ASSESSMENT OF CAUSES AND EFFECTS OF DELAY IN THE CASE OF ARBA RAKATI - MICHATA ROAD PROJECT

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Abstract. Road construction plays a crucial role in Ethiopia's economic and social development, yet delays are a persistent challenge, affecting project timelines and budgets. This study examines the causes and consequences of delays in the Arba Rakati - Michata road construction project in the West Hararghe Zone of the Oromia Region, currently facing a five-year delay from its initial three-year timeline. Employing explanatory and descriptive research methods, including literature review and contract document analysis, the study investigates the root causes of delays. A survey conducted through a 5-Point Likert Scale questionnaire targeted stakeholders such as clients, contractors, and consultants, with 50.8% (thirty-three out of sixty-five) response rate. Through quantitative analysis using the Weighted Average (WA) of the Relative Importance Index (RII), the study ranks factors contributing to delays. Additionally, qualitative insights are obtained through in-depth interviews. The factors contributing to project delays include late financial audits, security concerns, payment delays, slow decision-making, work suspensions, material shortages, and increased material costs. The study further determines that the primary impacts of these delays are include time and cost overruns, negative public perception, and legal disputes with affected property owners along the project route. This research offers valuable insights for project management and stakeholder coordination, shedding light on critical aspects affecting road construction projects in Ethiopia.

Keywords: Causes of Delay, Effects of Delay, Weighted Average (WA) of the Relative Importance Index (RII), Stakeholders.

1. Introduction

Transportation infrastructure is crucial for driving economic development in Ethiopia, given its distinct topography, settlement patterns, and economic geography. Road transport, in particular, plays a significant role in promoting socioeconomic growth and poverty reduction (Senouci et al., 2016). However, road construction projects often encounter delays and cost overruns, which can impede national economies and hinder progress in the construction industry. Timely completion of road projects is essential to meet stakeholder requirements, yet various factors present challenges to achieving this goal, posing a global concern.

In Ethiopia, particularly within the Oromia Regional State, road construction projects face recurrent delays and cost overruns, impacting construction management and Regional development (Bayissa & Adminstration, 2018). Despite efforts, the problem persists and worsens, leading to economic, political, and social drawbacks (Kabeto, 2020).

These delays not only affect project owners, users, and contractors through extended delivery times and cost overruns but also result in missed opportunities and diminished public trust in government-funded initiatives. Specific factors contributing to delays are unique to local industries, socio-economic contexts, and project characteristics, such as land disputes and right-of-way issues. Consequently, communities experience heavy traffic and accidents, further exacerbating the challenges faced by road construction projects in Ethiopia.

1.1. Background of the Study

The West Hararghe zone, situated approximately 321km east of Addis Ababa, Ethiopia, encompasses 14 districts with a predominantly Oromo population of nearly 1.9 million adherents of the Muslim faith, boasting an average family size of 7.0 (Central Statistical Agency, 2007). Despite its advantageous geographic location and abundant resources, the region grapples with challenges exacerbated by inadequate infrastructure.

In 2015, the Ethiopian Roads Authority (ERA) embarked on plans to construct an asphalt road, forging an agreement with Al Asab General Transport and Constructing LLC of Abu Dhabi, UAE, to undertake the project in two phases. The envisioned road, connecting Arba Rakati-Michata via Gelemso town, was scheduled for completion by 2018. Lot 1, spanning 57.5 km from Arba Rakati to Gelemso, entailed a project cost of 1,012,102,686.09 ETB, financed by various entities including the Arab Bank for Economic Development in Africa (BADEA), the OPEC Fund for International Development (OFID), the Saudi Fund for Development (SFD), and the Ethiopian Government (ETGOV). Lot 2, covering a 45.5 km stretch from Gelemso to Michata, with a budget of 972,757,588.54 ETB, received funding from BADEA, OFID, and ETGOV (excluding SFD) (Lemma, B. 2015).

The Arba Rakati-Michata road project in West Hararghe, Ethiopia, initially slated for completion within three years, has now exceeded its timeline by eight years, with no projected conclusion in sight. Beyond serving as a stark example of planning and construction failure, the delay holds significant implications for the project's stakeholders, including the beneficiary communities and the economic landscape of the zone. Furthermore, it sheds light on the deficiencies in public sector road construction management, emphasizing the critical need for a comprehensive explanation and understanding to ensure the timely delivery of future projects.

2. Literature Review

Multiple factors contribute to the causes of delays in construction projects, encompassing a wide range of elements. These factors can be attributed to various aspects, including technological aspects and their management, as well as the physical, social, and financial environment surrounding the project. These factors exert diverse effects on the roles played by different stakeholders involved in the completion of a road construction project, such as clients, contractors, and consultants. Each stakeholder is influenced differently by the delays, and their respective responsibilities and contributions in the project are impacted accordingly.

2.1 Causes of Delay

In their investigation of delay factors within the Indian construction industry, Rao, P.B. and Joseph Camron, C. (2014) identified seven distinct groups attributing to construction delays: the client, contractor, consultant, material, equipment, labor, and external factors. Three key factors were found to play a significant role in causing delays: revisions and approvals of design documents, subcontractor-related delays, and poor communication during change orders by the owner. Among these, contractor-related delays emerged as the most significant contributor to project delays, followed by delays associated with the client and consultant.

Examining large construction projects in Pakistan, Haseeb et al. (2011) quantitatively assessed 68 delay factors, leading to the identification of 16 significant elements impacting project durations. These factors encompassed finance and payments, inaccurate time estimation, substandard material quality, delays in payments to suppliers and subcontractors, inadequate site management, natural disasters, unforeseen site conditions, material shortages, delays by subcontractors, changes in drawings, improper equipment, inaccurate cost estimation, change orders, organizational and management changes, and regulatory changes.

Samarah, A. and Bekr, G.A. (2016) investigated delay causes and effects in Jordan public construction projects, meticulously assessing the frequency, severity, and importance of 55 identified factors. From these, the top 22 causes were determined, including inadequate management and supervision, client-initiated design changes, poor planning and control, low performance due to low bids, scope changes, design errors, delayed payments, construction faults leading to rework, and modifications to the original design. Additional factors like productivity issues, technical problems, lack of cooperation, cash flow problems, bureaucratic processes, and community influence were also noted.

Within the Nigeria construction industry context, Obodoh, D.A. and Obodoh, C. (2016) attributed project delays to factors such as insufficient equipment, inaccurate time estimates, payment challenges, change orders, imprecise cost estimates, deficient site management, inadequate modern equipment use, material scarcity, skilled workforce shortages, flawed planning, scheduling, and financial difficulties. These delays had significant impacts, including increased costs, extended project durations, disputes, reduced productivity, client dissatisfaction, and damage to stakeholders' reputation.

2.1.1 Causes of Road Construction Delays in Ethiopia

In their study regarding the causes of construction delays within the Ethiopian construction industry, Koshe, W. and Jha, K.N. (2016) identified a comprehensive list of eighty-eight significant factors contributing to project delays. After a thorough evaluation, the researchers determined that certain factors stood out as the most prevalent and critical causes of construction delays. These factors encompass challenges confronted by contractors in securing project financing, the escalation of material prices, ineffective project planning, scheduling, and resource management, delays in receiving progress payments for completed work, insufficient data collection and surveying before the design phase, a shortage of skilled professionals in construction management within organizations, and inadequate availability of experienced labor, particularly during specific seasons.

Tsegaye, G. (2009) delved into the realm of design risk management within Ethiopian federal road projects. Through this investigation, several primary factors contributing to time and cost overruns were identified. These factors encompassed inaccuracies in quantity estimation, insufficient subsurface investigation and interpretation, inadequate assessment of pavement conditions, inaccuracies or deficiencies in topographic survey data, inadequate inclusion of design details, omission of crucial tasks, changes in alignment, inadequate specifications, delayed implementation of design, and subpar assessment of drainage systems.

2.2 Effects of Delay

The persistent issue of delays in road construction projects has been widely recognized, with significant repercussions including surpassing allocated timeframes and budgets. Supporting this notion, Khair et al. (2016) conducted research emphasizing that delays in Sudan's road construction projects predominantly give rise to escalated costs and time overruns. Nonetheless, researchers have identified additional ramifications stemming from these delays.

While the consequences of delays can vary based on project type, certain general outcomes persist, notably cost overruns and time overruns. Specifically, for owners or clients, delays translate to financial losses, wasted time, and potential disruptions to other facilities or services. Conversely, contractors experience heightened expenses for equipment, materials, and the necessity to hire skilled labor (Khattri, T., and Pandey, M. 2016).

In a study conducted in Tripoli, Libya, Alfakhri et al. (2018) examined the effects of delays in road construction projects. Their findings illuminated a range of consequences encompassing cost overruns, time extensions, disputes, loss of profit, breaches of contract, poor work quality, and adverse impacts on a company's reputation.

3. Methodology

In research, methodology is crucial as it dictates the practical approach taken. Schwandt (2007) defines research methodology as the theory guiding inquiry procedures, encompassing analysis of assumptions, principles, and procedures. For this study, explanatory and descriptive research types were employed. The explanatory approach assesses time and cost overruns, while the descriptive method describes the nature and extent of delays encountered. These research designs were chosen to ensure a suitable framework for addressing the research questions at hand.

3.1 Sample Techniques

The study employed purposive sampling to select participants closely connected with the ongoing road construction project, ensuring the inclusion of stakeholders possessing in-depth knowledge about it. This sampling technique, endorsed by Walliman (2021), allows researchers to gather insights from individuals well-acquainted with the subject matter.

The target population for this research comprises individuals engaged in phases C1 and C2 of the Arba Rakati-Michata asphalt road project, including stakeholders such as ERA, Al Asab, Alami & Khatib, Core Consulting Engineers, and beneficiaries. By administering a questionnaire to these stakeholders, responses were collected, facilitating a comprehensive understanding of the project's dynamics (Investopedia, 2023).

According to Johnston, A., (2023), when the populations under 1000, a sample size of 30 percent is suitable, whereas populations over 1000 usually necessitate a sample size ranging from 10 to 20 percent. Given a population of 217 professionals, a sample size of 65 was calculated using Equation (1) as per the statistical formula employed for determining the sample size in the study.

n=N*0.3 **n = 217 * 0.3 = 65**	**(1)**

Where:

n = Sample size of the study
N = the population size and staffs who were working as consultant, contractor and client
0.3 = Represents 30% of the population size

Both primary and secondary data sources were employed to ensure a comprehensive understanding of the research topic. Primary data collection involved observations, interviews, and the administration of a meticulously designed questionnaire. Secondary data, including literature reviews and project completion reports, supplemented the primary data, providing valuable context and insights from earlier research.

3.2 Questionnaire Design and Approach

The questionnaire, developed for the research, drew insights from a review of literature on other delayed road projects and was enriched with personal observations, contract document analysis, and interviews with key stakeholders, including clients, contractors, and consultants. The questionnaire was structured into three sections. The introductory section aimed to gather basic information about the interviewees, including their experience, background, and involvement in the Arba Rakati - Michata road project, along with the delays encountered.

The second section focused on identifying perceived causes of delay. The interviewees were presented with 32 different potential factors that might contribute to delays in the road project. These factors were grouped into five categories, which were project-related (consisting of 3 questions), client-related (comprising 6 questions), contractor-related (encompassing 10 questions), consultant-related (including 8 questions), and external factors (involving 5 questions). Additionally, an extra set of questions focused on the effects of the delay (7 questions). The selection of these variables was informed by insights gathered from the literature review. Respondents were provided with a ranking scale in the questionnaire, allowing them to assess and prioritize the factors and effects. The scale offered the following options for ranking:

- S.A. = Strongly Agree (scored as 5)
- A. = Agree (scored as 4)
- N. = Neutral (scored as 3)
- D. = Disagree (scored as 2)
- S.D. = Strongly Disagree (scored as 1)

This scale allowed the interviewees to express their level of agreement or disagreement with each factor or effect, helping

to gather valuable insights into the perceived importance of each aspect in causing delays in the Arba Rakati - Michata road project. The third section involved semi-structured, open interview questions that focused on similar issues experienced in other road projects and potential solutions to address the problem of road project delays.

3.3 Method of Data Analysis

In this study, the data analysis methodology involved administering questionnaires to project-involved employees from ERA (client), Al Asab (contractor), Alami & Khatib, and Core Consulting Engineers (consultants). These questionnaires were distributed manually and collected in person after a two-week interval.

The research adopted a mixed data collection approach, combining qualitative and quantitative methods simultaneously, to provide a comprehensive understanding of a research topic (Creswell & Creswell, 2017). Qualitative data were gathered through interviews, with a selected subset of stakeholders chosen based on the significance of their questionnaire responses. This qualitative inquiry extended beyond commercial stakeholders to include elected and appointed officials, as well as residents along various points of the project route, ensuring a comprehensive understanding of the delay's impact across diverse demographics and geographic locations.

Quantitative analysis utilized raw data from 32 questionnaire responses, categorized for analysis using the Relative Importance Index (RII) technique. RII, a non-parametric method widely applied in construction and facilities management research, is particularly suitable for analyzing structured questionnaire responses with ordinal attitude measurements (International Research Journal of Engineering and Technology, 2019). This can be represented by equation (2):

$$RII = \frac{\sum w}{A * N} = \frac{1n1 + 2n2 + 3n3 + 4n4 + 5n5}{5(n1 + n2 + n3 + n4 + n5)} \quad (2)$$

Where:

RII= Relative Importance Index ($0 \leq RII \leq 1$)
W = the weight assigned to each factor by the stakeholders.
A: highest weight (in this study: 5)
N: overall number of respondents
n1= number of respondents who answered strongly disagree
n2= number of respondents who answered disagree
n3= number of respondents who answered neutral
n4= number of respondents who answered agree, and
n5= number of respondents who answered strongly agree

3.4 Reliability & Validity

This research rigorously assessed the validity of its measures, aligning with Bhattacherjee's (2012) definition of validity as the accuracy in representing the intended construct. Meticulously crafted questionnaire items, informed by literature, observations, and field knowledge, effectively captured pertinent data. The study demonstrated strong face and content validity, as explanations for project delays closely matched findings from the literature review. Expert respondents, drawing from extensive experience, offered diverse perspectives that enriched the study's insights. Cross-validation against existing literature further bolstered confidence in the validity of the study's instruments, ensuring accurate representation of the construct under investigation.

In assessing the causes and effects of delay in the Arba Rakati-Michata road project, the Cronbach's Alpha reliability test was employed. Reliability refers to the consistency of measurements, especially when conducted by different individuals across various conditions and using different instruments to measure the same phenomenon (Drost, E. A. 2011). This coefficient evaluates the internal consistency (IC) of a set of items, indicating the strength of their correlation.

The questionnaires' reliability is assessed using the commonly used Cronbach's Alpha coefficient test with the assistance of SPSS software. This evaluation is performed using 5-Point Likert Scale Questionnaires determined by equation (3):

$$\textbf{Cronbach's Alpha,} \quad \alpha = \frac{K}{K-1} \quad [1 - \sum Sy2 / Sx2] \quad (3)$$

Where:

α = Cronbach's Alpha
K = is the number of test item
∑Sy2 = is sum of the item variance
Sx2 = is the variance of total score

The values of Cronbach's alpha range from 0 to 1, where values above 0.70 are generally considered "acceptable" or reliable in most social science research. A higher value indicates a greater degree of internal consistency. In this study, the coefficient of internal consistency for the delay factors was determined to be 0.737, signifying that 73.7% of the responses provided by the participants regarding the causes of delays are dependable. This internal consistency is categorized as "Acceptable" based on the Alpha value, as shown in Table 1.

Table 1: Evaluating IC with Cronbach's Alpha

Variables	Values		Internal Consistency
	Cause of Delay	Effects of Delay	
K	32	7	0.79>α >0.70 (Acceptable)
∑Sy2	26.37	4.73	
Sx2	92.18	12.94	
α	0.737	0.740	

4. Results

The study's research methodology employed a meticulous approach to understand the progress of a construction project. The contract for the Arba Rakati - Michata road project was formally executed on March 21, 2015, with an initially outlined

three-year timeline for fulfillment, aiming to conclude by 2018. The project formulated plans to establish an asphalt road connecting Arba Rakati to Michata via Gelemso town. The construction was divided into two concurrent phases, C1 and C2, each with distinct objectives and tasks aimed at enhancing regional connectivity and socio-economic development.

In the pre-construction stage, Phase C1 focused on the initial segment of road infrastructure development from Arba Rakati to Gelemso town, spanning approximately 57.5 km. This phase primarily involved preparatory activities such as land surveying, soil analysis, and securing permits, laying the groundwork for subsequent construction. Similarly, Phase C2 aimed to extend the road network from Gelemso to Michata, covering around 45.5 km, emphasizing similar pre-construction tasks to ensure a smooth transition into the construction phase. Figure 1 presents an illustration of the project's pre-construction stage, highlighting distinct phases labeled as C1 and C2. These phases were indicated within the contractor's main office, signifying the project's early stages before the commencement of actual construction work.

Figure 1: Initial Phases of Gravel Road Construction for C1& C2

During the construction phase, Phase C1 concentrated on actualizing the planned road infrastructure, focusing on site preparation, grading, and laying foundational materials. This involved executing earthworks, compacting, and surfacing the road to establish a stable foundation and enhance durability. Additionally, the implementation of drainage systems and safety features was integral to ensuring the quality and longevity of the constructed road. In parallel, Phase C2 mirrored the construction standards of C1, emphasizing similar tasks such as earthworks, grading, and installation of infrastructure components.

Both phases played crucial roles in the overall project, aiming to improve connectivity and facilitate socio-economic development in the region. However, challenges and setbacks, including unforeseen obstacles and delays, have hampered the project's progress despite the initial planning and execution strategies, unforeseen challenges and setbacks have prolonged the project timeline, leading to significant delays in achieving the envisioned road infrastructure objectives, as visually represented in Figure 2 illustrating the ongoing status of both projects and providing a clear view of their respective levels of completion.

Figure 2: Current Stages of Arba Rakati – Michata road C1& C2

As of the current year 2023, the progress of both phases varies significantly, with Phase C1 having made substantial advancements and nearing 85% completion, indicating successful execution of planned construction activities. Conversely, Phase C2, running parallel to C1, has faced challenges and obstacles, resulting in only 75% completion. The significant setback of five years has impeded the progress of C2, underscoring the difficulties encountered during its implementation.

4.1 Response Rate Analysis of Questionnaire Surveys

The study achieved a commendable response rate of 50.8% in distributing sixty-five questionnaires among stakeholders, including ERA, Al Asab, Alami & Khatib, and Core Consulting Engineers. Bayissa, F.Y. (2018) suggests that a response rate between 30% and 40% is acceptable for effective data analysis in questionnaire-based research, highlighting the reliability of the attained 50.8% response rate. Despite facing significant challenges, such as prolonged payment delays causing dissatisfaction among staff and leading some to leave the site, the study maintained a substantial response rate. Table 2 provides a detailed breakdown of the response rate analysis, underscoring the resilience and effectiveness of the study methodology.

Table 2: Response Rate Summary

Stakeholders	Questionnaire Distributed	Questionnaire Returned	Response Rate (%)
ERA (client)	13	6	46.2
Al Asab (contractor	33	17	51.5
Alami & Khatib & Core(consultant)	19	10	52.6
Total	65	33	50.8

4.2 Response Ratio as Obtained Through Questionnaires

The response ratio for each stakeholder group (clients, contractors, and consultants) was determined by dividing the number of returned questionnaires from each group by the total number of questionnaires distributed. This computation allowed for evaluating the proportion of questionnaires received from each stakeholder group in relation to the total distributed questionnaires, as illustrated in Table 3:

Table 3: Questionnaire response ratio for each stakeholder

Stakeholders	Questionnaire Distributed	Questionnaire Returned	Response Ratio
ERA (client)	65	6	0.09
Al Asab (contractors)	65	17	0.26
Alami & Khatib, Core(consultant)	65	10	0.15

4.3 Analyzing and Ranking Delay Factors per WA of RII

The questionnaire responses were subjected to thorough analysis employing the Weighted Average (WA) of the Relative Importance Index (RII) method to identify the primary causes of delays in the project. This approach entailed multiplying the RII of each delay factor by the respective response ratios from contractors, clients, and consultants. The calculation of the weighted average of the Relative Importance Index (RII) for various stakeholders (including contractors, clients, and consultants) based on their response ratios can be determined by equation (4):

$$\text{WAofRII} = (\text{RII}_{\text{contractors}} \times \text{contractors}'\text{response ratio}) + (\text{RII}_{\text{clients}} \times \text{clients}'\text{responseratio}) + (\text{RII}_{\text{consultants}} \times \text{consultants}'\text{responseratio}) \quad (4)$$

Where:

WA of RII = Weighted Average of Relative Importance Index
RII contractors = Relative Importance Index for contractors.
RII clients = Relative Importance Index for clients.
RII consultants = Relative Importance Index for consultants.
Contractors', Clients', and Consultants' response ratios = the proportion of responses received from each group compared to the total responses collected.

The method directly integrates each stakeholder group's opinion, reflecting their response ratios, into the calculation of the overall weighted average of RII. The formula multiplies the Relative Importance Index (RII) for each stakeholder group by their corresponding response ratios and sums these products to compute the weighted average. These values are aggregated to derive a weighted average (WA) for each factor, which is then ranked to identify the most significant factors contributing to delays based on stakeholders' responses. This ensures that stakeholders with higher response ratios contribute more significantly to the weighted average, as outlined in Table 4:

Table 4: Ranking delay factors by stakeholders' responses

Factor	WA of RII				Rank
	Client	Contractor	consultant	Averages	
Security/political situation	0.09	0.25	0.14	0.48	1
Rise in price of materials	0.08	0.24	0.13	0.45	2
Late payments for completed work	0.08	0.22	0.13	0.43	3
Client's slow decision-making	0.05	0.23	0.14	0.42	4
Shortage of construction materials	0.07	0.22	0.12	0.41	5
Financial audit problems	0.09	0.15	0.15	0.38	6
Poor communication and coordination	0.05	0.20	0.13	0.38	7
Excessive bureaucracy in client organization	0.03	0.20	0.13	0.36	8
Suspension of work by owner or contractor	0.08	0.19	0.09	0.35	9
Poor contract management	0.03	0.19	0.12	0.34	10
Corruption	0.05	0.16	0.11	0.32	11
Weather conditions	0.05	0.17	0.09	0.31	12
Inadequate site investigation/ unforeseen surface conditions	0.04	0.15	0.12	0.31	13
Waiting times for approving tests and inspections	0.06	0.15	0.10	0.30	14
Labor disputes / personal conflicts on site	0.06	0.13	0.11	0.30	15
Slow preparation and approval of drawings	0.05	0.15	0.09	0.29	16
Poor contract management by consultant	0.06	0.18	0.05	0.29	17
Subcontractor problem	0.07	0.09	0.12	0.29	18
Government regulation and permit approval	0.05	0.11	0.13	0.28	19
Delay in revising design documents	0.04	0.15	0.07	0.26	20
Lack of adequate project coordination	0.03	0.12	0.11	0.26	21
Unrealistic imposed contract duration	0.03	0.13	0.09	0.25	22
Poor Site management and supervision	0.05	0.08	0.12	0.25	23
Unreliable planning and scheduling	0.05	0.09	0.11	0.25	24
Contractor's lack of experience	0.04	0.06	0.11	0.22	25
Discrepancies between contract documents	0.03	0.11	0.07	0.21	26

Inaccurate estimating of construction materials/quantities/price	0.04	0.09	0.05	0.18	27
Lack of clarity in project scope	0.03	0.10	0.05	0.18	28
Under-skilled workforce	0.03	0.08	0.06	0.17	29
Quality assurance/control	0.04	0.09	0.04	0.16	30
Equipment unavailability and/or failure	0.03	0.08	0.05	0.16	31
Consultant's lack of experience	0.02	0.07	0.03	0.13	32

4.3.1 Causes of Delay as per Stakeholders' Interview Responses

In-depth interviews were conducted with key stakeholders, including personnel from the client, consultant, and contractor, to gain insights into the factors contributing to delays in the Arba Rakati - Michata road project. Additionally, interviews were held with elected officials, residents along the project route, and other stakeholders to gather diverse perspectives.

Causes of Delay from Clients' Perspective

Issues related to delayed financial audits were identified as the primary cause of delays in client responses, leading to work suspension by the client. The client's withholding of payments from the contractor due to audit delays caused disruptions in funding installments and recurrent account suspensions, making it challenging for the contractor to meet payroll commitments. Consequently, labor disputes and conflicts arose on-site, with some employees experiencing significant payroll delays of up to six months, ultimately leading to workforce abandonment of the project site.

Another major factor contributing to postponement was the client's delayed payments for completed tasks, partly resulting from founders' payment delays to the client, compounded by the economic impact of the Yemen war on the Saudi Arabian economy. Funding delays from the Saudi Fund pressured the client to ensure timely payment for finished work. Additionally, hyperinflation in construction materials and supply shortages due to foreign currency scarcity escalated costs for crucial components like cement, straining project budgets and financial resources. Unforeseen surface conditions necessitated road redesign, further complicating the preparation and approval of drawings amid extended setbacks and project intricacies.

Causes of Delay from Contractors' Perspective

The contractor faced a multitude of challenges throughout the construction project. Chief among these were significant delays in payment from the client, which strained cash flow and led to resource shortages and decreased morale among the workforce. Access to the construction site was also delayed, causing logistical challenges and disruptions to the project schedule. Additionally, negotiating and implementing variation orders disrupted coordination among project teams, impacting project execution efficiency and contributing to delays and cost overruns.

Another major setback was the suspension of the contractor's local bank account by the Ministry of Revenue due to a tax debt, resulting in financial constraints and hindered procurement efforts. Violent protests stemming from unresolved compensation disputes further disrupted work, leading to increased costs and work stoppages. The absence of an exchange road in the design further complicated construction, slowing progress and causing logistical difficulties in managing traffic flow.

Moreover, nationwide shortages of cement, exacerbated by the COVID-19 pandemic, significantly delayed construction progress. Lockdowns, supply chain disruptions, and health and safety protocols hindered construction activities, highlighting the project's vulnerability to external factors beyond its control. Additionally, the contractor attributed delays to the civil war in the zone, which created an unsafe working environment and led to labor shortages as workers feared for their safety. These external challenges compounded the project's difficulties, further hampering progress.

Causes of Delay from Consultants' Perspective

The Arba Rakati-Michata road project faced significant challenges that caused delays and complications, particularly from the consultants' perspective. One major issue was the delay in revising the design documents, which failed to account for rapidly changing site conditions, leading to blind curve viewpoints, landslides, stream erosion, and fluctuating groundwater levels. Additionally, governmental regulations and delayed permit approval processes, exacerbated by design modifications requested by urban areas along the construction route, prolonged the project timeline. Unforeseen severe weather conditions, including prolonged heavy rainfall, further disrupted construction, lasting 2-3 months annually and significantly impacting project progress.

Furthermore, it became evident that the contractor's top management lacked road construction experience, primarily having expertise in the oil and gas industries of Arab states. This lack of experience led to poor coordination and communication, placing a burden on the consulting team to address emerging issues effectively. These challenges collectively contributed to substantial delays and hindered the successful completion of the project.

4.4 Analyzing and Ranking Delay Effects per WA of RII

The Arba Rakati-Michata road project has faced a substantial delay, extending its construction period by five years beyond the initial three-year projection. Assessing the impacts of this delay, stakeholders' responses were analyzed using the Weighted Average (WA) of the Relative Importance Index (RII) method, akin to the approach used for ranking delay causes. The results are presented in Table 5 providing a categorized evaluation of the project's prolonged timeline.

Table 5: Ranking effects of delay by stakeholders' responses

Factor	WA of RII			Average	Rank
	Client	Contractor	Consultant		
Time overrun	0.09	0.25	0.15	0.49	1
Budget overrun	0.09	0.24	0.14	0.47	2
Disputes & claims	0.07	0.14	0.10	0.31	3
Litigation & arbitration	0.08	0.14	0.08	0.30	4
Bad public relations	0.08	0.10	0.10	0.28	5
Total abandonment	0.06	0.13	0.07	0.25	6
Poor quality of completed project	0.04	0.10	0.06	0.19	7

The study's results indicate unanimous agreement among key stakeholders, comprising the client, contractor, and consultants, regarding the primary impact of delays: significant time overrun, profoundly affecting project progression. Additionally, stakeholders collectively acknowledge the emergence of budget overrun as another critical consequence, complicating financial aspects despite attempts by the client (ERA) to accommodate inflation. The inflation-driven material price increase presents significant challenges for contractors, hindering project continuity despite ERA's efforts.

The prolonged timeline has led to disputes, claims, and legal actions, including litigation and arbitration, further exacerbating challenges. Delays have also adversely affected public relations, tarnishing the project's image and raising concerns about potential abandonment due to extended construction periods, thus introducing uncertainties regarding successful completion.

4.4.1 Effects of Delay per Resident Interview Responses

The study investigates the ramifications of delays on residents living along the Arba Rakati-Michata road project route. Interviews reveal that these delays have resulted in adverse effects, hindering anticipated benefits and leading to postponements of essential improvements. Residents highlight the negative impact on their quality of life, citing flooding and persistent mud during the rainy season due to unfinished excavations, as well as significant dust problems during the dry season from abandoned sites.

Additionally, concerns arise regarding inadequate compensation, with disparities in payments and insufficient notice for vacating houses leading to perceptions of unfair treatment. This dissatisfaction has escalated into protests and social unrest, further disrupting the project. Overall, the extreme time overrun has disrupted the construction budget, delayed town benefits, and significantly affected residents' quality of life, underscoring the urgency for resolution and project completion.

5. Conclusions

This research study delves into the extensive road construction delay in West Hararghe, Oromia Region, Ethiopia, aiming to analyze causes and effects based on stakeholders' perspectives. Employing questionnaires, interviews, and contract documents, insights were gathered alongside observations. Combining quantitative and qualitative data, as well as literature review insights, conclusions were drawn. The Arba Rakati-Michata road project serves as a prominent example of project failure, raising concerns about government competency in infrastructure delivery, with the delay extending to five years and no certain completion date set for 2024.

Engaging sixty-five stakeholders through questionnaires with a 50.8% response rate, quantitative analysis via the weighted average of Relative Importance Index (RII) technique revealed deep-rooted causes contributing to the delay from each stakeholder's perspective. Primary causes included financial audit problems, late payments, material price increases, and inadequate site investigation. Challenges encountered by contractors ranged from payment delays to COVID-19 impacts, while consultants emphasized government regulations and design document revisions. These factors collectively extended the project timeline and amplified setbacks.

The primary effect of the delay was time overrun, significantly impeding project progress and leading to budget overruns, disputes, litigation, and arbitration, negatively impacting public relations and raising concerns about potential project abandonment. In-depth interviews highlighted geographic and demographic implications, with local residents experiencing declines in quality of life, leading to protests and social unrest. Overall, the consensus among stakeholders underscores the urgency of addressing challenges to achieve successful project outcomes in terms of time management, budget considerations, quality of work, and public perception.

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