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Examine the Effectiveness of Project Management Software in Enhancing Performance: A Case Study of the Lusaka Road Decongestion Project

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Abstract
Effective management of large-scale infrastructure projects requires accurate planning, resource allocation, and continuous monitoring. Project management software has become a critical tool for achieving these objectives by automating scheduling, budgeting, risk management, and reporting. Despite widespread adoption, the actual impact of these tools on project performance remains underexplored, particularly in the context of urban road infrastructure in Zambia. This study examines the effectiveness of project management software in enhancing project performance, using the Lusaka Road Decongestion Project as a case study, with a focus on efficiency, decision-making, and overall project outcomes. The study adopted an exploratory case study design, incorporating both qualitative and quantitative research methods. Data was collected from selected construction firms in Lusaka using structured questionnaires. Quantitative data was analyzed using STATA. Chi- square test was used to determine associations between variables like debt levels and business performance indicators. Thematic analysis was be applied to qualitative responses to identify common trends, challenges, and perspectives related to debt management practices. The Lusaka Road Decongestion Project primarily utilized Primavera P6, MS Project, and Civil 3D, with software adoption concentrated in planning and scheduling phases, daily use by core staff, and moderate team coverage. Software application most strongly influenced scheduling and budget control, improved time and cost efficiency, facilitated reporting, and reduced manual work, though its impact on risk management, quality, and communication was limited. Adoption faced significant human and financial constraints, with lack of trained personnel (40%) and high software costs (30%) being the main barriers, alongside occasional technical errors, partial software compatibility, usability challenges, and inconsistent technical support. While most project activities were tracked and core modules were used effectively, gaps remained in feature utilization, system integration, and meeting all project needs, highlighting that human capacity, software complexity, and organizational factors critically shaped the effectiveness and limitations of project management software in the LDP. The study concluded that project management software significantly improved planning, scheduling, and budgeting in the Lusaka Road Decongestion Project, enhancing efficiency and decision-making. However, its effectiveness was limited by inadequate training, software complexity, and poor integration. To maximize benefits, the study recommends continuous capacity building, improved system integration, simplified interfaces, and stronger technical and policy support. Gradual implementation, change management, and software customization to local project needs are essential for sustained performance improvement.

Keywords: Project Management, Project Management Software in Enhancing, Lusaka Road Decongestion Project

1. Introduction

1.1 Background

Globally, the adoption of digital tools such as Microsoft Project, Building Information Modelling (BIM), and Geographic Information Systems (GIS) has transformed infrastructure project management practices. These technologies streamline scheduling, improve cost estimation, and enhance real-time collaboration across stakeholders, enabling timely and cost-effective project delivery (Project Management Institute (PMI, 2021). Developed economies, particularly in North America, Europe, and parts of Asia, have successfully embedded these tools into public sector infrastructure delivery, reducing waste, improving transparency, and mitigating corruption risks (World Bank, 2020) [56].

The African Development Bank (2020) [1] reports that nearly 40% of infrastructure projects in the region suffer cost overruns and delays due to reliance on manual systems and weak planning tools. Countries like Rwanda, Kenya, and South Africa provide notable exceptions, showing progress through targeted ICT investments and institutional reforms. Rwanda's Smart Kigali initiative, for example, introduced ICT-based project tracking systems that improved accountability and reduced delays in urban projects (UN-Habitat, 2021) [51]. Similarly, Kenya has made strides with its National Land Information Management System (NLIMS), which digitized land records and streamlined urban infrastructure planning, despite initial challenges linked to limited digital literacy (Kiptum, 2021).

South Africa has leveraged procurement digitization systems to enhance transparency and efficiency in public projects (Moyo, 2020) [32]. However, despite these regional success stories, the majority of African countries continue to face barriers such as weak internet infrastructure, high software costs, limited training opportunities, and institutional resistance to change (Chitonge, 2019) [8]. These challenges have slowed the scaling up of PMTs across the continent, leaving infrastructure projects vulnerable to inefficiencies, corruption, and persistent budget overruns.

In Zambia, the Lusaka Decongestion Project (LDP) provides a critical case study of the opportunities and limitations of digital adoption in infrastructure project management. Launched in 2021 with the objective of reducing traffic congestion through the construction of flyovers, road expansions, and related urban transport infrastructure, the project symbolized Zambia's push toward modern urban development. However, the project also highlighted systemic weaknesses in digital adoption. Despite the use of some scheduling tools such as Primavera P6, implementation was hindered by inadequate training of staff, lack of interoperability across systems, and limited internet reliability (Zimba, 2021).

By 2023, the LDP had recorded an 18% cost overrun equivalent to ZMW 1.2 billion and faced significant delays attributed to estimation errors, weak cost control mechanisms, and partial reliance on paper-based or spreadsheet-based methods (Government of the Republic of Zambia [GRZ], 2022; LDP Progress Review, 2023 [25]). These challenges reflect broader trends within Zambia's public sector project management environment. While national policies such as the Smart Zambia e- Government Strategy and the Seventh National Development Plan (7NDP) advocate for digital-first approaches, practical implementation has been inconsistent (Smart Zambia, 2018). Smaller contractors and public institutions in particular remain heavily reliant on manual systems, while larger organizations and donor-funded projects are more likely to integrate digital project management tools (Ministry of Transport and Infrastructure (MoTI, 2023). Thus, the experience of the LDP underscores the urgent need for Zambia to strengthen digital adoption in project management, transform capacity gaps into opportunities, and ensure that technology becomes a driver of cost efficiency, transparency, and timely delivery in its infrastructure sector.

1.2 Statement of the Problem

The Lusaka Decongestion Project (LDP) aimed to ease traffic and improve infrastructure but faced significant overspending and delays, raising concerns about the effectiveness of Project Management Technologies (PMTs) used (GRZ, 2022). Despite substantial funding, the project struggled to stay within budget and meet deadlines, with PMTs failing to adequately control costs or optimize resource use. These tools were intended to enhance planning, budgeting, and transparency, but early evidence suggests they were not effectively applied to address overspending (GRZ, 2022). The gap between PMT capabilities and their practical use in the LDP highlights the need for a detailed review to assess their implementation. Without this examination, future projects risk repeating similar inefficiencies, undermining development goals (Smith & Jones, 2023) [48]. Key issues include potential flaws in the technology, inadequate training, or poor integration into project management processes. A thorough assessment could reveal whether PMTs were actively used for cost control or merely supplementary tools with little impact. Lessons from the LDP could improve PMT application by addressing weaknesses, enhancing training, and ensuring better integration (Mwansa, 2024). Such a review is critical to guide future infrastructure projects in Zambia, ensuring cost-effective and efficient use of technology to meet development objectives and minimize wasteful spending.

1.3 General Objectives

The general objective is to examine the effectiveness of project management software in enhancing efficiency in the implementation of the Lusaka Road Decongestion Project.

1.3.1 Specific Objectives

1. To identify the project management softwares utilized in the Lusaka Road Decongestion Project.
2. To determine the effectiveness of the softwares on project performance.
3. To ascertain the Limitations faced in implementing project management software.

1.4 Conceptual Framework

The Technology Acceptance Model (TAM), originally developed to explain user behaviour in information systems, remains a widely recognized framework for understanding technology adoption across various fields, including public administration, e-governance, and project management (Wirtz & Daiser, 2018). In the context of this research examining the effectiveness of project management technologies (PMTs) in enhancing cost efficiency, TAM provides a robust lens for understanding how and why project stakeholders adopt or reject digital tools in infrastructure development projects, such as the Lusaka Decongestion Project (LDP). TAM posits that two primary factors influence technology adoption: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). These factors are particularly relevant when examining how PMTs are employed in large-scale infrastructure projects where effective planning, budgeting, and monitoring are critical to achieving cost efficiency (Serrador, 2019).

2. Literature Review

2.1 Project management softwares utilized in the Road Decongestion Project

All over the world, project management software has become a game-changer for getting big infrastructure and construction projects done right. These tools help teams plan

schedules, manage budgets, and keep everyone on the same page, saving time and money. In places like the United States, Europe, and the Middle East, tools like Microsoft Project, Primavera P6, and Building Information Modelling (BIM) are must-haves for keeping projects on track (Meredith & Mantel, 2020) [27].

In Africa, countries are starting to catch up, using these tools to tackle growing infrastructure needs, though they face hurdles like spotty internet and limited training. Zambia's Lusaka Decongestion Road Project (LDP) is a great example of how these tools can make a difference, even in a developing country. Let's dive into how these technologies work globally, how they were used in the LDP, and what Zambia can learn for future projects.In countries with advanced economies, project management software is like the backbone of big projects. Microsoft Project, for example, is super popular because it's easy to use and helps break down complex projects into clear tasks. Picture the California High-Speed Rail project in the U.S, a massive $100 billion effort. Teams used Microsoft Project to juggle thousands of tasks across dozens of contractors, making sure everything stayed on schedule and within budget (California High-Speed Rail Authority, 2021).

Then there's Primavera P6, which is a heavy hitter for huge projects. In Saudi Arabia's NEOM city, a futuristic urban development, Primavera P6 helped planners map out critical tasks and cut scheduling conflicts by 15%, saving millions (Alshawi & Alalwany, 2019). Building Information Modelling (BIM) takes things to another level. It's not just about creating 3D designs, it combines those designs with schedules and cost estimates, so teams can see the whole project picture before construction even starts. In the UK, the Cross-rail project, a massive railway, used BIM to catch design mistakes early, saving £200 million by avoiding costly fixes (Eastman *et al*., 2018). These tools make projects smoother, cheaper, and higher quality by helping teams make smart decisions fast. Then there are cloud-based tools like Asana, Trello, and Monday.com, which are perfect for teams spread across different locations. These platforms let people share documents, track progress, and chat in real time. In Australia, road construction teams use Trello's visual boards to keep tasks organized, cutting delays by 10% (Kerzner, 2021). Singapore, always ahead of the curve, uses Monday.com for its Smart Nation projects, pulling in data from sensors to make real-time decisions about urban development (Singapore Land Authority, 2020).

GIS was like a super-smart mapmaker. It created detailed maps of Lusaka's roads, traffic patterns, and land use, helping planners decide where to build new roads or flyovers. For example, it pinpointed high-traffic spots where flyovers would make the biggest difference, saving 5% on planning costs by avoiding bad locations (Zambia Roads Development Agency, 2020) [58]. It also ensured projects met environmental rules. AutoCAD and Civil 3D: These tools were all about designing roads that were safe and practical. AutoCAD created precise blueprints, while Civil 3D built 3D models to test designs before construction. For instance, Civil 3D caught a flaw in a flyover design, saving $300,000 by fixing it early (JICA, 2019).

2.2 Effectiveness of project management Softwares on Cost Estimation, Budgeting, and Control

Worldwide, digital tools have transformed how projects handle cost estimation, budgeting, and expense control. In developed countries, tools like Building Information Modelling (BIM), Primavera P6, and CostX create accurate cost predictions, prevent overspending, and monitor expenses as they happen (Meredith & Mantel, 2020) [27]. BIM is especially useful because it combines 3D designs with time and cost data, known as 5D modelling. This helps teams predict costs at different project stages and spot financial risks early (Eastman *et al*., 2018). For example, in the UK, the government requires BIM for public projects, leading to average cost savings of 20% by improving planning and reducing errors (UK Cabinet Office, 2018).

Primavera P6, popular in the Middle East and North America, offers strong tools to track budgets, expenses, and future costs throughout a project. Connecting it with Enterprise Resource Planning (ERP) systems makes managing large budgets easier (Alshawi & Alalwany, 2019). Earned Value Management (EVM) systems are also widely used to check project progress and control costs. They compare planned costs with actual spending and work done, highlighting budget differences and performance (PMI, 2021). For instance, EVM helped a U.S. highway project identify a 5% budget overrun early, allowing managers to adjust resources and avoid further losses (Serrador & Pinto, 2019) [45].

In Africa, public infrastructure projects often face overspending and budget issues. Digital tools are slowly improving this. In South Africa, the Gautrain Rapid Rail Link used BIM and ERP systems to improve cost accuracy and reduce overspending by better coordinating planning and construction (South Africa Department of Transport, 2019) [49]. For example, BIM helped map the rail route, cutting unexpected costs by 15%. In Kenya, e-procurement and cost estimation tools, supported by the Integrated Financial Management Information System (IFMIS), have improved openness and financial control. These tools track budgets, provide real-time reports, and connect with national treasury systems (World Bank, 2020) [56].

In Nigeria, road projects use Microsoft Project and ERP modules to manage purchasing costs and predict budget needs. Project accounting tools help managers spot and fix cost problems early, such as a road project in Lagos that saved 10% by adjusting material orders (Obi, 2020) [40]. However, weak internet, limited training, and resistance to new tools still limit success across Africa (Kabwe & Chileshe, 2021) [21].

The Lusaka Decongestion Project (LDP), a partnership between the Government of Zambia and the Japanese International Cooperation Agency (JICA), aimed to ease Lusaka's traffic by building flyovers, widening roads, and improving intersections. Managing costs was a key focus, and digital tools were used to improve cost predictions, budgeting, and expense tracking (JICA, 2019). AutoCAD Civil 3D and quantity take-off software helped design and estimate costs. These tools measured materials and construction need accurately, leading to better cost predictions. For example, they ensured the LDP's flyover designs used the right amount of concrete, saving 8% on material costs (LCC, 2022) [24].

2.3 Limitations in Implementing project management softwares

Across the globe, one of the main barriers to adopting new project management technologies is resistance to change. Employees who are accustomed to traditional methods may

be hesitant to embrace new approaches. This resistance often stems from a fear of job loss or a belief that new technologies are too complex to learn. According to Venkatesh and Bala (2008), this fear can create a significant hurdle for organizations trying to implement automated systems. Another challenge is the need for specific skills to effectively use advanced project management tools. Many of these technologies require knowledge of software applications, data analysis, and systems integration. In countries like the United States and the United Kingdom, the initial lack of training programs limited the effective use of BIM and ERP systems (Azhar, 2011; Eastman *et al*., 2011) [5, 11].

Without proper training, employees may struggle to utilize these tools to their full potential. Technological fragmentation is also a significant issue. Integrating project data across different platforms such as combining ERP with Geographic Information Systems (GIS) or BIM often requires additional software or custom solutions. This need for integration can increase costs and complexity, making it harder for organizations to achieve their goals (Turner, 2016).

As projects become more digital, concerns about data security are on the rise. This is particularly true for public infrastructure projects that handle sensitive financial information. The risk of data breaches can create hesitation among stakeholders when it comes to adopting new technologies (Kerzner, 2017) [23]. In Africa, the use of project management technologies in infrastructure projects is inconsistent, with varying degrees of adoption and success. Several common challenges are faced by many countries in the region:

Many African countries struggle with unreliable power supply and poor internet connectivity. These issues can hinder the effectiveness of digital tools, which rely on stable electricity and internet access for real-time collaboration and data storage (World Bank, 2019) [54]. Without reliable infrastructure, the benefits of advanced project management tools may not be fully realized. The costs associated with licensing, implementing, and maintaining advanced technologies like Primavera P6 and Oracle ERP present significant barriers for many public sector projects in Africa (Obi, 2020) [40].

The high expenses can deter organizations from adopting these tools, especially when budgets are tight. A recurring issue in Africa is the lack of skilled professionals who can manage and operate advanced project management technologies. Many engineers and construction professionals have limited exposure to cutting-edge software (Ndou, 2004). This skills gap can prevent organizations from fully utilizing the tools available to them. Inconsistent or outdated policy frameworks across African nations often fail to provide guidance or incentives for the adoption of project management technologies in public infrastructure development (Smart Zambia, 2018).

Without supportive policies, organizations may struggle to implement new tools effectively. Cultural attitudes toward technology can also play a role in the adoption of project management tools. In many African contexts, there is a preference for traditional methods of project management, which can lead to resistance against adopting new technologies. This cultural inertia can slow down the pace of technological advancement in the region.

3. Research Methodology

3.1 Research Design

The study adopted an exploratory case study, utilizing a mixed method approach.

3.2 Target Population

The study consisted of project managers.

3.3 Sample Size

The study consisted of 50 project managers in Road construction projects in Lusaka.

3.4 Sampling

Convenience sampling approach was used to select the study sample.

3.5 Data Collection Methods

The main data collection method for this study was a structured questionnaire containing closed-ended questions.

4. Result Presentation

4.1 Presentation of results on background characteristics of the respondents

Of the 100 participants, 60% were male, and 40% were female.

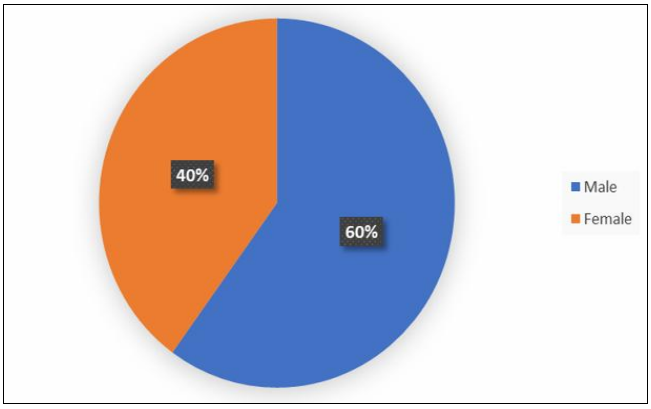

Fig 1: Gender

The majority of the participants (82%) were married. A smaller proportion, 8%, were single, while 10% were divorced.

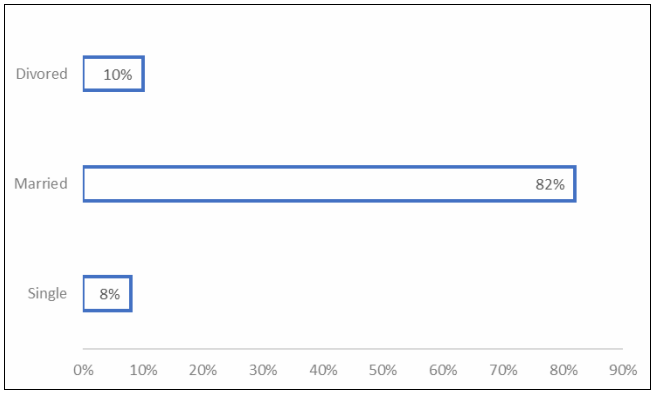

Fig 2: Marital Status

Most participants had a Bachelor's degree, with 80% reporting this level of education. An additional 18% held a Master's degree, and 2% had a PhD.

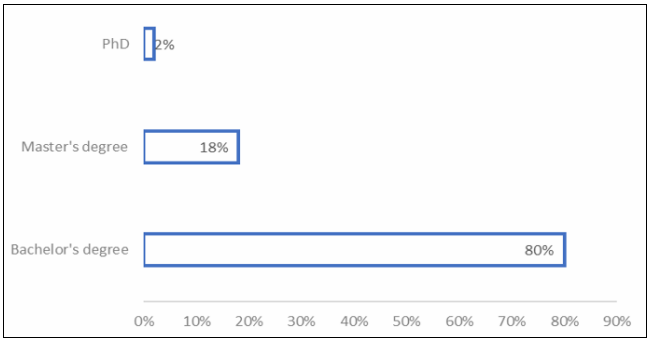

Fig 3: Educational Background

4.2 Project management softwares utilized in the Lusaka Road Decongestion Project

The findings indicate that Primavera P6 is the most frequently utilized project management software in the Lusaka Road Decongestion Project, with 40% of respondents reporting its primary use. MS Project and Civil 3D are also in use, reported by 30% and 20% of respondents, respectively. The low usage of AutoCAD (6%) and other software (4%) suggests that design or drawing-specific tools are secondary to scheduling and resource management functions.

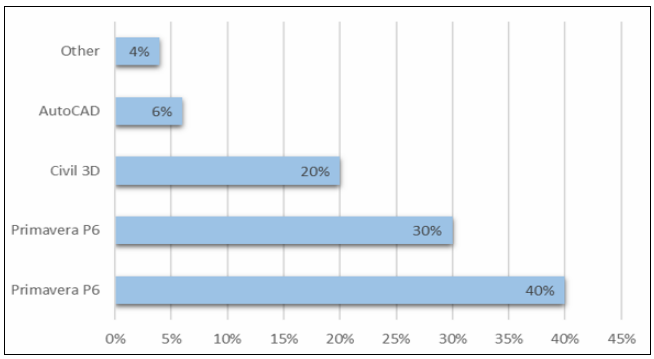

Fig 4.2.1: Primary software used

The data shows that software adoption is concentrated during the planning (24%) and scheduling (30%) phases, while resource management, monitoring, and reporting receive comparatively lower attention. This pattern suggests that project teams rely on software mainly for early- stage planning and coordination, rather than for ongoing monitoring or execution oversight.

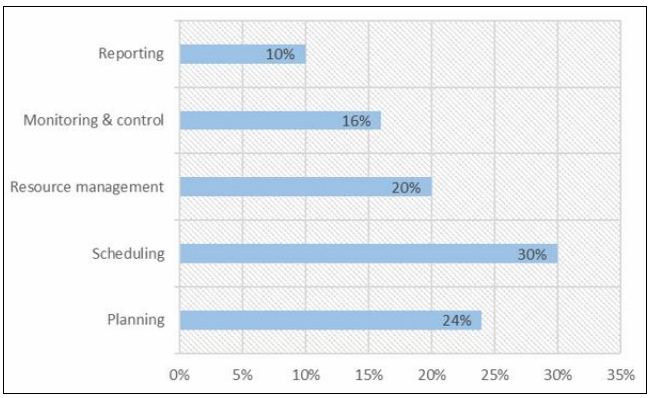

Fig 4.2.2: Phase software is used

The Chi-square test examined the relationship between the type of project management software used and the phase of the project where it is most frequently applied. The results show a statistically significant association between these two variables ($\chi^2 = 96.667$, df = 6, $p < 0.05$). This means that the choice of software is not random across project phases. Certain software tools are more commonly used in specific phases of the Lusaka Road Decongestion Project. For instance, applications such as Primavera P6 and Microsoft Project may be more dominant during the planning and scheduling stages, while tools like Civil 3D and AutoCAD are likely preferred during execution and monitoring phases.

Table 4.2.1: Association Between Type of Project Management Software and Project Phase of Use (Chi-Square Tests)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi- Square	96.667a	6	.000
Likelihood Ratio	112.288	6	.000
Linear-by-Linear Association	1.820	1	.000
N of Valid Cases	100		

The survey shows that 40% of respondents track 51–75% of project activities using the software, while 30% track 76–100%. Only a minority track fewer than half of the activities. This indicates that the software captures the majority of project workflows but does not cover all operational processes.

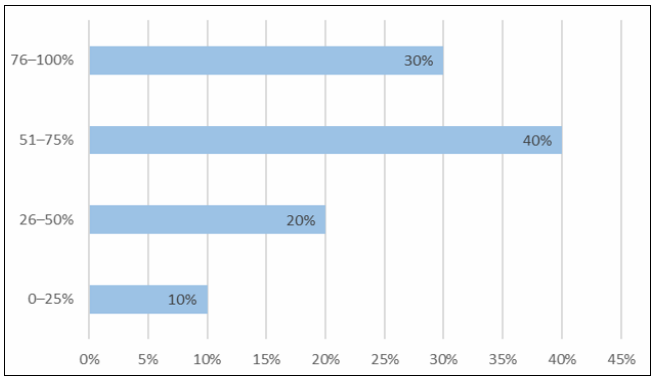

Fig 4.2.3: Percentage of project activities tracked

Desktops (60%) and laptops (30%) are the primary devices for accessing project management software. Tablets (8%) and smartphones (2%) are rarely used, highlighting a reliance on stationary devices for software interaction.

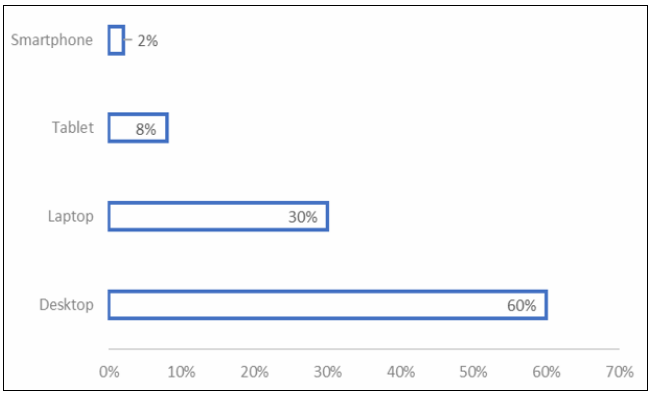

Fig 4.2.4: Devices used to access software

The most utilized modules are scheduling (36%) and budgeting (24%), followed by resource management (20%), reporting (14%), and risk management (6%). This pattern indicates that users prioritize time and cost control over analytics, risk mitigation, or reporting features.

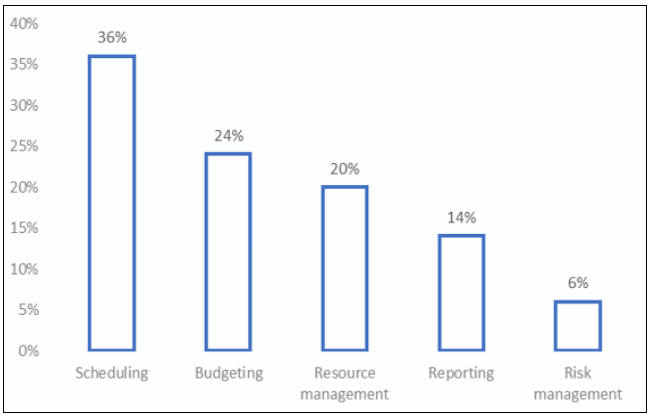

Fig 4.2.5: Modules most used

Project managers (40%) and project engineers (30%) are the primary operators, with fewer site supervisors (20%) and external consultants (10%) using the software. This demonstrates that adoption is concentrated among technical and managerial staff who oversee planning, scheduling, and reporting.

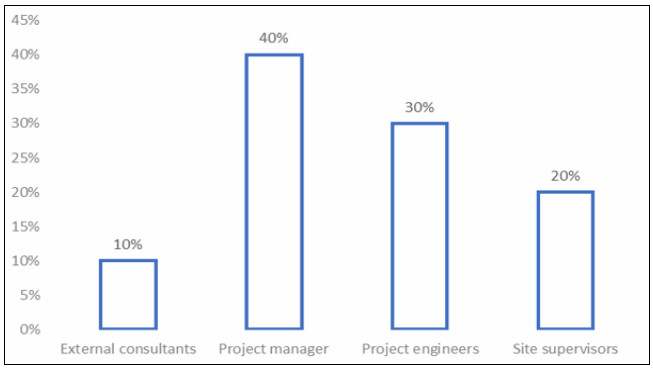

Fig 4.2.6: Who operates the software

The Chi-square test was conducted to determine whether the type of project management software used is associated with the category of professionals who primarily operate it. The results indicate a statistically significant relationship between these variables ($\chi^2 = 96.667$, df = 6, $p < 0.05$). This suggests that the use of specific software varies depending on the professional role.

Table 4.2.2: Association Between Type of Project Management Software and Primary Operator (Chi-Square Tests)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi- Square	96.667a	6	.001
Likelihood Ratio	112.288	6	.011
Linear-by-Linear Association	1.820	1	.001
N of Valid Cases	100		

Training is mostly provided in-house (50%) or through online courses (30%), with minimal reliance on external workshops (16%) or self- learning (4%). This indicates that organizations prefer internal capacity-building strategies, likely due to cost considerations and project-specific training needs.

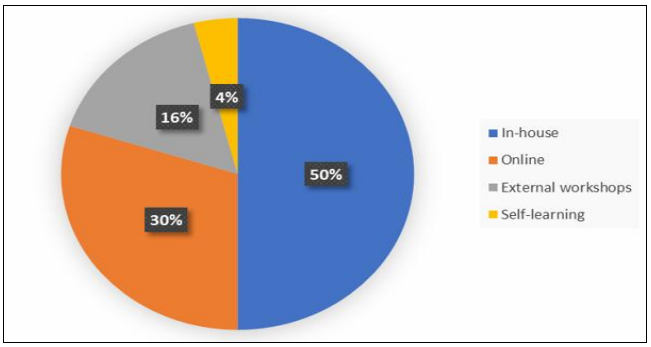

Fig 4.2.7: Training type

4.3 The effectiveness of the utilized software on project performance outcomes

Scheduling (36%) and budget control (24%) were identified as the performance areas most influenced by software use, followed by resource utilization, risk mitigation, and reporting. This demonstrates that software adoption contributes more significantly to planning and financial control than to risk management or communication, suggesting targeted effectiveness in operationally critical areas.

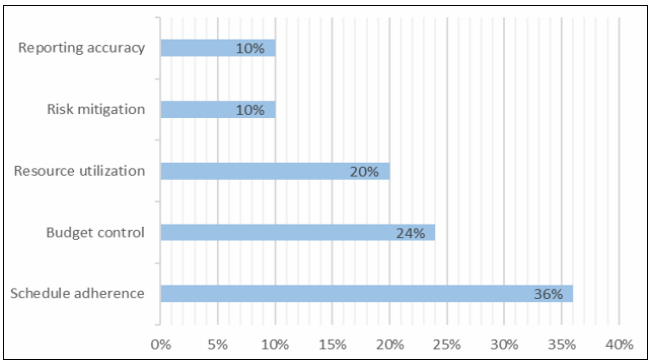

Fig 4.3.1: Performance indicators influenced

Time efficiency (36%) and cost efficiency (30%) were the primary improvements noted, with quality and communication showing smaller gains. This implies that the software has a tangible impact on operational efficiency but is less influential on collaborative or quality management outcomes.

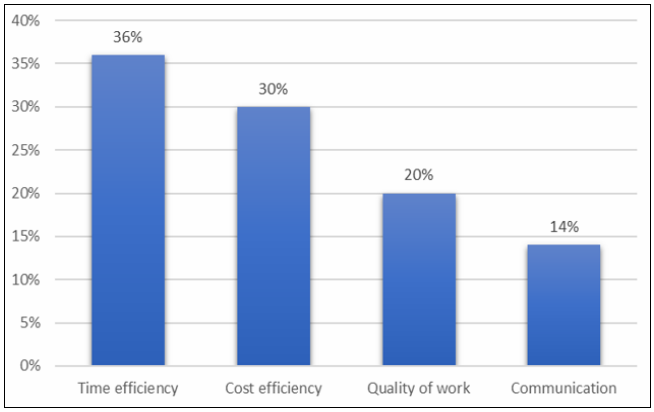

Fig 4.3.2: Project outcomes improved

Decision-making support occurs weekly (40%) or monthly (30%), with fewer daily applications (20%). This indicates that the software is more effective for periodic strategic or tactical decisions rather than immediate daily operational adjustments.

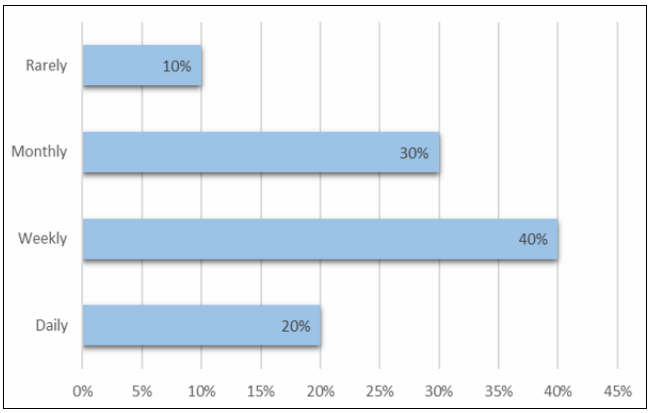

Fig 4.3.3: Decision support frequency

Scheduling (36%) and budgeting (24%) are the most valuable features in supporting project performance. Other features like resource management and reporting are used but are secondary, showing that users prioritize time and cost management above analytical or collaborative functions.

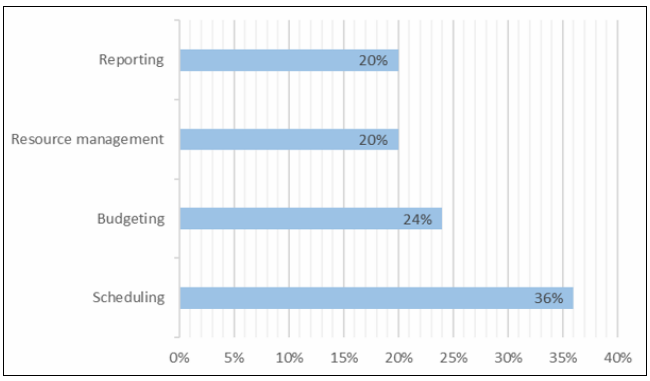

Fig 4.3.4: Software features contributing most

The Chi-square test examined the relationship between the project performance indicators most influenced by the software and the project outcomes that improved the most. The results show no statistically significant association between these two variables ($\chi^2 = 96.667$, df = 6, $p > 0.05$). This means that the type of performance indicator affected by the software such as schedule adherence, budget control, or resource utilization does not significantly correspond with specific areas of improvement like time efficiency, cost efficiency, or communication.

Table 4.3.1: Association Between Project Performance Indicators Influenced and Project Outcomes Improved (Chi-Square Tests)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi- Square	96.66 7a	6	.601
Likelihood Ratio	112.2 88	6	.231
Linear-by-Linear Association	1.820	1	.059
N of Valid Cases	100		

4.4 Limitations faced in implementing project management software

The survey findings reveal that the main barriers to adopting project management software in the Lusaka Road Decongestion Project are primarily human and financial factors. Lack of trained personnel was reported by 40% of respondents, making it the most frequently cited constraint. This suggests that even when software is available, staff may lack the knowledge or confidence to use it effectively, limiting the overall adoption rate. High software cost, reported by 30%, also serves as a significant barrier, indicating that budget constraints may prevent organizations from acquiring licenses or upgrading software. Other limitations, such as poor internet connectivity (16%), resistance to change (10%), and compatibility issues with other systems (4%), were reported less frequently but still indicate potential challenges in smooth software integration and operational consistency.

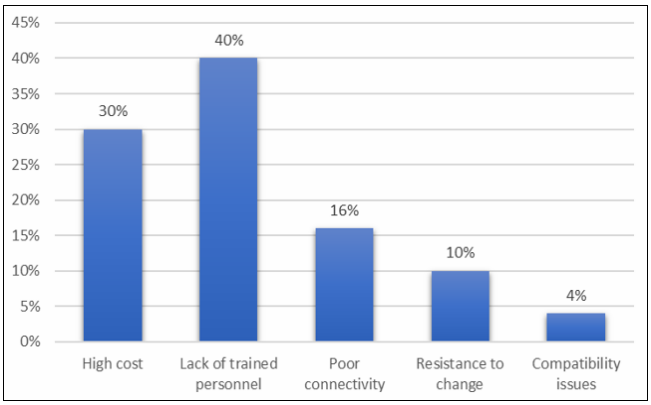

Fig 4.4.1: Limits to adoption

Scheduling (40%) and resource allocation (30%) were identified as the project management functions most affected by software limitations. These areas are highly dependent on accurate and timely data entry, as well as integration with other tools for real-time updates. Challenges in these areas suggest that software may be limited by incomplete datasets, user errors, or insufficient customization to match project requirements. Reporting (10%) and budgeting (20%) were less frequently impacted, indicating that software functionality in financial and reporting modules is relatively stable, but planning and operational execution remain sensitive to limitations.

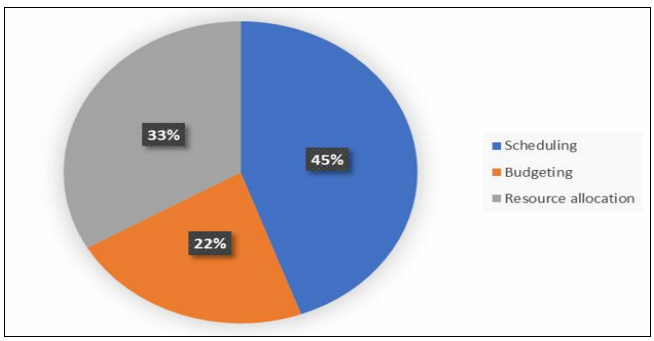

Fig 4.4.2: Areas facing challenges

Technical support availability appears to be inconsistent. While 24% of respondents reported that support is readily accessible, 40% said it is only sometimes available, and

20% reported rare access. Eight percent of respondents reported no accessible support.

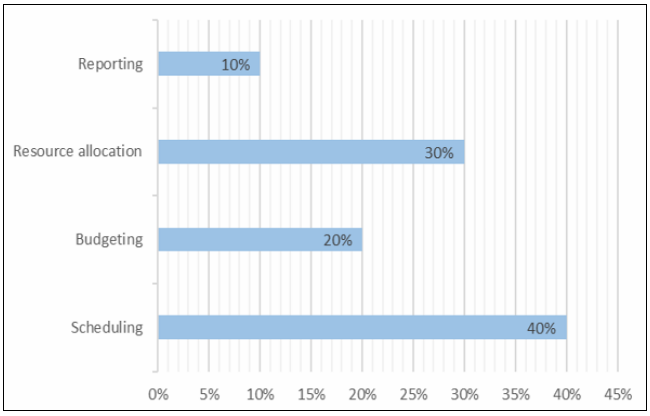

Fig 4.4.3: Technical support accessibility

Respondents identified insufficient training (40%) and software complexity (30%) as the limitations with the greatest impact on project performance. High-impact limitations suggest that human factors, including the knowledge and skill levels of users, are more influential on software effectiveness than technical issues alone.

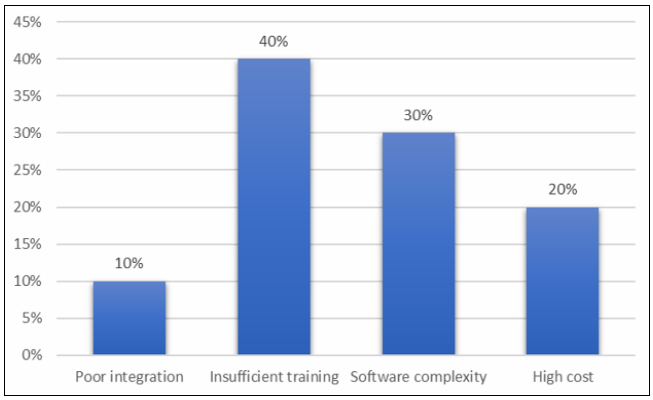

Fig 4.4.4: Limitation impact

Software updates were reported as occurring quarterly (40%) or annually (40%), with 10% receiving monthly updates and 10% rarely receiving updates. While the update schedule appears predictable, the infrequent updates for some users may delay access to new features, bug fixes, and improvements in functionality.

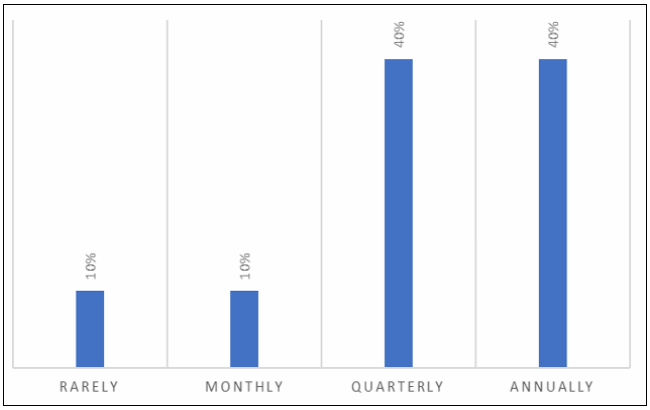

Fig 4.4.5: Update frequency

Feature underutilization was primarily attributed to software complexity (40%) and lack of awareness (30%). This indicates that even when features exist, users may not employ them due to insufficient training, lack of understanding, or the perceived difficulty of using advanced functions. Irrelevance of certain features (20%) and other unspecified factors (10%) also contributed to underutilization. Collectively, these findings highlight that both human and software design factors influence the effective deployment of project management tools.

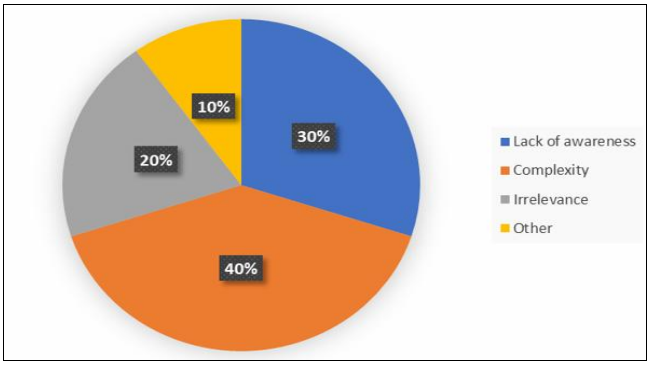

Fig 4.5.6: Feature underutilization

5. Discussion

Globally, project management software (PMS) such as Microsoft Project, Primavera P6, BIM, and ERP systems have enhanced planning, scheduling, budgeting, and coordination in infrastructure projects by improving cost control, efficiency, and decision-making. In Africa, adoption is growing, with countries like South Africa, Kenya, and Nigeria reporting measurable benefits despite challenges of limited technical capacity, high costs, and poor connectivity. The Lusaka Decongestion Project (LDP) in Zambia demonstrated similar outcomes, where Primavera P6, Microsoft Project, Civil 3D, and GIS were applied mainly in planning and scheduling to improve time and cost efficiency while reducing manual work and enhancing reporting. However, partial software integration, inadequate training, and high licensing costs limited full utilization, with 40% of respondents citing lack of trained personnel as a key barrier. Despite these constraints, PMS adoption in the LDP improved schedule adherence, budget control, and transparency, showing that even partial implementation can yield efficiency gains. The findings support the Technology Acceptance Model, highlighting that ease of use and perceived usefulness drive adoption, and emphasize the need for enhanced training, better integration, and supportive infrastructure to maximize PMS benefits in Zambia's future infrastructure projects.

6. Conclusion

Based on the study findings, it can be concluded that project management software plays a significant role in enhancing the performance of large-scale infrastructure projects, as evidenced by the Lusaka Road Decongestion Project. The adoption of tools such as Primavera P6, MS Project, and Civil 3D contributed positively to planning, scheduling, and budget control, improving operational efficiency, reducing manual work, and supporting timely decision-making. However, the study also revealed that the effectiveness of these tools was constrained by human and organizational

factors, including limited training, software complexity, partial integration, and inconsistent technical support. While software use enhanced time and cost efficiency and facilitated reporting, its impact on risk management, quality, and communication was less pronounced. Overall, the study demonstrates that project management software can substantially improve project performance, but maximizing its benefits requires targeted capacity-building, integration of systems, and alignment with user skills and project requirements. The Lusaka Road Decongestion Project illustrates that technological tools are most effective when combined with trained personnel, structured processes, and supportive organizational frameworks.

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