion of dam projects in Kitui County Kenya and results tabulated in Table 4.23.

Table 4. 23: Statements on Site Management.

	SD %	D %	M %	A %	SA %	Mean	Std. Dev.
Good site/ project management leads to improved morale hence timely completion of the dam.	0.0	1.1	1.1	79.6	18.3	4.151	0.465
Most dam projects in Kitui County lack/lacked experienced site managers.	0.0	3.2	18.3	65.6	12.9	3.882	0.657
Site management leads to effective resource allocation which is key in dam completion project.	0.0	2.2	11.8	66.7	19.4	4.032	0.633
Contract management can only be adhered to by a good site manager.	6.5	41.9	32.3	15.1	4.3	2.688	0.955
Project planning is the heart of a dam project cycle life.	0.0	0.0	7.5	72	20.4	4.129	0.516

Regarding the statement that good site management leads to improved morale hence timely completion of the dam, 1.1% of the participants disagreed, 1.1% were moderate, 79.6% agreed and 18.3% strongly agreed. The mean was 4.151 and std. deviation was 0.465. This implies that most participants agreed that good site management leads to improved morale hence timely completion of the dam.

Further on statement that most dam projects in Kitui County lacked experienced site managers, 3.2% of the participants disagreed, 18.3% were moderate, 65.6% agreed and 12.9% strongly agreed. The mean was 3.882 and std. deviation was 0.657. This shows that the majority of participants agreed that most dam projects in Kitui County lacked experienced site managers.

On statement that site management leads to effective resource allocation, which is key in dam completion project, 2.2% of the participants disagreed, 11.8% were moderate, 66.7% agreed while 19.4% strongly agreed. The mean was 4.032 and std. deviation was 0.633. This shows that most of participants agreed that site management leads to effective resource allocation which is key in dam completion project.

Further to the statement that contract management can only be adhered to by a good site manager, 6.5% of the participants strongly disagreed, 41.9% disagreed, 32.3% were moderate, 15.1% agreed while 4.3% strongly agreed. The mean was 2.688 and std. deviation was 0.955. This implies that most participants were moderate that contract management can only be adhered to by a good site manager.

Finally, on the statement that project planning is the heart of a dam project cycle life, 7.5% of the participants were moderate, 72% agreed while 20.4% strongly agreed. The mean was 4.129 and std. deviation was 0.516. This shows that the majority of participants agreed that project planning is the heart of a dam project's cycle life.

4.8.1 Correlation analysis for Site Management and Project Completion

The correlation was performed in the research to establish the strength of association between site management and completion of dam projects. The results are presented in Table 4.24.

Table 4. 24: Correlation Analysis for Site Management and Project Completion

		Site management	**Completion of Dam projects**
Site management and Supervision	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	93	
Completion of Dam projects	Pearson Correlation	.834**	1
	Sig. (2-tailed)	.000	
	N	93	93

As per the results in Table 4.24, there is a positive and significant relationship between site management and supervision and completion of dam projects in Kitui County, Kenya (r=0.834; p=0.000).

4.8.2 Simple Regression Analysis for Site Management and Project Completion

The simple regressions analysis was used to establish how site management affects completion of dam projects in Kitui County and results were presented in Table 4.25, 4.26 and 4.27.

Table 4. 25: Model Summary for for Site Management and Project Completion

Model	R	R Square	Adjusted R Square	Std. Error
1	.834[a]	.695	.691	.15636

a. Predictors: (Constant), Site management and Supervision

As per the results in Table 4.25, the R^2 was 0.695 which implies 69.5% of the variations in completion of dam projects in Kitui County is explained by site management.

Table 4. 26: **ANOVA for Site Management and Project Completion**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.065	1	5.065	207.164	.000[b]
	Residual	2.225	91	.024		
	Total	**7.290**	**92**			

a. Dependent Variable: Completion of Dam projects
b. Predictors: (Constant), Site management.

As per the results in Table 4.26, the sig. value was 0.000 which was less than 0.05. Hence, the study concludes that the regression model was statistically significant in predicting the completion of dam projects by use of project planning.

Table 4. 27: Regression Coefficients for Site Management and Project Completion

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	.385	.187		2.059	.042
	Site management and Supervision	.709	.049	.834	14.393	.000

a. Dependent Variable: Completion of Dam projects

From the findings, the regression equation is

$\mathbf{Y} = 0.385 + 0.709\ \mathbf{X_4}$

Where: **Y** = Completion of dam projects; $\mathbf{X_4}$ = Site Management

As per the results in Table 4.27, site management significantly affect completion of dam projects in Kitui County, Kenya (B=0.709; p=0.000). This implies that site management contribute significantly to completion of dam projects in Kitui County.

4.9 Completion of Dam Projects

The respondents were asked to indicate their level of agreement with various statements that describes completion of dam construction and results were tabulated in Table 4.28:

Table 4. 28: Statements on Completion of Dam projects

	SD %	D %	M %	A %	SA %	Mean	Std. Dev.
Project processes are completed on set the time	12.9	55.9	22.6	8.6	0.0	2.269	0.796
The project is completed on the set deadline	17.2	64.5	17.2	1.1	0.0	2.022	0.625
The project is completed on the set budget	7.5	8.6	62.4	21.5	0.0	2.979	0.780
The budget estimates of the project met all project needs	0.0	4.3	12.9	65.6	17.2	3.957	0.690
The project performance is satisfactory	0.0	21.5	55.9	18.3	4.3	3.054	0.757
The project outcomes are good.	0.0	0.0	9.7	66.7	23.7	4.140	0.563

Majority of the participants agreed that the project outcomes are good as represented by a mean of 4.140 and that the budget estimates of the project met all project needs as represented by a mean of 3.957. The respondents were however moderate that the project performance is satisfactory as represented by a mean of 3.054 and that the project is completed on the set budget as represented by a mean of 2.979. The respondents disagreed that project processes are completed on set the time as represented by a mean of 2.269 and that the project is completed on the set deadline as represented by a mean of 2.022.

The participants were also asked to specify the major cause of project delay affecting the completion of dam projects in Kitui County. They specified that the major cause of project delays include funding issues, community dynamics, county government regulations, inconsistency existing between the bill of quantities and the drawings, administrative problems and labor conflicts.

CHAPTER FIVE

SUMMARY, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter highlights the summary of the results, then discussion of study results after which the conclusions and recommendations are drawn from the findings highlighted.

5.2 Summary of the Findings

The study intended to establish how construction delay affects completion of dam projects in Kitui County Kenya. The summary of findings for each objective is illustrated in the following sections.

5.2.1 Design Changes and Completion of Dam Projects

The study sought to assess how design changes affect completion of dam projects in Kitui County, Kenya. The study established that there is significant and positive association between design changes and completion of dam projects in Kitui County, Kenya (r=0.846; p=0.000). The study found that design changes significantly affect completion of dam projects in Kitui County, Kenya (B=0.567; p=0.000). The study found that design changes are inevitable in a dam project and that many projects in Kitui have stalled due to design changes or impacts of design variations. The study established that not every design changes have cost variations and implications.

5.2.2 Delay of Payment and Completion of Dam Projects

The study also sought to examine how delay of payment affect completion of dam projects in Kitui County, Kenya. This study revealed a significant and positive relationship between delay of payment and completion of dam projects in Kitui County, Kenya (r=0.816; p=0.000). The results also showed that delay of payment significantly affect completion of

dam projects in Kitui County, Kenya (B=0.962; p=0.000). The study found that steady cash flow is crucial to the completion of a dam project and that progress payment helps the contractors and the client track the work progress of the project. The study also revealed that late payment affects all departments in the dam project and that delay and dispute in payment is a major reason for contractors to pause or stop works. The study found that incentive payments contribute greatly to the completion of a dam project by the contractor and that payment on time is not a very great motivator in the completion of a dam project.

5.2.3 Project Planning and Completion of Dam Projects

The study further sought to assess how project planning affect completion of dam projects in Kitui County, Kenya. The results showed that there is a positive and significant relationship between project planning and completion of dam projects in Kitui County, Kenya (r=0.831; p=0.000). The study also revealed that project planning and scheduling significantly affect completion of dam projects in Kitui County, Kenya (B=0.639; p=0.000). The study found that project planning ensures that the contract is executed as per the contract drawings hence timely completion of a project and that good work programs cross checks whether the project is on schedule and advise management accordingly. The study also found that due to the diversity of dam projects an experienced project supervisor is required for successful completion of the project.

5.2.4 Site management and Completion of Dam Projects

Finally, the study sought to establish how site management affect completion of dam projects in Kitui County, Kenya. The results showed that there is a positive and significant relationship between site management and completion of dam projects in Kitui County, Kenya (r=0.834; p=0.000). The results also showed that site management significantly affect completion of dam projects in Kitui County, Kenya (B=0.709; p=0.000). The study found that good site management leads to improved morale hence timely completion of the

dam and that most dam projects in Kitui County lacked experienced site managers. The study found that site management leads to effective resource allocation which is key in dam completion project and that contract management can only be adhered to by a good site manager. The study established that project planning is the heart of a dam project cycle life.

5.3 Discussions

This section highlights the discussion of findings by linking the current results with previous literature.

5.3.1 Design Changes and Completion of Dam Projects

The study established that there is significant and positive association between design changes and completion of dam projects in Kitui County, Kenya (r=0.846; p=0.000). The study found that design changes significantly affect completion of dam projects in Kitui County, Kenya (B=0.567; p=0.000). The findings agree with Bassa, Reta, Alyew and Tora (2020) who noted that the most common causes of design change were errors and omissions in design, lack of design review during the design process, client plan changes, contract documents that are incomplete, unappealing site conditions, a lack of experience for design evaluation during the phase of design period and an obstacle to prompt decision making.

The study found that design changes are inevitable in a dam project and that many projects in Kitui have stalled due to design changes or impacts of design variations. The study established that not every design changes have cost variations and implications. The findings concur with Jiménez, Afonso and Fernandes (2020) argued that changes in design in construction may be triggered by a variety of factors on varying phases of the project. The causes on changes might internal or external in nature which arises in the course of development phases, that is, design stage to construction.

5.3.2 Delay of Payment and Completion of Dam Projects

The study revealed a significant and positive relationship existing between delay of payment and completion of dam projects in Kitui County, Kenya (r=0.816; p=0.000). The results also showed that delay of payment significantly affect completion of dam projects in Kitui County, Kenya (B=0.962; p=0.000). The study found that steady cash flow is crucial to the completion of a dam project and that progress payment helps the contractors and the client track the work progress of the project. The findings concur with Owusu (2020) who argued that the actual causes to delays in project delivery include delays in honouring payment for work done, inadequate financial resources of clients, underestimation of project duration, difficulties in accessing bank credit (client), poor communication between contracting parties, complexity, and change orders during construction.

The study also revealed that late payment affects all departments in the dam project and that delay and dispute in payment is a major reason for contractors to pause or stop works. The study found that incentive payments contribute greatly to the completion of a dam project by the contractor and that payment on time is not a very great motivator in the completion of a dam project. The findings agree with Perera and Dewagoda (2021) who established that most serious causes of delayed payments among Government-funded construction projects, the most substantial consequences of such delayed payments and the most suitable strategies the clients, consultants and contractors can adopt to mitigate the consequences of such delayed payments.

5.3.3 Project Planning and Completion of Dam Projects

The findings of this research revealed a positive and significant relationship existing between project planning and completion of dam projects in Kitui County, Kenya (r=0.831; p=0.000). The study also revealed that project planning and scheduling significantly affect

completion of dam projects in Kitui County, Kenya (B=0.639; p=0.000). This concurs with Kabiti and Kikwatha (2022) who unveiled existence of a substantial effect of project resource, communication, schedule, and scope planning on performance of construction projects in Meru County. Processes in the projects are arranged in order of what needs to be undertaken first for a smooth project undertaking and the specific activities are all defined.

The study found that project planning and scheduling ensures that the contract is executed as per the contract drawings hence timely completion of a project and that good work programs cross checks whether the project is on schedule and advise management accordingly. The study also found that due to the diversity of dam projects an experienced project supervisor is required for successful completion of the project. This corelates with Yang, Yu and Zhu, (2020) who noted that project planning has a potential of improving knowledge integration and thus, facilitate successful construction project in which knowledge integration plays a mediating role. Kakar, Hasan and Jha (2020) noted that project planning from a project management standpoint, contain interconnected inputs and precise outputs that must be implemented in accordance with their assigned objectives.

5.3.4 Site management and Completion of Dam Projects

The study established that there is a positive and significant relationship between site management and completion of dam projects in Kitui County, Kenya (r=0.834; p=0.000). The study found that site management significantly affect completion of dam projects in Kitui County, Kenya (B=0.709; p=0.000). The findings concur with Tengan and Aigbavboa (2021) who argued that the most important aspects influencing project supervision were favorable working circumstances, dedication of all project participants, site layout arrangement, top management support, and project participants' indecisiveness. Eze, Awodele, Adegboyega, Onyeagam and Guto (2020) noted that the key aspects contributing

to bad site management are challenges brought by poor inventory management, unfit coordination, and communication issues, as well as poor characteristics of the site management itself.

The study found that good site management leads to improved morale hence timely completion of the dam and that most dam projects in Kitui County lacked experienced site managers. The study found that site management leads to effective resource allocation which is key in dam completion project and that contract management can only be adhered to by a good site manager. The study established that project planning is the heart of a dam project cycle life. The findings concur with Lin, Ning, Shi, Liu, Chen and Tan (2021) who argued that the process of ensuring that the project is built in compliance with the requirements of the contract papers, specifications, authorized plans, building codes, building code standards and required municipal rules and regulations is termed as project supervision.

5.4 Conclusions

On objective one, the study concluded that design changes significantly affect completion of dam projects in Kitui County, Kenya. This could be attributed to the fact that most projects in Kitui have stalled due to design changes or impacts of design variations. Though design changes are inevitable in a dam project, not every design changes have cost variations and implications.

On objective two, the study also concluded that delay of payment significantly affects completion of dam projects in Kitui County, Kenya. Steady cash flow is crucial to the completion of a dam project. This ensured through progress payment which helps the contractors and the client track the work progress of the project. Further, incentive

payments contribute greatly to the completion of a dam project by the contractor. Most delays in completion projects have been linked to late payment and dispute in payment.

On objective three, the concluded that project planning significantly affect completion of dam projects in Kitui County, Kenya. Project planning ensures that the contract is executed as per the contract drawings hence timely completion of a project. Good work programs cross check progress of the projects and advises management accordingly. There is a need to have experienced supervisors to ensure successful completion of the dam project due to their diversity of dam projects.

On objective four, the study finally concluded that site management significantly affect completion of dam projects in Kitui County, Kenya. Good site management leads to improved morale hence timely completion of the dam. Moreover, site management leads to effective resource allocation which is key in dam completion projects and contract management can only be adhered to by a good site manager.

5.5 Recommendations

Based on findings, the study makes the following recommendations:

1. The study recommends that project managers and contractors of dam projects in Kitui county should conduct robust initial planning. This includes conducting a thorough feasibility study and site investigation before initiating the project by engaging relevant stakeholders to ensure all concerns are addressed. This would ensure that design changes that might affect completion of dam projects are addressed as early as at planning stage.
2. The study also recommends that recommends that county government of Kitui in collaboration with projects managers should foster collaboration and communication among project stakeholders, including government agencies, contractors, consultants,

and local communities. This would facilitate regular project status updates, progress reports, and stakeholder meetings to ensure timely decision-making and address design changes effectively.

3. The study recommends that that effective planning and the implementation of suitable precautionary steps, such as addressing possible risks like delayed funding from external financiers or the postponed approval of payment requests from contractors, are essential for ensuring timely payments to contractors.

4. The study also recommends that county and national government should ensure that all funds are released to contractors of dam projects on time. This can be done by establishing a streamlined payment process that ensures timely disbursement of funds to contractors and suppliers and setting clear guidelines for the submission of invoices and release of payments, reducing bureaucratic delays.

5. There is also a need for county and national government to ensure that there is adequate allocation of funds to cover the entire project duration, including contingency reserves for unforeseen circumstances. County government should explore opportunities for public-private partnerships to enhance funding and expertise for dam projects.

6. Recommendation made is that county government of Kitui should ensure that every dam project is awarded to experienced contractors and site managers. This is because it was established that most dam projects in Kitui County lacked experienced site managers.

7. Recommendation made is that county government should invest in training and skill development for site managers, supervisors, and construction workers involved in dam projects. This can be done through provision of adequate training and skill

development programs to ensure they possess the necessary technical expertise, safety awareness, and project management skills required for successful project execution.

5.6 Recommendations for Further Research

The study makes the following recommendations for further research:

1. Since the study focused on Kitui County only, it is recommended that another study to be done on how construction delay affects completion of dam projects in other counties in Kenya.
2. This study also recommends further research to focus on other factors affecting completion of projects which are not covered in this study.
3. Recommendation made is that there is need for future researchers to look at challenges facing project managers in ensuring successful completion of dam projects in Kitui county.

REFERENCES

Abera, S. (2022). *Causes and Effects of Construction Delay in Koye Feche Condominium Houses in Addis Ababa: Project O8 Branch Office* (Doctoral Dissertation, St. Mary's University).

Adino, D. (2020). Integrating Benefit Sharing with Compensation as a Poverty Risk Reduction Strategy for Persons Displaced by Large Dams: Focus on Thiba Dam Irrigation Development Project in Kenya. *Journal of African Interdisciplinary Studies*, *4*(12), 53-72.

Afelete, E., & Jung, W. (2021). Causes of design change depending on power project-types in ghana. *Energies*, *14*(21), 6871.

Aginako, Z., Peña-Lang, M. B., Bedialauneta, M. T., & Guraya, T. (2021). Analysis of the validity and reliability of a questionnaire to measure students' perception of inclusion of sustainability in engineering degrees. *International Journal of Sustainability in Higher Education*, *22*(6), 1402-1420.

Al Amri, T., & Marey-Perez, M. (2021). Project delays and cost overruns between public and private sectors in Oman. *Journal of Public Affairs*, *21*(3), e2262.

Ammar, T., Abdel-Monem, M., & El-Dash, K. (2022). Risk factors causing cost overruns in road networks. *Ain Shams Engineering Journal*, *13*(5), 101720.

Baird, I. G., Manorom, K., Phenow, A., & Gaja-Svasti, S. (2020). Opening the gates of the Pak Mun Dam: Fish migrations, domestic water supply, irrigation projects and politics. *Water Alternatives*, *13*(1), 141-159.

Bajjou, M. S., & Chafi, A. (2020). Empirical study of schedule delay in Moroccan construction projects. *International Journal of Construction Management*, 20(7), 783-800.

Barutha, P. J., Jeong, H. D., Gransberg, D. D., & Touran, A. (2021). Evaluation of the impact of collaboration and integration on performance of industrial projects. *Journal of Management in Engineering*, *37*(4), 04021037.

Bassa, M., Reta, A., Alyew, A., & Tora, M. (2020). Causes and effects of design change in building construction projects in three selected Southern Ethiopia zones. *Int. J. Eng. Res*, 5(12), 757-761.

Carvalho, A. B., Maués, L. M. F., Moreira, F. D. S., & Reis, C. J. L. (2021). Study on the factors of delay in construction works. *Ambiente Construído*, *21*, 27-46.

Cassin, J., & Ochoa-Tocachi, B. F. (2021). Learning from indigenous and local knowledge: the deep history of nature-based solutions. In *Nature-Based Solutions and Water Security* (pp. 283-335). Elsevier.

Csaszar, F. A., & Ostler, J. (2020). A contingency theory of representational complexity in organizations. *Organization Science*, *31*(5), 1198-1219.

Dindi, A. M. (2022). *Influence of Personal Ethics of Construction Project Participants on Project Performance in Kenya* (Doctoral dissertation, JKUAT-SABS).

Dula, A. (2021). Causes of Delays in Large Scale Irrigation Projects in Ethiopia. Masters Project, Addis Ababa University.

Durdyev, S., & Hosseini, M. R. (2020). Causes of delays on construction projects: a comprehensive list. *International journal of managing projects in business*, *13*(1), 20-46.

Egwim, C. N., Alaka, H., Toriola-Coker, L. O., Balogun, H., Ajayi, S., & Oseghale, R. (2021). Extraction of underlying factors causing construction projects delay in Nigeria. *Journal of Engineering, Design and Technology*, (ahead-of-print).

Eja, K. M., & Ramegowda, M. (2020). Government project failure in developing countries: a review with particular reference to Nigeria. *Global Journal of Social Sciences*, *19*, 35-47.

Elagib, N. A., & Basheer, M. (2021). Would Africa's largest hydropower dam have profound environmental impacts? *Environmental Science and Pollution Research*, *28*(7), 8936-8944.

Elong, S. (2020). *Assessment of the challenges and effects of delays in compulsory land acquisition on the performance of road construction projects in Uganda* (Doctoral dissertation, Kyambogo University).

Eze, C. E., Awodele, I. A., Adegboyega, A. A., Onyeagam, O. P., & Guto, J. A. (2020). Assessment of the triggers of inefficient materials management practices by construction SMEs in Nigeria. *International Journal of Real Estate Studies*, *14*(1), 38-56.

Farid, W., Kureshi, N. I., Babar, S., & Mahmood, S. (2020). Critical risk factors of construction industry of Pakistan for improving project outcome. *Mehran University Research Journal of Engineering & Technology*, *39*(1), 71-80.

Fashina, A. A., Omar, M. A., Sheikh, A. A., & Fakunle, F. F. (2021). Exploring the significant factors that influence delays in construction projects in Hargeisa. *Heliyon*, *7*(4), e06826.

Fertilia, N. C., & Ayuningtias, H. S. (2020). Cause Analysis of Contract Amendment in the X Dry Dam Construction Project in Indonesia. *Neutron*, *20*(01), 33-40.

Ford, D. N., & Lyneis, J. M. (2020). System dynamics applied to project management: a survey, assessment, and directions for future research. *System Dynamics: Theory and Applications*, 285-314.

Hansen, M. J., Vaagen, H., & Van Oorschot, K. (2020). Team collective intelligence in dynamically complex projects—A shipbuilding case. *Project Management Journal*, *51*(6), 633-655.

Harris, F., McCaffer, R., Baldwin, A., & Edum-Fotwe, F. (2021). *Modern construction management*. John Wiley & Sons.

Hennink, M., Hutter, I., & Bailey, A. (2020). *Qualitative research methods*. Sage.

Hussain, T., & Jergeas, G. F. J. (2021). Relationship of project contextual settings and execution best practices with schedule growth on major construction projects. *The Journal of Modern Project Management*, *9*(2).

Idrees, S., & Shafiq, M. T. (2021). Factors for time and cost overrun in public projects. *Journal of Engineering, Project, and Production Management*, *11*(3), 243-254.

Ilyas, M., Shaojun, C., Li, Y., Ahmad, S., & Hamza, A. (2022). Cause analysis of delay in development induced displacement and resettlement (DIDR) project. A case study of Diamer Basha Dam Project in Pakistan. *International Journal of Construction Management*, 1-10.

Ingle, P. V., & Mahesh, G. (2022). Construction project performance areas for Indian construction projects. *International Journal of Construction Management*, *22*(8), 1443-1454.

Jiménez, V., Afonso, P., & Fernandes, G. (2020). Using agile project management in the design and implementation of activity-based costing systems. *Sustainability*, *12*(24), 10352.

Kabiti, F. K., & Kikwatha, R. W. (2022). influence of project planning practices on performance of kerra road construction projects in meru county, kenya. *International Research Journal of Business and Strategic Management*, *4*(3).

Kakar, A. S., Hasan, A., & Jha, K. N. (2020). Schedule success factors in construction projects in a war-affected region. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, *12*(3), 05020008.

Kapogiannis, G., Fernando, T., & Alkhard, A. M. (2021). Impact of proactive behaviour antecedents on construction project managers' performance. *Construction Innovation*.

Kar, A. K., & Dwivedi, Y. K. (2020). Theory building with big data-driven research–Moving away from the "What" towards the "Why". *International Journal of Information Management*, *54*, 102205.

Lagos, C. I., & Alarcón, L. F. (2021). Assessing the relationship between constraint management and schedule performance in Chilean and Colombian construction projects. *Journal of management in engineering*, *37*(5), 04021046.

Lees, C. M., Rutschmann, A., Santure, A. W., & Beggs, J. R. (2021). Science-based, stakeholder-inclusive and participatory conservation planning helps reverse the decline of threatened species. *Biological Conservation*, *260*, 109194.

Li, D., Lu, D., Moran, E., & da Silva, R. F. B. (2020). Examining water area changes accompanying dam construction in the Madeira River in the Brazilian Amazon. *Water*, *12*(7), 1921.

Lin, P., Ning, Z., Shi, J., Liu, C., Chen, W., & Tan, Y. (2021). Study on the gallery structure cracking mechanisms and cracking control in dam construction site. *Engineering Failure Analysis*, *121*, 105135.

Lopes, J. (2022). Construction in the economy and in national development. In *Research Companion to Construction Economics* (pp. 104-125). Edward Elgar Publishing.

Mahdi, I., & Soliman, E. (2021). Significant and top ranked delay factors in Arabic Gulf countries. *International Journal of Construction Management*, *21*(2), 167-180.

Maingi, J. K., & Marsh, S. E. (2002). Quantifying hydrologic impacts following dam construction along the Tana River, Kenya. *Journal of Arid Environments*, *50*(1), 53-79.

Matu, J., Kyalo, D. N., Mbugua, J., & Mulwa, A. S. (2020). Stakeholder participation in project initiation: a foundation to completion of Urban road transport infrastructure projects, Kenya. *Journal of Civil, Construction and Environmental Engineering*, *5*(1), 11-19.

Mbatha, S. K., Alkizim, A. O., & Mbiti, T. K. (2022). Delay Management as a Mitigation Strategy for Conflicts in Construction Projects in Kenya. *East African Journal of Engineering*, *5*(1), 205-220.

McDermot, E., Agdas, D., Rodriguez Diaz, C. R., Rose, T., & Forcael, E. (2020). Improving performance of infrastructure projects in developing countries: an Ecuadorian case study. *International Journal of Construction Management*, 1-15.

Mirzaee, A. M., Hossieni, M. R., & Martek, I. (2022). Optimal Buyer Credit Arrangements for Chinese Procured Dam-building Projects: An Iranian Perspective. *KSCE Journal of Civil Engineering*, *26*(12), 4984-4996.

Musick, K., Bea, M. D., & Gonalons-Pons, P. (2020). His and her earnings following parenthood in the United States, Germany, and the United Kingdom. *American Sociological Review*, *85*(4), 639-674.

Nayak, J. K., & Singh, P. (2021). *Fundamentals of research methodology problems and*

prospects. SSDN Publishers & Distributors.

Newman, M., & Gough, D. (2020). Systematic reviews in educational research: Methodology, perspectives and application. *Systematic reviews in educational research*, 3-22.

Newman, M., & Gough, D. (2020). Systematic reviews in educational research: Methodology, perspectives and application. *Systematic reviews in educational research*, 3-22.

Ngugi, K. K., Gichaba, C. M., Kathumo, V. V., & Ertsen, M. M. (2020). Back to the drawing board: assessing siting guidelines for sand dams in Kenya. *Sustainable Water Resources Management*, *6*, 1-28.

Ngugi, K. N., Gichaba, C. M., Kathumo, V. M., & Ertsen, M. W. (2020). Back to the drawing board: assessing siting guidelines for sand dams in Kenya. *Sustainable Water Resources Management*, 6(4), 1-28.

Njora, B., & YILMAZ, H. (2021). Evaluation of water accessibility, distribution, water use policies and management in Kenya. *International Journal of Water Management and Diplomacy*, *1*(3), 5-16.

Njuguna, K. T., Alkizim, A. O., & Njuguna, M. (2022, April). Cross-Cultural Project Management in International Construction Projects in Kenya. In *Proceedings of the Sustainable Research and Innovation Conference* (pp. 202-206).

Nzau, G. N. (2021). *Using Remote Sensing and Geographic Information Systems to Determine Suitable Borehole Sites in Kitui County, Kenya* (Doctoral dissertation, University of Nairobi).

Olala, L. A., & Kinoti, K. (2021). Risk Management Processes and Success of Projects: A Case Study of Kenya Power Company. *The International Journal of Business & Management*, *9*(3).

Omonge, P., Herrnegger, M., Gathuru, G., Fürst, J., & Olang, L. (2020). Impact of development and management options on water resources of the upper Mara River Basin of Kenya. *Water and Environment journal*, *34*(4), 644-655.

Ondiek, F. B. (2020). Influence Of Project Planning On Road Construction Projects Performance In Uasin Gishu County, Kenya (Doctoral dissertation, JKUAT-COHRED).

Owusu, P. K. (2020). Examining the Effect of Project Delays in Construction Field, A Case Study of Prime Engineering and Service Ghana Limited. *Asian Journal of Applied Science and Technology*, *4*(3), 129-144.

Oyieyo, P. A., Rambo, C. M., & Ndiritu, A. (2020). Ranking the prevalence of construction cost overrun risk factors in completion of public-private partnership projects: A case

of the Sondu-Miriu hydro-electric power project in Kenya. *International Journal of Research in Business and Social Science (2147-4478), 9*(5), 351-356.

Oyieyo, P. A., Rambo, C. M., & Ndiritu, A. (2020). Ranking the prevalence of construction cost overrun risk factors in completion of public-private partnership projects: A case of the Sondu-Miriu hydro-electric power project in Kenya. *International Journal of Research in Business and Social Science (2147-4478), 9*(5), 351-356.

Pandey, P., & Pandey, M. M. (2021). *Research methodology tools and techniques.* Romania: Bridge Center.

Perera, B. A. K. S., & Dewagoda, K. G. (2021). Streamlining the management of payment delays: the case of Sri Lankan Government building construction projects. *Journal of Financial Management of Property and Construction*.

Perera, D., Smakhtin, V., Williams, S., North, T., & Curry, A. (2021). Ageing water storage infrastructure: An emerging global risk. *UNU-INWEH Report Series, 11*.

Pickavance, K. (2015). *Delay and Disruption in Construction Contracts.* Third Edition. LLP, VA.

Rashid, Y. (2020). Analysis of delay factors and their effects on construction projects. *Management Science Letters*, *10*(6), 1197-1204.

Rashid, Y. (2020). Analysis of delay factors and their effects on construction projects. *Management Science Letters*, *10*(6), 1197-1204.

Reynolds, M., & Holwell, S. (2020). Introducing systems approaches. *Systems approaches to making change: A practical guide*, 1-24.

Rinjit, K. (2020). *Research methodology.* New York: Springer International Publishing.

Rivera, L., Baguec Jr, H., & Yeom, C. (2020). A study on causes of delay in road construction projects across 25 developing countries. *Infrastructures*, *5*(10), 84.

Rivera, L., Baguec Jr, H., & Yeom, C. (2020). A study on causes of delay in road construction projects across 25 developing countries. *Infrastructures*, *5*(10), 84.

Roba, M. Q., & Odollo, L. (2022). Monitoring and evaluation practices on performance of water projects in marsabit county, kenya. *International Journal of Social Sciences Management and Entrepreneurship (IJSSME),* 6(1).

Rosegrant, M. W., Cai, X., & Cline, S. A. (2020). Water and food to 2025. *IFPRI and IWMI Report*.

Rotich, F. K. (2021). Numerical Modeling and Analyses of Water Diversion Tunnels at Thwake Multi-Purpose Dam, Kenya. New Mexico Institute of Mining and Technology.

Safari, A., & Saleh, A. S. (2020). Key determinants of SMEs' export performance: a resource- based view and contingency theory approach using potential mediators. *Journal of Business & Industrial Marketing*.

Samboma, T. A. (2022). Project implementation in local authorities: The Botswana context. *Journal of Public Affairs*, *22*(4), e2610.

Santoso, D. S., & Gallage, P. G. M. P. (2020). Critical factors affecting the performance of large construction projects in developing countries: A case study of Sri Lanka. *Journal of Engineering, Design and Technology*, *18*(3), 531-556.

Sardar Ahsen, D., Memon, N. A., Memon, A. H., & Ahmed, N. (2021). Success Factors Affecting Public Projects of Construction Industry in Pakistan. *International Journal*, *9*(10).

Scholes, R. J. (2020). The future of semi-arid regions: A weak fabric unravels. *Climate*, *8*(3), 43.

Shah, M. N., Dixit, S., Kumar, R., Jain, R., & Anand, K. (2021). Causes of delays in slum reconstruction projects in India. *International journal of construction management*, *21*(5), 452-467.

Shariffudin, F. N. S. N., & Mohamad, M. M. (2021). Construction Waste Management Practices in The Construction Site: Virtual Source Analysis. *Research and Innovation in Technical and Vocational Education and Training*, 1(1), 202-211.

Shirazi, D. H., & Toosi, H. (2023). Deep Multilayer Perceptron Neural Network for the Prediction of Iranian Dam Project Delay Risks. *Journal of Construction Engineering and Management*, *149*(4), 04023011.

Shirazi, D. H., & Toosi, H. (2023). Deep Multilayer Perceptron Neural Network for the Prediction of Iranian Dam Project Delay Risks. *Journal of Construction Engineering and Management*, *149*(4), 04023011.

Speckhann, G. A., Kreibich, H., & Merz, B. (2021). Inventory of dams in Germany. *Earth System Science Data*, *13*(2), 731-740.

Sürücü, L., & Maslakçi, A. (2020). Validity and reliability in quantitative research. *Business & Management Studies: An International Journal*, *8*(3), 2694-2726.

Tam, C., da Costa Moura, E. J., Oliveira, T., & Varajão, J. (2020). The factors influencing the success of on-going agile software development projects. *International Journal of Project Management*, *38*(3), 165-176.

Tariq, J., & Gardezi, S. S. S. (2022). Study the delays and conflicts for construction projects and their mutual relationship: A review. *Ain Shams Engineering Journal*, 101815.

Tengan, C., & Aigbavboa, C. (2021). Validating factors influencing monitoring and evaluation in the Ghanaian construction industry: a Delphi study approach. *International Journal of Construction Management*, *21*(3), 223-234.

Thesing, T., Feldmann, C., & Burchardt, M. (2021). Agile versus waterfall project management: decision model for selecting the appropriate approach to a project. *Procedia Computer Science*, *181*, 746-756.

Tshidavhu, F., & Khatleli, N. (2020). An assessment of the causes of schedule and cost overruns in South African megaprojects: A case of the critical energy sector projects of Medupi and Kusile. *Acta Structilia*, *27*(1), 119-143.

Vogl, A. L., Bryant, B. P., Hunink, J. E., Wolny, S., Apse, C., & Droogers, P. (2017). Valuing investments in sustainable land management in the Upper Tana River basin, Kenya. *Journal of environmental management*, *195*, 78-91.

von Bertalanffy, L. (1968). General System Theory: Foundations, Development, Applications. New York: George Braziller.

Wang, Z., & Liu, J. (2020). A seven-dimensional building information model for the improvement of construction efficiency. *Advances in Civil Engineering*, *2020*, 1-17.

Wanyama, E. W. (2021). Performance of regional development authorities in Kenya (Doctoral dissertation, MMUST).

Wanyama, E. W. (2021). *Performance of regional development authorities in Kenya* (Doctoral dissertation, MMUST).

Wideman, R. M. (2022). *Project and program risk management a guide to managing project risks and opportunities*. Project Management Institute, Inc..

Yang, X., Yu, M., & Zhu, F. (2020). Impact of project planning on knowledge integration in construction projects. *Journal of construction engineering and management*, *146*(7), 04020066.

Yang, X., Yu, M., & Zhu, F. (2020). Impact of project planning on knowledge integration in construction projects. *Journal of construction engineering and management*, *146*(7), 04020066.

Yogi, M., Kumar Mishra, A., & Aithal, P. S. (2022). Accessing the Compliance Standards of Selected Projects of Thabang Rural Municipality, Nepal. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, *7*(1), 127-140.

Zaniolo, M., Giuliani, M., Bantider, A., & Castelletti, A. (2021). Hydropower development: Economic and environmental benefits and risks. In *The Omo-Turkana Basin* (pp. 37-57). Routledge.

APPENDICES

Appendix I: Introductory Letter

Natalie Arum Auma

Dear Respondent,

RE: QUESTIONNAIRE

Am a student at the University of Nairobi pursuing Masters of arts in Project Planning and Management. Am carrying out a study on **CONSTRUCTION DELAY AND COMPLETION OF DAM PROJECTS IN KITUI COUNTY KENYA.**

I kindly request you to complete the attached questionnaire so as to enable me accomplish the study. Please note that all the information given shall be treated purely and used for academic purposes and shall be treated as confidential. Thank you for your Cooperation and taking your time to complete the questionnaire.

Yours faithfully,

Natalie Arum Auma

Appendix II: Questionnaire

I have read and understand the above information. I agree to participate in this study.
Yes. [ ]

No. [ ]

If No, please may we know the reason:_____?

Kindly tick appropriately

PART A: General Information

1. In this section, the study shall basically focus on the general information regarding the respondents.

Gender

Male = 1 [ ]

Female =2 [ ]

2. Kindly indicate your age bracket?

Below 25 years ( )

25-30 years ( )

31-40 years ( )

41-50 years ( )

Above 50 ( )

3. What is your highest level of education?
Certificate ( )

Diploma ( )

Undergraduate ( )

Postgraduate ( )

4. How long have you been working in your current position in a dam project?

1-5 years ( )

6-10 years ( )

Above 11 years ( )

5. What is your current position in the organization? (Dam Project)

E.g. Contractor, Consultant, Project managers, Design Engineer etc

……

6. What is the name of your department?

Finance= 1 ( )

Material = 2 ( )

Supervision =3 ( )

Design=4 ( )

Other department =5 ( )

7. How many dam projects have you worked on in Kitui county?

8. Date of Interview: ……...……

PART B: Main Constructs

This section is concerned more on how construction delay affects completion of dam projects in Kitui County.

Note that in selecting your choices, tick appropriately (√)

1. **What is your level of agreement on the following statements Design changes affects/influences completion of dam projects in Kitui County Kenya?**

   Scale 1-strongly disagrees, 2-disagree,3-moderate, 4-agree, 5-strongly agree.

Design Changes					
Statements	**1**	**2**	**3**	**4**	**5**
Design changes/variations are inevitable in a dam project.					
All design changes have cost variations and implications.					
Many projects in Kitui have stalled due to design changes or impacts of design variations.					

In your own opinion, what other aspects of design changes affect the completion of dam projects in Kitui County?

……
……

2. **What is your level of agreement on the following statements Delay of payment affects/influences completion of dam projects in Kitui County Kenya?**

   Scale 1-strongly disagrees, 2-disagree,3-moderate, 4-agree, 5-strongly agree.

In your own opinion, what other aspects of delay of payment affect the completion of dam projects in Kitui County?

……
……

Delay of payment					
Statements **Scale 1-strongly disagrees, 2-disagree,3-moderate, 4-agree, 5-strongly agree.**	**1**	**2**	**3**	**4**	**5**
Steady cash flow is crucial to the completion of a dam project.					
Progress payment help the contractors and the client track the work progress of the project.					
Late payment affects all departments in the dam project.					
Payment on time is a great motivator in the completion of a dam project.					
Delay and dispute in payment is a major reason for contractors to pause or stop works.					
Incentive payments contribute greatly to the completion of a dam project by the contractor.					

3. **What is your level of agreement on the following statements Project planning and Scheduling affects/influences completion of dam projects in Kitui County Kenya?**

Project planning and Scheduling					
Statement	**1**	**2**	**3**	**4**	**5**
Project planning and scheduling ensures that the contract is executed as per the contract drawings hence timely completion of a project.					
Good work programs cross checks whether the project is on schedule and advise management accordingly.					
Due to the diversity of dam projects an experienced project supervisor is required for successful completion of the project.					

In your own opinion, what other aspects of project planning affect the completion of dam projects in Kitui County?

……

……

4. **What is your level of agreement on the following statements Site management and Supervision affects/influences completion of dam projects in Kitui County**
   Scale 1-strongly disagrees, 2-disagree,3-moderate, 4-agree, 5-strongly agree.

   Kenya?

Site management and Supervision.					
Statement	**1**	**2**	**3**	**4**	**5**
Good site/ project management leads to improved morale hence timely completion of the dam.					
Most dam projects in Kitui County lack/lacked experienced site managers.					
Site management leads to effective resource allocation which is key in dam completion project.					
Contract management can only be adhered to by a good site manager.					
Project planning is the heart of a dam project cycle life.					

In your own opinion, what other aspects of site management and supervision affect the completion of dam projects in Kitui County?

……

……

5. **What of the following factors best describes completion of dam construction?**
   Scale 1-strongly disagrees, 2-disagree,3-moderate, 4-agree, 5-strongly agree.

Completion of Dam projects					
Statements	**1**	**2**	**3**	**4**	**5**
Project processes are completed on set the time					
The project is completed on the set deadline					
The project is completed on the set budget					

The budget estimates of the project met all project needs					
The project performance is satisfactory					
The project outcomes are good.					

In your own opinion, what other factors affect the completion of dam projects in Kitui County?

……

……

6. Summary

Causes of Project Delay	
In your view what is the major cause of project delay affecting the completion of dam projects in Kitui County?	

THANK YOU

CONSTRUCTION DELAY AND COMPLETION OF DAM PROJECTS IN KITUI COUNTY KENYA.

ORIGINALITY REPORT

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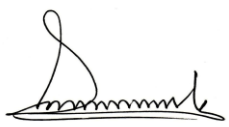

Prof. Charles M. Rambo

29 – 11 - 2023