The Seybold Report

ISSN 1533-9211

DOI: 10.5281/zenodo.0000000

INFRASTRUCTURE DELIVERY MANAGEMENT CHALLENGES IN KWAZULU-NATAL: A REVIEW OF THE OPERATIONS AND MAINTENANCE MODULE

WEZIWE N. HADEBE [1], ZAKHEEYA ARMOED [2] and MODUPE C. MEWOMO [3]

[1] KwaZulu-Natal Department of Education, 480 King Dinuzulu Rd N, Musgrave, Durban, 4001, Kwazulu-Natal, South Africa.

[2,3] Faculty of Engineering and the Built Environment, Durban University of Technology, Berea, Durban, 4001, Kwazulu-Natal, South Africa.

Email: [1]weziwemhlongo@gmail.com, [2]ZakheeyaA@dut.ac.za. [3]ModupeM@dut.ac.za

Abstract

Globally, governments have prioritized infrastructural policy and infrastructure development as the key to economic development. Efforts to accelerate effective infrastructural delivery in South Africa gave rise to the development of a government-wide tool called the Infrastructural Delivery Management System (IDMS). This was developed as a standardized approach for the planning, budgeting, procurement, operations, maintenance, decision-making and general management of South Africa's infrastructural development across all tiers of government. The study explores the effectiveness of implementing the Operations and Maintenance (O&M) module of the IDMS in the province of KwaZulu-Natal (KZN). Focusing on the KZN province, the study utilizes a mixed method research approach. Articles were sourced from databases which included Scopus, Web of Science, Google Scholar and Governmental platforms. Peer-reviewed studies in the English language that were published between 2010 to 2024 were identified. Key search terms were infrastructure delivery management system, challenges, operations, maintenance, and efficiency that informed the literature review of the study. The study drew a sample of 133 participants responsible for infrastructural delivery using purposive sampling. Data was analyzed using thematic and content analysis. Findings suggest within the ecosystem of infrastructural development in the KZN province, the necessary IDMS capacity and capabilities do exist. However, the impact of different institutional roles, responsibilities and concurrent functions; in coordinating and implementing the IDMS, has influenced a growing backlog in public infrastructural delivery in KZN. This can be attributed to the failures in coordination resulting in the efficiencies of the O&M module. Through the resurrection of district maintenance workshops and decisive leadership in response to poor operational and maintenance plans, the application of IDMS may prove to be successful in alleviating infrastructure backlogs across all tiers of governance.

Keywords: Infrastructural Delivery Management System; Maintenance; Operations; Challenges; Efficiency, South Africa.

1. INTRODUCTION

The 4th industrial revolution gave rise to significant advancements in technology and innovation, in the construction sector. These advancements have sought to integrate the United Nations Sustainable Development Goals (SDGs) in seeking the optimized use of natural and human resources to promote efficiency and sustainability in the built environment. While pre-dating Construction 5.0, in South Africa, the Infrastructure Delivery Management System (IDMS) has played and continues to play a vital role in promoting public sector infrastructure delivery and its efficiency. The IDMS seeks to achieve this by optimizing resource allocation,

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ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

reducing expenditures, and enhancing time effectiveness, management, and improving organizational productivity; yet this process has not been without its challenges (National Planning Commission, 2020 and National Treasury, 2012). Advanced technological modifications in the implementation of the IDMS continue to be devoid of the dynamic changes in the project management and life cycle of infrastructural asset portfolios in the Kwazulu-Natal province. As a result, the role of the IDMS cannot be understated in construction decision-making processes. Challenges include inter alia, construction procurement, project management, risk prediction and management including operations and maintenance of infrastructure. This paper argues that within the IDMS, the module to implement effective operations and maintenance of public infrastructure is not only less known, but is also less invested in and successfully managed. The unintended consequence is that the operations and maintenance of public infrastructure is not effectively built into infrastructural planning processes. This has resulted in ill-fitting life cycle asset management that costs the state more in operations and maintenance than infrastructural development. Findings suggest that predictive operations and maintenance (O&M) functions has the ability to significantly enhances infrastructural efficiency and risk reduction (Chigangacha, et, al., 2021; Watermeyer, 2018 and National Treasury, 2015).

2. LITERATURE REVIEW

Since 1994 South Africa's long-term economic and social goals have been premised on the existence of sustainable infrastructure. The role of the public sector in leading the infrastructure budget spend, in construction procurement and in the expansion of the construction sector at large, is undisputed (Cottle, 2015 and Cottle, 2014). In the 2022 gazette National Infrastructural Plan (NIP), the Department of Public Works & Infrastructure (DPWI) clearly articulates the leading role of government in public infrastructural delivery up to the year 2050.6 The NIP locates public infrastructural delivery within South Africa's legislative and policy framework and strategic priorities of poverty reduction, job creation, broad-based social and economic transformation and a sustainable built environment (Rakolote, 2024; Department of Public Works & Infrastructure, 2022 and Aigbavboa, et. al., 2017).

The NIP also recognizes how public infrastructure is critical to driving social policy. Through effective infrastructural investment and contractor development, it views infrastructure as central to addressing South Africa's triple plight of poverty, inequality and unemployment (Department of Public Works & Infrastructure, 2022). The sheer volumes and scales of works involved in construction projects on behalf of the state requires efficient precision and a standardized approach to infrastructure planning, procurement and management in public infrastructural delivery. A plethora of literature exists to examine public infrastructural delivery, its impact, outcomes and challenges (Rakolote, 2024; Dlamini, 2023; Mhlongo and Awuzie, 2023; Gcaba, 2022; Watermeyer and Philips, 2020; Price Waterhouse Cooper; 2019; Khumalo et. al., 2017; Mabugu, 2015; Shivambu. and Thwala, 2014). The literature focuses less on the role and impact of the IDMS while even less is known about the operations and maintenance applications of the IDMS (Chigangacha, 2021 and Mamabolo, 2020).

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ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

2.1. The IDMS on Infrastructural Delivery

As government and industry sector stakeholders acknowledge the complexities of public infrastructure development and maintenance, the need grows urgent to arrest the challenges confronting infrastructural development in South Africa (Price Waterhouse Cooper; 2019). A robust infrastructural value chain must be promoted, with much emphasis on investment, transformation and skills development (Manchidi, and Harmond, 2002; and Letchmiah, 2018). Equal attention must also be paid to creating common data environments and the utilization of digitalization tools that will enhance the efficiency of infrastructural delivery. Together, these will help track project implementation and expenditure of public infrastructural projects (Mhlongo, and Awuzie, 2023; Mamabolo, 2020 and; Gibson, and Rioja, 2017). In the post-apartheid era, strategic priorities of the government of South Africa, elevated role of public infrastructure in economic and social development required a management framework for infrastructural delivery. As a home-grown tool, the IDMS was conceived to fulfil this function across all tiers of government that required physical infrastructure to promote South Africa's national development. The IDMS became the tool to guide, monitor and oversee the implementation and expenditure of all public infrastructural programmes (National Treasury, 2012). The IDMS focuses on three portfolios of infrastructural delivery throughout the lifecycle of an infrastructural asset: portfolio management, project management and; operations and maintenance. It forms an ecosystem of processes and gateway decisions that are inter-connected for public infrastructural management and delivery (Chigangacha, et. al., 2021; Watermeyer, 2018). The IDMS was developed to address the challenges of public infrastructural delivery across the three tiers of government. To date, within the ecosystem that the IDMS must regulate, little is known about how the IDMS can improve the effectiveness of maintenance and ongoing operations of public infrastructure (Chigangacha, et. al., 2021; Watermeyer, and Phillips, 2020 and National Planning Commission, 2013). In an analysis of the IDMS guidelines, Watermeyer, (2018) notes that IDMS guidelines are meant to guide client departments in tracking progress of their infrastructure projects. Yet the operations and maintenance of existing infrastructure remains neglected as IDMS is mostly utilized in new infrastructure project developments. This is evident in how O&M is the least known module of the IDMS (Mhlongo, and Awuzie, 2023; Chigangacha, et. al., 2021; Watermeyer, and Phillips, 2020; National Planning Commission, 2020; National Treasury, 2019; National Treasury, 2017a; Civolution, 2016; National Treasury, 2015; and National Planning Commission, 2013).

2.2. The Operations & Maintenance Function of the IDMS

The O&M function within the IDMS has four core planning processes. First, is the custodian asset and management planning process. This process is concerned with the development of a custodian asset and management plan for the province, by government department, category of projects and functionality. It is a function operated on behalf of client departments by the provincial Department of Public Works. It links to the user operation and surrender planning process but is more interrelated to the departmental Medium-Term Expenditure Framework (MTEF) planning and budget processes for O&M, as required by National and Provincial

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Treasury (Chigangacha, at. al., 2021 and KwaZulu-Natal Provincial Planning Commission, 2019). Once budgets are determined for O&M, then O&M procurement commences where required. Procurement for O&M is influenced by the determinations that come out of the construction project management value chain on completion of infrastructural projects. Watermeyer, et.al., (2013) expounds on this intimate process and the relationships drawn by the O&M function of the IDMS. Watermeyer et.al., (2013), address the challenges that arise in the ability of the IDMS to monitor O&M related procurement. They note that due to the broad range of goods and services required for O&M, it is often difficult to monitor all O&M procurement because in their nature and at face-value, do not seem to be infrastructure-related at times. This inevitably questions, some of the efficacies of the O&M functions of the IDMS which are clearer at a process level, but not at an operational level. For government departments not responsible directly for the operations and maintenance of their own portfolio of infrastructure, such as both the Departments of Education and Health, managing the effectiveness of the Operations & Maintenance module of the IDMS becomes a challenge (Chigangacha, et. al., 2021; Awuzie, and McDermott, 2019; and Watermeyer, et.al., 2013). Lifecycle activities that include the planning for and execution of maintenance, renewal or replacement, decommissioning and disposal are also inefficiently administered by governmental organisations (KwaZulu-Natal Public Works, 2019; and KwaZulu-Natal Provincial Planning Commission, 2019). There is therefore wide recognition in both local and international literature that asset care activities, should form part of the lifecycle management of assets. Furthermore, lifecycle of assets should be managed holistically by the different role players, which the IDMS can achieve if managed effectively. The challenge for the implementation of the IDMS is in the integration of various role players, systems and risk management process. This includes challenges with the identification and classification of the risk sources, assessment analysis, operation practices and management responses to the O&M module within IDMS (Chigangacha, et. al., 2021). Drawing specifically from Watermeyer, 2012, this study interrogates the IDMS from the systems underpinnings of:

- Processes – understood as a succession of logically related actions and decisions which culminate in the completion of a major infrastructural deliverable;
- Procedures – the formal steps to be taken in the course of process, that must comply with a suite of policies and practices (e.g. compliance to professional regulations, procurement and/or public finance managements);
- Methods – a documented, systematically-ordered collection of rules or approaches supported by policy, governance/management arrangements, and documentation which communicate what has been decided upon during the execution of a process or part thereof.

2.3. Challenges in Public Infrastructural Delivery

Impressive strides that South Africa has made in addressing significant social, health, education and economic infrastructural backlogs. Challenges in public infrastructural delivery still remain. A cocktail of factors can be attributed to the slowed pace in public infrastructural delivery. This includes waning investor confidence, procurement challenges, outdated

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ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

infrastructural management systems, lack of required capacity, compromised infrastructure standards for monitoring and managing construction projects and complex institutional arrangements (Watermeyer and Philips, 2020; Khumalo et. al., 2017; Price Waterhouse Cooper; 2019; Mabugu, 2015 and Shivambu. and Thwala, 2014). Dlamini (2023), examines the public-school infrastructure backlog crisis in KZN, highlighting operational and maintenance issues as the main challenge as national and provincial departments of Public Works, lack the capacity and required capabilities to execute O&M practices. Other challenges include shortcomings in construction project management that has also influenced a short-sightedness in post-delivery activities in O&M practices, including the degeneration of public infrastructure, due to poor service delivery (Gibson and Rioja, 2017). Researchers highlight the disturbing pattern of public sector governance, of implementing new infrastructure projects instead of maintaining existing infrastructure projects that promotes their longevity (Ntjatsane, 2017; National Treasury, 2017a and; Thumbiran, and Raphiri, 2016).

3. RESEARCH METHODOLOGY

This mixed method, cross-sectional study was undertaken using a combination of qualitative and quantitative research to interrogate the problem statement on the challenges associated with the IDMS and its O&M module. The sampling strategy selected in this study was purposive in its multi-case study approach, to focus on Provincial Treasury – in its responsibility for public infrastructural investment, the KZN Department of Education that comprises a significant proportion of KZN's public portfolio of infrastructure, and the sole department responsible for driving infrastructure delivery in KZN Public Works.45 It is important to note that though a sample was also drawn from the KZN Department of Health (see Table 1), none of its officials were able to participate in this study. The study was undertaken in compliance with the Durban University of Technology's (DUT) Ethical committee procedures on conducting research (Ethics Clearance Certificate Reference IREC291/22).

3.1. Sampling Strategy

Within each department, study respondents were selected using a non-probability sampling method called purposive sampling. A sample was drawn from the list of 199 officials with user rights to the IDMS system (derived from the IDMS user profile database) and/or who formed part of the IDMS ecosystem. The sample comprised officials who utilize the IDMS and have experience in the built environment, public sector management, infrastructure management, procurement, planning and budgeting, and considerable experience and extensive knowledge of IDMS implementation. To identify the study's sampling frame, with the relevant permission and due cognizance of the parameters of the Protection of Personal Information Act of 2021. Within each department, study respondents were selected using a non-probability sampling method called purposive sampling. Purposive sampling, also known as judgmental, selective, or subjective sampling, is a form of non-probability sampling in which researchers rely on their own judgment when choosing members of the population to participate in their surveys.45,46 The study's final sample size was 133 which was obtained utilizing a formula hypothesized by Yamane (1967) where N = Population n= Sample Size e= Margin of error (±5%). Table 1

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ISSN 1533-9211
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illustrates the distribution of the sampling frame, the distribution of the sample drawn and the actual number of study respondents who did participate in the study.

Table 1: Study Sample

INSTITUTION	SAMPLE NO	NO. OF RESPONDENTS	% OF RESPONDENTS
KZN Provincial Treasury (Infrastructure & Planning)	8	6	4%
KZN Department of Education (Infrastructural Planning & Delivery)	75	53	40%
KZN Department of Health (Infrastructure Development, Management & Technical Support)	29	0	0%
Department of Public Works (Infrastructure Management & Technical Support)	87	74	56%
TOTAL	**199**	**133**	**100%**

3.2. Data Collection and Analysis

A systematic literature review was conducted as the primary data analysis with a structured questionnaire as the secondary data collection tool. Articles were collected from Web of Science, Scopus and Google Scholar data bases, with the review of internal governmental documents on infrastructure projects. Key words searched included infrastructure delivery management system, challenges, operation and maintenance; and project delivery. The literature reviewed was used as a mirror of accuracy for emerging primary data patterns. The articles were screened with focus on research conducted over the past 10-years, articles that were in the English language and those applicable to the South African governmental sector. Key themes were identified and used in the development of the structured questionnaire. As the secondary data collection tool, questionnaires were distributed electronically to all study respondents to complete them within a prescribed period. On receipt, responses were checked for completeness, accuracy and further probing. In either case, follow up communication was made with respondents prior to commencing the analysis of data. In the case of those whose questionnaires lacked information, had missing information or disengaged responses, follow-up phone-calls were made to them to close the data gaps. Quantitative data was then cleaned and analysed using Microsoft Excel Advanced for presentation in graph and frequency table form for ease of presentation. Qualitative data was analysed through a thematic analysis. The research limitation included the sample size of a small community of practice in the KZN provincial government. Finally, the omission of inputs from KZN's Department of Health represents a major gap in the data collected that otherwise would have been useful to draw comparisons on the efficacies of IDMS in operations and maintenance of its health infrastructure asset portfolio using the IDMS.

4. FINDINGS AND DISCUSSION

The study findings point to serious gaps in the effectiveness of operations and maintenance as a module of the IDMS. Given the lifecycle of assets, their role in discharging the constitutional functions of service delivery in KZN and the immense damage inflicted on many public immoveable assets of the KZN province in early 2022, the study findings highlight the

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DOI: 10.5281/zenodo.0000000

necessity for review of how the IDMS can add value to government's national infrastructural development programme. Almost half of the study respondents (56 percent or n=74) were drawn from the provincial KZN Public Works Department, which is the lead department nationally, and provincially for public sector infrastructural delivery. Provincially, the public infrastructural delivery value chain commences with infrastructural planning at client department level, which accounted for 40 percent (n=53) of the sample drawn from KZN's Department of Education. Of 133 study respondents, only 4 percent (n=6) of the study's sample was drawn from Provincial Treasury, responsible for infrastructure budgeting and performance management of infrastructural delivery over the Medium-Term Strategic Framework of government. In establishing the extent to which IDMS is implemented in public sector operations and maintenance (O&M) in KZN, the study established a delineated value chain in the implementations of the IDMS.

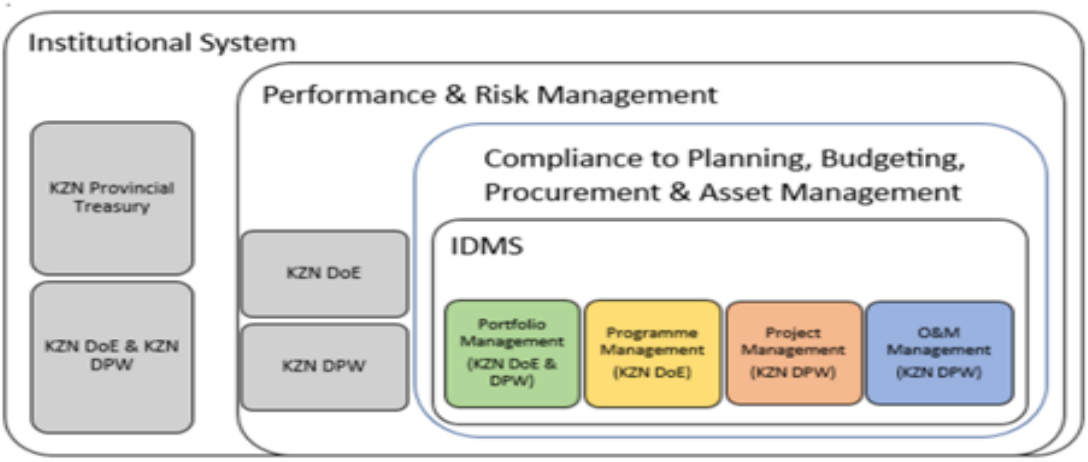

Figure 3: Simplifying the IDMS in the KZN Provincial School Infrastructure Delivery System

Figure 3 gives a very high-level snapshot of the public infrastructural delivery system built around its participating departments and the IDMS, as the engine for managing government's billion-Rands strategic function. Figure 3 further illustrates the institutional system that provides guidance on generic approaches towards building an institutional system to effectively implement the IDMS. This system comprises the institutions involved include National & Provincial Treasury, National & Provincial Departments of Education & Provincial Public Works or other implementing agent.

4.1. Skilled Capacity to Implement IDMS Operations & Maintenance Module

This study tested for the availability of capacity and capabilities and found that within the ecosystem of infrastructural development in the KZN province, the necessary IDMS capacity and capabilities do exist in support of a Provincial Treasury appropriation aligned to the MTEF budget cycle, is managed using the IDMS as the engine for managing government's billion-Rands strategic function along the six stages of a construction project. The study found that of

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ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

the IDMS users, 85 percent (n=113) of them were officials responsible for the administrative functions and execution of IDMS with only 15 percent (n=20) of study respondents executed a managerial and decision-making function within the implementation of IDMS. That the overwhelming majority of IDMS users execute an administrative function, is confirmation of the complex administrative processes and functions that must be undertaken in the effective implementation of the IDMS' value chain. That only 15 percent of users conduct a management and/or decision-making role bears witness to the IDMS' decision gateways that require considered decision to be made in accordance with the appropriate delegation of authority. This study found that a third of officials involved in a management capacity of the IDMS, were professionally registered built environment officials employed under the occupational specific dispensation to attract and retain the necessary capacity for effective public infrastructural delivery. The study also found that a rather stark contrast existed in the years of experience that study respondents displayed on asset life cycle management. With extreme figures of 31 percent (n=41) with less than 5 years' experience in asset life cycle management and 31 percent with more than 5 years' experience in asset life cycle management, given the role of IDMS' O&M module, in asset life cycle management is critical and the effectiveness of IDMS thereto is cause for concern. The study findings also suggest that only 31 percent were comfortable with the use of IDMS in portfolio O&M, while less than 10 percent were knowledgeable in the use of IDMS in portfolio O&M.

4.2. Capabilities in support of an Effective IDMS in Operations and Maintenance

The planning component of operations and maintenance of the IDMS are four functions which include verifying the infrastructure asset register, operations planning, maintenance planning and updating the asset register. Figure 4 confirms an above average level of knowledge of all four functions, especially in the verification of the infrastructure asset register, and the updating thereof.

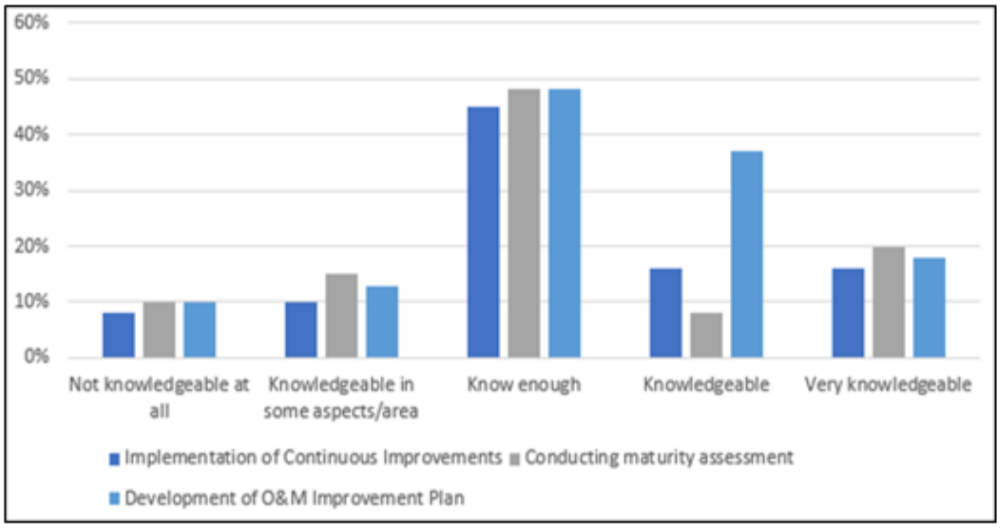

Figure 4: Capabilities of Study Respondents in Planning: O&M System of IDMS

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ISSN 1533-9211
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With respect to the implementation of maintenance and planning system of IDMS, the study findings indicate that the KZN provincial government is void of particularly strong capabilities; in the implementation module of the IDMS operations and maintenance system. Up to half of the study respondents in all three departments indicated little knowledge of the administration of work orders, with an equal number having enough knowledge of maintenance planning.

A plausible reason for the generally below average knowledge in developing a maintenance management plan, mobilizing for maintenance implementation, administration of work orders and compiling asset information, is that the infrastructural delivery value chain is fragmented over three departments: Treasury, Client and Implementing departments. By implication therefore, the capabilities relate to the functions required along the value chain and the business processes that each department has. This in essence would also suggest that the IDMS being a "one-size-fits-all" system for public service delivery, cannot yield its full potential in the current model that governs public infrastructural delivery in the provinces of South Africa.

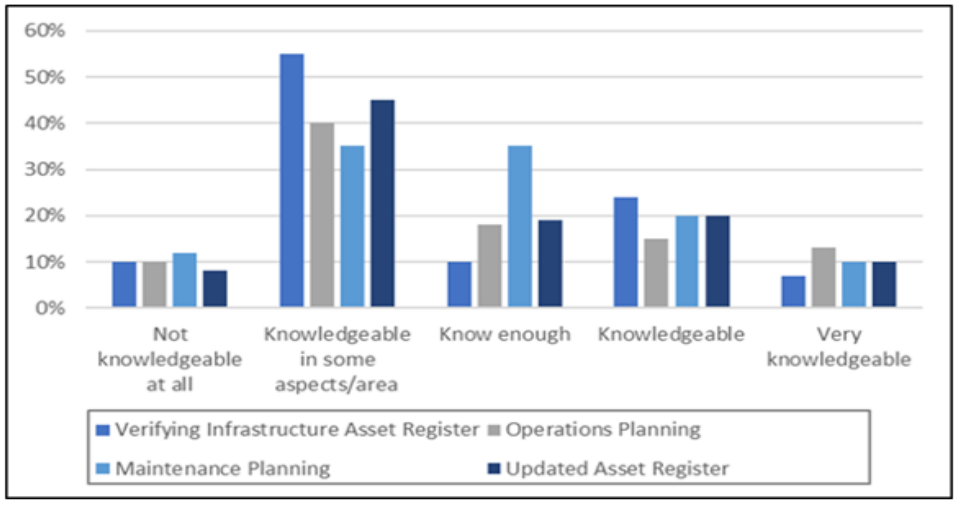

Figure 5: Capabilities of Study Respondents in Improvements: O&M System of IDMS

Within the O&M function of the IDMS that study respondents were given an opportunity to assess their capabilities in the compilation of maintenance management review reports. Maintenance management is critical to optimal functioning infrastructure. As a system of IDMS, the O&M function has been designed to help process maintenance operations and centralized maintenance information in one place in the form of a common data environment.

Periodic review reports generated from the system are central to improving efficiency and optimizing the use and availability of resources. The study findings demonstrated in Figure 5 concluded that the province is able to rely on maintenance management review reports to monitor the O&M functions of public infrastructural delivery in the KZN portfolio.

4.3. The Effectiveness of IDMS in Operations and Maintenance

Because this study set out to determine the extent to which IDMS is implemented in public sector O&M in particular, the study found that regardless of whether IDMS users were

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ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

conducting management or administrative functions in all provincial departments of KZN responsible for public infrastructure delivery; up to a third of them were not convinced that the IDMS is effective in the management and oversight of portfolio of public infrastructural operations and maintenance, or that the IDMS added value to O&M functions of asset management as one manager aptly conceded:

> *"Operations and maintenance of assets is different to the construction of the same assets. The current asset life cycle in terms of GIAMA requires a different consideration, and therefore a different infrastructural management system, which I do not think IDMS adequately addresses the issue of frequent operations and both frequent and ad-hoc maintenance of school infrastructure for example" (Respondent 4, Interviewed 25 July 2023).*

This finding concurs with the findings of Watermeyer (2018), who asserts that construction procurement systems of the public sector in the IDMS portfolio of operations and maintenance focuses on the procurement of equipment, goods, works and services with the construction sector. The IDMS therefore does not lend itself well to the effective functioning of the portfolio of O&M, because it was designed in the main, for IDMS usage and application of particular procurement procedures and project delivery, rather than the operations and maintenance thereafter (National Treasury, 2017b). Watermeyer (2018), concludes that there is urgent need to have a separate supply chain for the delivery and maintenance of infrastructure. For the client department, the result of less than adequate effective use of IDMS in operations and maintenance increases the risks involved in operations and management, resulting in mismanagement, underperformance of scheduled maintenance and even collusion between government and industry to the detriment of the maintenance of public infrastructure facilities.

4.4. Contributing Factors Influencing the Effectiveness of IDMS to Operations & Management in KZN

In her budget speech of March 2022, the then KZN Province's MEC for Finance, Honorable Ms Nomusa Dube-Ncube, drew attention to the Department of Education's infrastructure budget allocation for the financial year 2022/2023 estimated at R9.1 billion over the MTEF.44 The budget is influenced by the need to address overcrowding, creating new teaching and learning spaces and providing specialist classrooms, and implement the priority programmes which include the repair and rehabilitation of 189 storm damaged schools – the aftermath of storm ravages of early 2022 in the province, as it highlights the importance of infrastructure spending as an economic recovery method. The impact this priority project of operationalizing and maintaining storm damaged schools will be influenced by the effectiveness of IDMS to operations & management in the KZN asset portfolio for schools. According to the Provincial Treasury as the main strategic, financial and management custodian of the IDMS tool, has in place, all the relevant skills, infrastructure, coordination and communication platforms required for effective implementation of IDMS, include the operations and management system of IDMS. Water Meyer, (2018) asserts how IDMS implementation begins at the strategic level. At an institutional level within a provincial government system, the strategic level is at provincial treasury level and in the case of this research study, is indicative of the provincial

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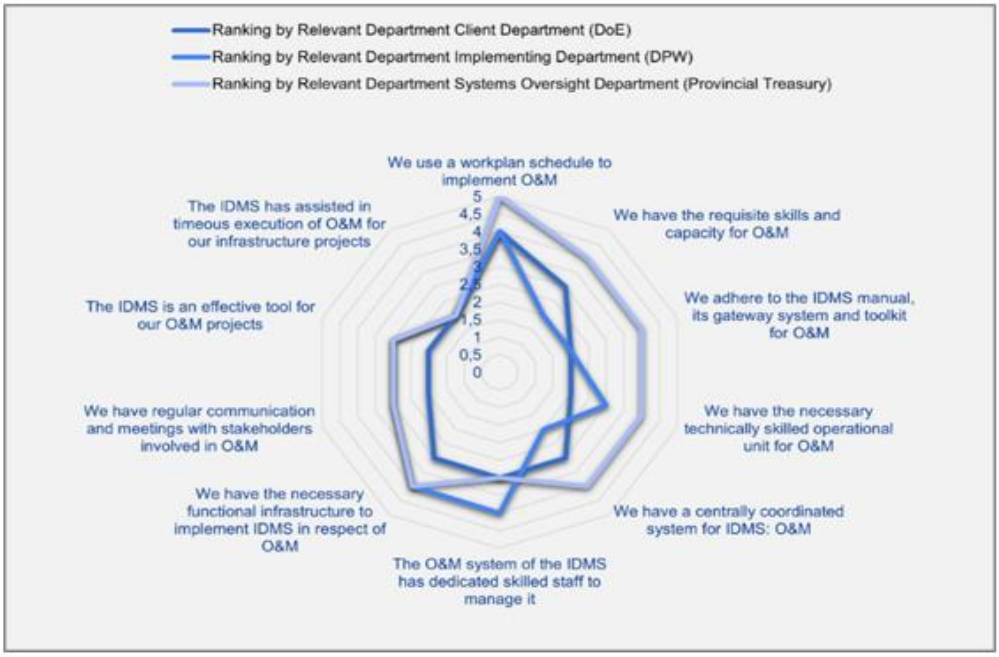
treasury's leadership and expertise in infrastructure planning and management as custodians of the IDMS. The case for a client department (KZN DoE) and an implementing department (KZN DPW) is not necessarily the same. Unsatisfactory conditions for the effectiveness of IDMS in operations and maintenance are felt more acutely by the client department, Department of Education, in KZN. There are several reasons for this which include the huge backlog of public-school infrastructure and other mitigating factors such as climate change that is rapidly affecting the longevity of infrastructure such as schools. Whatever the reasons are, for the KZN-DoE in particular, a precarious situation is created as a client department whose legislative and constitutional mandate is dependent on adequate infrastructure whose operations and maintenance are dependent on an implementing agency, the KZN-DPW. While the DoE may have and use a work plan schedule to implement O&M and possess the requisite skills and capacity required, according to the ranking by DoE as demonstrated in Figure 6 it is not always for practical for them to adhere to the IDMS manual, its gateway system and toolkit for the O&M module:



1.Very unsatisfactorily; 2. Unsatisfactorily; 3. Sometimes; 4. Satisfactorily; 5. Very satisfactorily

Figure 6: Ranking the Effectiveness of IDMS in Operations and Maintenance

The mandate of the department also precludes the existence of a functional yet necessary technically skilled operational unit for O&M. This function lies with the KZN-DPW, with a less than satisfactory centrally coordinated system for IDMS: O&M and insufficient communication and meetings with stakeholders involved in O&M. The net result is that for KZN-DoE, the IDMS is not an effective tool for O&M projects, nor does it assist in the timeous execution thereof. The case of the 2022 storm damaged schools becomes a case in point, which

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ISSN 1533-9211
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calls for alternative infrastructure planning and process that is more responsive to the urgency to repair schools for education for all. It is in this context that the next section addressed the challenges faced in the implementation of IDMS in the public sector operations and maintenance in KZN. By interviewing IDMS users with an administrative responsibility and also those with a management responsibility, the study findings conclude that the challenges faced in the implementation of IDMS Operations and maintenance module depends on whether your function is managerial or administrative. While 70 percent of the study respondents in administration agreed that sometimes the procurement challenges are related to lack of uniformity in procurement procedure, 90 percent of study respondents in management agree that the fragmented inconsistent procurement procedure in IDMS is a major challenge insofar as it affects the ability of the KZN provincial government to operate and maintain its public infrastructural assets. This is supported by the assertions of one study respondent who stated that:

> *"In and of itself the (IDMS) system is good. But we as departments lack the formation of standalone infrastructure procurement unit within the Departments as stipulated in FIDPM (Framework for Infrastructure Delivery and Procurement Management). To add to that is the lack of establishment of contractor's framework contracts to quickly respond to repairs on the facilities that damaged by storm/floods and emergency respond to reactive maintenance – unscheduled repairs as acts of nature. Then the issue of budget – we have all the templates currently in use – User Asset Management Plan (U-AMP), Infrastructure Programme (IP) and Infrastructure Programme Management Plan (IPMP) to formulate budget and projects list per sub-programme. Yet still, budget constraints limit the role out of more infrastructure programmes, repairs and renovations and storm damage repairs programme" (Respondent 11, Interviewed 14 December 2023).*

Another study respondent laments the lack of innovation in infrastructural delivery options and the type of construction contracts explored. This with little progress towards digitized systems, presents serious challenges for monitoring and implementing O&M in the KZN province:

> *"Infrastructure delivery processes are in place, so are gate approval committees. But the challenge is that so far, a full variety of delivery options are hardly explored. Instead, traditional designs and construction contracts are still being used. Programme delivery plans are still on analogue systems (not digitised) with huge narrative reports and spreadsheets that are time-consuming. The manual system means that it takes a long time to maintain assets … (Respondent 6, Interviewed 11 December 2023).*

4.5. Systemic Challenges with Operations and Maintenance in IDMS

Several systemic challenges can be identified from the study findings. These included ineffective planning; a lack of skilled capacity, especially in technical skills; misaligned procurement procedures; ineffective infrastructural project monitoring and unreliable reporting; misalignment to national and sector priorities; poor decision-making within the delivery and procurement management processes; insufficient asset management and poor

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ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

operations and maintenance within the lifecycle of assets. What also emerged as a concerning factor in public sector O&M was how the IDMS does not consider systemic issues such the concurrent functions, institutional arrangements, roles and responsibilities of coordinating, client and implementing departments in respect of the implementation of IDMS. Impairments affecting IDMS implementation are borne from the failure by the relevant provincial government departments to successfully deliver infrastructure in an integrated manner. The prevailing reason this study confirms is prevalence of poor interdepartmental relationships and unclear communication channels. Because this study set out to determine the extent to which IDMS is implemented in public sector O&M in particular, the study found that regardless of whether IDMS users were conducted management or administrative functions in all provincial departments of KZN responsible for public infrastructure delivery, up to a third of them were not convinced that the IDMS is effective in the management and oversight of portfolio of public infrastructural operations and maintenance. The study also noted how the IDMS added value to operations and maintenance functions of asset management: According to study respondents, the operations and maintenance module of the IDMS was not the focus area during the initiation of IDMS. This in their view, accounts for its less than optimal results which have arisen from poor implementation of IDMS especially for maintenance as at the moment, the absence of maintenance plans with estimated cost at departmental level and from operations and maintenance business units within departments that are not integrated into the IDMS system during planning stages. Collectively, these factors have led to massive inefficiencies in the O&M system.

5. CONCLUSION

Based on in-depth interviews with managers with oversight of IDMS in the infrastructure departments of the KZN province, several issues were raised that could be knitted together towards developing a more refined model for effective implementation of the IDMS in respect to the operations and maintenance module. These proposals included integration of O&M in infrastructure delivery planning and improving governance of the IDMS where study respondents were generally of the opinion that standard operating procedures (SOPs) would assist in effective role out of O&M within each department responsible for infrastructure delivery. Oversight of all financial management duties and responsibilities within IDMS were reported by study respondents as being executed accordingly. Capacity development of staff is integral in the management of maintenance projects, including the establishment of digital tools that improve the governance of IDMS would assist, couple with other management tools such as templates for asset registers, templates for maintenance management plans and lifecycle asset management plans. The misalignment between operations and maintenance has not been prioritized in the IDMS, yet it plays a significant role in the life cycle of an asset. An effective model for O&M implementation will be the recruitment of artisans, maintenance engineers and the prioritization of other infrastructure maintenance posts in the KZN Province. Study respondents unanimously called for considerations of the establishment of functional maintenance hubs and decentralized establishments within the provincial structures to implement operations and maintenance. Findings indicate that poor reporting on the

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

implementation of maintenance projects by the implementing agent, is not conducive for effective monitoring of programmes. Study respondents emphasizes the role of greater and more decisive leadership in driving the implementation of IDMS and ensuring its effectiveness for operations and maintenance in the IDMS. Noting a general lack of commitment within departments at high level management and limited budget allocation for the implementation of O&M practices. This would address the current paucity of necessary choice in procuring framework contracts for electrical, mechanical, general building and urgent repairs to deal with operations and maintenance more timeously. Greater oversight of the implementation of IDMS, its risk management, support and decision making are critical to an effective O&M module. This research forms part of a broader investigation on improving infrastructure delivery in South Africa. It provides provincial and national spheres of government with awareness of critical factors influencing usability and applicability of the IDMS to optimize the effectiveness of IDMS.

References

1) Aigbavboa, C., Ohiomah, I., and Zwane, T. (2017) Sustainable construction practices: "a lazy view" of construction professionals in the South Africa construction industry. The 8th International Conference on Applied Energy Procedia, 105, 3003–3010

2) Almeida, F., Faria, D. and Queirós, A. (2017) Strengths and Limitations of Qualitative and Quantitative Research Methods. European Journal of Education Studies, 3: pp.369-387. Doi 10.5281/zenodo.887089

3) Anthony, A.M. (2019) Subcontracting in public procurement – the impact of the 2017 preferential procurement regulations on the Construction Industry, Available online at

unisa.ac.za/bitstream/handle/10500/25659/, Accessed 15 August 2023

4) Awuzie, B.O. and McDermott, P. (2019) Infrastructure delivery systems: governance and implementation issues. Singapore: Springer

5) Chigangacha, P., Haupt, T. and Awuzie, B. (2021) Examining the maturity of South Africa's government departments to implement the Infrastructure Delivery Management System (IDMS). Acta Structilia, 28(2). Available Online at www.scielo.org.za, Accessed 13 April 2022

6) Cidb (2010) Infrastructure delivery management toolkit management companion. Available online www.toolkit.cidb.org.za/Shared%20Documents/IDM-Toolkit-Management-Companion-v9-1-2010-10-17.pdf, Access 24 July 2023

7) Civolution (2016) Focus on: National Treasury Standard for Infrastructure Procurement and Delivery Management. Pretoria: National Treasury

8) Cottle, E (2014) The transformation of the construction sector in South Africa since apartheid: social inequality and labour. Dissertation submitted in partial fulfilment of the Degree of Master of Arts at the Institute of Economics, State University of Campinas, Campinas, Brazil

9) Cottle, E (2015) The transformation of the construction sector in South Africa since apartheid: social inequality and labour. In the Global Labour Column: A Joint Publication of the Global Labour University and the University of the Witwatersrand. 98. April 2015

10) Creswell, J.W. and Creswell, J.D. (2018) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition. California: Sage

11) Creswell, W.J. (2014) Research Design: Qualitative, Quantitative and Mixed Methods Approaches. 4th Edition, Thousand Oaks: SAGE Aspers, P. and Corte, U. (2019) What is Qualitative in Qualitative Research? Qualitative Sociology 42, 139–160

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

12) Department of Public Works & Infrastructure (2022) National infrastructural plan 2050, Pretoria: DPWI. Gazetted in the Government Gazette, Board Notice No 1874 of 11 March 2022. Available online at www.gov.za, Accessed 13 April 2022

13) Dlamini, S.P. (2023) Capacity challenges in the delivery of public school infrastructure in the province of KwaZulu-Natal: A Case Study of KZN Department of Public Works. Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of M.Sc. (Construction Economics and Management) in the Faculty of Engineering & Built Environment University of the Witwatersrand, Johannesburg, South Africa

14) Gcaba, M. (2022) Factors constraining the planning and design process for public health construction projects in KwaZulu-Natal, South Africa. Master of Business Administration at the UKZN Graduate School of Business & Leadership. Durban, South Africa

15) Gibson, J. and Rioja, F. (2017) Public infrastructure maintenance and the distribution of wealth. Economic Inquiry, 13 June 2016. doi.org/10.1111/ecin.12371

16) International Monetary Fund (2023) Rwanda: technical assistance report-public investment management assessment–PIMA and Climate PIMA. Washington D.C.: IMF

17) Khumalo, M.; Choga, I. and Munapo, E. (2017) Challenges associated with infrastructure delivery. public and municipal finance. 6: pp. 35-45

18) KwaZulu-Natal Provincial Planning Commission (2019) 2035 Provincial growth and development plan. Pietermaritzburg: Office of the Premier. Available Online at

www.kznppc.gov.za/images/downloads/PGDP%202019%20v4%20Final.pdf, Accessed 23 May 2021

19) KwaZulu-Natal Public Works (2019) Annual report 2019/20, Available online at www.kznworks.gov.za (Accessed 26 November 2020)

20) Letchmiah, D.R. (2018) An examination of the effectiveness of preferential procurement in the South African construction industry. A thesis submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in fulfilment of the requirements for the degree of Doctor of Philosophy, Johannesburg

21) Mabugu, R.E. (2015) Responding to South Africa's infrastructural challenges: Chapter 1. Excerpt Submission available online at www.ffc.co.za/docman-menu-item/2015/971-pages-from-submission-2016-2017-chapter-1, Accessed 17 November 2020

22) Mamabolo, J. (2020) Integrated infrastructure planning and coordination for the Gauteng city region. Johannesburg: Gauteng Provincial Department of Infrastructure Development

23) Manchidi, T.E. and Harmond, I. (2002) Targeted procurement in the Republic of South Africa: an independent assessment. Joint Assessment Commissioned by the DBSA, Department of Public Works and Internationals Labour Organisation, Pretoria, April 2002

24) Masiya, T., Davids, D.Y.D. and Mangai, M. (2019) Assessing service delivery: public perception of municipal service delivery in South Africa. Theoretical and Empirical Research in Urban Management, Research Centre in Public Administration and Public Services, Bucharest, Romania, 14(2): pp. 20-40

25) Mhlongo, S.T. and Awuzie, B. (2023) Exploring the utility of common data environment platforms in enabling effective construction project information management in the KwaZulu-Natal Department of Health. Conference Paper submitted to the SA Council of Quantity Surveying Professions (SACQSP), The Maslow, Johannesburg, 22 - 23 October 2023

26) National Planning Commission (2020) Review of economic progress towards the National Development Plan's Vision 2030: Recommendations for Course Correction. Pretoria: NPC, December 2020

27) National Treasury (2012) Standard for an Infrastructure Delivery Management System. Pretoria: National Treasury

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.0000000

28) National Treasury (2015) Cost model for the establishment of control budgets for primary and secondary schools. Pretoria: National Treasury

29) National Treasury (2017a) Budget review. Pretoria: National Treasury

30) Ntjatsane, M.C. (2017) Financing of infrastructure maintenance in South Africa. Unpublished Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Management, Wits Business School, University of the Witwatersrand, Johannesburg, South Africa

31) Pallant, J. (2013) SPSS Survival Manual - A Step by Step Guide to Data Analysis using the SPSS Program 4th Edition. Berkshire: McGraw Hill

32) Price Waterhouse Cooper (2019) SA construction – 4th edition. Pretoria: PwC, also available Online at www.pwc.co.za/en/assets/pdf/sa-construction-2016.pdf, Accessed on 14 November 2020

33) Rakolote, N.E. (2024) Exploring the lived experiences of construction project managers in South Africa through the lens of a strategy implementation framework. A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Philosophy

34) Sesele, M. (2023) Improving Infrastructure Delivery Models. Development Bank of Southern Africa Working Paper Series, August 2023, Pretoria: DBSA

35) Shivambu, X. and Thwala, W.D. (2014) The causes of delays in the delivery of construction projects: a review of literature. Proceedings of the 17th International Symposium on Advancement of Construction Management and Real Estate. 715-720. 10.1007/978-3-642-35548-6_74

36) Thumbiran, I. and Raphiri, R. (2016) cidb perspective: alignment to the construction procurement environment. cidb Provincial Stakeholder Liaison Meetings, July-September 2016

37) Watermeyer, R. (2012) A Systems Approach to the Effective Delivery of Infrastructure. Civil Engineering, pp: 46-54

38) Watermeyer, R. (2018) Client guide for improving infrastructure project outcomes. Johannesburg, University of the Witwatersrand: School of Construction Economics and Management

39) Watermeyer, R. and Phillips, S. (2020) Public infrastructure delivery and construction sector dynamism in the South African economy. National Planning Commission Economy Series - Background Paper