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Investigating the dynamics of delays in public building projects in Uganda

Bamwesigye Rhita[1] Nnadi Ezekiel Oluwaseum[2], Daniel Mogaka[3]

[1]Post graduate student, Kampala International University, Uganda
[2]Associate Professor, Kampala International University, Uganda
[3]Lecturer, Kampala International University, Western Campus, Uganda
Corresponding Author: rhitabamwesigye@gmail.com

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Abstract

This study investigates the dynamics of delays in public building projects in Uganda, with a focus on identifying the types, causes, and impacts of delays on project timelines and outcomes. A mixed-methods approach was employed, combining quantitative data from surveys and qualitative insights from interviews with key stakeholders, including project managers, engineers, and contractors. The status of the projects for instance were, 51.4% of public building projects were ongoing, with over 47% facing delays extending between 6 to 12 months, and 38.9% delayed beyond 12 months. The findings reveal that weather-related delays (25%), material procurement issues (19.4%), and labour shortages (26.4%) are the most significant contributors to project delays. Additional factors such as design changes (15.3%) and regulatory delays, including permitting and approval processes (5.6%), also play a crucial role. The research shows that these delays lead to substantial socio-economic impacts, including increased project costs, extended timelines, and delayed service delivery, ultimately affecting infrastructure development in Uganda. To address these challenges, the study recommends adopting advanced project management tools, such as the Critical Path Method (CPM) and Time Impact Analysis (TIA), integrating accurate weather forecasting into project planning, improving procurement systems, and streamlining regulatory frameworks. The research contributes original insights into the specific delay factors in fast-urbanizing cities like Mbarara and suggests further studies on integrating smart technologies to mitigate delays.

1.0 Introduction

Public buildings play a crucial role in urban development, contributing to the well-being and prosperity of communities as emphasized, and thus well-designed public buildings enhance the overall habitability of urban areas (Awasho & Alemu, 2023). Public buildings stimulate economic activity by providing community centers, libraries, and marketplaces enhancing economic transactions (Kim, 2015). Public buildings create a sense of identity and belonging, bringing people together and fostering community cohesion (Kim, 2015). They offer spaces beyond private homes, allowing residents to gather, interact, and engage in various activities. These spaces contribute to a higher quality of life by providing opportunities for socialization, recreation, and cultural expression (Chandra & Raj, 2020).

Additionally, investment in public infrastructure can create jobs and boost local economies (Javid, 2019). Public building projects involve significant financial and human resources. The opportunities range from assignments in urban transformation (Hepburn et al., 2021), historic restoration projects, (Giddings, 2007).

Despite the opportunities surrounding investments of public building construction, delays in these projects can result in cost overruns, misallocation of funds, and underutilization of resources (Idrees & Shafiq, 2021). Delays in public building projects have profound socio-economic implications, including affecting employment opportunities, hampering economic growth, and affecting the quality of life of residents (Jussila & Lähtinen, 2020). Delays in public building projects have become a significant challenge in Uganda, particularly in urbanizing cities experiencing rapid population growth and economic expansion. This phenomenon, as observed in several studies, has profound consequences on the country's development, affecting infrastructure delivery, economic progress, and social well-being. The growing demand for public infrastructure—spanning educational facilities, healthcare centers, recreational spaces, and transportation networks—highlights the urgency of addressing project delays and their underlying causes.

In Uganda, delays in public building projects are caused by a variety of factors, both internal and external to the project stakeholders. Okello et al. (2020) point to inadequate project planning, regulatory challenges, financial constraints, and communication breakdowns as key drivers of delays in construction projects. These factors often create bottlenecks that impede progress, leading to extended timelines and increased costs. Moreover, the involvement of multiple stakeholders—such as government agencies, contractors, and community groups—further complicates project management and coordination, particularly in large-scale urban projects.

Poor planning, often exacerbated by lack of proper feasibility studies, unclear project scope, and weak coordination among stakeholders, is one of the most common causes of delays in Uganda (Arinaitwe, 2021). In many cases, the lack of early risk assessment and resource allocation results in project stagnation. As noted by Aravindhan et al. (2023), effective project planning is essential for identifying potential delays and implementing mitigation strategies early in the project lifecycle. When planning is deficient, even minor setbacks can cascade into larger delays, especially in complex public infrastructure projects.

Uganda's regulatory environment poses significant hurdles to timely project completion (Tukundane & Yang, 2024). Issues such as lengthy permitting processes, bureaucratic inefficiencies, and unpredictable regulatory requirements can slow down construction (Msafiri, 2015). In urban centers, the challenge of navigating local government regulations, land acquisition issues, and environmental clearances can create substantial delays. This regulatory bottleneck is particularly evident in public building projects that require extensive approval from multiple agencies. According to Rauzana & Dharma (2022), the interaction between regulatory delays and project financing challenges can exacerbate the overall delay time. Limited funding is another major factor contributing to delays (Ogbeifun, & Pretorius, 2022). Public sector projects in Uganda are often underfunded or subject to budgetary cuts during the construction phase. This lack of financial liquidity can result in stalled projects, material shortages, or delays in paying contractors and laborers. As noted by Okello et al. (2020), these financial constraints are especially prevalent in urbanizing areas where the demand for infrastructure far exceeds the available budget, creating a constant cycle of delayed and incomplete projects.

Effective communication between contractors, project managers, government officials, and the public is critical in ensuring project success (Amila, 2022). Communication lapses, whether due to misunderstanding, unclear directives, or lack of coordination, can lead to errors, rework, and delays (Obonadhuze, Eze, Siunoje, & Sofolahan, 2021). Project managers often find it challenging to align all stakeholders with the same vision, which can result in work stoppages and extended timelines. Delays in public building projects have far-reaching consequences for the socio-economic fabric of Uganda, particularly in rapidly growing urban centers. As urban populations increase due to rural-urban migration and natural population growth, the demand for essential infrastructure such as schools, hospitals, and housing has skyrocketed (Asoka, Thuo & Bunyasi, 2013). These public projects are essential to accommodate the expanding population, especially the young demographic, which requires access to quality education, healthcare, and social services. As construction projects extend beyond their initial timelines, additional costs are incurred, often straining public finances and diminishing the potential economic benefits of the infrastructure once completed. Extended projects can also result in inflationary pressures on materials and labor costs, leading to further financial burdens on the government and taxpayers. Delayed infrastructure projects, such as transportation networks or commercial facilities, can stifle economic growth by

limiting access to essential services. Manufacturing, trade, and other business sectors that rely on timely infrastructure may face disruptions, leading to reduced productivity and economic output. The completion of public buildings such as schools, hospitals, and community centers directly impacts the quality of life for residents. Delays in these projects often mean that the community lacks critical services, leading to poor educational outcomes, insufficient healthcare, and a general decline in social welfare. For instance, as noted by Anesi and Kerlin (2019) delayed schools and healthcare facilities hinder the delivery of essential services. Delays in construction projects, particularly in public building projects, refer to the situation where the actual progress of the project deviates from the planned or scheduled timeline, and it encompasses a variety of factors and influences that result in the extension of the project timeline, affecting both time and cost (Durdyev & Hosseini, 2020; Hoque et al., 2023; Mohammed & Bello, 2022). Several empirical studies have focused on identifying and assessing types of delays in public building projects in various regions, thus offering insights into the types and scale of delays of such projects in different contexts. For instance, studies by (Durdyev & Hosseini, 2020; Fashina et al., 2021; Hoque et al., 2023) surveyed and categorized public building projects in a similar urban setting, providing a typology of projects based on their functions, sizes, and intended beneficiaries.

Global studies done by Sanni-anibire et al., (2020) focussed on the causes of delay in the global construction industry and noted that the construction sector is still beset by productivity and efficiency losses from things like delays. Delays can result in litigation, project abandonment, and time and cost overruns. As a result, there are a ton of studies looking into the reasons behind construction delays in the global research domain. Nevertheless, despite the growing trend of globalization in construction, there is a dearth of systematic reviews of the accomplishments made thus far in the field of construction delay research. This kind of study could help interested parties because it compiles existing data from earlier research to show the big picture. As a result, this study conducts a meta-data analysis using Relative Importance Index (RII) values from a few significant studies published in the last 15 years, and it provides an overall review of research on the reasons behind construction delays.

Studies by Ali et al., (2020) did delay analysis framework for construction projects in Abu Dhabi, UAE indicated that cost overruns and delays have become the norm in the construction industry. The study inspired scholars and professionals to employ a variety of methods to determine project delays and allocate blame for delays amongst the relevant stakeholders. Studies by Bagaya & Song (2019) focused on factors influencing schedule delays of public construction projects in Burkina Faso, and significant delay factors were ranked as follows after a quantitative statistical method was used to analyze their frequency, severity, and importance index: the contractor's financial capability, the owner's financial difficulties, the contractor's equipment availability, the owner's slow payments for completed work, and the contractor's subcontractor's subpar performance. Studies done in Rwanda by Umuhoza and Esperance(2019) centred on delay factors in building construction projects, with one of the most important problems with building projects noted to be delays, which cause enormous losses in both developed and developing nations. Equally studies by Abarinda and Kibwami (2019) centred towards improving schedule performance of construction projects in Uganda with lean construction. The majority of construction projects in Uganda do not finish within the original contract durations, indicating a lackluster schedule performance. The research by Ayebare (2019) centered on monitoring and evaluation practices and performance of road infrastructure projects in Uganda, The purpose of this study was to investigate how road infrastructure project performance is impacted by monitoring and assessment procedures. The objective of the study was to determine the impact of monitoring and evaluation planning on road infrastructure project performance, investigate the impact of M&E capacity on project performance, and finally investigate the impact of monitoring and evaluation communication on project performance within the study context.

Research by Muzaale, Auriacombe, and Byaruhanga (2018) investigated the effects of delays in road infrastructure projects within a Ugandan context, identifying substantial financial implications, stalling societal benefits, and hampering regional development. Similarly, a study by Ogbeifun and Pretorius (2022) examined the impacts of project delays on public infrastructure in the Uganda. Their empirical analysis highlighted the socioeconomic consequences, including increased costs and reduced service delivery. Understanding these effects is critical in evaluating the repercussions of delays in public building projects in Uganda. Mwelu et al., (2019) reported on the success factors for implementing Uganda's public road construction projects. Due to subpar work and contract variations, construction projects are frequently completed over budget and delayed globally. They then have a negative impact on the objectives that the public sector client set forth. Public road construction projects are among the many studies that seek to identify the elements of a successful construction project. Challenges still exist, though. This study by . Mwelu et al., (2019) applies institutional theory to examine what makes public road construction projects in Uganda successful. In these kinds of projects, financial loss has a major impact and slows down the implementation process (Muzaale et al., 2018). Equally, professionalism, monitoring practices, regulatory framework familiarity, and perceived regulatory framework inefficiency affect successful implementation of public road construction projects (Mwelu, Davis, Ke, & Watundu, 2020).

2.0 Materials and Methods

Literature review of documents from previous researchers gave a basis of identifying the types of delays in Uganda, and foundation for questionnaire for field deployment. This review consisted structured ways including formulating the research objective where the review's main objective was established thus underscoring the type of information that was needed, and informed the exploration for and selection of relevant literature, and guide or orient the subsequent analysis. Further, Searching the extant literature was conducted through decisions about the suitability of material to be considered in the review. After identification of the right documents from literature which forms potential studies for consideration, screening for inclusion was used to evaluate the applicability of the material identified in the preceding step. To assess the acceptability of the studies considered as reference in literature review, the quality of primary studies was established based on the appraisal of the rigour of the research design and methods used in those studies. This helped to determine the extent to which the selected study addresses possible biases and maximizes validity. Ultimately, extracting of data from each primary studies was based on the sampling and deciding what is relevant to the problem of interest. The data extracted was analyzed and synthesized by collating, summarizing, aggregating, organizing, and comparing the evidence extracted from the included studies. Document review helped the researcher develop structured surveys or questionnaires to collect quantitative data from stakeholders involved in public building projects. The researcher included closed-ended questions with predefined response options to quantify the frequency and extent of delays, financial implications, and perceptions of project management efficiency. The researcher also reviewed official project documents, contracts, and reports to gather quantitative data on project timelines, cost overruns, and other measurable indicators of delays. The researcher extracted relevant quantitative information to supplement survey responses. The researcher used SPSS (Statistical Package for Social Sciences) to analyze the quantitative data collected through structured surveys and questionnaires. SPSS was employed to perform descriptive statistics (such as means, frequencies, and percentages) to summarize the characteristics of the data.

3.0 Results and Discussions

The research findings on delays in public building projects in Uganda align with existing literature, such as the studies by Durdyev & Hosseini (2020) and Hoque *et al*. (2023), which highlight common delay factors like design changes, material shortages, and adverse weather conditions.

The summary of results on the types of delay as identified by respondent are presented in Table 1.

Table 1. Common delays in the construction industry in Uganda

Type of Delay	Percentage of Projects Affected	Average Delay Duration (Months)	Average Cost Overrun (%)
Management Delays	30%	2.5	10%
Technical Delays	20%	2	8%
Financial Delays	25%	3	15%
Material Delays	25%	1.5	5%
Labor Delays	15%	1	3%
Environmental Delays	10%	1.5	4%

In Uganda, common construction delays significantly impacting project outcomes as noted in the number of projects affected and and the average delay duration are respectively highlighted with management delays (30%, 2.5 months) arising from bureaucratic inefficiencies as asserted by (Kiggundu, 2013). Financial delays (25%, 3 months) often result from cash flow issues, as noted by Mubiru (2015). Others are Technical delays (20%, 2 months) stemming from design flaws and lack of expertise (Bubshait & Sadek, 1998), which compares to the world average of 7.5 % (Rivera, Le, Kashiwagi, & Kashiwagi, 2016). Material delays in the global scale stands at 8.2 % compared to the value in Uganda (25%, 1.5 months) that occur due to supply chain challenges, while labor delays (15%, 1 month) are linked to skill shortages compared to global values of 6.2% and lastly, environmental delays (10%, 1.5 months), which stands at 5.6 % ((Rivera, et. al. 2016) Notably though management delays affects the highest number of projects, its average cost overrun come second after financial delays. The findings agree with the previous research by Bagaya & Song (2019) on contractor-related issues and material procurement delays being significant contributors to project delays. Labor shortages seem to be the main event that mostly affects construction in Uganda and therefore causes

serious delays, which deviates from the general aspect noted in Uganda.

The causes of delay as shown in Table 2 includes incomplete design, procurement challenges, cashflow issues, inadequate labour, poor management permit approval delays, and unfavorable weather These Causes of delays can be affirmed by previous works by Kiggundu, (2013), and Mubiru, (2015). Within the capability of management in construction it should be noted that, management, technical and financial delays can easily be controlled, since they are directly manned by the project owner. Materials delays depends on management in material planning, storage and inventory, material purchasing, and supply, distribution and onsite (Vipin & Shabeen, 2019) which are not directly controlled by the project owner. Moreso the issues around marketing, logistics, and production (Hasim, Fauzi, Yusof, Endut & Ridzuan, 2018), all controlled by environmental factors, international and national politics relating to imports, exports and market dynamics, affects the supply chain of construction materials. This means that the aspect of materials delay may continue persisting in affecting construction, given the web that controls it. Environmental delays poses a challenge, which is likely to get magnified with the adverse climate changes to the future, where despite the many climate-focused delay studies, there is a gap in accounting for future climate changes and provision of mitigation strategies (Schuldt, Nicholson, Adams, & Delorit, 2021).

Table 2: Causes of delays in the construction site in Uganda

Causes of delay		SA----------SD							RII	Rank
	W	5	4	3	2	1	TOTAL	EW		
Incomplete design	F	108	8	2	0	0	118	578	4.898	1st
material procurement challenges	F	88	12	3	11	4	118	523	4.432	2nd
inconsistent Cashflow	F	81	11	6	14	6	118	501	4.245	3rd
inadequate Labour	F	77	19	4	7	11	118	498	4.220	4th
poor management	F	67	10	18	14	9	118	466	3.949	5th
Delay in Permit and approval	F	60	9	22	18	9	118	447	3.788	6th
Unfavorable weather	F	55	8	31	11	13	118	435	3.686	7th

The statistical correlations of the delays are given in Table 3. It indicates the mean, mode, median, and standard deviation of the identified delays.

Table 3: The statistical correlations of the delays

Impact of delays to delivering public building projects in Uganda	Material Shortages	Weather Changes	Unforeseen Issues	Logistical Challenges	Design Changes	Contract-Related Issues
Mean	2.46	2.75	2.46	2.43	2.44	2.46
Median	2.00	3.00	2.00	2.00	2.00	2.00
Mode	2	3	2	2	2	2
Std. Deviation	1.255	1.110	1.198	1.085	1.221	1.288
Variance	1.576	1.232	1.435	1.178	1.490	1.660
Skewness	.514	.389	.354	.421	.563	.623
Std. Error of Skewness	.283	.283	.283	.283	.283	.283

The standard deviation ranges from 1.085 for logistical challenges to the high of 1.288 for contract-related issues. It should be noted that standard deviation conceptually indicates how apart the mean the average quantity is. Meaning, for contract-related issues which has a larger standard deviation, indicates the values to be largely spread around the mean as compared to other delays. Equally for logistical challenges in contrast, the standard deviation is smallest compared to other construction related delays, implying the spread around the mean is also small, comparatively. The mean ranges between 2.43 for logistical challenges to 2.75 for weather changes. It should be noted that, the mean is the arithmetic average of a number of observations, and this implies weather changes posed a higher indicator affecting construction compared to the rest of the delays observed.

Impact of delays on construction projects in Uganda

The aforementioned construction delays have a number of impacts as enumerated in figure 1. These can be termed as setbacks in construction projects in Uganda, among them,

resource misallocation, legal consequences, economic impact, stakeholder frustration, loss of funding, compromise of quality, extensions in the completion time leading to estimated increases in costs due to inflation, as also shown in Mubiru (2015). The construction delays highly influences cost overruns and minimally, on the resource misallocation (fig.1). Greatly, unhappiness of the stakeholders grows, making it hard to work with them in the future (Kiggundu, 2013), while economic growth stagnates; restricting the growth of employment opportunities, legal issues concerning breach of contracts, which can lead to more costs. Taken all together, these issues bring to fore the importance of effective management of projects in order to control delays and their effects as seen in fig 1.

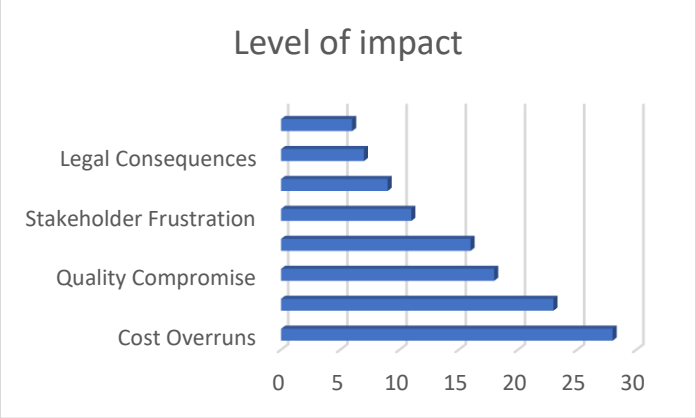

Fig. 1 – Impact of delay on public building in Uganda

Mitigating delays in Uganda

The research evaluated mitigation measures which can be deployed to reduce on the construction delays and are as highlighted in figure 2. The weigthing of the mitigation measures as per the respondents are stakeholders engagement at 9%, use of technology at 10%, training and capacity building at 13%, proper resource allocation at 14 %, risk management framework at 15%, effective communication at 19% and improved project planning at 20 %. All these factors can help in improving project implementation and curbing delays as collaborated by Kiggundu (20130 and Mubiru, (2015). are qualified.

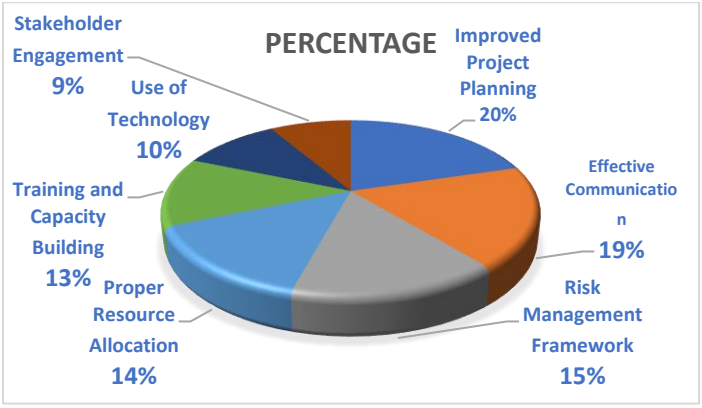

Fig. 2 Mitigation measures

5.0 Conclusions

There are six main construction delays that majorly affects construction in Uganda, which includes management delays, technical delays, financial delays, material delays, labor delays, environmental delays. Amongst these, environmental delays affecting the lowest percentage of the projects standing at 10 % and management delays affecting the highest at 30 %. On cost overruns as influenced by these delays, financial delays has the highest at 15 % and the lowest is posed by environmental delays at 4%. In the management aspect, management, technical and financial delays can easily be controlled, since they are directly manned by the project owner. The other construction delays have a larger scope which dictates their occurrence, but there are mitigation measures which are enumerated to help minimize their effects in construction, including risk management frameworks, use of technology, among others. Notably there are a range of impacts caused by construction delays, including resource misallocation, legal consequences, economic impact, stakeholder frustration, loss of funding, compromise of quality, extensions in the completion. All these can be minimized when the delays are mitigated. In general it is practical to mitigate against the aforementioned construction delays in Uganda, given that the world levels are low that as observed in Uganda.

Recommendation

Early-stage planning, using tools like the Critical Path Method and Time Impact Analysis, can help identify potential delays and address them proactively. Simplifying the permitting and approval process, adopting transparent procedures, and reducing bureaucratic inefficiencies can also help prevent delays. The government should prioritize and secure consistent funding streams for critical public building projects, exploring public-private partnerships to pool resources and minimize financial constraints. Enhancing stakeholder communication through regular meetings, progress reports, and collaborative decision-making can also help ensure projects stay on track and reduce misunderstandings and delays.

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Declaration of conflict of interest

The authors have collectively contributed to the conceptualization, design, and execution of this journal. They have worked on drafting and critically revising the article to include significant intellectual content. This manuscript has not been previously submitted or reviewed by any other journal or publishing platform. Additionally, the authors do not have any affiliation with any organization that has a direct or indirect financial stake in the subject matter discussed in this manuscript.

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