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The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 10, Iss.2, pp 582 – 603. May 7, 2023. www.strategicjournals.com, ©Strategic Journals

PROJECT SCHEDULE MANAGEMENT ON PERFORMANCE OF CONSTRUCTION PROJECTS IN MOMBASA COUNTY, KENYA

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Accepted: April 28, 2023

ABSTRACT

This study analyzed the effect of project scheduling management on performance of construction projects in Mombasa County, Kenya. The study targeted 175 contractors implement construction projects in Mombasa County. The contractors targeted were categorized as NCA5, NCA6, NCA7 and NCA8. This study adopted a cross-sectional survey design. Stratified random sampling method was used to select relevant respondents from across the board in the various categories of NCA contractors in Mombasa County. Structured questionnaires were used to collect primary data from respondents. Quantitative data was analyzed using SPSS version 26. From the findings, the study revealed that most contractors performed project tasks sequence to ensure effective use of resources. Also project managers finds the order of tasks that will take the least amount time. Further, the study found that constraints between tasks were taken into considerations and that the construction projects tasks are assigned baseline measures. Also project tasks are defined prior to construction commencement as most the respondents agreed and also the tasks of the construction projects are defined using sequencing tools. The study concluded that tasks dependencies of the project are effectively considered by the project leadership during project scheduling. Also Gantt Chart is prominently used by the project team to visualize project tasks dependencies and the construction projects task dependencies are well documented and that the critical path of the project task dependence is focused with resources. Also the schedule of the project tasks is communicated frequently to the project team and the communication of the schedule procedures is relayed horizontally stated and communication is centralized throughout the project life cycle as well as internal communication amongst the project team is always promoted throughout projects' life cycles. The study recommended that project resources should be scheduled systematically before the commencement of the project construction. The construction projects should be equipped with knowledgeable human resources. This would improve on the project deliverables such as timeliness, within budget and quality. The technological resources should be deployed in the construction projects as well as provision of sufficient financial resources.

Key Words: *Project Tasks Definition, Tasks Dependence Mapping, Scheduling Procedures Communication, Project Resourcing*

CITATION: Mogoa, A. M., & Muchelule, Y. (2023). Project schedule management on performance of construction projects in Mombasa County, Kenya**.** *The Strategic Journal of Business & Change Management,* 10 (2), 582–603.

INTRODUCTION

A building construction project is a high-risk activity which must be managed effectively in all stages, in order to avoid delays overruns, which in most cases are part of it, and a common problem (Acquah, Eyiah & Oteng, 2018). Dolage and Pathmarajah (2017) opine that these problems occur frequently during project life-time leading to disputes and litigation. Delivering projects within the contract stipulated time is one of the yield sticks of measuring a successful project. Despite its proven importance it is not uncommon to see construction projects failing to achieve their objectives. However, construction projects schedule overruns have negative impacts to all construction parties including the client (Awolesi, Fabi & Akinseinde, 2017).

Basically, a global problem as most of the construction industry around the world, do exceeds the expected budget often. A global study by Memon, Rahman and Azis (2017) on construction projects has found that; cost overrun is the most faced problem, with an estimation of 9 out of 10 projects facing the problem with an overrun of 50% to 100%. Likewise, another investigation on 87 projects conducted by Naveenkumar and Prabhu (2016) revealed that; the problem of schedule overrun exists in projects by an average of 10.3%, giving an example of the United Kingdom (UK) where nearly one third of all clients' files complains about their projects exceeding their allocated budget. Malaysia is also another country being affected severely by cost overrun, in which only 46.8% of public sector and 37.2% of private sector projects are being finished within the allocated budget (Memon, 2016).

Schedule overruns are common issues in the building construction industry, in developing countries. According to Bentil, Nana-Addy, Asare & Fokuo-Kusi (2017), this makes it difficult for building construction projects, which in most cases are complex endeavours, associated with large costs and long duration, to achieve their major criteria in terms of success (project completion within budget, time, best quality and the satisfaction of the client's requirement). Santoso and Soeng (2016) asserts that; the achievement of these project success in the building construction industry, is even more critical, as companies work on narrow margins. Kholif, Hosny and Sanad (2017) further insist that; even with various schedule control software and techniques, schedule overruns still prevail in building construction projects.

The Contractors registration establishment in Kenya has 8 distinct categories ranging from NCA1 (Highest) to NCA8 (Lowest) with most of the contractors doing more than one class of work. The main classes of work include Roads, Water, Building, Electrical and Mechanical. There are a total of over 13,700 contractors registered by NCA with over 22,400 licenses in the above classes of work (Kogi & Were 2017). According to Ogutu and Muturi (2017), building works has the highest proportion of licensed contractors at 43% followed by Roads at 34%. Water and Electrical works have proportions of 10% and 9% respectively. Mechanical has a paltry 3%. The sector is dominated by small and medium enterprise contractors which account for a total of 79% with NCA5 11%, NCA6 22%, NCA7 31% and NCA8 15%. Large establishment contractors account for 21% with NCA4 13%, NCA3 4%, NCA2 2% and NCA1 3% (Nyangilo, 2016). There are over 169,000 semi-skilled and 214,000 unskilled construction workers currently employed by contractors in the industry. There is need for specific training courses to improve skills and competencies of this category of workers in the industry. In addition, contractors should be sensitised to take training/upgrading of their employee's skills as a strategy for quality improvement, higher productivity and profitability (Phiri, 2016).

In Kenya, the construction industry contributes up to 5% of the National GDP as reported in the Economic Survey and contributes 10% to employment nationally. Its contribution is valued at 50% in terms of demand which is a significant proportion from a single Client (Nyangwara &

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Datche, 2016). The provision of infrastructure consumes about 10% of the National Budget as indicated in the Printed Estimates (Mose & Moronge, 2016). In Kenya, delays of building works projects are rampant especially due to endemic corruption and poor reporting structures among the public sector (Mbatha, 2017). According to Kogi and Were (2017), foreign investors have shown a lot of keenness to have a stake in Kenya considered a business hub in east and central Africa and a centre from which they can operate with in Africa. As a result of this, Mombasa and its environs has witnessed a boom in building works projects. These projects are government, private individuals, private companies and international businesses and institutions sanctioned.

Building and construction is quite central to creating numerous employment opportunities which would help in reducing the unemployment levels which are a problem in many countries Kenya included (Kihoro, 2017). Many of the projects are labour intensive and thus very many of otherwise unemployed people of the working age are employed in this industry. In Kenya many government projects fail to be completed in time causing cost overruns and at times complete abandonment (Mose & Moronge, 2016). This can be seen in various number of building projects which stand unfinished. Even more are those projects that are in the end finished but at an inflated budget and at a date later that agreed in the project schedule (Kogi & Were, 2017).

Mega construction projects are not just magnified versions of smaller projects but are a completely different breed of project in terms of their level of aspiration, lead times, complexity, and stakeholder involvement; implying that they are also a very different type of project to manage. Building works projects are also among the most complex category of project (Murithi, Makokha & Otieno, 2017). Inherent complexity in mega building works projects is the main source of contextual risk which is usually referred to as typological risk. The magnitude of this risk increases as we move from an environment of low complexity towards high complexity (Ogutu & Muturi, 2017). According to Mose and Moronge (2016), the effectiveness of project schedule control is usually affected by typological risk in such a way that as the value of the typological risk increases, exercising project control becomes more difficult. This could explain why complex building works megaprojects are usually delivered over budget, behind schedule, with benefit shortfalls, over and over again.

Statement of the Problem

Construction schedule overruns are not uncommon on construction projects world over and the Kenyan construction industry has not escaped the challenges of failing to deliver projects on time. In order to find mitigation measures of schedule overruns, the first step is to identify the causes of these overruns (Maturi, 2019). The lack of effective resource scheduling has continually led to the poor performance of construction projects. A literature review reveals that a number of public construction projects and road construction projects still register poor performance related to the project management practices (Boru, 2016.

Schedule performance in Kenya is poor such that over 70% of projects initiated escalate in time with a magnitude of over 50% (Mbeche, 2015; Mbatha, 2015). According to Ocharo and Kimutai (2018), power construction projects in this country are not implemented on schedule either. Finding by Nyangilo (2018) further revealed that 70% of power construction projects experienced time overrun and that 35 out of the 50 projects considered were not completed on time and therefore failure to manage construction risks in a systematic way make the project suffer in schedule overruns, delayed completion, non-completion or may fail to meet the quality specifications and the benefits they were intended for. The Global Construction Survey also confirmed that project sponsors continue to experience project failure (KPMG, 2020). Survey on private organizations showed that 53% suffered one or more underperforming projects in the previous year whereas for energy and natural resources and

public-sector respondents the figures were 71% and 90% respectively. Only 25% of projects came within 10% of their original deadlines in the earlier 3 years (KPMG, 2020).

Local scholars such as Nyangwara and Datche (2015), Kogi and Were (2017), Ogeno (2016), Kihoro (2015), Wanjau (2015), Shammah (2016), Shadrack (2018) and Opiyo (2019) among others have mostly done studies on performance of construction projects. A study by Kihoro (2017) carried out a study on the causes of delay in Kenyan construction industry and the results showed that the major causes of schedule overruns were lack of effective communication and underestimation of complexity of projects among other factors. Kogi and Were (2017) also affirm that most contractors in Kenya face a major challenge in controlling building project budgets over the time span between project initiation and the completion of building works projects. Findings by Ong'ondo, Gwaya and Masu (2019) reveal that 35-60% of projects initiated in Kenya face cost overruns while time overrun is most severe with 35-73% projects overrunning their schedule. However, based on the reviewed literature, little has been done on schedule management. This study therefore filled this knowledge gap by carrying out an analysis on the effect of project schedule management on performance of construction projects in Mombasa County, Kenya.

Research Objectives

The general objective of the study was to analyse the effect of project schedule management on performance of construction projects in Mombasa County, Kenya. The specific objectives were;

- To analyze the effect of project tasks definition on performance of construction projects in Mombasa County, Kenya.
- To evaluate the effect of tasks dependence mapping on performance of construction projects in Mombasa County, Kenya.
- To establish the effect of scheduling procedures communication on performance of construction projects in Mombasa County, Kenya.
- To examine the effect of project resourcing on performance of construction projects in Mombasa County, Kenya.

The study was guided by the following hypotheses

- **H_{01}:** Project tasks definition has no significant effect on performance of construction projects in Mombasa County, Kenya.
- **H_{02}:** Tasks dependence mapping has no significant effect on performance of construction projects in Mombasa County, Kenya.
- **H_{03}:** Scheduling procedures communication has no significant effect on performance of construction projects in Mombasa County, Kenya.
- **H_{04}:** Project resourcing has no significant effect on performance of construction projects in Mombasa County, Kenya.

LITERATURE REVIEW

Theoretical Framework

Resource Based Theory

The resource based theory was propounded by Barney in 1991. Resource-Based View (RBV) theory that posits that a firm is defined as a set of resources. The theory originated from strategic management research on how firms create value and specifically how they can obtain a competitive advantage in the market. Barney suggested that a firm's competitive advantage is its value-creating strategy, one that is significantly distinct from the current or future strategy of the competitors. Therefore, in this view, the firm's resources are its source of sustained competitive advantage. That is, the resources that a firm has are their primary source of competitive advantage, and the resources can either be strength or a weakness, including both the intangible and tangible resources available to the company.

Barney notes that the two critical assumptions of the RBV theory are that the resources must be

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heterogeneous and immobile. The heterogeneity assumption holds that companies possess different skills, capabilities, resources, and structure, which makes the company inherently different. The immobility assumption holds that a certain company's resources have to be immobile, that is, they cannot be moved from one company to the other. Therefore, a firm can get a sustained competitive advantage if the resources are -valuable, rare, imperfectly imitable, and not substitutable‖ (VRIN). The RBV theory is applicable to the current study since one of the critical aspects of project management includes project resource planning/scheduling/management.

Program Theory

Program theory is a theory developed to guide monitoring and evaluation process in project management by identifying and relating key project elements to each other (Sammy, 2016). Using this theory project team draws data collection plan and collect data using different methods within the frame work. The collected data by different methods or sources on the same program element are triangulated. Muchelule (2018) suggested that 'use of path diagrams to model the sequences of steps between a programs' intervention and the desired outcomes helps the M&E expert identify the variable to include in the evaluation, discover where in the chain of events the sequence breaks down, and stay attuned to changes in program implementation that may affect the pattern depicted in the model.

Program theory, as applied in monitoring and evaluation practice has been regarded a constructive and a sensible model that demonstrates what goes on in the black box during the transformation on input to output process (Sammy, 2016). The theory also looked at the process through which program components are presumed to affect outcomes. Naveenkumar and Prabhu (2016) describes program theory as consisting of the organizational plan which deals with how to acquire, configure, and deploy resources, and how to organize program activities so that the intended service system is developed and maintained. The theory also deals with the service utilization plan which looks at how the intended target population receives amount of the intended intervention through interaction with the programs service delivery system. Finally, it looks at how the intended intervention for the specified target population brings about the desired social benefits (impacts).

This interjection anchors well with second variable: to analyze the effect of project monitoring on performance of construction projects by contractors in Mombasa County. This intervention to monitor is recognized as one of the key instruments used to guarantee that project undertakings are effective (Murithi *et al.,* 2017). In simple terms, a Program Theory is the assumption that your program's design, activities, and execution will lead to the achievement of the outcomes you intend for your clients. Mustapha (2016) identifies advantages of the program theory-based framework to monitoring processes to include attributes of project outcomes to specific projects or activities and identify unanticipated and undesired program or project consequences. Therefore, program theory enables the implementers to check if the program is within the cost constraints. The theory supports tasks dependence mapping variable.

Complexity Theory

The complexity theory as discussed by Mavuti, Kisingu and Oyoo (2019) is based upon the management belief that total order does not allow for enough flexibility to address every possible situation. The complexity exists in projects. The complexity theory acknowledges that projects by nature have parts that work together as a system. Because of this, even though some people would be unhappy with the changes; a lot of processes have to result from the changes. Certain impediments have to be removed, certain procedures that would be unproductive have to be changed or modified and this can only happen through a comprehensive project planning exercise (Doloi *et al.,* 2017).

Complexity theory states that critically interacting components self-organize to form potentially evolving structures exhibiting a hierarchy of emergent system properties (Lucas, 2019). During project life cycle, many team members will be concerned about how the project will end. The project team is behind schedule, the challenge of delays and how the project will probably end over budget. This explains why changes in project are likely to happen (Memon *et al.,* 2017).

Complexity theorists view projects in a different light: a project is nonlinear and dynamic where the project has within itself the capacity to interact with its environment resulting in a whole that cannot be understood by analyzing its constituent parts. This perspective mandates that project team members should not be viewed mechanistically, where control, order and predictability are common (Doloi, Sawhney, Iyer & Rentala, 2017). Instead, project team members should be viewed as having more engagement and influence in the project team environment and processes in order to encourage learning, creativity and, most importantly, adaptation (Haseeb *et al.,* 2017). This aids in the identification of the potential occurrences that would impede the smooth flow of the project in form of project risks in a timely way. The risks can be mitigated timely to ensure project performance (Memon *et al.,* 2017).

Complexity theory augurs well with the second objective of project planning. This is because complexity theory and Project Management gives a firsthand view on the future of complexity theory as a driving force in the management field, and allows project managers to get a head start in applying its principles of project planning immediately to produce more favorable outcomes.

Conceptual Framework

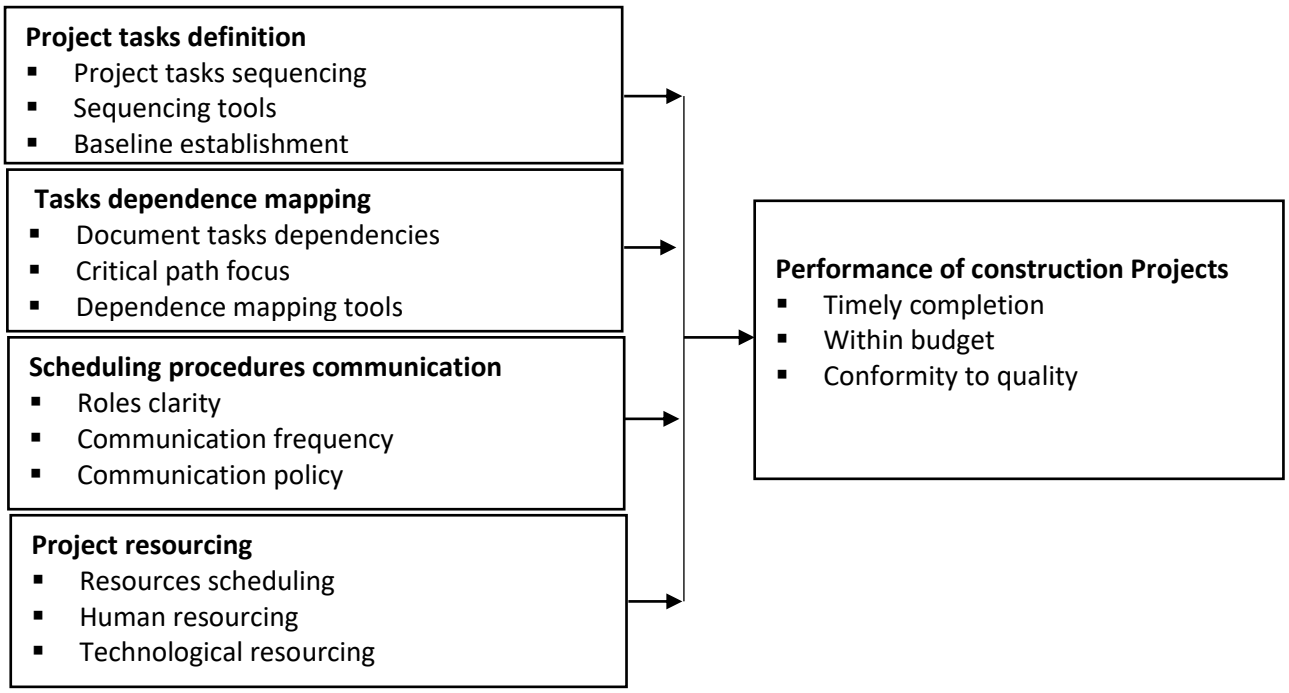

Figure 1: Conceptual Framework

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Review of Literature on Variables

Project Tasks Definition

The success of a project is largely dependent on the ability to define tasks and activities clearly and effectively. Whether you are working on a complex construction project, launching a new product, or organizing a large event, defining tasks and activities is the first step towards achieving your goals and realizing your vision (Acquah, Eyiah & Oteng, 2018). In project management, a task is a work item or activity with a specific purpose related to the larger goal. It's a necessary step on the road towards project completion.

A task is a single unit of work — a single step in a multi-step project. A task is accomplished by a set deadline and must contribute towards work-related objectives. Just as project management is the coordination of individual tasks, a task can be further broken down into subtasks, which should also have clear start and end dates for completion. A task in project management is a specific piece of work that contributes to the overall success of the project. It is a unit of work that has a well-defined purpose, a specific outcome, and a deadline for completion. A task can range in size and complexity, and it can take anywhere from a few minutes to several months to complete.

Tasks are the building blocks of a project, and they are the key to achieving project success. A well-defined task has a clear objective, is measurable, and can be completed by a specific person or team. Effective project management involves breaking down the project into smaller, manageable tasks and then organizing and executing those tasks in a structured and efficient manner. Whether you are a seasoned project manager or just starting, understanding the importance of tasks in project management is the first step toward success. It is important in the management of processes in a project to clearly define roles and responsibilities in order to ensure that they are implemented successfully (Anantatmula, 2010). It leads to increase in responsibility of the team members towards their job since their roles have been clearly spelt out and their performance is measured against the same. Responsibility matrix is a popular tool which is used for the purpose of clarifying roles and responsibilities.

Task sequencing is figuring out the best order to do things. It's like when you're trying to get things done, you want to make sure you're doing them in the most efficient way possible (Dokata, 2017). This can apply to a lot of different situations, like when you're managing a project, scheduling work, or even when you're putting together a to-do list for the day. The goal of task sequencing is to make sure that you're using your time and resources most effectively. This means finding the order of tasks that will take the least amount of time or cost the least amount of money, while also making sure that all of the constraints and dependencies between tasks are taken into consideration (Hornstein, 2017). The goal of task sequencing is to make sure that you're using your time and resources most effectively. This means finding the order of tasks that will take the least amount of time or cost the least amount of money, while also making sure that all of the constraints and dependencies between tasks are taken into consideration (Darusi & Makokha, 2018).

Tasks Dependence Mapping

Projects are made up of many tasks which are mapped out on a project schedule so they can be executed in a timely and organized manner. One of the most important steps when creating a project schedule is to identify task dependencies, as they're critical for time and task management (Michugu, 2020).

Task dependencies are the interrelations that exist between project activities. These task dependencies determine the order in which project tasks must be executed. For example, some tasks need to be executed in sequence, meaning one task must be completed before the next can begin (Müller *et al.,* 2017).

Project dependencies describe the relationships between work projects that determine the order

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and timeline in which items need to be completed by teams. In large projects, there are often many individual tasks involved – and keeping track of them all can be a pain.

Project dependency mapping is a vital part of the planning process, enabling you to work out how the tasks in a project are connected and contingent on each other (Challal & Tkiouat, 2016).

Project dependency mapping identifies all the elements in an ecosystem and how they work collaboratively in real-time so you can test changes and understand their effect. When something goes wrong, project dependency mapping helps teams find the area of failure quickly and proceed with the best course of action (Tesha, 2018).

Scheduling Procedures Communication

Project schedule performance greatly depends on the project team's communication (Coble, 2018). Large-scale project planning is an art form. There are countless jobs to complete, teams to manage, and deadlines to meet. Without proper communication in place, your complex project will fall apart at the seams. Team communication, dedication, expertise or skill, experience and empowerment determine a teams' ability to quickly comprehend and respond to uncertainties during project implementation, thereby improving the chances of effective project implementation (Frimpong *et al.,* 2018).

Effective implementation of projects is realized under circumstances where there are small teams which are self-organizing, autonomous, composed of best skilled expertise and experienced, highly collaborative and capable project team members (Doloi *et al.,* 2017). Correspondingly, Ahsan and Gunawan (2016) indicated that there existed significant and positive relationships between project team dedication and project schedule performance. This implies that dedicated project team members more often do not have intentions to quit, which saves the project the costs of recruiting and orienting new members in terms of both time and money (Kappagomtula, 2017).

Effective internal project communication creates a feeling of responsibility and attachment between project team members and the project tasks that make the team indebted to the project (Alexandrova *et al.,* 2017). As a result, this creates an atmosphere for individual team members to act without much control and coercion. Under such circumstances, what drives a person to work is the emotional attachment to the project as fostered through communication. This is consistent with Linton *et al. (*2017) who indicated that those workers with a positive attitude about project tasks carry out certain role behaviors well beyond the basic minimum levels required of them.

Project Resourcing

The allocation of resources to the project plan is part of the overall process of planning, estimating and resourcing the project. Each time the plan is reviewed and revised, resourcing will be addressed. Project resources are components that are necessary for successful project implementation. They include people, equipment, money, time, knowledge – basically, anything that you may require from the project planning to the project delivery phases. A lack of resources is therefore a constraint on the completion of the project, that's why resource management is the key project management activity that defines a great part of the project success (Gulghane & Khandve, 2016).

During the project definition and initial planning of the project, resourcing is generally considered at a summary level. You will need to identify roles or classes of resource and their general capability, availability and costs etc. This is also the time to start the campaign to persuade line management that they need to participate and release resources for the project.

People are the most important resource in your project and your company. It's the driving force that carries out tasks moving the project towards its completion. To advance the project, your team members should have enough knowledge resources: skills and expertise necessary to make

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the right decisions and accomplish their assignments efficiently. At the same time, human resources are the most complex ones because they involve individuals with their own backgrounds, cultures and ways of work, which may cause conflicts and personality clashes at the workplace. More than that, your company and you as a project manager are in charge of empowering and motivating your team members to grow and drive your business forward (Luvara & Mwemezi, 2017).

Financial resources are another building block of your project. Without them, you won't be able to finance human resources, purchase material resources and handle other project costs. Usually, financial resources are planned and documented at the earliest stages of project development to allocate them and include them in the project costs that must be approved by clients (Hornstein, 2016).

Performance of Construction Projects

The construction projects' performance is often considered in terms of quality, schedule, and cost. Project Management Institute (PMI) acknowledges that successful projects are finished within budget, on time, and meets the desired quality. Across the world, different projects struggle to meet these performance parameters. According to KOG (2018) the term 'delay' in construction contracts has no precise technical meaning, as it can be used in different sense refereeing different conditions in project execution. However, the term is often used in its basic sense to mean any occurrences or events that extend the duration or delay the start or finish of any of the activities of a project. Memon (2016) claims that; apart from delays being rampant across the world, they are invariably accompanied by cost and time overruns.

Schedule delays is a global problem as most of the construction industry around the world do exceeds the expected schedule. This is due to the fact that; keeping building construction projects within estimated costs and schedules, requires sound strategies, good practices, and careful judgment (KPMG, 2015). A global study by Shahzad and Said (2017) on construction projects has found that; Schedule overrun is the most faced problem, with an estimation of 9 out of 10 projects facing the problem with an overrun of 50% to 100%. Likewise, another investigation on 87 projects conducted by (Bisogno *et al.,* 2017) has revealed that; the problem of time overrun exists in projects by an average of 10.3%, giving an example of the United Kingdom (UK) where nearly one third of all client's files complains about their projects exceeding their allocated schedule. Malaysia is also another country being affected severely by cost overrun, in which only 46.8% of public sector and 37.2% of private sector projects are being finished within the allocated schedule (Challal & Tkiouat, 2016).

Challal and Tkiouat, 2016) opine that contractors should appoint project manager, who are expected to draw up a workable project plan, and strategies which should implement the project activities in the proper sequence, to complete the defined stages of the project within the stipulated time frame, with designated resources. Darusi and Makokha (2018) assert on improving the ability of managers and engineers which may mitigate schedule overrun as they reduce the human and management problems. Furthermore, Ghaffari and Emsley (2017) also insists on performing appropriate and proper preconstruction planning on tasks and resources, which may help on monitoring the project progress against stipulated time and budget. A faulty planning and scheduling may lead to project delays due to poor site management and supervision; hence leading to the misunderstanding between owner, consultant and building contractors.

Hornstein (2017) suggested possible mitigation measures in dealing with delay and cost overrun in public building project such as; frequent progress management meeting; consistent supervision, site and technical meetings; frequent coordination between the parties involved; use of up-to-date technology and construction methods; clear information and communication channel among project team members; and delay in decision making. Clients are the project owner, when they

do not make decisions on time regarding project matters, they slow down on-site project activities. This compliments Memon (2016) findings that; slow decision making could be caused by an organization's internal bureaucracy, or wrong channel of communication in building projects.

Construction scheduling is the process of developing, maintaining and communicating schedules for construction time, resources and tasks (Ray, 2017). A schedule is the timetable for a construction project. Schedules are presented in many different ways in order to suit the circumstances. The most common form of graphical schedule is the Gantt chart. On conclusion of the work, schedules that show what was planned and what actually happened are an important resource in determining lessons learned (Ecker, 2018). It is the desire of stakeholders that management practices don't procrastinate, but rather, expedite the accomplishment and delivery of the construction project within the scheduled time frame.

Empirical Literature

Pinha and Ahluwalia (2019), in their study on the effect of flexible resource management on project duration and cost, highlight that poor resource management is often the leading cause of cost overruns and schedule slippage. They propose an approach aimed at empowering the project managers to assess the different scenarios and consequently reduce the project costs and duration. The researchers present a new approach to dynamic resource allocation and project management, which plays a critical role in modern project scheduling approaches. The study concludes that as the project environments become complex, state of the art approaches should be used in project scheduling as they are central to the construction projects' performance.

Jongo, Tesha, Kassonga, Teyanga and Lyimo (2019) analyzed the mitigation measures in dealing with delays and cost overrun in public building projects in Dar-Es-Salaam, Tanzania. This study identified mitigation measures in dealing with delay and cost overrun in public building project, in which out of 25 mitigation measures, effective project planning and scheduling was ranked first; followed by controlling design changes, and effective coordination and communication between parties. Furthermore, the authors insisted on more attention to be paid on the progressively payment to the parties by the client; having accurate cost estimates; as well as appointment of competent site and project manager. Others included, comprehensive contract administration; ensuring prompt resolution in design change queries, issues and authorization report; efficient and effective planning time schedule for material procurement delivery process; developing effective strategic planning for solving identified risks; and ensuring on the timely availability of finance.

Obegi and Kimutai's (2017) study on the effects of resource scheduling on the performance of NGO projects in Nairobi City County highlighted that effective resource scheduling is one of the central project success factors. The study findings highlighted that the occasional monitoring of budget to assess expenses vis-à-vis project budgets, project changes during implementation, equipped project staff, and periodic project performance assessment. The project performance was influenced by resource scheduling because it ensured that the project was operating within budget and the changes are made to adapt to the dynamic nature of the projects, and the staff had what was needed for the job.

Gacheru (2016) carried out an investigation into the national construction authority's challenges in regulating building contractors: The Case of Mombasa County. The study raised three specific objectives; to investigate the challenges faced by contractors in ensuring compliance with NCA regulations; to identify weaknesses in the NCA regulation enforcement strategies; to investigate the relationship between weaknesses in the NCA regulatory structure and challenges of contractor compliance with NCA regulations. The research

The Strategic Journal of Business & Change Management. **ISSN** 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

concluded that there is a relationship between weaknesses in the NCA regulatory structure and contractor challenges of compliance with regulation since most challenges identified were as a result of human resource constraints in the NCA. These challenges included: Inadequate capacity to detect errant behaviour in contractors by conducting frequent random surveys; Poor enforcement of regulations; Lack of adequate sensitization; and Poor attitude of contractors towards the NCA. The research recommended that the NCA should increase the human capital throughout the country to ensure timely inspections thus getting rid of deterrent contractor behaviour.

Maturi (2019) sought to assess the effectiveness of construction site management in Nairobi County. The selected site aspects that were investigated in relation to effective site management included; material management, labour management, health and safety management, cost management and information management. Therefore, a site management framework was recommended to aid construction project managers in managing materials (Use Oracle prime), labour (Use Oracle prime, RFID, UAVs & Navisworks), health and safety (Use Oracle prime, RFID, UAVs & Navisworks), cost (Use Oracle prime, Oracle Textura & Navisworks) and information (Use Oracle prime, Oracle Textura, Revit & Skype).

METHODOLOGY

This study adopted a cross-sectional survey design because the design is best suited for finding out the prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population as it stands at the time of the study (Kumar, 2014). The study targeted 175 general foremen. The population for the study comprised of general foremen of contractors registered by the National Construction Authority (NCA5, NCA6, NCA7, NCA8) implementing construction projects in Mombasa County. The main reason for choosing the aforementioned cadre wa because of their mandate of project execution, encompassing construction schedule control. The sampling frame consisted of small and medium contractors registered by the National Construction Authority (NCA5, NCA6, NCA7, NCA8) implementing construction projects in Kenya by close of business on 31st December 2021. Stratified random sampling method was used to select 122 relevant respondents from across the board in the various categories of NCA contractors in Mombasa County.

Secondary data was collected using NCA reports. Primary information was sought through a Likert framed questionnaire. The questionnaires were served to respondents through drop and pick method. Before processing the responses, the completed questionnaires were cleaned and checked for completeness and consistency. Both descriptive and inferential statistics were used to analyze the data. Quantitative methods of data analysis was used to analyze the research variables. A Likert scale was adopted to provide a measure for qualitative data. The scale helped minimize the subjectivity and make it possible to use quantitative analysis. The numbers in the scale was ordered such that they indicate the presence or absence of the characteristic to be measured. SPSS version 26 was utilized for descriptive and inferential statistics. The relevancy and relationships was then determined by simple regression and correlation analysis techniques where;

$$\mathbf{Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\varepsilon}$$

Y – Performance of construction projects **(**outcome as a result of changes in any or all the variables, X_1 to X_4

$\boldsymbol{\beta_0}$ – is a constant, the results when all variables X_1 to X_4 are zero.

X_1 – Project tasks definition

X_2 – Tasks dependence mapping

X_3 – Scheduling procedures communication

X_4 – Project resourcing

$\beta_1 – \beta_4$ – Regression coefficients

ε – error term

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FINDINGS AND DISCUSSION

Descriptive Results on Project Scheduling

The broad objective of this study was to determine the extent to which project scheduling affects performance of construction projects in Mombasa County. In order to achieve this objective, respondents were required to indicate the extent to which they had adopted selected aspects of project scheduling on a five-point Likert scale where 1 represents strongly disagree and 5 represents strongly agree. The results are discussed in the following subsections.

Projects Task Definition

Respondents were required to indicate the extent to which project tasks definition aspects affect project performance. The results are shown in Table 1.

Table 1: Projects Task Definition

	N	Mean	Std. Dev.
Project tasks are sequenced to make sure time and resources are used effectively	109	3.94	.619
The project managers finds the order of tasks that will take the least amount time	109	3.91	.856
The constraints between tasks are taken into considerations	109	3.88	.492
The construction projects tasks are assigned baseline measures	109	3.81	.535
Project tasks are define prior to construction commencement	109	4.10	.281
The tasks of the construction projects are defined using sequencing tools	109	3.99	1.007
Average	109	3.9413	.47684

From Table 1, the results revealed that respondents agreed to the statement that project tasks are sequenced to make sure time and resources are used effectively with a mean of 3.94 (SD = 0.619). Respondents also agreed to the assertion that the project managers finds the order of tasks that will take the least amount time as shown by a mean of 3.91 (SD = 0.856). The practice "the constraints between tasks are taken into considerations" had a mean of 3.88 (SD = 0.492) implying that respondents were in agreement. Respondents agreed to the statement that the construction projects tasks are assigned baseline measures with a mean of 3.81 (SD = 0.535). Project tasks are define prior to construction commencement as most the respondents agreed and also the tasks of the construction projects are defined using sequencing tools (mean=3.99).

Tasks Dependence Mapping

Respondents were required to indicate the extent to which contractors have adopted selected tasks dependence mapping aspects. The results are shown in Table 2.

Table 2: Tasks Dependence Mapping

	N	Mean	Std. Dev.
Project leadership takes in to consideration tasks dependencies while scheduling the project	109	4.17	.647
The project team uses Gantt Chart to visualize project tasks dependencies	109	3.84	.628
The construction projects task dependencies are well documented	109	3.69	.693
The critical path of the project task dependence is focused with resources	109	3.97	.609
The project team uses dependence mapping tools to establish tasks dependencies	109	4.54	.883
The critical tasks are identified in the project life cycle	109	4.27	.572
Average	109	3.8438	.51490

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From Table 2, the descriptive results indicate that respondents agreed to the statement that project leadership takes in to consideration tasks dependencies while scheduling the project with a mean of 4.17 (SD = 0.647). The statement that the project team uses Gantt chart to visualize project tasks dependencies had a mean of 3.84 (SD = 0.628) meaning that respondents were in agreement with the statement. Respondents agreed to the statement that the construction projects task dependencies are well documented and that the critical path of the project task dependence is focused with resources as shown by a mean of 3.69 and mean of 3.97 respectively. Respondents agreed that the project team uses dependence mapping tools to establish tasks dependencies and that the critical tasks are identified in the project life cycle.

Scheduling Procedures Communication

Respondents were further required to indicate the extent to which contractors have adopted selected scheduling procedures communication aspects. The results are shown in Table 3.

Table 3: Scheduling Procedures Communication

	N	Mean	Std. Deviation
The construction project team is provided with schedule procedures communication policy	109	3.53	1.016
The construction projects team are assigned roles which are clear	109	3.75	.622
The schedule of the project tasks is communicated frequently to the project team	109	3.75	.880
The communication of the schedule procedures is relayed horizontally	109	3.81	.780
Communication is centralized throughout the project life cycle	109	4.11	.391
Internal communication amongst the project team is always promoted throughout projects' life cycles	109	4.62	.618
Average	109	3.7109	.60278

From Table 3 it can be observed that respondents agreed to the statement that the construction project team is provided with schedule procedures communication policy with a mean of 3.53 (SD = 1.016). Respondents also agreed to the statement that the construction projects team are assigned roles which are clear with a mean of 3.75 (SD = 0.622). Further, respondents agreed with the statement that the schedule of the project tasks is communicated frequently to the project team and the communication of the schedule procedures is relayed horizontally stated as indicated by a mean of 3.75 and mean of 3.81 respectively. Respondents agreed that communication is centralized throughout the project life cycle and that internal communication amongst the project team is always promoted throughout projects' life cycles as shown by a mean of 4.11 and 4.62 respectively.

Project Resourcing

Respondents were required to indicate the extent to which contractors have adopted project resourcing aspects. The results are shown in Table 4.

Table 4: Project Resourcing

	N	Mean	Std. Dev.
Project resources are scheduled systematically before the construction begins	109	3.97	.595
The construction projects are equipped with knowledgeable human resources	109	4.22	.491
Technological resources are deployed in the construction projects	109	4.11	.554
Construction projects are provided adequate financial resources	109	4.13	.574
There is timely construction projects resourcing	109	4.16	
Project resourcing has a significant effect on project performance	109		
Average	109	4.0250	.43030

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From Table 4, the descriptive results revealed that respondents agreed that project resources are scheduled systematically before the construction begins as shown with a mean of 3.97 (SD = 0.595). Respondents agreed to the assertion that the construction projects are equipped with knowledgeable human resources and that technological resources are deployed in the construction projects as indicated with a mean of 4.22 (SD = 0.491) and mean of 4.11 respectively. Respondents were in agreement with the statement that construction projects are provided adequate financial resources and that there is timely construction projects resourcing as shown with a mean of 4.13 and mean of 4.16 respectively. Project resourcing has a significant effect on project performance as shown by a mean of 4.98.

Multiple Regression Analysis

The general objective of the study was to determine the effect of project scheduling on performance of construction projects in Mombasa County. In order to achieve this objective, performance of construction projects was regressed on project scheduling as shown in the following sub-sections.

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.693a	.481	.329	.40822

a. Predictors: (Constant), Project tasks definition, Scheduling procedures communication, Tasks dependence mapping, Project resourcing

From Table 5, the correlation coefficient (R) for project scheduling and performance is 0.693 indicating that there is a positive correlation. The coefficient of determination (R^2) is 0.481 revealed that 48.1% change in performance of construction projects is explained by project scheduling.

Table 6: Model Validity (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.702	4	.925	24.342	.001[b]
	Residual	4.000	104	.038		
	Total	7.701	108			

a. Dependent Variable: Performance

b. Predictors: (Constant), Project tasks definition, Scheduling procedures communication, Tasks dependence mapping, Project resourcing

Analysis of variance results in Table 6 shows that the predicted relationship under the model is statistically significant at p–value of 0.001 which is less than the significance level of 0.05. This shows that the model between project scheduling and projects performance is statistically significant. The model coefficients is shown in Table 7.

Table 7: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.289	.984		.294	.071
Project tasks definition	.213	.221	.183	.961	.043
Tasks dependence mapping	.150	.174	.143	.863	.006
Scheduling procedures communication	.280	.186	.303	1.506	.015
Project resourcing	.254	.242	.219	1.047	.011

a. Dependent Variable: Organizational Performance

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From Table 7, the model would appear as follows:

$$Y = 0.289 + 0.213X_1 + 0.150X_2 + 0.280X_3 + 0.254X_4$$

The regression model indicates that performance of construction projects would increase by 0.289, given that all the other factors are held constant at zero. Further in the regression model it shows that a unit increase in project tasks definition would lead to an increase in construction projects performance by 0.213. A unit increase in tasks dependence mapping would lead to a positive increase in construction projects performance by 0.150. Further, regression results showed that a unit increase in scheduling procedures communication would lead to an increase in construction projects performance by 0.280 and a unit increase in project resourcing would lead to an increase in construction projects performance by 0.254. The predictors had significance levels of 0.05 and below implying that they had significant effect in explaining change construction projects performance.

Discussion of Key Findings and Hypothesis Testing

The regression coefficient results were used to achieve the study objectives. This was achieved by considering the P-values that are associated with the relevant regression coefficients and t-values. The first objective of the study was to find out how project tasks definition affect construction projects performance. The regression results for project tasks definition was β_1=0.213, t=.961, and p<0.05 showing that there was a positive and significant relationship between project tasks definition and construction projects performance. It is concluded that a unit increase in projects tasks definition would lead to an increase in construction projects performance by 0.213. On hypothesis testing, since the P-value is less than 0.05, null hypothesis that project tasks definition has no significant on construction projects performance is, therefore, rejected.

The second objective of the study was to investigate how tasks dependence mapping affects construction projects performance. According to the regression analysis's findings (β2 = 0.150, t=.863, p<0.05), tasks dependence mapping significantly affects construction projects performance. According to the study, a unit increase in tasks dependence mapping would lead to a positive increase in construction projects performance by 0.150. The null hypothesis that tasks dependence mapping has no significant effect on construction projects performance is, therefore, rejected since the p-value is less than 0.05.

Third objective of the study sought to investigate the effect of scheduling procedures communication on construction projects performance. According to β3 = 0.280, t=1.506, and p<0.05, the regression analysis results showed a substantial positive relationship between scheduling procedures communication and construction projects performance. According to the findings, a unit increase in scheduling procedures communication would lead to an increase in construction projects performance by 0.280. The null hypothesis that scheduling procedures communication has no significant effect on construction projects performance is, therefore, rejected since the p-value is less than 0.05.

Fourth objective of the study sought to establish the effect of project resourcing on construction projects performance. According to regression analysis, project resourcing and construction projects performance had significant and positive connection (β4 = 0.254, t=1.047, and p<0.05), which implies that a unit increase in project resourcing would lead to an increase in construction projects performance by 0.254. The null hypothesis that project resourcing has no significant effect on construction projects performance rejected since the p-value is less than 0.05.

CONCLUSIONS AND RECOMMENDATIONS

The study concluded that most contractors perform project tasks sequence to ensure effective use of resources. Also project managers finds the order of tasks that will take the least amount time. Further, the study concludes that constraints between tasks

are taken into considerations and that the construction projects tasks are assigned baseline measures. It is concluded that project tasks are defined prior to construction commencement as most the respondents agreed and also the tasks of the construction projects are defined using sequencing tools.

The study concluded that tasks dependencies of the project are effectively considered by the project leadership during project scheduling. Also Gantt Chart is prominently used by the project team to visualize project tasks dependencies and the construction projects task dependencies are well documented and that the critical path of the project task dependence is focused with resources. Also the project team uses dependence mapping tools to establish tasks dependencies and that the critical tasks are identified in the project life cycle.

The study concluded that the construction project team is provided with schedule procedures communication policy and that the construction projects team are assigned roles which are clear. Also the schedule of the project tasks is communicated frequently to the project team and the communication of the schedule procedures is relayed horizontally stated and communication is centralized throughout the project life cycle as well as internal communication amongst the project team is always promoted throughout projects' life cycles.

The study also concluded that project resources are scheduled systematically before the construction begins. The construction projects are equipped with knowledgeable human resources and that technological resources are deployed in the construction projects. The study concludes that construction projects are provided adequate financial resources and that there is timely construction projects resourcing.

The study recommendedthat the construction contractors should conduct project tasks sequence to make sure time and resources are used optimally. The contractors should seek to identify the order of tasks that will take the least amount time and consider the constraints between tasks. The construction projects tasks should be assigned baseline measures and it should be a norm for the contractors to always define project tasks prior to construction commencement. The contractors should utilize available tools for sequencing tasks.

The study recommended that project contractors should pay attention to the tasks dependencies of the project during project scheduling. The project tasks visualization should take center stage during project process as this would visualize dependencies of project tasks hence enhance project planning. This could be achieved using prominent Gantt Chart. In addition, the contractors should document projects task dependencies and pin point project critical path so as to focus resources to the path. The contractors should employ dependence mapping tools to establish tasks dependencies.

The study recommended that the contractors should design a schedule procedures communication policy to guide in project communication. This would solidify the various tasks in the project. The team of the construction project should be clearly assigned roles and the project tasks schedule should be communicated frequently to the project team.

The study recommended that project resources should be scheduled systematically before the commencement of the project construction. The construction projects should be equipped with knowledgeable human resources. This would improve on the project deliverables such as timeliness, within budget and quality. The technological resources should be deployed in the construction projects as well as provision of sufficient financial resources.

Suggestions for Further Study

This study was limited on investigating the project scheduling and performance of construction projects in Mombasa. However, the project scheduling aspects adopted in the study only

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explained 48.1% change in construction projects performance. It is on this basis that the researcher recommends a study be carried out on other project scheduling factors with a view to establishing their effect on construction projects timeliness. Also the study should be extended to cover other sectors as well.

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