Journal of Engineering, Project, and Production Management
2024, 14(3), 0023

Pipeline Projects: Matters Arising in the New Zealand Construction Industry

Taofeeq Durojaye Moshood[1], James Olabode Bamidele Rotimi[2], and Wajiha Shahzad[3]
[1]PhD Student in Construction Management, School of Built Environment, Massey University, New Zealand, E-mail: tmoshood@massey.ac.nz (corresponding author).
[2]Professor, School of Built Environment, Massey University, New Zealand, E-mail: J.Rotimi@massey.ac.nz
[3]Senior Lecturer, School of Built Environment, Massey University, New Zealand, E-mail: W.M.Shahzad@massey.ac.nz

Project Management
Received May 22, 2023; received revision May 30, 2023; accepted November 11, 2023
Available online September 27, 2024

Abstract: The construction industry in New Zealand has undergone significant growth in recent years with an active commercial sector and ongoing infrastructure development projects. However, the industry has faced criticism due to failures, particularly in pipeline projects involving public infrastructure due to its underperformance, unnecessary postponement, and delay. This study, utilizing data from a ten-year plan of the Palmerston North City Council and employing document analysis techniques, examined the issues that have arisen in New Zealand's pipeline projects. The study identified government legislation, workforce, finance, and materials as major factors for the industry's underperformance. To address these issues, the study proposes various strategies and plans to improve the industry's stability; the proposal has practical implications for government and development agencies seeking the implementation of effective strategies for future projects. Furthermore, findings highlight the need for improved collaboration between the government and the industry's stakeholders, particularly in developing effective regulatory frameworks and ensuring a skilled workforce. The study provides valuable insights into the construction industry's challenges and opportunities in New Zealand, and underscores the importance of adopting a strategic approach to infrastructure development. The proposed strategies and plans can help to improve the industry's performance, thus contributing to sustainable growth and development in the sector.

Keywords: Construction, Pipeline Projects, Delays, Enablers, New Zealand.

DOI 10.32738/JEPPM-2024-0023

1. Introduction

The New Zealand government is a significant client in the construction business with a focus on developing basic infrastructure such as roads, dams, drainage systems, educational institutions, residences, and industrial facilities. According to Lessing et al. (2017), these developmental efforts are designed to raise the living standards of the general public. The provided budgets by the government are significant, yet several public projects are not functioning well due to poor implementation of programmes (Cielo and Subiantoro, 2021). On the supply-side, the construction sector grapples with operational challenges which further hamper well-intended efforts towards national growth and development. For example, du Plessis and Simpson (2021) outlined some of the challenges facing small and medium-sized construction enterprises in New Zealand thus: scale, finance, regulatory and resource challenges. Furthermore, Ogunlana et al. (1996) submit that three issues arise within significant construction activities. These issues are problems resulting from inadequate industrial infrastructures (primarily the supply of resources), problems resulting from the actions of clients and consultants, and problems resulting from the actions of incompetent contractors (Assaad and El-adaway, 2021).

An important objective for setting up the Construction Sector Accord is to create a "high-performing construction industry for a better New Zealand" where safe and durable houses, buildings, and infrastructures are produced by a productive, competent, resilient, and proud sector for the welfare of New Zealanders (BDO, 2021). This demonstrates the relative importance of the construction industry within the national economy (BDO, 2021). In spite of the construction industry's resiliency, the sector remains vulnerable to ongoing cost pressures and demand risks (New Zealand Infrastructure Commission, 2022), having influence on its ability to effectively deliver pipeline and ongoing projects. Post Covid realities have exacerbated the construction industry's challenges.

Construction project outcomes are influenced by functionality, fitness for purpose, lack of claims or legal action, contractor profitability, among others (Majid, 2006). The definition of a project's success depends on various criteria such as the golden triangle of time, money, and quality (Ghandour, 2020). Nevertheless, the term "project success" can be viewed in various ways by various individuals depending on the circumstances. Each client, consultant, contractor, designer, and subcontractor has an idea of what constitutes a successful project. Chan and Chan (2004) describe project success as relying on a variety of criteria, such as the type of project, the magnitude and sophistication of the project, the number of project participants, and the skill of the project owners. Nevertheless, in construction projects, researchers opine that the so-called golden triangle consisting of the three components, time, money, and quality, are significant in the assessment of project success (Abdullah et al., 2010; Endut et al., 2009; Sambasivan and Soon, 2007).

Additionally, completing projects within their allocated cost, timelines, and performance standards is becoming extremely important in today's increasingly competitive economic world (Durdyev and Hosseini, 2019). However, delays are a common concern and cause of cost and schedule overruns, lower-quality deliverables, and litigations (Jatarona et al., 2016). Furthermore, delayed, deferred, or postponed construction projects slow down the pace of economic activities and has an impact on national growth and development targets; this delay has a high possibility of resulting in government's economic costs. In addition, such projects portend damages to the reputation of the parties associated with the construction work (Abdullah et al. 2010). Therefore, it is important to investigate the challenges experienced in pipeline construction projects in New Zealand because of the deficits that may result from the inability to provide local infrastructure and other public service facilities, such as water, roads, bicycle pathways, footpaths, sewerage, garbage and recycling, parks and sports fields, leisure centres, libraries, swimming pools, civil defence, and social housing units.

Identifying the most critical factors that contribute to delays, deferment and or postponement of pipeline projects in New Zealand will aid decision-makers working in this sector to develop strategies that reduce the causes of project failure and contribute to the successful achievement of a project's objectives. The current study pursues three interrelated objectives: (1) to review the performance of some critical projects within a local council; (2) to provide some logical explanation of the challenges associated with pipeline projects undertaken by the local council; and (3) to recommend mitigation strategies for underperforming critical projects.

2. Literature Review

2.1. Overview of New Zealand's Pipeline Projects

A pipeline project is a collection of initiatives that must be successfully planned, launched, tracked, and assessed after they have been completed (Castagnino et al., 2020). Maintaining consistency in the project pipeline process is essential so as to ensure that projects have agreed-upon dates, team members are allocated to a particular job to ensure unambiguous statuses and to precisely maintain project information (Luo and Shahzad, 2020). Project pipeline management is essential to the success of each pipeline's projects. The New Zealand construction sector had an average annual growth rate of 6.6% from 2016 to 2019. The COVID-19 virus pandemic was predicted to cause the industry to expand by 7.3% in real terms in 2020 (Construction in New Zealand H1, 2021). The economic instability and difficulties that resulted from the government's stringent limitations in the first half of the year, as well as the following economic uncertainty and weakness, significantly influenced the amount of activity conducted in the industrial/construction sector. Aside from that, the financial crisis was worsened because of delays in the completion of projects and the reallocation of a portion of the government's budget towards mitigating the COVID-19 epidemic.

A 12.2 per cent increase in the construction industry in New Zealand is expected for 2022, an increase from the earlier forecast of 6.2 per cent growth. This indicates how well it has been able to limit the spread of COVID-19. The fact that building activity has remained strong in the face of the COVID-19 pandemic and is anticipated to continue in that manner, reopened the country's domestic economy. Construction projects that had been put on hold have now been restarted, thus increasing the growth prediction from the prior estimate of 7.8 per cent in 2021 (BDO, 2021). According to their calculations, Statistics New Zealand believes that the value generated by the building industry increased by 25.9 per cent in the first six months of 2021. For the first time, the government stated its desire to support substantial shovel-ready infrastructure projects to spur economic development and to assist the construction industry during the early stages of the pandemic. Thus, the government established the Infrastructure Industry Reference Group (IRG) in April 2020 to identify infrastructure projects that could be started as soon as authorization to commence construction activity was obtained. IRG received applications for 1,900 projects totalling NZD136 billion (US$79.3 billion) in response to the publication of the IRG's Q2 2020 report. The IRG selected 246 projects for financing, with each project receiving a total of NZD2.6 billion (US$1.5 billion) as support from the government. The combined estimated value of the projects was NZD4.7 billion (US$2.7 billion) (Construction in New Zealand H1, 2021).

The industry is expected to grow by an average of 3.6 per cent per year during the five years (2022-2025), due to the rising investment in infrastructure, the financial sector, and renewable energy initiatives. During the 2021 Wellbeing Budget released in May, Grant Robertson, Finance Minister of New Zealand, indicated that infrastructure investment between 2021 and 2025 will reach NZD57.3 billion (US$41.2 billion). The New Zealand Transport Agency, which accounts for a quarter of the total, will spend NZD13.9 billion (US$10 billion) on public transit and roads. Aside from that, the government has committed a total of NZD4.7 billion (US$3.4 billion) to healthcare, as well as an extra NZD746.8 million (US$537.2 million) in capital spending on education, which will be spread over a period of four years (BDO, 2021). As a result of New Zealand's construction project plans, which will be integrated with Green Investment Finance to achieve the country's 2035 objective of 100 per cent renewable energy usage, the construction sector is expected to grow (Construction in New Zealand H1, 2021).

Palmerston North continues to expand and develop into the top regional city in New Zealand. The concept of 'Small city advantages, Big city ambition' was included in the most recent 10-Year Plan published in 2018. This audacious goal aims to create a sustainable eco-city with a developing, innovative, sustainable economy and a lively regional destination that is creative, comfortable, well-linked, and safe (BDO, 2021). One of the council's most important responsibilities is the provision of infrastructure for the city. This includes transportation, storm-water management, wastewater treatment, real estate, and recreational assets. All these factors contribute to achieving economic, social, cultural, and environmental well-being. The overall replacement cost of this infrastructure is estimated to be around $2 billion. However, infrastructure is expensive to maintain; maintenance costs are approximately $21 million each year. The government acknowledges the need to spend more money maintaining and updating infrastructure to continue providing the day-to-day services that people demand. Over the subsequent several years, the government has proposed to step up the renovation and maintenance efforts (Construction in New Zealand H1, 2021).

There are specific gaps in the council's information concerning the status of its assets. Therefore, rather than having unique knowledge of the assets, the increased expenditure on renewals and maintenance has been based on the age of the asset and industry's best practices rather than on the assets themselves. Councils are focusing more on gaining a more profound knowledge of the state of their communities. The city needs to submit a resource consent application for a new wastewater treatment facility by June 2022 to receive approval. This is included in the 10-Year Plan at the cost of $350 million (plus inflation). It is the most significant financial and environmental choice the city will make in its history (Construction in New Zealand H1, 2021). Councils are responsible for managing drinking water, wastewater, and urban storm-water. According to a three-year initiative to restructure local government, three waters service delivery arrangements were designed to bring about improvements. The government proposed the establishment of a limited number of multi-regional bodies to control water and wastewater (the approach to storm-water is yet to be decided). This would have positive impact on who would be in charge of developing, financing, and operating the new wastewater treatment plant, as well as who would be in charge of upgrading and maintaining water infrastructure. The city possesses assets, with a replacement value of around $2 billion, which are sufficient to accommodate significant population development. Upon increasing its investment in asset management planning, the council has improved the condition evaluations of its infrastructure assets over the last few years. After considering the available information, the council has determined that it needs to increase its asset maintenance and renewal spending.

The council also decided to reduce its budgeted operating expenditure for 2020/21 while increasing rates by 1.95 per cent rather than the 4.4 per cent increase proposed initially in recognition of the potential loss of income from a range of services, considering that many people in the community may have uncertain income as a result of Covid-19. The result is that the council must make up for a lost time by increasing its operational expenditure allocations for various programmes and initiatives (Construction in New Zealand H1, 2021). Assuming that the statewide lockdown will not be repeated and that supply lines for goods and services will stay open, the 10-Year Plan was developed. There are more and more examples of international interruptions to these channels. The result is that commodities are either unavailable when needed or if they are accessible, the cost (particularly the transportation component) would have escalated significantly.

2.2. Problems in New Zealand's Pipeline Projects

The New Zealand government is committed to advancing the national economy. Several transformations have been developed and implemented to ensure the success of all pipeline initiatives (Abdullah et al. 2010). These transformations, including pipeline initiatives in New Zealand, are no exception to the challenges that have been discussed previously (Castagnino et al., 2020). Many pipeline projects have been identified as being behind schedule, over budget, and failing to meet specifications. Due to functional changes that occur throughout project execution, it is necessary to make revisions to the requirements and deliverables, resulting in increased costs and delays (Ramachandra and Rotimi, 2015). This study holds the view that cost growth is a crucial element of project performance since cost overruns are one of the most serious financing difficulties in the construction industry (Jatarona et al., 2016). Project execution failure has a detrimental effect on a country's economy since the outcomes of pipeline projects are substantial in nearly all other sectors, eventually leading to the misuse of public resources. The current condition of numerous pipeline projects has been described as incomplete, over budget, without adherence to contract requirements, not functionally acceptable, and not fulfilling the necessary quality standards. Other pipeline projects are experiencing delays and not reaching specifications, and some are experiencing challenges with quality control and assurance (Sanni-Anibire et al., 2020).

As a result, some firms are already incurring losses on projects where profits were anticipated. Others are making efforts to find a solution that allows them to win work without committing themselves to unquantifiable cost increases. Many have already had a rethink and modified how they negotiate and manage this risk for new projects, while others are still trying to find solutions. The industry has not yet come up with a workable answer (Jatarona et al., 2016). A second significant difficulty, well-known and not specific to the construction industry, is a severe scarcity of qualified workers to fill open positions (Yong and Mustaffa 2012). Significant increases in salaries and wages, as well as other measures, have been implemented by employers to try to keep their employees. However, these modifications do not result in the rapid production of more skilled labour that the sector solely requires.

The sector has responded quickly to these issues by rethinking and implementing new tactics. Procurement teams track individual shipment moves to keep track of their materials' location. They identify alternate providers if their current supplier cannot meet their needs. Materials are ordered and stored months before they are needed (Babaeian Jelodar et al., 2021). Despite the new processes implemented to control project delays, the problems have become increasingly difficult to resolve. This will necessitate a rethink and revision of contract conditions to ensure that risks are not unjustly borne by a party who has followed best practice processes but cannot obtain the materials required on time. Organizations must

determine whether or not they will decline some forward work to maintain current activity levels and manage their workforce within their capacity to do so effectively (Shahzad et al., 2021). Alternatively, by taking on new projects, businesses suffer the danger of not finding enough qualified employees to manage and complete such projects correctly, resulting in financial losses. The combination of factors such as material delays, inflation, and the inability of all project participants to secure the required staff resources might have influenced growth and resulted in losses.

3. Research Materials and Methods

The data needed for this research was gathered methodically from reliable sources. The information was obtained from many databases, such as Scopus, Web of Science, and Google Scholar. A description of the delay in construction projects literature is provided in this study. This article used qualitative and analytic techniques in gathering, processing, and evaluating the data. The study's objectives were met through content analysis techniques (Fauzi, 2019) because it is easy to use content analysis to detect the existence of specific keywords, ideas, or a set of texts in a manuscript. In this particular study, a four-step technique that adhered to a similar methodology was utilized. These steps included identifying the data, filtering the original data, determining eligibility, and finally including the data. The collection of this data is necessary so as to give insight and future directions for research (Fahimnia et al., 2015; Malviya and Kant, 2015). Data was collected in conjunction with the issues that arose during the execution of various pipeline projects.

In addition, researchers have proposed a systematic and objective technique that may be replicated, namely, the approach outlined to lower pipeline project risks and issues. In the opinion of Tranfield et al. (2003), examining literature may be essential to any research involving human subjects. Researchers conducted mapping and analysis of significant problems that need to be explored, resulting in the production of questions that contribute to the improvement of pipeline projects in New Zealand. By using prior research, the current reality may be improved upon and better prepared for the near future (Webster and Watson, 2002). For the long-term benefit of those using this research as a strategic model in guiding pipeline projects, it is essential to use the gaps discovered through this literature review to provide insights and direction (Moshood et al., 2020). The research serves as a source of insights and direction for those who would use the research as a strategic model to guide pipeline projects (Tranfield et al., 2003). Therefore, the ATLAS.ti 9 software package was considered adequate for storing, categorizing, and evaluating evidence in this study (Moshood et al., 2021). It is regarded as a powerful workbench for qualitative analysis where large bodies of textual and graphical data are involved.

4. Results and Discussion

Identifying the faults in New Zealand's pipeline projects necessitated the use of keywords found in the reasons for the delays. Furthermore, any thoughts or words from papers that are relevant to this topic were recorded and documented in detail. For each pipeline project, several variables were taken into consideration, such as the initial contract amount, the contract extension cost, the beginning, and ending dates, the construction phase time frame, and the final completion time frame, as well as the factors that may have caused the construction project's delay. Afterwards, these elements were investigated and categorized according to the phases and stages that led to the failure of the pipeline project in New Zealand. The variables that caused problems in pipeline-building projects in New Zealand are summarised in Fig. 1.

Consequently, among other things, the government must take necessary steps to ensure that previous errors are not made in subsequent projects. As a reminder, the difficulty indicated above is similar to the problem that pipeline projects are experiencing right now (Radman et al., 2021). Furthermore, the same issues continue to arise in practically every public initiative despite efforts to address them (Jatarona et al., 2016). This indicates that New Zealand has not drawn any conclusions from her previous experience. The implications of these issues for New Zealand and taxpayers must be considered since they will ultimately bear the resultant brunt of the late delivery of the pipeline projects.

Product shortages and severe inflation in both material costs and labour are among the most serious concerns identified in the 2021 study. Notably, there have been supply shortages; we are witnessing an increase in construction companies buying goods before they are needed and hoarding them (Jatarona et al., 2016). For those who can obtain the materials, this is advantageous. Still, it makes life more difficult for others who cannot, and the ensuing imbalance in supply contributes to the problem, thus driving inflation even higher (Shahzad et al., 2021). Most contracts have fixed pricing, and the inflation rate has surpassed estimates, causing gross margins to be severely eroded (Radman et al., 2021).

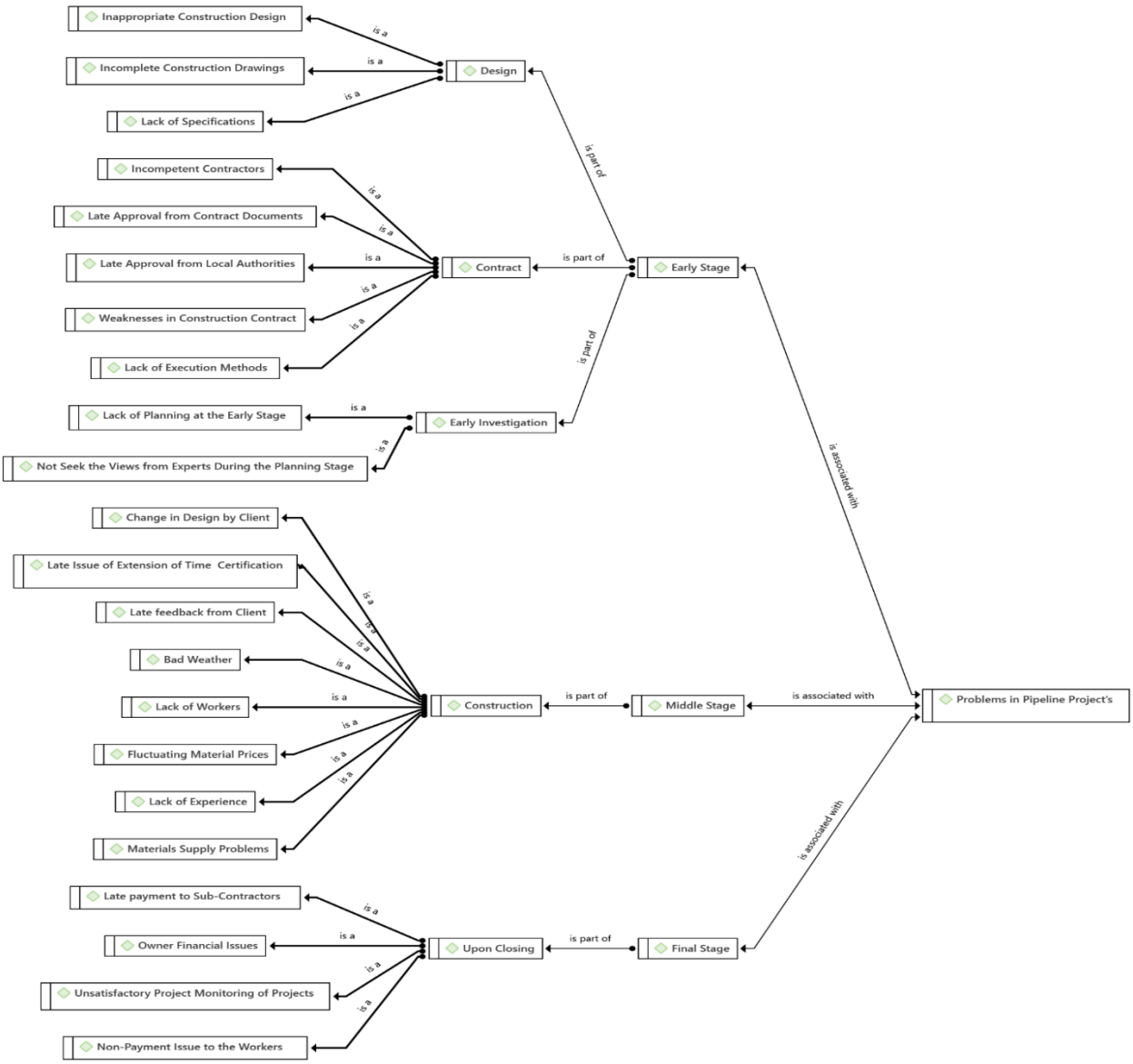

Fig. 1. Problems classification according to phases in pipeline projects

The construction industry's performance, particularly in public construction projects, has long been questioned. Several suggestions for improvement have included the preparation of proper project planning, the identification of project requirements from users and authorities before beginning work on projects, and the assurance that the committee has approved 'amendments to work' guidelines before work begins or before payments are made, and the expansion of the committee's supervision and monitoring of work on construction sites. It has been reported that the pipeline project did not meet the requirements of the Project Management Iron Triangle (time, cost, and quality). Additionally, it is said to have struggled with several other issues, such as a delayed approval for an extension of time (EOT), insufficient specific requirements and drawings, and modifications made by the owner at the same time the project was being carried out. Fig. 2 depicts pipeline construction projects' four most important challenges and concerns.

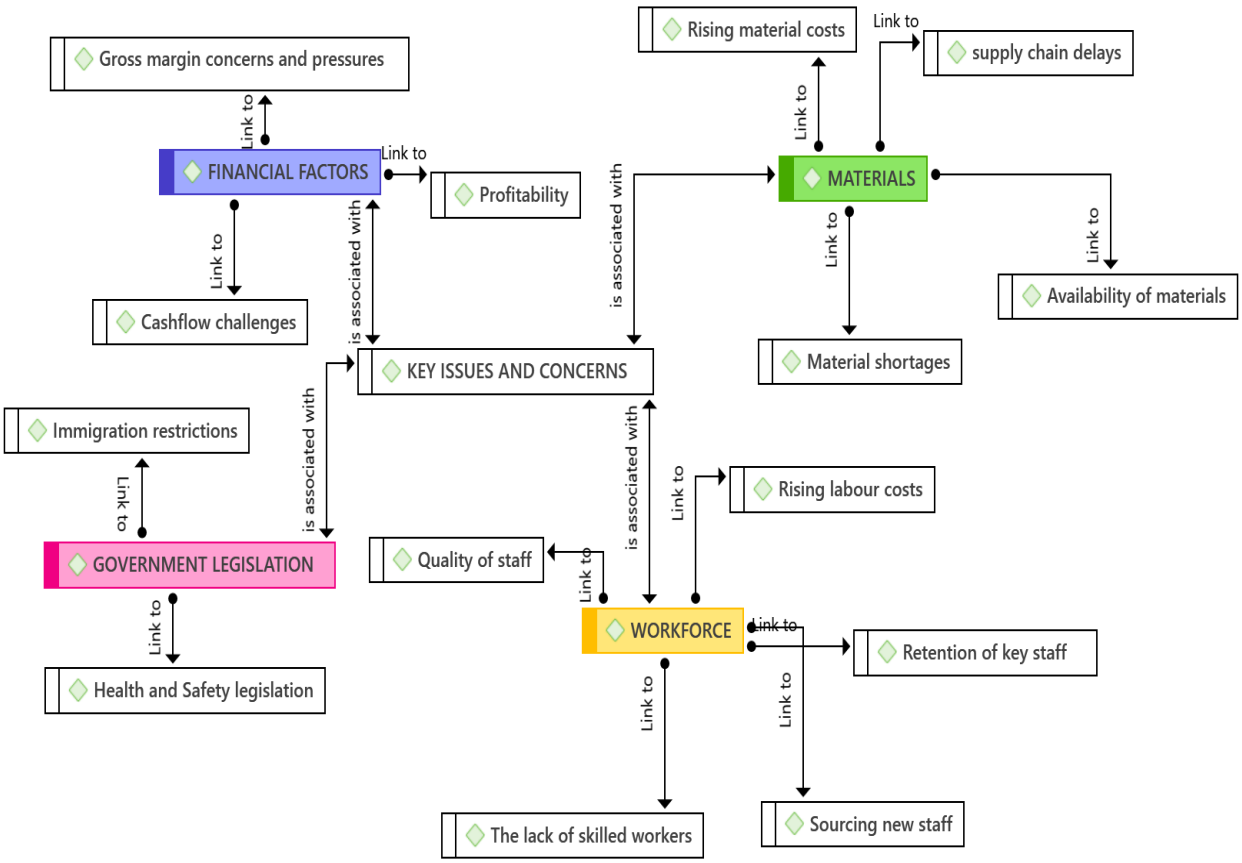

Fig. 2. Four priority areas in pipeline project performance

There have only been a few studies to date that have examined the general issue faced by public construction projects around the world. One such study by Yong and Mustaffa (2012) reexamined a construction project in Malaysia. Still, their research was focused on private industry rather than public organizations. Other studies, such as those done by Wei, (2010) and Sambasivan and Soon (2007), concentrated on problem-related issues in the construction sector, such as delays, cost overruns, and labour productivity. In accordance with previously published findings, the data from these early results indicate that pipeline construction projects in New Zealand are experiencing underperformance issues. Therefore, this article emphasizes the factors that caused pipeline construction projects in New Zealand to perform below expectations. It hopes to serve as the basis for future studies attempting to address the poor performance difficulties associated with pipeline construction projects in New Zealand. It is important to remember that the factors that have been identified are critical factors that must be focused on and controlled because they have the potential to cause a larger problem in the construction industry in general, and in New Zealand in particular. This situation is supposed serve as a reminder to those involved in pipeline construction projects in New Zealand.

5. Conclusion

Findings from this study have established that pipeline projects have been plagued by low-performance as a result of delays, poor planning, and poor quality. The recurrence of the issues throughout this report suggests that no investigation or attempt has been made to discover the underlying reason for the challenges. If this situation persists in the sector, it will lead to low quality of the public project. Furthermore, several low-performance factors that should be addressed during each phase of the construction process were identified as follows: preliminary research, early investigation/contract/design/closing phase/construction, and after-closing phase. It is vital for professionals working in the construction sector to quickly address the factors causing low-performance before they become uncontrollable in the construction industry. The end-users of the various structures will undoubtedly bear the consequences of poor construction. It is very clear that if construction projects are not properly built and completed at the right time, the public could become upset because they do not enjoy the facilities paid for through taxes. For this reason, there is a high possibility that this situation may result in the public's distrust in the government's construction companies because of their inability to properly and effectively manage the country's construction sector, thus denting its image.

In order to prevent this from happening, the government must resolve any issues that may have a negative impact on its reputation. It is therefore recommended that practicable steps be taken to deal with all the identified problems so as to drastically reduce the possible factors that are having a negative impact on the operations of pipeline projects. In the process of constructing public structures, it is very important for the New Zealand government to ensure that its development policy or strategy regarding construction is properly monitored and effectively carried out. Based on the

findings and analysis of this study, it is obvious that future research may concentrate on creating strategies for a process model that can be utilized and implemented in all industrial sectors, including the construction industry.

Author Contributions

Conceptualization: Taofeeq D. Moshood, writing—original draft preparation; James O.B. Rotimi, writing—review and editing; Wajiha Shahzad, review and methodology. All authors have read and agreed to the published version of the manuscript.

Funding

The authors gratefully acknowledge the generous financial support the CanConstructNZ research program provides through the Ministry of Business, Innovation, and Employment (MBIE) Endeavour Fund, administered within the School of Built Environment at Massey University.

Institutional Review Board Statement

The study was evaluated by peer review and judged low risk. The Ethics notification number for this project is 4000023852, and the low-risk notification is valid till 2025.

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Taofeeq Durojaye Moshood is currently a PhD fellow in construction project management at the School of Built Environment, Massey University. He badged his master's degree in construction project management from Universiti Malaysia Pahang in 2019. During his master's degree, he served as a research assistant in many national projects at Universiti Malaysia Pahang. He also served as a technical committee member at the first international conference on business intelligence, industrial engineering, and management (ICBIIEM 2018) at Universiti Malaysia Pahang in 2018. His current research focuses on the pipeline construction project in New Zealand. His research interests include Sustainability Related Issues, Sustainable Projects Management, Risk Management, Issues in Construction Industry, and Organizational Control. He has published in many international journals such as Safety Science, Safety Research, Journal of Cleaner Production, Sustainability, International Journal of Construction Management, Journal of Retailing and Consumer Services, Critical Review in Biotechnology and so on. Currently he is being supported by a scholarship from the CanConstruct Research Project through MBIE-funded Research Programme at Massey University in New Zealand.

Dr. James O. B. Rotimi is a Professor in the School of Built Environment, Massey University, New Zealand. He is also a visiting Professor in the School of Construction Economics and Management, University of the Witwatersrand, Johannesburg, South Africa. James has qualifications in building construction management, civil engineering, commerce and education. He is a Fellow of the Chartered Institute of Building UK and holds professional membership of the Royal Institution of Chartered Surveyors, UK, New Zealand Institute of Building, Facilities Management Association of New Zealand, and the Nigerian Institute of Building (NIOB). James' researches have focused on improving performance within the construction industry, integrating its supply chain and optimizing the achievement of construction and project deliverables. He has over 29 years of tertiary teaching and research experience in academic institutions in Nigeria, UK, South Africa and New Zealand. He also has various building construction industry experiences, including a senior associate role in a quantity surveying consultancy in Nigeria. James publishes extensively within peer-reviewed journals and conference proceedings and in edited books. He is the Founding Editor of the International Journal of Construction Supply Chain Management IJCSCM (Q3), established in 2011.

Dr. Wajiha Shahzad is a highly experienced academic with over 15 years of academic and construction industry experience. Currently, she is a senior lecturer in Construction Management at the School of Built Environment, Massey University in New Zealand. Her expertise includes construction management, productivity, and modern methods of construction, with a specific focus on offsite construction. Her research has been recognized for its positive impact and novel contributions to the field of offsite construction. She has published various quality-assured journal papers, conference papers, book chapters, and industry reports. Her work has played a significant role in shaping policies surrounding the advancement of the construction industry in New Zealand.