



Exploring infrastructure project delays in a selected Eastern Cape Municipality, South Africa



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Background: The King Sabata Dalindyebo (KSD) Municipality greatly experienced setbacks when infrastructure projects were delayed in their completion. Significant financial consequences are elevated from these delays, such as higher project costs, slower economic growth and lowered investor trust in the municipality.

Aim: This study investigated the factors contributing to the delays in completing the KSD Municipality's infrastructure project.

Methods: The study adopted a qualitative approach and a case study design and employed purposeful sampling in KSD Municipality in the Eastern Cape. Thematic analysis was employed to analyse the data obtained from open-ended questionnaires.

Results: The research showed that several factors contributed to the delays at the KSD Municipality, specifically at the Dosi location. The delays include design delays and scope creep; permitting, regulatory and contractual dispute delays; labour, material and equipment procurement delays; financial delays; weather and unforeseen events delays and contractor performance and site management delays. The causes of these delays include lack of funding, legal issues, site settlements, shortage of labour, corruption, theft of supplies and equipment, strikes, design modifications, lack of stakeholder engagement, changes to the project scope and bad weather.

Conclusion: The study's findings indicate that various reasons contribute to the KSD Municipality's infrastructure project delays, making comprehensive solutions necessary to resolve these problems.

Contribution: The study recommends mitigating delays in construction projects, including stakeholder engagement and collaboration, legal and contract management, practical monitoring and controlling, risk management and contingency planning and planning and resource allocation.

Keywords: infrastructure; construction; projects; municipality; risk.

Introduction

Several countries worldwide, mainly those still developing economically, emphasise infrastructure development as an integral component of their development plan. However, project execution is naturally risky (Alzoubi 2022). The lack of a sufficient strategy to address these risks has resulted in many unsuccessful construction projects (Blindenbach-Driessen, Van Dalen & Van Den Ende 2010; Fourie 2018). Any construction undertaking must be finished on schedule, within budget and at the intended level of quality (Asiedu & Adaku 2020). Durdyev, Omarov and Ismail (2017) also claim that many construction projects operate beyond schedule.

Conversely, Ika (2012) indicates that most construction projects fail to meet their goals owing to inefficient implementation processes, resulting in contractor and client discontent as they anticipated projects to be completed regularly and without interruption. This research explores factors that contribute to delays in the completion of infrastructure projects in King Sabata Dalindyebo (KSD) Municipality by outlining the background of the study, stating the statement of the problem, determining the research questions, aims and objectives, emphasising the significance of the study, defining the concept terms, reviewing the literature and determining the research methodology.

Note: The manuscript is a contribution to the themed collection titled 'Innovating Governance: Revolutionizing Local Government through Innovative Research and Practices' under the expert guidance of guest editors Dr Tando Rulashe, Dr Kutu Ramolobe, Prof. Pandelani Harry Munzhezdi and Dr Sareesha Pillay.

Moodley's (2017) study at the University of KwaZulu-Natal in South Africa outlines that successful and efficient project delivery without the currently pervasive delays and disruptions on public sector construction projects is severely hindered by the lack of innovation, existing industry fragmentation, separation of design from construction, lack of effective communication and inequitable distribution of risk between and adversarial relationships of participants within the construction process as a result of the current procurement routes used by the public sector that exclude integrated project delivery approaches with their associated benefits.

Whereas Mansfield, Ugwu and Doran (1994), cited in Vahed (2022), stipulate that the most common factors that result in project delays are lack of proper planning, changes in designs, changes in site conditions, shortages of materials and unpredictable weather conditions. After reviewing several studies on the delays of infrastructure projects, the researchers confirmed that there is still a gap in studies on this issue in the Eastern Cape in KSD Municipality. Therefore, there was an urgent need to identify the types of delays and the causes of these delays and recommend applicable delay mitigation techniques to improve construction projects.

Statement of the problem

Delays in infrastructure project construction in the KSD Municipality have serious negative consequences, resulting in significant economic costs such as increased project expenses, reduced economic growth and diminished investor confidence (Tshidavhu & Khatleli 2020). Haseeb et al. (2011) agree with this perception of these researchers, stating that the construction industry, particularly road construction, is essential for national development and economic advancement. Ntshangase and Tuan (2019) assert that these delays disrupt daily life, limit access to essential services, heighten safety risks, erode public trust, foster political dissatisfaction and tarnish the reputations of government officials. Simpson et al. (2019) outline that they have also led to an infrastructure deficit, where the municipality struggles to meet the demand for new projects. Overall, addressing the causes of these delays is vital for the timely and effective completion of essential infrastructure projects, given their extensive economic, social, political and environmental implications at KSD.

The systemic delays and obstacles in the construction processes of infrastructure projects in the KSD Municipality stressed the broader challenges of programming efforts that seek to support development in various spectrums. These delays reflect underlying problems, including poor project planning, resource management, governance and accountability. They lead to immediate economic destruction through higher costs and eroding investor confidence. They also cause severe social damage, from disruption to daily life with less access to policing and public services to public safety issues. Politically, they undermine public trust in

governmental institutions, breed dissatisfaction and damage officials' credibility, while environmentally, incomplete projects, sometimes dragging on for decades, increase pollution and land degradation. These delays often have a pattern, indicating that core issues are not addressed, leading to ineffectiveness and poor performance that deepens the municipality's infrastructure gap and impedes sustainable development.

Objectives of the study

The study objectives were:

- to identify the types of delays in the completion of infrastructure projects.
- to discuss the causes of delays in the completion of infrastructure projects.
- to make recommendations on the delays of infrastructure projects.

Significance of the study

Research on the factors contributing to delays in infrastructure projects in the Eastern Cape's KSD Municipality remains limited. Investigating these factors is essential for developing effective strategies to mitigate risks and ensure timely project delivery, ultimately improving cost-effectiveness by avoiding extra expenses because of delays. When minimising delays, resources such as workforce, equipment and materials can be utilised more efficiently, encouraging better stakeholder engagement. Vahed (2022) emphasises that understanding these factors enables project managers to identify potential risks and develop effective mitigation strategies to meet project timelines and objectives. The study's findings and recommendations provide valuable support for researchers conducting research on minimising or preventing delays in infrastructure projects.

Literature review and theoretical framework

A literature review helps one establish a theoretical foundation for research. Paul and Criado (2020) indicate that a literature review provides the necessary background information, concepts and theories that inform the research design and methodology. A literature review is an essential step in conducting thorough and meaningful research. A theoretical framework helps ensure the validity and credibility of one's study (Varpio et al. 2020). This part constitutes a theoretical framework and literature review, which dwells more on the viewpoints of other authors regarding the factors that contribute to the construction of infrastructure projects.

Theoretical framework

The underpinning theories adopted for this study are organisational and financial distress theories.

Organisational theory

Organisational theory focuses on social organisations and bureaucracies and how they relate to their surroundings (Guo, Zhang & Yang 2018). The goal of organisational theory is efficiency. Nguyen (2019) provides an overview of the organisation's decision-making procedure. According to organisational theory, social groups of individuals are arranged and run to suit their requirements.

In this study, organisational theory can support recommendations for policy reforms, procedural enhancements or structural changes within the municipality to streamline project execution, reduce delays and optimise infrastructure development. Organisational theory can allow for the analysis of stakeholder relationships and engagement strategies within the municipality, helping to identify how stakeholder dynamics, such as community involvement, public-private partnerships and regulatory interactions, may impact project timelines. Elucidating how organisational elements contribute to project delays can inform the development of targeted strategies to address inefficiencies, foster better coordination and improve overall project management within the municipality.

Financial distress theory

Financial distress theory looks at factors that contribute to a decline in a firm's performance (Steffen 2018; Keasey & Watson 2019). This theory explores the factors, dynamics and consequences of a company's financial distress, which can ultimately lead to bankruptcy or insolvency (Ceylan 2021; Farooq, Jibrán Qamar & Haque 2018). In this study, financial distress theory can reveal how financial constraints, including budget limitations and cash flow issues, impact the timely execution of infrastructure projects within the municipality (Steffen 2018). Understanding these constraints is crucial for addressing funding gaps and managing project finances more effectively.

Financial distress theory supports the development of more accurate forecasts and financial planning for infrastructure projects, enabling better anticipation of potential financial challenges that could lead to project delays (Gatti 2023). This allows for the implementation of proactive measures to avoid or minimise such delays. Applying financial distress theory can lead to identifying specific risk mitigation strategies related to financing and financial management, enabling the development of targeted interventions to address financial factors contributing to project delays (Keasey & Watson 2019).

Types of delays

According to Rachid, Toufik and Mohammed (2019), a non-critical delay will not affect the project duration but will impact the timely completion of scheduled operations. A critical delay, on the other hand, directly affects the project length. In the view of Rachid et al. (2019), there are situations in which a contractor is entitled to an extension of time

because of an excusable delay in which the contractor had no control over the delayed activity. Whenever an activity is delayed and affects the project's duration, it counts as a non-excusable delay, and the contractor and management bear full responsibility for it. The financial repercussions will be the contractor's responsibility.

Furthermore, as noted by Rachid et al. (2019), a concurrent delay occurs when a contractor encounters delays that affect many tasks simultaneously and ultimately damage the project's duration. The reason for the delays will determine liability and compensation. The last type of delay is a compensable delay when the contractor carries responsibility for the cost and time extension resulting from an acceptable delay. If the contractor is at fault, there will be no compensation for the delay.

There are several reasons why infrastructure project construction is delayed. According to Vallejo-Borda et al. (2015), design flaws, inadequate or erroneous specifications and changes in project needs can all result in design delays. Delays in permitting and regulations arise from problems getting the required permits and following the rules; project progress is impacted by delays in the procurement of materials and equipment; financial setbacks, such as inadequate financing or postponements in making financial plans (Chadee et al. 2023); weather delays, contractor performance and site management delays and delays resulting from modifying the project's needs, design or scope (Prasad, Vasugi & Bhat 2019).

In a study by Kang (2010) at the University of Technology's Faculty of Civil Engineering Malaysia, there are 57 primary causes of delays. These were divided into eight categories: delays caused by clients, finances, consultants, contractors, equipment, materials, workforce or external factors. It is worth noting that delays in construction projects often result from multiple factors working in combination. Effective project planning, risk management, stakeholder communication and proactive issue resolution are crucial to mitigate delays and ensure timely and successful project completion. After reviewing several studies on the delays of infrastructure projects, the researchers confirmed that there is still a gap in studies on this issue in the Eastern Cape in KSD Municipality. Therefore, there was an urgent need to identify the types of delays in the KSD Municipality.

Causes of infrastructure project delays

Rivera, Baguec and Yeom's (2020) study from Korea lists 84 distinct delays that were found: delays in decision-making by the owner; slow decision-making and administration in client organisations; protracted financial procedures in client organisations; contract modification; financial difficulties of the owner (Enshassi et al. 2010 & Kadry et al. 2017); lowest bidder selection; low performance of the bidder; delay in progress payments; owners' lack of experience and involvement; delays in approving whole designs, shop designs, the sample tested materials and significant changes in the work; delays in accomplishment progress billing.

Overall, several authors discuss the following: insufficient qualification of the contractor; health issues with the technical workforce and project crews; lack of modern communication equipment; low tender price; poor labour productivity; rework because of poor material quality; impact on the land of the people alongside the road construction project; shortage of equipment (Durdyev & Ihtiyar 2019; Durdyev et al. 2018); cost overruns; delay of other projects related to the main one; rework; changes in material types and a lack of adequate workforce (Chan & Kuwaraswamy 1998).

Moreover, there are other causes, such as a lack of building supplies (Durdyev & Hosseini 2020; E-Sayegh 2021; Haseeb et al. 2011), insufficient technical staff, a delay in site mobilisation, labour disputes, unreliable suppliers of materials on the local market, insufficient workforce assignment and insufficient project engineer experience (Alsuliman 2019; Durdyev & Mbachu 2011). Additional causes include a lack of traffic safety during construction, resource fluctuation, contractor financial difficulties (Enshassi et al. 2010; Kadry et al. 2017), summer work schedule restrictions, a lack of experience with structural engineers, a low level of education among labourers (Chan & Kuwaraswamy 1998), delays in subcontractor work and their ineffectiveness, which results in frequent changes in subcontractors and a lack of expertise among construction managers.

Inflation, political unrest (Durdyev & Ihtiyar 2019; Durdyev et al. 2018); force majeure; inadequate IT management, impeded economic and urban development; fuel scarcity and insufficient foreign exchange (for the import of supplies and machinery) are other causes of delays in the construction of infrastructure projects (Gunduz & AbuHassan 2017; & Mpofo et al. 2017). Weather and climate conditions, especially sudden and severe ones, can cause significant project delays depending on their nature. These delays are acceptable because they are not within the contractor's control (Apipattanavis et al., 2010; Ballesteros-Pérez et al., 2015; Hussain et al. 2018; Mahamid 2017; Nguyen et al. 2019).

After reviewing several studies on the delays of infrastructure projects, the researchers confirmed that there is still a gap in studies on this issue in the Eastern Cape in KSD Municipality. Therefore, there was an urgent need to identify the causes of these delays and recommend applicable delay mitigation techniques to improve construction projects within the KSD Municipality.

Research methods and design

The researchers also employed a constructivist paradigm to explore the social, political and organisational dynamics contributing to delays. The constructivist paradigm recognises that multiple realities and perspectives exist within a social context (Ugwu, Ekere & Onoh 2021). In municipality infrastructure projects, various stakeholders have different views on what constitutes a delay and the factors contributing to it. The constructivist paradigm

allowed the researchers to explore and analyse these diverse perspectives (Erciyes 2020).

The choice of research methodology depends on various factors, such as the nature of the research topic, the type of data required and the research goals (Pandey & Pandey 2021). This study explores the dynamics of infrastructure project delays in selected municipalities within the Eastern Cape in South Africa. Therefore, an informed consent form was administered to all the participants in this qualitative case study, and open-ended questionnaires were administered. This data collection instrument allowed the researchers to further probe the participants' answers by including extended questions (Groenland & Dana 2020).

The open-ended questionnaire entailed part A, which collected the participants' demographic data; the open-ended questionnaire also contained part B, which collected information on the dynamics of infrastructure project delays within the selected municipality in the Eastern Cape. This instrument allowed the researchers to understand better the strategies that can be adopted to eliminate delays in the construction of infrastructure projects.

Sample and procedures

In this study, 15 stakeholders participated, including municipal residents, organisational leaders, contractors, business owners and municipal officials. The collected data reflect the dynamics of infrastructure project delays within a selected municipality in the Eastern Cape. Data were analysed through thematic analysis. The researchers familiarised themselves with the data, generated initial codes, identified themes, reviewed themes, defined and named themes to ensure that each theme encapsulates a clear and recognisable pattern within the data; extracted the relevant data segments that relate to each identified theme; reviewed themes across the dataset and lastly, wrote the thematic analysis by integrating the identified themes and supporting evidence from the data. The researchers considered alternative explanations and remained objective in analysing the study's content and text.

Ethical considerations

An application for full ethical approval was made to the Walter Sisulu University Research Ethics Committee (UREC) consent was received on 31 July 2023. The ethics approval number is 2023/HN/AHM-3575.

Results

Demographic data

This part of the study reveals the demographic data of the participants (see Table 1). This study's demographic data, such as the role or position held within the municipality, gender, age, race and home language, provided valuable insights into how different community segments perceive and experience project delays.

TABLE 1: Presentation of participant's demographic data.

Participant No.	What role or position do you hold in this municipality?	Gender	Age (years)	Race	Home language
1	Resident	Woman	25–34	Black person	Isixhosa
2	Resident	Woman	25–34	Black person	Isixhosa
3	Resident	Woman	25–34	Black person	Isizulu
4	Resident	Woman	25–34	Black person	Isizulu
5	Resident	Man	25–34	Black person	Isixhosa
6	Business owner	Man	35 and above	Black person	Isizulu
7	Business owner	Woman	25–34	Black person	Isixhosa
8	Business owner	Woman	25–34	Black person	Isixhosa
9	Municipal official	Woman	35 and above	Black person	Isizulu
10	Municipal official	Man	35 and above	Black person	Isizulu
11	Municipal official	Woman	25–34	Black person	Isixhosa
12	Contractor	Man	35 and above	Black person	Isixhosa
13	Contractor	Woman	35 and above	Black person	Isixhosa
14	Organisational leader	Man	35 and above	Black person	Isixhosa
15	Organisational leader	Man	35 and above	Black person	Isixhosa

Understanding the role or position of each participant within the municipality allowed for categorising viewpoints based on their professional or community roles. This helped identify perspectives from residents, business owners, municipal officials, contractors and organisational leaders, providing a comprehensive understanding of how delays impact various stakeholders. Furthermore, age demographics shed light on how different age groups perceive the impact of project delays on the community. Some younger participants had different concerns than older individuals, and these data provided insights into generational perspectives on infrastructure delays.

Theme 1: Types of delays in the construction of road infrastructure projects

Participants shared various views regarding the delays that are likely to occur in the construction of infrastructure projects. The prominent sub-themes that emerged were: (1) design delays and scope creep; (2) permitting, regulatory and contractual dispute delays; (3) labour, material and equipment procurement delays; (4) financial delays; (5) weather and unforeseen events and (6) contractor performance and site management delays.

Sub-theme 1.1: Design delays and scope creep delays

If there are design flaws, inadequacies or changes in project requirements, it can cause delays. Additional time might be required to rectify design errors or incorporate modifications, resulting in project delays. Changes in project scope, design or requirements can lead to delays. Causes include inadequate initial project scoping and planning, lack of clarity in project specifications, stakeholder requests for changes or additions and inefficient change order management.

Resident 1 mentions that 'Order change as requested by the owner'. Business Owner 2 shared that the types of delays include 'design changes'. In addition, Business Owner 3 added that 'changes in designs' are another type of delay in constructing infrastructure projects. Municipal Official 1 agreed with the above two business owners, stating that 'changes in design' are another type of delay. Municipal Official 2 and Municipality Official 3 also shared their views on the types of delays by

mentioning 'changes in design'. In addition, Contractor 2 added that 'Design changes' is another type of delay, which often occurs 'when the community wants the different thing than what we had planned before'. Lastly, Organisational Leader 1 added that 'Last-minute design changes' are another type of delay often occurring for various reasons.

Delays in the design phase occur when there are design errors, incomplete or inaccurate specifications or changes in project requirements. Factors contributing to design delays include inadequate project scoping and planning; lack of coordination between designers, architects and engineers; changes in design requirements during the project and lack of timely decision-making on design issues.

Sub-theme 1.2: Permitting, regulatory, legal and contractual dispute delays

Infrastructure projects often require various permits and regulatory clearances. Delays can occur if there are issues obtaining these permissions or the regulatory process takes longer than anticipated. Legal or contractual disputes among project stakeholders, such as contractors, subcontractors or government authorities, can delay the project because the resolution process takes time.

Resident 2 mentioned that 'Site settlement' and 'Disputes in stakeholders' delay the construction of the infrastructure project. Resident 3 also mentioned 'Discussions with Kings and Chiefs' as a type of delay. Business Owner 1 outlined 'Legal battles' and 'Obtaining permits'. Business Owner 2 also adds that 'Legal and contractual disputes' and 'Land acquisition right of way' are other types of delays in the construction of infrastructure projects. In addition to what the other participants have outlined, Business Owner 3 mentions 'Permits approval and Legal disputes'. Municipal officials also mention 'Land acquisitions and public orientation' as delays in the construction of infrastructure projects.

Meanwhile, Municipality Official 2 mentions 'Legal, contractual delays'. Municipal Official 3 agreed with other participants by mentioning 'Getting Permits and Legal battles on Land Occupation' as delays. The perception of

other participants regarding the types of delays in the construction of infrastructure projects was supported by Contractor 1, stating that:

'Environmentally in other cases we face politics of the community which do not want the land to be disturbed as they believe will ruin the nature and Obtaining the working permits for some of our engineers as they would be coming out of the country it takes time.' (Contractor 1)

Resident 4 also highlighted that:

'Site for contractors where they will settle, Legal and contractual battles, Stakeholder engagement before the project starts, some community members will not be willing to participate as types of delays.' (Resident 4)

In addition, Resident 5 mentioned 'Public opposing the project, Legal disputes between government and community leaders' as delays in the construction of infrastructure projects. A participant who is a leader in the church and an elder within the community, Organisational Leader 1, mentions that 'Land claims and contractual disputes amongst stakeholder engagement and traditional leaders' are also types of delays. Lastly, Organisational Leader 2 also agrees with the other leader and other participants by stipulating that 'Legal and contractual disputes in land claims' are delays in constructing infrastructure projects in the Dosi location.

Sub-theme 1.3: Labour, material and equipment procurement delays

Shortages of skilled labour, construction materials or equipment can cause delays in the execution of infrastructure projects. Increasing demand or unavailability of specific resources can affect construction timelines.

Resident 1 shared that 'Labour protests' cause this type of delay in constructing infrastructure projects. Resident 2 mentioned that the 'Tender award process and procurement process' are also other causes of this delay, whereas Resident 3 mentioned 'lack of skilled people' as a delay in constructing infrastructure projects in the Dosi location. Two of the three business owners who participated agreed that the shortage of material was another type of delay. Business Owner 1 mentioned 'Material shortages', whereas Business Owner 3 mentioned 'Labour and material shortages'.

In addition, Municipal officials 1 and 2 agreed with the two business owners, stating that 'Labour and material shortages' are another type of delay in constructing infrastructure projects. However, Municipality Official 3 added 'Procurement of required materials' as another delay type. Contractor 2 agreed with the above perceptions: 'Labour shortages also become a problem because sometimes the community would want us to employ them for higher positions, and they do not have relevant qualifications'. Resident 5 also outlined 'Labour and material shortages on Site' as a type of delay. Lastly, Organisational Leader 1 highlighted 'Hiring of skilled labour for the specific project of that time' as a delay in constructing infrastructure projects.

Sub-theme 1.4: Financial delays

Insufficient funding or delays in financial arrangements can hinder project progress. Causes of financial delays include inadequate project budgeting and planning; delays in securing project financing or approvals; cash flow issues or payment disputes and unforeseen cost overruns. Various participants shared similar perceptions of this delay.

Resident 3 mentions 'Corruption and Funding' as a delay in constructing infrastructure projects. Business Owner 1 also outlined the 'funding complications'. Business Owner 2 agreed with Resident 3, who mentions 'corruption' as a delay in constructing infrastructure projects. Business Owner 3 also mentions 'Funding delays' as a delay in constructing infrastructure projects. In addition, Municipality Official 2 mentions 'Release of funds' as a type of delay. Contractor 1 mentions 'Funding the release of agreed funds before we can start working on the project'. Resident 5 also mentions 'The release of funds to the appointed contractor'. Lastly, Organisational Leader 2 articulates 'Funding delays' as a delay in constructing infrastructure projects.

Sub-theme 1.5: Weather and unforeseen events delays

Unpredictable events such as extreme weather conditions, natural disasters or other force majeure events can disrupt or delay infrastructure projects, impacting construction schedules and progress.

Resident 1 mentions 'protests, floods, earthquakes, and other calamities'. Resident 3 mentions 'Weather' as a delay in constructing infrastructure projects. Business Owner 1 outlines 'Environmental delays'. Business Owner 2 argues that 'Geotechnical site challenges' are another type of delay in constructing infrastructure projects. Municipality Official 1 indicates that 'site challenges' relate to the environment. Municipality Official 2 also agrees with other participants on 'Unpredictable weather changes', another type of delay. Municipality Official 3 adds 'Unforeseen weather changes' as a delay in constructing infrastructure projects. Contractor 1 also supports other participants' perception of weather delays by stating, 'Weather changes at any minute and in outside works it is difficult to work under rainy days or too windy'.

Contractor 2 also argues that:

'Geotechnical and site challenges, someplace that we work in have nature that you should consider when you are working so that you do not affect it such as trees and in some cases there are rocks, Weather is also one of the problems more especially in summer because you need to be on schedule and the rain would be a problem as well.' (Contractor 2)

Resident 5 outlines 'Unforeseen weather changes'. Organisational Leader 1 also supports the perception of other participants by stating that 'Weather changes more especially windy and rainy

wetlands' are a type of delay. Lastly, in addition, Organisational Leader 2 also agrees by stating that 'Unforeseen weather changes' are a type of delay in constructing infrastructure projects at the Dosi location.

Sub-theme 1.6: Contractor performance and site management delays

Resident 1 mentions that 'Mistakes and errors of commission or omission' are a contractor performance delay. Resident 2 mentions that 'Getting qualified companies for the job' delays contractor performance. Resident 3 also mentions the 'lack of skilled people' in the construction of infrastructure projects as a delay in contractor performance. Contractor 1 mentions that 'Environmental in other cases we face politics of the community which do not want the land to be disturbed as they believe will ruin the nature'.

Contractor 2 also mentions that 'Labour shortages also become a problem because sometimes the community would want us to employ them for higher positions, and they do not have relevant qualifications'. Resident 5 also mentions the 'Labour and material shortages on Site', which indicates delays relating to a lack of site management skills.

Theme 2: Causes of delays in the construction of infrastructure projects

Participants shared various views regarding the causes of delays that are likely to occur in the construction of infrastructure projects. The prominent sub-themes that emerged were: (1) changes in design and changes in scope; (2) obtaining permission, regulatory and approved contracts; (3) shortage of labour, material and equipment; procurement processes; (4) finance-related problems; (5) weather changes and unforeseen events; (6) corruption; (7) poor planning and (8) lack of engagements.

Sub-theme 2.1: Changes in design and changes in scope

These include inadequate project scoping and planning; lack of coordination between designers, architects and engineers; changes in design requirements during the project and lack of timely decision-making on design issues.

Resident 1 mentions that 'Construction Drawings' and 'Design Changes' cause delays in the construction of infrastructure projects. Contractor 1 mentions 'Sometimes you come with your people to start working, and you are told that things have changed. You have to include a certain portion that was not quoted for and changes the scope'. Resident 5 also outlines that 'Changes in the initial agreed project' cause delays. The organisational leader also agrees with others by mentioning 'Too many changes in the project scope'.

Sub-theme 2.2: Obtaining permissions, regulations and solving disputes

These include complex and time-consuming approval processes; inadequate coordination with regulatory

authorities; environmental concerns or issues with compliance; legal.

Resident 1 mentions 'Permits' as a cause of delay in constructing infrastructure projects. Resident 3 also mentions 'Land battles'. Business Owner 1 noticed and mentioned that 'Getting operating permits' is another cause of delay in the construction of projects.

Sub-theme 2.3: Shortage of labour, material and procurement processes

These include inaccurate estimation of material quantities and lead times, delays in supplier production or delivery schedules, quality control issues with material and bureaucratic hurdles in the procurement process.

Resident 2 mentions 'Delay in the supply of materials'. Resident 3 also mentions 'Unskilled labour' as a cause of delay in construction projects. Business Owner 1 adds that 'Theft and Shortage of materials' are causes of infrastructure projects. Business Owner 3 indicates that other causes of delays are 'Procurement delays'. Municipality Official 2 also mentions 'Procurement delays and Labour shortages and skills gap' as causes of delays in the construction projects in the Dosi location. Municipality Official 3 also outlines that 'Shortages of skilled labourers and Shortages in Material' are causes of delays in the construction of infrastructure projects.

Contractor 2 mentions 'Theft of our materials as at times the communities would steal even the materials more especially in building projects' and 'Labour shortages as well'. Resident 5 also agreed with other participants, stating that 'Procurement issues and delays' cause delays in the construction of infrastructure projects. In addition, Organisational Leader 1 also agreed that 'Procurement delays' cause delays. Moreover, lastly, Organisational Leader 2 also mentioned 'Unskilled labour' as a cause of delay in the construction of infrastructure projects.

Sub-theme 2.4: Finance-related problems

Finance-related problems include inadequate project budgeting and planning, delays in securing project financing or approvals, cash flow issues or payment disputes and unforeseen cost overruns.

Resident 1 mentions 'Securing finance' as a cause of delay in constructing infrastructure projects. Business Owner 3 also indicates that 'Financial constraints' cause delays. Municipal officials 1 and 3 also agree with Business Owner 3 as they mention 'Financial constraints' as a cause of delay. In addition, Organisational Leader 1 agreed with other participants by mentioning 'Financial constraints where funds are not released' as a cause of delay.

Sub-theme 2.5: Weather conditions and unexpected events

These include adverse weather conditions such as heavy rain, storms or extreme temperatures; natural disasters such as earthquakes or floods; labour strikes or civil unrest and unforeseen geological or environmental issues.

Resident 2 mentions 'Rain and Pandemic'. Resident 3 also mentions 'Weather'. In addition, Business Owner 1 agreed with Resident 3 by mentioning 'Weather' as a cause of project delays. Business Owner 2 also supported other participants' perception that 'Unpredictable weather changes' cause project delays. Municipality Official 2 mentioned 'Unexpected site conditions' as a cause of delay in the construction of infrastructure projects. Resident 4 also agreed with Municipality Official 2, stating 'Unexpected site conditions may arise while working'.

Sub-theme 2.6: Corruption

Resident 2 mentions 'Corruption' as a cause of delay in projects. Resident 3 mentions 'Fraud' as a cause of delay in projects. Business Owner 1 also mentions 'Theft and Corruption' as causes of project delays. Contractor 2 also agreed by stating that 'Corruption that takes place while we are busy with the project' is a cause of delays in projects. Resident 4 mentions the 'Corruption between tender people' as another cause of project delays. Organisational Leader 2 also mentions 'Fraud and corruption that takes place' as a cause of delay in constructing infrastructure projects. Out of all the responses received regarding the types of delays in the construction of infrastructure projects, Resident 4 mentioned corruption as a type of delay, outlining that there are 'Corrupt government officials who want to be bribed'.

Sub-theme 2.7: Poor planning

Business Owner 2 mentions 'Poor strategic planning' as another cause of project delays. Business Owner 3 also mentions 'Poor planning' as a cause of project delays. Municipality Official 1 also agrees with other participants by mentioning 'Poor planning' as a cause of delay in the construction of infrastructure projects. Municipality Official 3 also indicates 'Lack of proper planning and Inadequate project management' as causes of project delays. Contractor 1 mentions 'With improper planning, you experience many of these delays and complications'.

Contractor 2 also agreed by stipulating that 'Poor planning from our side or the municipality' is a cause of delay in the projects. Resident 4 also mentions 'Poor planning for both sides'. Even Resident 5 stipulates that 'Lack of proper planning by the project manager' is a cause of delay in projects. Organisational leaders also add 'Inadequate planning' as a cause of project delays. Lastly, Organisational Leader 2 emphasises that 'Poor project planning' is a cause of delay in the construction of infrastructure projects at KSD Municipality.

Sub-theme 2.8: Lack of engagements

Out of all the causes mentioned by the participants, Business Owner 2 was the first to share 'Poor communication'. Municipal officials 1 and 2 also agreed by mentioning 'Stakeholder involvement'. Contractor 1 outlines that another cause of delay might be 'The leaders of the certain

community were not involved in some cases by the government officials, especially the traditional leaders that can have serious implications on your project'. Resident 4 also agrees with other participants by mentioning 'Poor communication between the government and communities' as a cause of project delays. Organisational Leader 1 also mentions 'Poor communication between involved parties'. Lastly, Organisational Leader 2 also emphasised 'Poor communication between stakeholders' as a cause of project delays.

Discussion of findings

Participants shared various views regarding the delays likely to occur in the construction of infrastructure projects. The prominent sub-themes that emerged include design delays and scope creep, which occur when design errors, incomplete or inaccurate specifications or project requirements change. The findings of this study reveal that factors contributing to design delays include inadequate project scoping, planning and changes in design requirements during the project. Permitting, regulatory and contractual dispute delay infrastructure projects often require multiple permits, regulatory clearances and contractual disagreements, adding to the complexity of project timelines.

Therefore, it can be argued that effective project management and thorough planning are crucial to minimising delays in infrastructure projects. Project timelines can be significantly improved when addressing design errors early and ensuring clear communication among stakeholders. Streamlining the permitting and regulatory processes could further reduce delays and enhance project efficiency.

The findings of this study articulated the issues related to site settlements, disputes among stakeholders, discussions with Kings and Chiefs, legal battles, obtaining permits and land acquisitions as delays. The findings of this study also identify delays in labour, material and equipment procurement because of shortages of skilled labour when there are strikes, as well as lack of construction materials or equipment as causes of delays in the execution of infrastructure projects. Additionally, insufficient funding or delays in financial arrangements hinder project progress.

Therefore, one could argue that addressing these challenges requires comprehensive planning and proactive risk mitigation strategies. Implementing effective communication channels among stakeholders and ensuring timely financial arrangements are crucial for successfully executing infrastructure projects. Investing in workforce training and securing reliable material and equipment suppliers can help prevent procurement delays.

The findings of this study revealed that corruption, lack of funding and late release of funds contribute as factors that cause financial delays. Weather and unforeseen events are stipulated as part of delays in the construction of infrastructure

projects in this municipality. The findings also identified contractor performance and site management delays because of lacking skills and difficulty getting qualified companies for the job. The findings of this study also outlined poor planning and poor communication as causes of delays in the construction of infrastructure projects.

Therefore, it is possible to argue that addressing these issues requires a comprehensive approach that includes better governance, improved funding mechanisms and enhanced training for contractors and site managers. While focusing on these areas, the municipality can mitigate delays and ensure that infrastructure projects are completed efficiently and on time. Additionally, encouraging transparent communication and strategic planning will further contribute to the successful execution of these projects.

These findings are similar to the literature of this study, which reveals that design delays occur when there are design errors, incomplete or inaccurate specifications or changes in project requirements (Vallejo-Borda et al. 2015). Permitting and regulatory delays are sometimes caused by issues related to obtaining necessary permits and complying with regulatory requirements (Chadee et al., 2023); weather delays; contractor performance and site management delays and changes in project scope, design or requirements delays (Prasad, Vasugi, Bhat 2019).

Looking at these present types of delays and their causes, it is clear that there is still a gap regarding accountability and transparency between all stakeholders involved. The municipality needs to be transparent and accountable to the people whenever a project occurs to avoid disputes related to land, contracts and theft of material and equipment, as the community will protect what they are part of.

Conclusion

In conclusion, this study highlights various angles on the nature of delays in infrastructure projects, identifying key factors such as design errors, permitting issues, procurement challenges, financial constraints and external factors such as weather. The findings highlight the need for improved project planning, stakeholder communication and transparency to mitigate these delays. Addressing these issues is crucial for enhancing project efficiency and reducing costs.

Recommendations

Based on the findings of this study, it is recommended that the municipality takes the following actions to mitigate delays in infrastructure projects:

Enhance project planning and scoping

Ensure comprehensive project scoping and planning to minimise design errors and scope changes. This includes detailed and accurate specifications from the outset.

Streamline permitting and regulatory processes

Work closely with regulatory bodies to expedite the permitting process and ensure compliance with all necessary regulations to avoid delays.

Secure adequate funding and financial management

Ensure sufficient funding is available before project commencement and manage financial resources efficiently to prevent delays because of financial constraints.

Risk management

There is a need to develop risk management plans to address any potential weather-related delays and unforeseen events.

Assessment of resource scarcity and procurement efficiency

Investigate the impact of shortages in labour, materials and equipment on project delays. This should also include an analysis of procurement processes, focusing on potential inefficiencies or obstacles contributing to delays in acquiring necessary resources.

Study of environmental and unforeseen risks

Investigating the influence of weather changes and unforeseen events on project timelines. This should include assessing the measures taken to mitigate environmental risks and address unexpected occurrences in construction projects.

Analysis of corruption risks

Conduct a comprehensive analysis of corruption risks within construction projects, focusing on identifying potential points of vulnerability and developing strategies to enhance transparency and integrity in project execution.

Evaluation of planning practices

Evaluate the impact of poor planning on project delays, examining the root causes of planning deficiencies and potential solutions to improve project scheduling, coordination and risk management.

Based on the identified gap concerning accountability and transparency among stakeholders involved in infrastructure projects, the following recommendations were proposed:

Investigation into stakeholder engagement

Research the role of stakeholder engagement in project delays, assessing the impact of inadequate communication and collaboration on project timelines. This should include examining best practices for fostering effective engagement and collaboration among project stakeholders to minimise delays.

Stakeholder perception analysis

Conduct a comprehensive analysis of stakeholder perceptions regarding transparency, accountability and community involvement in infrastructure projects within the municipality. Explore the existing gaps and challenges experienced by stakeholders, including residents, business owners, municipal officials, contractors and organisational leaders, to understand their expectations and concerns regarding project governance.

Best practices review

Review best practices in promoting transparency and accountability in infrastructure projects. Identify successful strategies implemented in similar municipalities or regions, focusing on measures that effectively engage stakeholders, ensure open communication and establish precise mechanisms for reporting and addressing project-related issues.

Policy and governance analysis

Assess the existing policies, governance structures and regulatory frameworks within the municipality to determine the extent to which they support transparency and accountability in infrastructure projects. Identify any gaps or inconsistencies that hinder the establishment of transparent and accountable project practices.

Through addressing these areas, the municipality can reduce delays, control costs and improve the overall success of infrastructure projects.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

S.M.F. and Y.L. contributed to the design and implementation of the research, analysis of the results and writing of the

manuscript. Y.L. supervised the project. S.M.F. and Y.L. contributed to the final version of the research article.

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Data availability

The data that support the findings of this study are available from the author, S.M.F., upon reasonable request.

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