

Investigating the Factors of Mega Infrastructure Project Delays: Dhaka Context

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Abstract: Projects are short-term initiative that aim to produce a distinctive advantage, service or outcome, and infrastructure refers to the physical features that use the operation of a company, region, or nation, frequently involving the generation of public goods or the execution of production procedures. Mega infrastructure project, which costs at least 1 billion are a haphazardly organized collection of unconnected components with various uncertainty and unknown challenges. These various uncertainties and unknown challenges cause mega infrastructure project delays. Project delay increases the cost of the project and causes economic loss. For example, Bangladesh is currently running some mega infrastructure projects but facing project delays in some cases resulting financial loss for the government. To be more specific, MRT Line 6 project was selected as a case study that faced delay in completion. In this connection, this study tries to identify the specific reasons causing delays in completing MRT Line-6. This study followed a qualitative research approach to explore the factors through In Vivo Coding in the first cycle of coding and Pattern Coding in the second cycle of coding. Issues of the contractors, lack of knowledge and skills, design changes, low quality of planning and management, material collection, political issues, land acquisition, covid 19, safety and security concerns of foreign workers, traffic pressure in the city, institutional issues are the factors explored in this study that causes the delay of MRT Line 6. The study can contribute to understanding delay factors and applying knowledge for future infrastructure projects, particularly in developing countries, at the same time, it will provide valuable insights for policymakers to make better infrastructure decisions and ensure successful completion of project.

Keywords: MRT Line 6, Mega Infrastructure Project, Complexities, Project Delay, Project Management.

1. Introduction

Projects aim to achieve defined goals via interconnected activities, utilizing resources, diverse participants, tools, and materials within a set timeframe, while facing inherent risks (Jack Gido, Jim Clements, 2018). Infrastructure projects characterize public goods, including utilities like roads, railways, dams, electricity, water supply, and waste management (World Bank, 1994). A mega project, as defined by (Flyvbjerg, 2014), entails large-scale, high-cost ventures involving extensive timelines, numerous

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stakeholders, impacting society, economy and typically exceeding USD 1 billion. An infrastructure project becomes a mega infrastructure project (MIP) when it possesses these mega project characteristics.

Bangladesh, an emerging developing country, ongoing MIPs like Dhaka Metro Rail, Dhaka Elevated Expressway, and many others (Databd.Co, 2020; Railway Technology, 2023; UNV, 2022; Yeasin, 2021) have introduced new challenges in project management and execution. Many MIPs have faced delays and substantial cost overruns, impacting positive outcomes, and government's reputation (N. Ahmed, 2021).

Prior research examines mega infrastructure projects (Esposito et al., 2021), investigates the causes of construction project inefficiencies (Islam et al., 2015), and core schedule delay reasons in Bangladesh (Mizanur et al., 2014). Globally, project management importance in design phases of transport infrastructure projects (Germany) is explored (Sözüer & Spang, 2014), along with the complexity of project management in developing countries (Yanwen, 2012) and challenges faced in constructing MIPs (Ezzat Othman, 2013). Researchers develop a conceptual model to overcome MIP challenges (Othman, 2014). Institutional Theory aids mega-project management (Biesenthal et al., 2018) and analyzes global project complexity (Mahalingam & Levitt, 2007). However, limited research addresses delays in MIPs within Bangladesh's context. This study aims to explore the specific reasons causing delays in MRT Line 6 project, to analyze the problems of causing the mega infrastructure project delays. To achieve this the following section will discuss the reasons for project delay based on previous research.

2. Project Delay

Project delays extend the end date beyond the initially scheduled days in the contract, breaching the legally binding agreement's agreed-upon completion date (Assaf & Al-Hejji, 2006; Zack, 2003). In Bangladesh, inadequate experience and skill, low bidder selection, funding scarcities, project location limitations, inappropriate planning and management, heavy workloads and less monitoring, increasing prices of materials (Islam et al., 2015), political imbalance, poor communication among stakeholders, delay in design and decision making, rework for errors, government and public interfere, equipment shortage, complexity in legislative permission and changing of subcontractors frequently (Mizanur et al., 2014) responsible for project delays.

Land acquisition, lack of site management and investigation, changing client requirements and issues, financial issues (Patil, 2013; Scott, 2017), unavailability of materials (Mahalingam & Levitt, 2007), wrong time estimation, legislation issues (Fallahnejad, 2013; Scott, 2017), design changes, physical obstacles, public counteraction, environmental and technical problems (Han et al., 2009), insufficiency of workers, poor construction planning and complexity among stakeholders (Oyegoke & Kiyumi, 2008), building codes and permits (Esposito et al., 2021; Mahalingam & Levitt, 2007), taking ownership of state-owned lands, court rulings (Esposito et al., 2021), political instability, lack of decision making by the government (Ezzat Othman, 2013), institutional hierarchies (Scott, 2017) causes delays globally.

Besides, Natural and manmade disaster (Padgett & Tapia, 2013; Waheeb, 2022), cultural complexity (Qiu et al., 2019) includes visualization (Mahalingam & Levitt, 2007), religious ideologies, ethnicities and languages (Scott, 2017), diverse organizations (Qiu et al., 2019), and normative complexity (Scott, 2017), gathering information, (Mahalingam & Levitt, 2007), professional standards, social requirements (Scott, 2017) also responsible for delays.



Figure 1: Map of the Study Area

The next section will describe the methods followed in this research.

3. Methodology

Methodology refers to the systematic framework and techniques for gathering, analyzing, and interpreting data to answer research questions. This section contains the context of this research, sampling technique, variables, data collection methods, data processing, and analysis.

3.1 Context

MRT Line-6 project from Uttara to Kamapur in Dhaka, the capital city of Bangladesh was selected for this study (Figure-1). The Government of Bangladesh (GoB) and the Japan International Cooperation Agency (JICA) jointly funded TK 21,985 crores for the project. Initially scheduled for July 2012 to 2024 as per the Development Project Proforma (DPP), but a special order from the Honorable Prime Minister's office aimed to complete the Uttara to Agargaon section by 2019 and the Uttara to Bangladesh Bank section by December 2020. These deadlines were not met, resulting in a one-year extension to December 2021. However, the project again failed to meet the deadline "(Dhaka Mass Rapid Transit Company Limited (DMTCL), n.d.; The Daily Star, 2019) as a result, the government mentioned MRT Line 6 is a fast-track government project and will be completed within 2024 (Adhikary & Byron, 2022). For the purpose of line extension from Motijheel to Kamapur, the project period increased to 2025 (Dhaka Mass Rapid Transit Company Limited (DMTCL), n.d.) and a 52.25% increase in project costs, or TK 11,487 crore, in revised DPP. At the end of the year 2022, the authority opened only a portion of MRT Line 6 from Uttara to Agargaon ("PM Opens Bangladesh's First Metro Rail," 2022).

Sampling

This study suites with Judgmental Sampling, a part of non-probability sampling (Pandey & Pandey, 2015), as this study interviews the officials linked with this project relating to the variables. Interviewees are from Dhaka Mass Rapid Transit Company Limited (DMTCL)-P1, Dhaka South City Corporation (DSCC)-P2, Dhaka North City Corporation (DNCC)-P3, Dhaka Transport Cooperation Authority (DTCA)-P4, Jahangirnagar University (JU)-P5, Bangladesh Sangbad Sanstha (BSS)-P6.

3.2 Variables

To identify the factors causing delays in MRT Line-6, the study took land acquisition, budget and finance, social and political aspects, planning and management in the perspective of project management, collaboration and integration of institutions, legislative issues, and capacity of the institution as variables.

3.3 Methods of Data Collection

This study employed content analysis, a qualitative method, to quantify the frequency of words, phrases, subjects, and concepts in written works. It aids in drawing a qualitative framework and exploring term meanings (Bhandari, 2020). It is flexible and verifiable and provides benefit for sorting and analysis. Key informant interviews (KIIs) used for collecting primary data. KIIs involve predetermined questions and strategies, but also encourage creative information gathering (Ineed Editorial Team, n.d.). Secondary data originate from journals, magazines, newspapers, project offices, and relevant websites.

3.4 Data Processing and Data Analysis

The study employed two coding steps: the First Cycle of Coding and the Second Cycle of Coding. In the First Cycle, In Vivo Coding technique was used, wherein participant language from data is used as codes, and in the Second Cycle, Pattern Codes method was

utilized to condense data into categories (Miles et al., 2014). Pattern Codes capture emergent themes, explanations, and configurations, synthesizing First Cycle coded material into more concise units (Miles et al., 2014). Lastly, the categories as described with rationality.

The subsequent section will present the findings and analysis.

4. Findings and Analysis

This section identifies, analyzes, categorizes and describes the factors from collected data of this study.

Table-1: First Cycle Coding - Primary Data (Description represents transcribed information)

ID	Descriptions	Codes
P1	¹ Line 6 faced construction delays. International contractors are responsible for construction, but directly blaming them is not much pointful. We ² had no experience implementing this type of project, and it is the first metro rail in Bangladesh. ³ Line extension from Motijheel to Kamalapur also extended the project period, but hopefully, we can finish the project within the extended DPP.	¹ Delay of contractors
		² Lack of institutional capacity
		³ Line extension
P2	I thought that ⁴ MRT Line 6 was delayed as Dhaka is a highly populated city that generates heavy traffic, and most of the lines go at the center of the roads, delaying the project's completion. ⁵ Locals, including engineers and the authorities, required time to adopt new technology as Bangladesh's first metro rail project. Besides, ⁶ Materials for MRT Line 6 need to import from foreign countries, which causes complexity and time consume more.	⁴ Pressure of heavy traffic on the city
		⁵ Lack of knowledge
		⁶ Material collection
P3	I had joined some meetings with DMTCL and thought that ⁷ multi-stakeholder (RAJUK, DNCC, DSCC, DMP, DWASA) engagement in MRT Line 6 project causes complexity that increases the project period— ⁸ bureaucratic complexities before declining as a first track project from Bangladesh Government. ⁹ Political problems and political instability, including decision changes and political strikes in specific periods in the country. ¹⁰ Shortage of local skilled human resources was unable when the government started the project as it was the first metro rail in this country.	⁷ Complexity among the stakeholders
		⁸ Bureaucratic complexations
		⁹ Political Issues
		¹⁰ Lack of skilled local manpower
P4	The institutional issues of MRT Line 6 are that ¹¹ DMTCL does not take any suggestions or permissions from DTCA, though DTCA is the regulating agency according to law. The Managing Director of DMTCL was a high government official; he is able to directly contact the government's higher authority. ¹² Multi-stakeholder causes legislative problems as many government institutions are directly engaged with this project.	¹¹ Complexity among the stakeholders

ID	Descriptions	Codes
	¹³ The procurement process of contractors and sub-contractors takes much time because each time new tender has to assign. ¹⁴ Design changes influence or pushes to change the contracts that increase the period. ¹⁵ Moreover, design changes push for searching for new contractors. ¹⁶ Lack of skilled local labor as it is the first metro project in Bangladesh. ¹⁷ The metro line and stations touched hospitals, parliament, airport, and other sensitive areas that caused delays in the design period.	¹² Legislative problems due to multi-stakeholders
		¹³ Assign new contractors
		¹⁴ Design changes
		¹⁵ Selection of contractors
		¹⁶ Lack of skilled local manpower
		¹⁷ Touched sensitive areas
P5	As an academician, I thought that MRT Line 6 was delayed for ¹⁸ inadequate capacities for a successful implementation of this type of project; ¹⁹ lack of clear definition of the implementing agencies' responsibilities and lack of coordination mechanisms and ²⁰ time management—besides, ²¹ inefficient implementation/delivery arrangements are institutional issues. Other reasons for the project delay are ²² frequent changes in the design of the MRT Line 6 route were the main challenges for the initiation of the project. ²³ Any minor changes required approval from the ministry through revised DPP. This bureaucratic system prolongs the approval process, and overall, the project is delayed.	¹⁸ Lack of institutional capacity
		¹⁹ Role of implementing agency
		²⁰ Wrong time estimation
		²¹ Quality of planning and management
		²² Design changes
		²³ Bureaucratic complexations
P6	DMTCL is implementing MRT Line 6 through the funding of JICA. The project was planned to complete within 2020, but unable to meet the deadline. ²⁴ Institutional limitations were also an important factor in this. MRT Line 6 was delayed for ²⁵ lack of Institutional capability as Bangladesh's first metro rail project. ²⁶ Lack of skilled local labor as it is the first metro project in Bangladesh. ²⁷ Land Acquisition problems and ²⁸ design change rapidly due to lack of institutional experience causing complexity in this project. ²⁹ Different international organizations were engaged in this project, which is why DMTCL failed to coordinate between them. As a result, the project is delayed. There are many other reasons for delaying the project. ³⁰ ³¹ A terrorist attack on Holey Artisan café in Gulshan killed 8 Japanese; as a result, foreign workers left the country. ³² Covid 19 Pandemic stopped the project in 2020. ³³ Land Acquisition complexity increases project cost and time. ³⁴ Line extension from Motijeel to Kamlapur creates complexity with Bangladesh Railway. ³⁵ Manage the traffic on the roads, pushes them to continue most of the work only at night.	²⁴ Institutional limitations
		²⁵ Lack of institutional capacity
		²⁶ Lack of skilled local manpower
		²⁷ Land acquisition problem
		²⁸ Rapidly Design changes
		²⁹ Bad qualities of planning and management
		³⁰ Dependency on foreign labor
		³¹ Safety and security concerns of foreign workers
		³² Covid 19
		³³ Land Acquisition
		³⁴ Line extension
		³⁵ Pressure of heavy traffic

Table-2: First Cycle of Coding - Secondary Data (Description represents gathered information)

Source	ID	Description	Codes
(SULTANA, 2022)	S1	³⁶ The company also finds problem convincing the existing contractors of the Mass Rapid Transit Line-6 (MRT-6) project to carry out the work on the extension part due to a variation in their work. Italian-Thai Development Public Limited Company known as ITD, two Japanese companies working under contract package 4 and 5 did not show interest in the proposal put forward by the DMTCL for the extension part. ³⁷ Necessary study and detailed design work on the Motijheel-Kamalapur part have already been done, the DMTCL could start the work on 1.16 kilometers without any delay if negotiations with the existing contractors are held and the BR and Dhaka South City Corporation (DSCC) give approval. Though the Bangladesh Railway verbally agreed to set up the Kamalapur MRT station outside the Kamalapur iconic building, it is dragging its feet over giving its nod to the design DMTCL submitted by integrating the design with BR's MMTH. When contacted, BR officials failed to give any reason for the delay.	³⁶ Less interest of contractors.
			³⁷ Complexity with Bangladesh Railway.
(Z. Ahmed, 2021)	S2	³⁸ We were progressing towards meeting the deadline, but the issue is with the foreign workforce. The Japanese consultants working on the project have to follow health rules and restrictions due to the pandemic. ³⁹ We also have to import materials from abroad. Much of the equipment requires on-the-spot inspections. But our consultants are unable to visit the site, causing delays. There are also problems with acquiring equipment and bringing foreign workers here due to embargoes imposed by certain countries. ⁴⁰ We also have to import materials from abroad. Much of the equipment requires on-the-spot inspections. But our consultants are unable to visit the site, causing delays. There are also problems with acquiring equipment and bringing foreign workers here due to embargoes imposed by certain countries.	³⁸ Health issues of Covid 19.
			³⁹ Restrictions of Covid 19.
			⁴⁰ Problems in material collection for Covid 19.
(Noman, 2020a)	S3	⁴¹ When the virus situation worsened, many local staff and workers also left the project sites as they were unwilling to work amid the pandemic. The authorities did not force them to work and the entire project gradually stalled. ⁴² The project was already delayed by a 2016 terror attack on Holey Artisan café in Gulshan – killing 22 people including seven Japanese nationals. Work on the Line 6 project was disrupted for six months following the attack.	⁴¹ Health issues of Covid 19.
			⁴² Safety and security concerns of foreign workers.
(The Daily Sun, 2021)	S4	⁴³ Although a portion of the Dhaka metro rail project was supposed to be finished in 2019-20 and was later rescheduled for 2021, it did not materialize as works were delayed due to Covid-19 wreaking havoc across the country.	⁴³ Restrictions of Covid 19.

Source	ID	Description	Codes
(Tunnels and Tunnelling, 2014)	S5	⁴⁴ Construction work on the Dhaka Mass Rapid Transit (MRT) 6 has been delayed due to lack of necessary Bangladeshi engineers	⁴⁴ Lack of skilled local manpower.
(Adhikary & Habib, 2022)	S6	⁴⁵ Although the project was approved in December 2012, its physical works could not commence before mid-2016 as the authorities had to complete detailed design and other preparatory works. Prime Minister Sheikh Hasina finally inaugurated the construction work of MRT Line 6 on June 26, 2016. ⁴⁶ Although the project was approved in December 2012, its physical works could not commence before mid-2016 as the authorities had to complete detailed design and other preparatory works. Prime Minister Sheikh Hasina finally inaugurated the construction work of MRT Line 6 on June 26, 2016. ⁴⁷ The works on MRT Line 6 halted after the attack, although the deceased Japanese engineers and consultants were involved with the feasibility study of MRT Line 1 and MRT Line 5 (Northern route). ⁴⁸ Physical work came to a halt again when the government imposed a shutdown in March 2020 to contain the spread of the coronavirus. The project saw only 0.55% progress in April and May that year. Many foreigners, especially Japanese, were unable to return to Bangladesh for work, severely hampering progress. ⁴⁹ In addition to these challenges, managing traffic during construction was a major concern for the project authorities. As a result, much of the work was done at night, with certain sections of busy roads, particularly in Mirpur, being blocked off. ⁵⁰ According to the original route plan, the metro rail line was supposed to run through Bijoy Sarani, but the Bangladesh Air Force objected to the route on Bijoy Sarani, arguing that it would be an obstruction to aviation-related operations from the Tejgaon airfield nearby during emergencies. ⁵¹ Later, the authorities realigned the metro line through the Khamarbari side of the parliament premises. In addition to the route, the authorities faced a similar problem in selecting a location for the metro rail depot. After two attempts, they were able to select Diabari as the depot.	⁴⁵ The long time period for the design.
			⁴⁶ Long time is required for preparatory work.
			⁴⁷ Safety and security concerns of foreign workers.
			⁴⁸ Restrictions of Covid 19.
			⁴⁹ Traffic congestion in the city.
(Mamun, 2022)	S7	⁵² We've taken all the preparations to print smart cards for collecting fares from metro rail users. We will not depend on the rapid pass as we don't know when it will be available. Our smart card must be available before launching the new metro service in Dhaka. We can supply smart cards as per the demand of the passengers," said MAN Siddique, managing director, DMTCL. While replying to a query, he said there will be a provision to use the rapid pass once it is available. Printing of smart cards for metro rail will start immediately after getting approval of the fare rate as the fare rate must be put into the software.	⁵⁰ Design changes of proposed roots.
			⁵¹ Design changes of proposed roots.
			⁵² Lack of coordination from the Rapid Pass Project Authority

Table-3: Second Cycle Coding (Codes categorized into factors influencing delay)

Codes	Factors	Codes	Factors
¹ Delay of contractors	Issues of the contractors	³ Line extension	Design changes
¹³ Assign new contractors		¹⁴ Design changes	
¹⁵ Selection of contractors		²² Design changes	
³⁶ Less interest of contractors.		²⁸ Rapidly Design changes	
² Lack of institutional capacity	Institutional issues	³⁴ Line extension	Design changes
⁷ Complexity among the stakeholders		⁴⁵ The long time period for the design	
⁸ Bureaucratic complexations		⁵⁰ Design changes of proposed roots	
¹¹ Complexity among the stakeholders		⁵¹ Design changes of proposed roots	
¹² Legislative problems due to multi-stakeholders		¹⁷ Touched sensitive areas	
¹⁸ Lack of institutional capacity		²⁰ Wrong time estimation	Low quality of planning and management
¹⁹ Role of implementing agency		²¹ Quality of planning and management	
²³ Bureaucratic complexations		²⁹ Bad quality of planning and management	
²⁴ Institutional limitations		⁴⁶ Long time is required for preparatory work	
²⁵ Lack of institutional capacity		³² Covid 19	Covid 19
³⁷ Complexity with Bangladesh Railway	Traffic pressure in the city	³⁸ Health issues of Covid 19	
⁵² Lack of coordination from the Rapid Pass Project Authority		³⁹ Restrictions of Covid 19	
⁴ Pressure of heavy traffic on the city		⁴⁰ Problems in material collection for Covid 19	
⁴⁹ Traffic congestion in the city		⁴¹ Health issues of Covid 19	

Codes	Factors	Codes	Factors
³⁵ Pressure of heavy traffic		⁴³ Restrictions of Covid 19	
⁵ Lack of knowledge	Lack of knowledge and skills	⁴⁸ Restrictions of Covid 19	
¹⁰ Lack of skilled local manpower		³¹ Safety and security concerns of foreign workers	Safety and security concerns of foreign workers
¹⁶ Lack of skilled local manpower		⁴² Safety and security concerns of foreign workers	
²⁶ Lack of skilled local manpower		⁴⁷ Safety and security concerns of foreign workers	
⁴⁴ Lack of skilled local manpower		⁶ Material collection	Material collection
³⁰ Dependency on foreign labor		⁹ Political Issues	Political issues
		²⁷ Land acquisition problem	Land acquisition
		³³ Land Acquisition	

4.1 Description and Rationale of the Explored Factors

4.1.1 Land Acquisition

From P6, the project encountered delays due to land acquisition problems. Acquiring private land through negotiations or legal proceedings increased project time. Additionally, the project requires more land than initially planned, furthermore, at Shewrapara and Kazipara stations, limited space for footpaths due to the dense population, requires additional negotiations or proceedings that caused delays (Sani, 2022).

4.1.2 Issues of the Contractors

The extended part of the project is experiencing delays for less interest from contractors. Current contractors are less inclined to participate in its completion (Sultana, 2022) in some projects. The reasons for this are not entirely clear, however, it is suggested that some contractors might be hesitant due to the risks and uncertainties associated with such a large-scale project, according to P1, P4. Furthermore, the government struggled with contractor selection as previous contractors declined to participate again (Sultana, 2022).

4.1.3 Political Issues

P3 mentioned that political problems and instability caused significant delays in the construction. The country faced political disturbances and crises, such as the 2014-2015 unrest, leading to violent protests and strikes, severely impacting the project. Mismanagement in the political system, lack of accountability, and transparency also contributed to delays.

4.1.4 Low Quality of Planning and Management

Adhikary & Habib (2022) reported a long delay in the MRT Line 6 project, despite approval in 2012. Construction commenced in June 2016 after extensive work, route planning, design, land acquisition, and funding (Railway Technology, 2023). P6 emphasized inadequate planning and management, while P5 identified delays stemming from incorrect time estimations and substandard planning and management due to the project's novelty in Bangladesh.

4.1.5 Design Changes

According to Adhikary & Habib (2022), the project encountered route alignment challenges. Initially proposed from Uttara to Sayedabad, the route was changed to avoid conflicts with the Mayor Mohammad Hanif Flyover. Subsequent changes resulted from objections by the Bangladesh Air Force, leading to rerouting via Khamarbari. The preparation and design phase took four years, highlighting the project's complexity. An extension to 2024-2025, including a new Kamlapur station mentioned by P1, introduced inefficiencies, necessitating fresh studies, designs, and tenders indicating substandard planning. P4 mentioned that the project touched sensitive areas, such as Dhaka University, the National Parliament, and the Tejgaon Air Field, leading to protests and design changes.

4.1.6 Lack of Knowledge and Skills

P3, P4, P6, and S5 identified unskilled and lack of experienced local labor and engineers in MIPs, a major hindrance to the project. Foreign companies involved in the project faced a shortage of skilled local manpower. Additionally, the dependency on foreign labor caused delays, as they often took long leaves to visit their home countries, resulting in low availability (Railway Technology, 2023).

4.1.7 Material Collection

According to P2, the construction of MRT Line 6 required importing many materials as they were not readily available. Importing materials involved bureaucratic procedures and obtaining permits and certifications, which were time-consuming and complicated.

4.1.8 Institutional Issues

P2 and P5 indicate significant delays due to the implementing agency's weak capacity, leading to unclear responsibilities and improper management of complexities, resulting in insufficient construction oversight. S1 points out bureaucratic complexities among project organizations causing decision-making complexities and led to delays. Moreover, conflicting stakeholder opinions and priorities, as highlighted by P4, complicate

adherence to regulations, laws, and policies. Approval delays from Bangladesh Railway and Dhaka South City Corporation for Motijheel to Kamalapur design have hindered project progress (Sultana, 2022).

4.1.9 Covid-19

According to S2 and S3, the construction has faced significant delays due to the Covid-19 pandemic. The physical work stopped in March 2020 during a government-imposed shutdown, severely affecting the project. The unavailability of many foreign workers to return to Bangladesh for work has further contributed to delays (Ahmed, 2021). Many local staffs and workers left the project sites due to the worsening virus, and equipment requiring on-site inspections faced delays, as consultants could not visit the site (Sultana, 2022). S2 and S3 indicated that the foreign workforce's strict Covid-19 guideline compliance significantly prolonged project delays.

4.1.10 Traffic Pressure in the City

Dhaka's congested roads and high traffic volume have posed challenges for constructing the metro lines expressed by P2 and S6. Blocking roads for construction work can lead to heavy traffic jams and risks for commuters. To minimize the impact, the authority carried out work mostly at night, particularly in busy areas like Mirpur (Adhikary & Habib, 2022).

4.1.11 Safety and Security Concerns of Foreign Workers

Adhikary & Habib (2022), asserted that the Holey Artisan attack in July 2016 significantly impacted the project. The tragic loss of 22 lives, including seven Japanese nationals, some of whom were involved with the project, affected the construction process (Noman, 2020). Work stopped for six months following the attack, likely due to heightened security measures, psychological trauma, and a backlog of work to complete stated by Adhikary & Habib (2022) and S6.

The section devoted to the discussion will follow right after this section.

5. Discussion

This study attempted to investigate the reasons for being delay in MRT Line 6 project and explored that land acquisition, issues of the contractors, political issues, low quality of planning and management, design changes, lack of knowledge and skills, material collection, institutional issues, covid-19, traffic pressure in the city, safety and security concerns of foreign workers are responsible for delay in this mega project (Figure-2).

MIPs faced many unknown challenges (Flyvbjerg, 2014), the MRT line 6 project also exhibited a similar nature, with challenges including the impact of Covid-19, congested roads and high traffic volume in Dhaka city, and safety and security issues concerning foreign workers. These challenges were unforeseeable at the project's initiation, necessitating mental and physical preparedness on the part of all involved institutions and organizations to effectively acknowledge and overcome such hurdles. Flexibility in project timelines was imperative to effectively solve these challenges, on the contrary the

government exerted pressure on the implementing agency to speed up project completion, leading to the reduction of the original timeline.

Issues of the contractors, institutional issues, design changes, low quality of planning and management, material collection, land acquisition factors also explored by (Ezzat Othman, 2013; Fallahnejad, 2013; Flyvbjerg, 2014; Han et al., 2009; Islam et al., 2015; Mizanur et al., 2014; Oyegoke & Kiyumi, 2008; Patil, 2013; Qiu et al., 2019) in previous. The implementing agency must draw insights from existing literature and prior experiences. They are accountable for these delay reasons, they should development of a comprehensive strategy to address and overcome from these challenges.

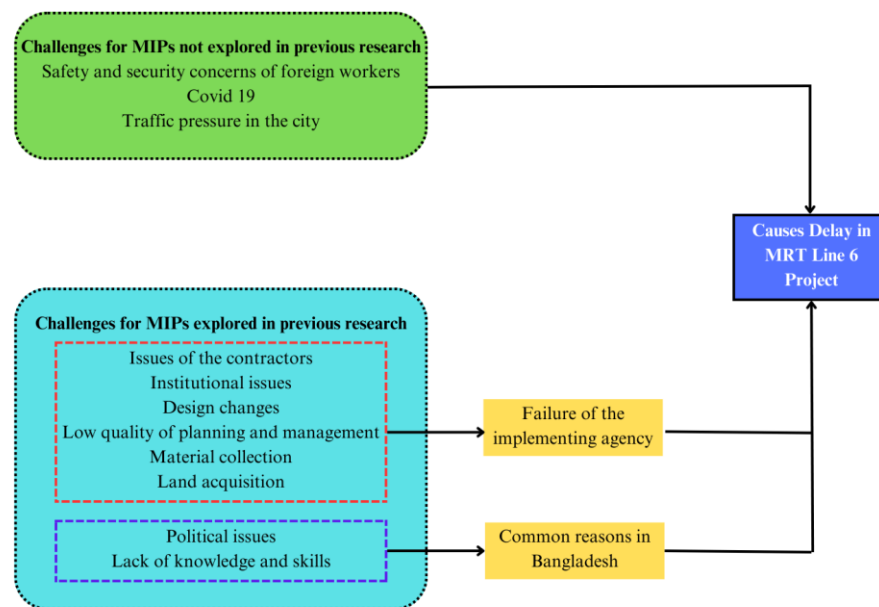


Figure 2: An overview of delays reasons of MRT Line 6 project

Political issues also claimed by (Mizanur et al., 2014) is very common problem implementing projects in Bangladesh. Political instability including widespread protests, strikes, violence, corruption, and mismanagement delay MRT Line 6 project, political instability increases the complexity of MIPs argued Ezzat Othman, (2013). Lack of knowledge and skills in local engineers and works are also a very important reason for delaying the project, (Ezzat Othman, 2013; Islam et al., 2015; Oyegoke & Kiyumi, 2008) also supported this finding.

Insufficient knowledge and experience are not limited to local workers and engineers; the implementing agency also exhibits this knowledge deficiency in executing the MRT Line 6 project. With a clear vision and robust capabilities, the project could have avoided such delays. Shortening the construction timeline constitutes a significant planning and management mistake in the context of MIPs. The implementing agency holds a crucial responsibility in establishing and adhering to project deadlines.

The study has potential to enhance project management and implementation in Bangladesh and other nations, especially for developing nations, aiding future MIPs and informing resource allocation for policymakers. It offers insights into infrastructure development successfully. While relying on six interviews and secondary sources, it may limit insights; more interviews could reveal additional factors, including changes in donor agencies. The study solely explores MIP delays, lacking mitigation suggestions. Future research should focus on strategies to reduce delays and uncertainties which will help to reduce extra expenses.

6. Conclusion

The MRT Line 6 project in Bangladesh serves as a vivid example of the complex challenges that mega infrastructure projects (MIPs) often face. This study investigated into the project's delays and identified key factors responsible behind this delay. Land acquisition, issues of the contractors, political issues, low quality of planning and management, design changes, lack of knowledge and skills, material collection, institutional issues, COVID-19, traffic pressure in the city, safety and security concerns of foreign workers are the factors responsible for delaying MRT Line 6 project. In conclusion, this research sheds light on critical aspects of project delays, contributing to the advancement of effective project management practices and infrastructure development strategies. This investigation highlights the need for meticulous planning, robust risk management, and bolstered local capabilities in executing MIPs. By learning from these challenges, future projects can aspire to achieve smoother implementation and make more significant contributions to the nation's development.

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