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Key Factors that Lead to Late Completion of Government Funded Construction Projects in South Africa

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Abstract

Project schedule overruns are a significant problem in South Africa and globally. This research investigates the factors that cause the late completion of government funded construction projects in South Africa and the mitigation measures that may be implemented to minimize the delays. The research is anchored in the Project Management Book of Knowledge (PMBOK) as a theoretical framework and the research employed a quantitative research design. Primary data was collected from built environment professionals registered with the South African Council for Project and Construction Management Professionals through an online questionnaire survey. The results indicated that the top five ranked project delay factors include poor performance of contractors, labor unrest and strikes, slow decision-making, poor project planning and rework due poor quality. The top five mitigation measures noted by the respondents appeared in both the literature review and the PMBOK framework, and include the use of competent contractors and professional service providers; securing project funding before the start of a project; proper project planning and the use of comprehensive project plans; the implementation of comprehensive change management systems, and effective stakeholder management.

Keywords
Construction Projects, Schedule Delays, PMBOK

1. Introduction

The construction industry plays an important role in the growth of the economy of any country and South Africa is no exception. Economically, construction contributes significantly towards the gross domestic product (GDP of a country (Construction Industry Development Board (CIDB), 2017) and in South Africa, infrastructure projects contribute 7% the national GDP (National Treasury, 2016). According to the South African Mid Term Expenditure Framework (SAMTEF) released by the National Treasury in 2016, the country spent ZAR865.4 billion on infrastructure projects from 2013 – 2016. The report further states that the government planned to spend ZAR900 billion on infrastructure from 2019 - 2021 (National Treasury, 2016). The past and planned expenditure indicates the importance of infrastructure projects towards economic growth in South Africa.

Apart from the contribution of the construction industry to the GDP and the growth of the economy, the industry contributes significantly to job creation for both the formal and informal sectors. According to the CIDB construction monitor report (2017), the industry contributes 10% to South Africa's employment index. The 2030 National Development Plan (NDP) indicates that the South African government plans to reduce unemployment by 6% through the implementation of infrastructure projects until 2030. Hence, it is important to manage projects well and complete projects timeously given the signficant resources invested in government projects (Construction Industry Development Board, 2017).

Government funded construction projects are completed late in South Africa and this has a significant impact on the economy of the country (Muriwa and Bekker, 2017; Khumalo et al., 2017). If infrastructure projects are delayed, it means that the growth and economy of the country are also delayed. Gaetsewe, Monyane and Emuze (2015) revealed that, due to construction delays, the construction of the new Kimberly Mental Hospital cost the South African government an additional ZAR189 million compared to the baseline project budget. Cruywagen (2012) indicated that the majority of roads and infrastructure projects implemented by the City of Tshwane are completed late. Baloyi and Bekker (2011) concluded that even though the FIFA 2010 World Cup stadiums were finished before the start of the competition, these stadiums encountered many schedule delays with consequent cost escalations.

The objectives of the research were twofold, namely to determine the key factors that lead to the late completion of government funded construction projects in South Africa; and to identify the mitigation measures that may be implemented to minimise these delays.

2. Literature Review

2.1 Delay factors that lead to late completion of construction projects

Mukuka, Aigbavboa and Thwala (2015) indicate that construction delays do not only occur in South Africa, but remains a global challenge with many countries failing to complete construction projects timeously. This may be due to the nature and complexity of the project activities as well as additional external factors. The authors also found that construction delays affect both developed and developing countries. Mukuka, Aigbavboa and Thwala (2015) studied the consequences of schedule delays in construction projects in South Africa and found that these include litigation, extension of time claims, project cost overruns, stress of clients and project teams and poor company reputation.

Khumalo, Choga and Munapo (2017) investigated the challenges affecting the infrastructure delivery in the KwaZulu-Natal province of South Africa and focused on the Independent Development Trust (IDT) as a case study. They found that major causes of delays are late payment of contractors and service providers, lack of adequate project planning, low levels of professional ethics and a lack of conformance to standards within the built environment. Marzouk and El-Rasas (2014), Kikwasi (2012), and Khumalo et al. (2017) rated late payment of contractors as the major cause for time overruns. Failure to deliver infrastructure project successfully not only affects the province but the country at large (Khumalo et al., 2017).

Murwira and Bekker (2017) studied factors that cause poor schedule performance in infrastructure implemented by the Department of Public Works and Roads (NWDPWR) in the North-West Province of South Africa. The authors identified 50 factors that lead to delays and grouped them into three categories namely, client-related, contractor-related and consultant-related. Their research revealed that the top ten causes of schedule overruns are inaccurate project cost estimation, lack of project experience, contractors' cash-flow problems, corruption during the tender phase, poor site monitoring by contractors, awarding tenders solely on price, inaccurate estimation of time to completion, lack of skilled labour, errors and omissions in designs, and delayed payments to subcontractors. The authors further stated that seven of the ten top factors are contractor-related (Murwira and Bekker, 2017).

Baloyi and Bekker (2011) investigated causes of schedule and cost overruns of the FIFA 2010 World Cup Stadiums construction projects. Their findings indicate that, although all stadiums were ready for the big tournament, almost all projects faced schedule as well as cost overruns. From their study the top ten factors that led to delays in completing these stadiums were unfinished drawings, regular changes in designs, poor planning, delayed decision making, late issuing of client instructions, lack of skilled labour, shortage of the workforce, high number of variation orders, labour unrests, poor project communication and delayed of approval of completed works. Six of the top ten factors were client related. Khan and Gul (2017) expressed the same view as Baloyi and Bekker (2011) stating that a lack of effective project communication leads to the late completion of projects.

Gaetsewe et al. (2015) examined cost and schedule overruns in public sector projects in the Northern Cape of South Africa focusing on the construction of the New Kimberly Mental Hospital as a case study. This construction project was planned to be completed within 4 years, but 12 years later, the project had only progressed by 70%. The initial project cost was ZAR290 million, but due to schedule delays the project cost increased to ZAR479 million.

Marzouk and El-Rasas (2014) examined the causes that lead to delays in construction projects in Egypt and found that these causes can be grouped into seven categories, namely client, consultant, contractor material, labour and plant, project and external related causes. The contribution of each factor varies from project to project depending on the situation (Marzouk and El-Rasas, 2014). According to the frequency index (FI) developed by the authors, the top seven delay factors are the tendering approach, poor planning and scheduling, frequent scope changes, late approval of project drawings, late payment of contractors by clients, inadequate site management by contractors and low levels of productivity on site.

In Kenya, Seburo (2015) stated that 50% of construction projects are completed late due to late payment of work done, poor planning and bad weather. Slow decision-making and complex approval processes also played a major role in project failure. Furthermore, the late completion of infrastructure projects compromised the development of the country. In Tanzania, Kikwasi (2012) conducted a descriptive study to uncover causes of construction delays and disruptions in the country. Kikwasi pointed out that delays and interruptions are sources of all emerging projects risks that have the potential to delay projects. Findings of the study revealed that design changes, late payment of payment certificates, delayed project information and poor application of project management delay construction projects significantly.

Oke, Ogungibile, Oyewobi and Tengan (2016) studied factors that affect construction projects performance in terms of time and cost in Nigeria. From the study, the major factors that affect project performance are a lack of resources, lack of construction materials, low productivity of the workface, high design changes and high levels of complexity. The researchers evaluated key measures of project performance and on time delivery of a project was ranked the highest. This finding suggests that the project team should manage the project schedule closely to enable successful project performance.

Ullah, Abdullah, Nagapan, Suhoo and Khan (2017) conducted "a theoretical framework research of the causes of construction projects in Malaysia". The authors grouped construction delays in four categories including consultant, owner, contractor and other external factors. The impact of each category varied from project to project, depending on the circumstances, site conditions and other factors. The study found that poor site management by contractors, regular design changes and a shortage of labour and materials lead to project delays in the Malaysian construction industry. Similarly, Shehu (2015) researched construction delays within the Malaysian construction industry and indicated that public projects are more likely to fail compared to private projects, with procurement strategies playing a significant role in the duration and completion of a project.

Ponz-Tienda and Go'mez-Cabrera (2017) explored literature to determine major causes of delays in construction projects in Colombia. Their work indicated that cost and schedule overruns are a worldwide phenomenon. They listed the factors that cause late completion of projects as poor performance of contractors, adverse weather conditions, alterations in the scope of work and repeated changes in designs. The authors emphasised that proper planning can reduce project delays.

Safapour, Kermanshachi, Shane and Anderson (2017) and Jaziri, El-Mahjoub and Boussaffa (2018) studied the application of best practices to achieve success in construction projects in United States of America (USA). The best practices were grouped into five categories including project change management, affiliation and partnering, configuration, prior planning and teamwork. Project change management ensures that changes due to errors, additions or variation orders in projects are managed with diligence to ensure that project cost and schedule are not negatively affected. Furthermore, partnering and affiliation ensure that project managers maintain good relationships with internal and external project stakeholders, and prior project planning can assist project teams in identifying potential project risks.

Basak, Coffey and Perrons (2017) explored risks that cause time and cost overruns in natural gas projects in Australia; these were classified as internal and external risks. The top five risks that delayed oil and gas projects were frequent design changes, slow decision making by clients, poor site management by contractors, unknown site conditions and poor planning.

McCord, Davis, Haran and Rodgers (2015) studied schedule overruns in housing construction projects in Northern Ireland. It was found that schedule delays are an integral part of the Irish construction industry, and this negatively impacts overall customer satisfaction. The findings of the study revealed that the top eight delay factors are lack of

sufficient funds by clients, contractor financial problems, errors in designs, delayed decision-making processes, late provision of utilities, slow provision of permits and late approval of designs.

Table 1 indicates the number of occurrences of each key delay factor found in the literature review. The results indicate that regular design and scope changes, together with errors and mistakes in drawings, are ranked the highest delay factors, with 18 occurrences each.

Table 1. The number of occurrences of key delay factors that lead to late completion of construction projects

Factor Reference	Key Delay Factor	Occurrence/Frequency
FR 01	Regular designs and scope changes	18
FR 02	Errors and mistakes in drawings	18
FR 03	Client's financial problems	17
FR 04	Late payment of contractors and service providers	12
FR 05	Poor project planning	9
FR 06	Unrealistic completion targets	8
FR 07	Flawed procurement processes	6
FR 08	Slow decision making	6
FR 09	Poor performance of contractors	9
FR 10	Lack of construction materials	5
FR 11	Underground services	5
FR 12	Lack of development and skills	5
FR 13	Delayed project information	7
FR 14	Lack of monitoring and control	4
FR 15	Poor/lack of communication	3
FR 16	Bad/adverse weather	3
FR 17	Political interference and uncertainty	3
FR 18	High construction material costs	3
FR 19	Delayed land acquisition	3
FR 20	Unforeseen ground conditions	2
FR 21	Poor project management	2
FR 22	High inflation rates	2
FR 23	Shortage of Materials	2
FR 24	Complex projects	2
FR 25	Fraud and corruption	2
FR 26	Reworks due to poor quality	2

2.2 Mitigation measures to reduce project delays

Table 2 summarises the number of occurrences of each mitigation measure highlighted in the literature review. Accordingly, proper project planning and the use of detailed project plans rank as the highest mitigation measures to reduce project delays.

Table 2. The number of occurrences each mitigation measure

Mitigation Measure Reference	Mitigation Measures	Occurrence/ Frequency
MMR 01	Thorough project planning and development of comprehensive project plans by project teams	6
MMR 02	The use of well-experienced contractors and professional service providers for successful completion of projects	4
MMR 03	Clients should secure project funding before the project starts	3
MMR 04	Refine the procurement policies to ensure that competent contractors and professional service providers are selected	3
MMR 05	Complete designs and drawings before the project starts to minimise scope changes	3
MMR 06	Adopting good project governance for effective implementation of projects	2
MMR 07	Early conclusion of land acquisition processes	2
MMR 08	Clients and consultants to promptly respond to contractor queries and adopt effective contract management principles	2
MMR 09	Use of proper change management systems to minimse scope changes	2
MMR 10	Contractors to adequately manage construction sites thus minimising delays	1
MMR 11	Use of the Earned Value Management technique to monitor construction projects.	1
MMR 12	Contractors need to conduct a complete assessment of projects before pricing tender documents	1
MMR 13	The use of ISO 9000 and 9001 standards to ensure good quality of work and minimise reworks	1

3. Methods

The research adopted a positivism research philosophy utilising deductive reasoning and a quantitative research method. A survey was conducted using a questionnaire to collect primary data from qualified and registered individuals within the built environment registered with the South African Council for Project and Construction Management Professionals (SACPCMP). The research questionnaire was derived and designed based on the findings from the literature review in Tables 1 and 2 respectively. Reliability of the research was determined with Cronbach's Alpha and calculated as 0.838 which is deemed acceptable. A panel of three experts reviewed the research instrument and confirmed its validity.

The Project Management Book of Knowledge (PMBOK) guide was employed as a reference framework for this study. Effective project management aims to complete projects on time, within the approved cost and the acceptable standard of quality. The theory of project management and the PMBOK framework are founded on the three principles of time, cost and quality, with five process groups and ten knowledge areas. It was also noted that the existing PMBOK methodology lacks focus on technology, environmental matters, innovation and health and safety, and that these requirements should be addressed to improve project results.

4. Results and Discussion

Figure 1 presents the feedback from respondents, indicating that the top five sources of project schedule delays in South Africa are:

1. The poor performance of contractors (93.18%)
2. Labour unrests and strikes (92.61%)
3. Slow decision-making (92.00%)
4. Poor planning (90.86%)
5. Rework due to poor workmanship (89.20%)

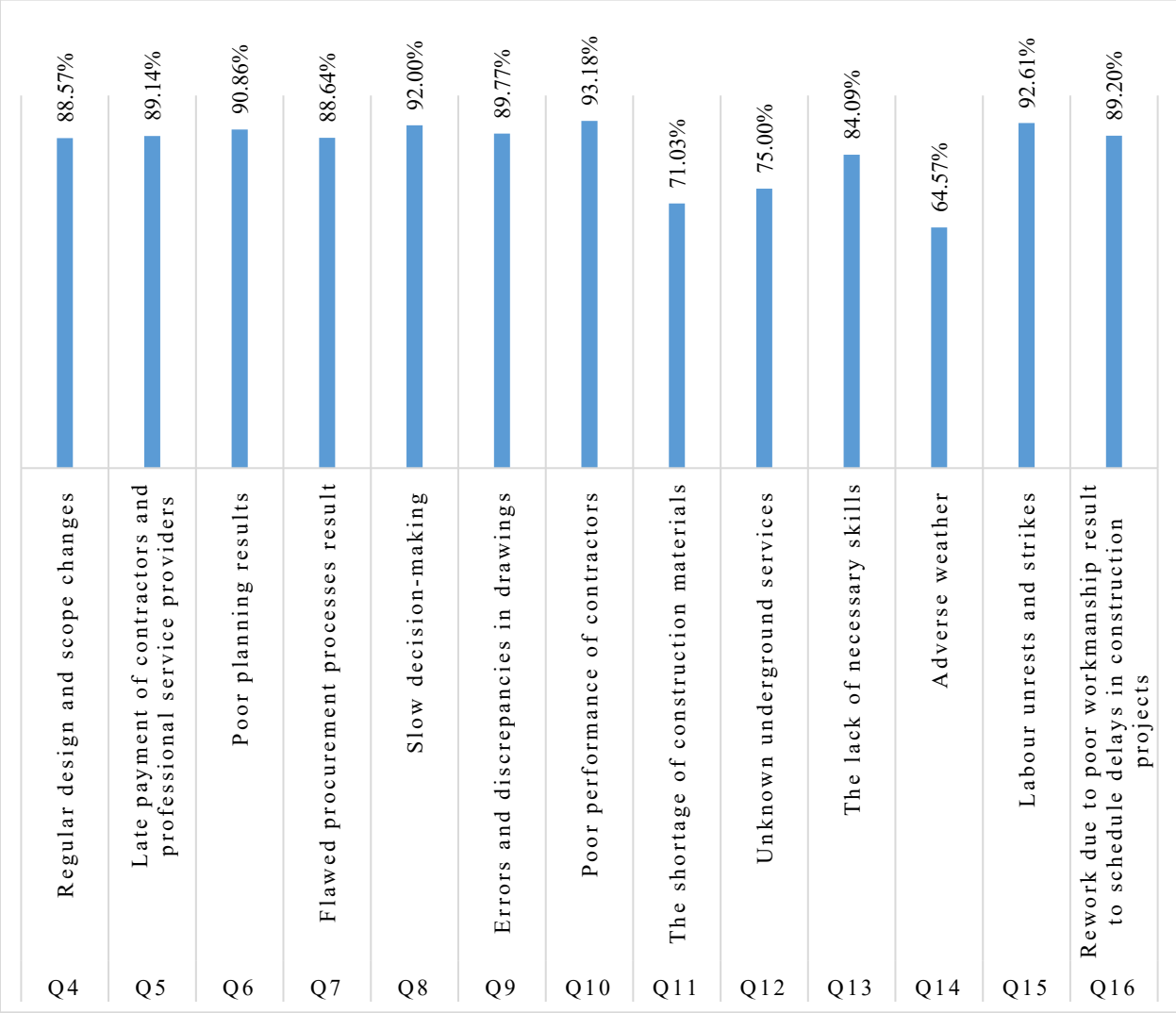

Figure 1. Showing responses to factors leading to late completion of projects

Figure 2 indicates the top five mitigating factors that could prevent schedule delay, namely:

1. The use of competent contractors and professional service providers (94.88%)
2. Securing project funding before the start of a project (93.75%)
3. Proper project planning and the use of comprehensive project plans (92.57%)
4. Adopting adequate stakeholder management (89.20%)
5. The implementation of proper procurement processes and policies (88.07%)

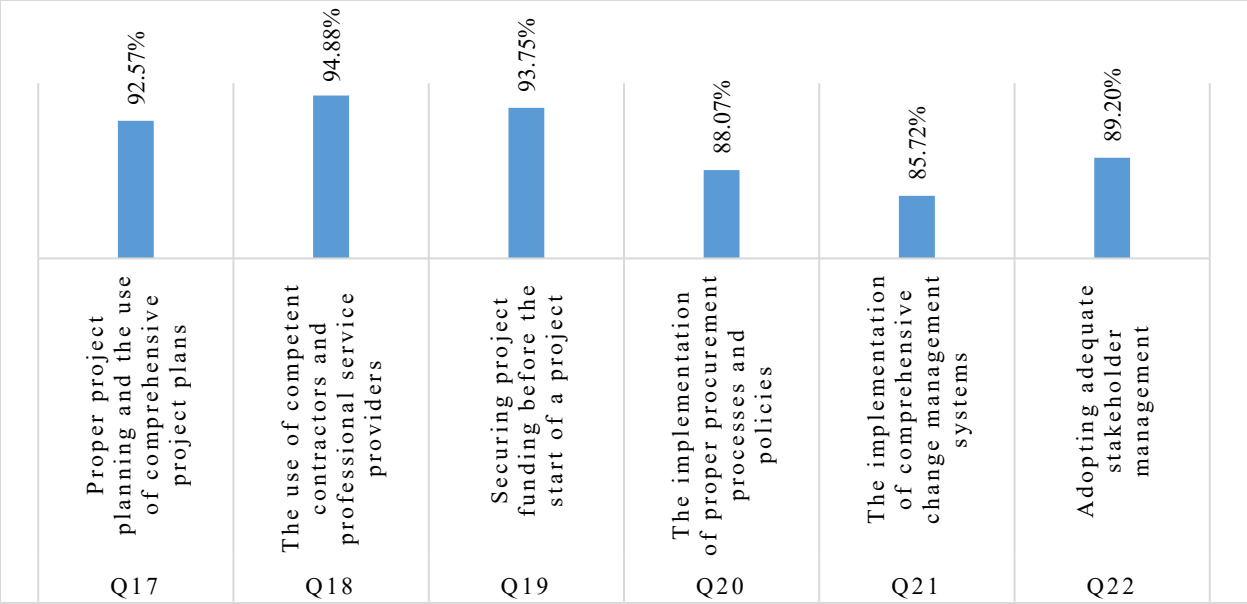

Figure 2. Showing a summary mitigation measure to reduce construction delays

The conclusion provides comparative review of the research findings and literature review to enable the researchers to answer the stated research questions.

5. Conclusion

The researchers sought to identify key factors that lead to project delays of government-funded construction projects and the mitigation measures that can address and improve these delays. The literature review identified the key delay factors and mitigation measures from various global research studies, and studied the theoretical propositions of the PMBOK framework. In this section the research data and findings are analysed to respond to the two research questions "What are the key factors that lead to the late completion of government funded construction projects in South Africa?" and "What mitigation measures may be implemented in order to minimise construction delays in government funded construction projects South Africa?".

Interestingly, the only common factor found in both the literature review, and confirmed by the research respondents, was poor project planning. The respondents did not consider regular designs and scope changes, a client's financial problems and late payment of contractors and service providers as constituting the top five factors that lead to the late completion of government funded construction projects in South Africa. Instead, the respondents stated that poor contractor performance, labour unrest and strikes, slow decision-making, and rework due to poor quality as being amongst the top five factors leading to project delay. Labour unrest and strikes is the only delay factor which was not present in the literature review and confirms that it is a unique factor in South Africa. Due to the close-ended nature of the questions, the research findings did not highlight the cause of labour unrests and strikes.

The PMBOK framework suggests ten project management knowledge areas and five process groups to be used to mitigate delays (Alyad, 2017; Kerzner and Kerzner, 2017). For example, proper project planning and the use of comprehensive project plans are mitigation measures that appear in the literature review, the PMBOK framework and the research findings. The pattern suggests that this factor can reduce the risk of project delays. Respondents noted the following four factors identified in the literature review as mitigation measures that may be implemented to minimise construction delays in government funded construction projects in South Africa:

- The use of competent contractors and professional service providers;
- Securing project funding before the start of a project;
- Proper project planning and the use of comprehensive project plans; and
- The implementation of comprehensive change management systems.

Finally, the respondents noted the importance of adopting effective stakeholder management processes as an important mitigation measure to reduce project delays in South Africa.

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Biographies

Simangaliso Hlengwa is an accomplished and dynamic professional with over 15 years within the Built Environment. He is the Director: Technical Services at the South African National Biodiversity Institute (SANBI) managing and administering multi-disciplinary infrastructure projects. Furthermore, he is responsible and accountable for the security, fleet as well as maintenance of various facilities. He leads a diverse team that consists of 76 staff members. From 2008 August to date he has been involved in various types of contracts including the NEC, JBCC and GCC. He gained experience in numerous aspects of infrastructure projects such as initiation, planning, execution, close-out, construction management and project administration, and has gained valuable experience in the co-ordination of infrastructure projects whilst working with various project teams as well as other client departments.

Prof Hannelie Nel is based in Abu Dhabi, United Arab Emirates and appointed as the Senior Regional Assurance Manager for Worley UAE, Oman, North Africa and Iraq. She is an Associate Visiting Professor of Practice with the Postgraduate School of Engineering Management at the University of Johannesburg and a registered Professional Engineer. She holds a DEng Engineering Management, an MSc in Industrial Engineering, and a BEng in Chemical Engineering; and has over 25 years of experience in both industry and academia. She served as Past President of the

Southern African Institute for Industrial Engineering and is currently an Honorary Fellow of the Institute; and has recently been appointed as an Industry Advisory Board Member of the American Society for Engineering Management. She has received numerous international awards for her contribution to industry and academia; the most recent being the global IEOM Lifetime Women in Industry and Academia Award for outstanding leadership received in Sydney, Australia in December 2022. She continues to contribute to industry and academia through consulting, research, and supervision, and her commitment to the recognition and advancement of women in engineering remains a lifelong passion.