

# ASSESSMENT OF LEAN GUIDED CONSTRUCTION PROJECT MONITORING AND EVALUATION PRACTICES: ISSUES AND CHALLENGES

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## ABSTRACT

Monitoring and evaluation (M&E) practices in construction projects are valuable for managing the execution and ensuring quality project delivery. However, implementing the lean-guided M&E practice in construction projects faces different issues and challenges. The study considered issues and challenges in lean-guided monitoring and evaluation practices for construction projects in South Africa. A field survey was carried out among construction professionals in Mpumalanga province, South Africa, to identify issues and challenges they faced in lean-guided M&E practices on construction project activities. A random sampling method was used to collect data, and 36 questionnaires were retrieved from the construction professionals within the study area. Data collected were computed using a descriptive statistical approach. The valid mean item score was determined in this study by utilizing a statistical data equation (mathematical equation). The study's findings showed that lack of dedicated management staff, proper documentation, and construction project goals were the highest-ranked challenges facing lean-guided M&E practices in construction projects. The study concluded that construction professionals should be trained on lean principles and their application in different aspects of construction management and planning to improve the M&E practices on construction sites to achieve set project goals.

## KEYWORDS

Construction projects, monitoring and evaluation, lean construction, lean thinking, South Africa.

## INTRODUCTION

The procedure for controlling and examining the construction project process to ensure that professionals involved meet the project objectives is M&E (Ogunbayo et al., 2022). Tengan and Aigbavboa (2019) state that M&E is a tool that aids effective project performance. It is also

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a valuable tool for managing the execution and successful project delivery (Kissi et al., 2019; Ogunbayo & Aigbavboa, 2019).

M&E is a project management function aimed at sequentially collecting information on construction projects to inform stakeholders involved on the progress on cost, quality, and time triangle towards promoting organizational learning and management decision (Otieno, 2000; Tengan and Aigbavboa 2016; Kusek and Rist 2004). However, M&E, aided by the lean principle for construction projects, will define a clear set of objectives for the delivery process of construction projects. Effective use of the Lean construction principle in guiding the M&E system in construction projects will improve production control throughout the project's life (Locatelli et al., 2013).

Construction professionals and other stakeholders benefit from effective M&E by avoiding unforeseeable issues (Ogolla & Moronge, 2016; Ogunbayo & Mhlanga, 2021). In project appraisal for construction work, M&E needs to be complete and ready for projects to be sustainable and relevant (Muiga, 2015). M&E practices in construction projects make it simpler for the construction professional to execute the construction program for an effective production process. Tengan and Aigbavboa (2016) postulated that M&E practices in construction projects are management functions for effective project resource organisation. Hence, M&E is significant to construction industry performance by facilitating strategic decision-making for successful project implementation (Otieno, 2000). Nonetheless, Thomas et al. (2003) noted that the main effort of lean thinking in M&E practice in a project is to reduce the high variability that affects it through a more reliable workflow of information, materials, and equipment carried out mainly through the last planner system. Further, Howell et al. (2004) sustain that lean construction and principle is not only about project activity optimization by activity but overall project optimization with bases for consideration on how every single activity affects the next.

Despite efforts made by construction professionals to achieve lean-guided M&E practice in the construction industry, the process faced different issues and challenges. Also, fewer studies have established the issues and challenges affecting lean-guided M&E practices within the construction industry, especially in developing economies (Ogolla & Moronge, 2016; Tengan & Aigbavboa, 2019). Hence, this study uses the South African construction industry as a case study to assess issues and challenges in lean-guided M&E practices in construction projects.

## LITERATURE REVIEW

Developing economies' inability to deliver construction projects successfully is based on poor implementation of M&E and practice (Otieno, 2000; Ogunbayo et al., 2018). Construction projects in these countries faced different issues and challenges hindering the lean-guided M&E practice within their construction industry (Bohn & Teizer, 2010). These issues and challenges affected developing economies' construction industry, including South Africa, in meeting their construction target leading to abandonment and delays in construction delivery (Tengan & Aigbavboa, 2016; Ogunbayo et al., 2021).

Bhagavan (2004) states that in the construction industry of developing economies, lean-guided M&E practices are affected by weak government policies, political conflict, corruption among policymakers (government), and a lack of standard M&E guidelines. Similarly, weak government institutions have made the M&E practice in the construction industry face issues and challenges (Oloo, 2011). This has caused corruption among stakeholders (government and construction professionals) involved in the tendering process for construction projects and impacts the lean-guided M&E practice and its implementation (Crawford & Bryce, 2003).

Chaplowe and Cousins (2015) state that lean-guided M&E practice needs a combined effect of good planning, budgeting, and construction targets to achieve all stages in the construction

project cycle. However, Prennushi, Rubio, and Subbarao (2002) assert that the lack of construction project goals, objectives, and standard guides or planning for the construction industry are issues and challenges affecting the lean-guided M&E practice in developing economies. Waithera and Wanyoike (2015) noted that insufficient data gathering, poor construction methodology, and construction documentation were issues and challenges affecting lean-guided M&E practice in construction operations and processes. This clearly shows that the weak link between construction project goals, objectives, standard guides or planning, and M&E practice will lead to issues and challenges affecting construction activities (Prennushi et al., 2002; Ogunbayo et al., 2021).

Badom (2016) postulated that in ensuring effective lean-guided M&E practice in construction projects, stakeholders must be dedicated to its implementation, especially by working with appropriate construction documents and lean principles. Zhou and Hardlife (2013) assert that this process can be difficult due largely to a lack of a dedicated management team, poor construction documentation, and a shortage of skilled construction professionals. Similarly, Tengan and Aigbavboa (2016) noted that lean-guided M&E practice is a process that can improve construction proceedings, but its implementation within the construction industry is hindered by insufficient funding allocation by the government, lack of resources and knowledge on lean principle for M&E implementation for construction projects.

Kusek and Rist (2004) posit that a corrupt-free system within a country has a multiplying impact on national economic development, including the construction industry. However, Masoetsa et al. (2022) postulated that the construction industry's economic expansion problem without adequate planning for bureaucracy to cater for lean-guided M&E practice toward a healthy construction industry has led to issues and challenges affecting project executions. Also, the lean-guided M&E practice faces implementation problems in construction projects due to corruption and unethical behaviour of construction workers on sites (Kamau & Mohamed, 2015).

Further, Issa (2013) reveals that Lean construction techniques and principles can potentially reduce the effects of risk factors (issues and challenges ) on cost, quality, and time objectives during the M&E process for construction projects. On this note, studies on the significance of using lean construction in construction projects have been conducted in different countries (Adamu & Hamid, 2012; Akinradewo et al., 2018; Fiallo & Revelo, 2002). Further attempts have been made to apply lean principles and techniques to construction project management processes, including the M&E aspect of the construction projects, production control, design, project delivery system, and supply. Koskela et al. (1996) studied a fast-track office building project, and the study's findings showed how the building process could be made leaner and speedier. The study of Tsao et al. (2000) indicated how lean thinking and work structuring helped improve the construction process's design and installation. The finding of the study by Ballard et al. (2002) illustrated the power of lean concepts and techniques and their applicability to construction project processes and operations.

Table 1: Issues and challenges affecting M&E practices.

<b>s/n</b>	<b>Issues and Challenges</b>	<b>Authors</b>	<b>Countries</b>
1	Lack of dedicated management staff	Kusek and Rist (2004) Badom (2016)	USA Nigeria
2	Lack of proper construction documentation	Prennushi et al. (2002) Crawford and Bryce (2003)	USA Australia
3	Lack of construction project goals	Prennushi et al. (2002) Chaplowe and Cousins (2015)	USA USA
4	Corruption in the construction projects tender process	Crawford & Bryce (2003)	Australia
5	Lack construction objectives	Kamau & Mohamed (2015) Locatelli et al. (2013)	Kenya UK

6	Problem of economic expansion of the construction industry	Ogolla & Moronge (2016) Kusek and Rist (2004)	Kenya USA
7	Lack of M&E policy by the government	Masoetsa et al. (2022) Oloo (2011)	South Africa Kenya
8	Corruption among government personnel	Bhagavan (2004) Crawford & Bryce (2003)	Sweden Australia
9	Corruption among construction workers	Bhagavan (2004) Oloo (2011)	Sweden Kenya
10	Lack of standard guide for the construction industry	Crawford and Bryce (2003)	Australia
11	Unethical behaviour of construction workers	Zhou and Hardlife (2013) Crawford and Bryce (2003)	Zimbabwe Australia
12	Shortage of skilled M&E team	Bhagavan (2004)	Sweden
13	Lack of knowledge of implementing M&E	Zhou and Hardlife (2013) Tengan and Aigbavboa (2016)	Zimbabwe Ghana
14	Political conflicts	Bhagavan (2004) Oloo (2011)	Sweden Kenya
15	Lack of construction resources	Crawford & Bryce, 2003 Chaplowe and Cousins (2015)	Australia USA
16	Insufficient data gathering	Kusek and Rist (2004)	USA
17	Lack of proper construction methodology	Tengan and Aigbavboa (2016) Kusek and Rist (2004), Tengan and Aigbavboa (2019)	Ghana USA Ghana
18	Insufficient construction funding	Prennushi et al. (2002) Waithera and Wanyoike (2015)	USA Kenya
		Kusek and Rist (2004) Tengan and Aigbavboa (2016)	USA Ghana

However, the application of the lean principles in the M&E process still faces issues and challenges that need to be identified as it affects the construction project processes and operations (Badom, 2016; Kusek & Rist, 2004; Tengan & Aigbavboa, 2016). Additionally, it is critical to identify issues and challenges as it affects the lean-guided M&E practice in construction projects. This is because the political climate around construction projects (on and off the project site) might make it difficult to have effective and efficient lean-guided M&E practices within the project (Masoetsa et al., 2022). These issues and challenges, as highlighted in Table 1, have deprived M & E practitioners within the developing economies' construction industry of meeting the demand for effective construction project flow, budgeting, execution, and delivery (Oloo, 2011; Kamau and Mohamed, 2015; Tengan & Aigbavboa, 2016; Masoetsa et al., 2022). This study aims to affirm these issues and challenges in M&E practice as it affects construction project operations and processes in developing countries using the South African construction industry as a case study.

## METHODOLOGY

This study was carried out within Mpumalanga province in South Africa among construction professionals working on construction projects within the construction industry. Respondents for this study were selected based on their involvement and experience with the M&E process in construction projects. Mpumalanga province was chosen for this study because it has many ongoing construction projects (government and private projects) with M&E units established within their construction process. Through the systematic random sampling method, 50 (fifty) questionnaires were administered to the respondents, and 36 (thirty-six) were retrieved. This study used the systematic random sampling method because it is easier and more direct and eliminates the possibility of clustering when adopted than cluster sampling, which breaks the population into different clusters and takes a simple random sample from each cluster. (Rea &

Parker, 2014). It also tends to cover all the elements evenly (Ogunbayo et al., 2022). The questionnaire was designed on a 5-point Likert scale and recorded a 72% response rate, using Strongly Disagreeing=1, Disagreeing=2, Neutral=3, Agreeing=4, and Strongly Agree=5.

The respondents were asked questions about their genders, years of experience, profession, and type of construction projects they were involved in the construction industry. Through the questionnaire, respondents were further asked about eighteen issues and challenges facing M&E practices in construction projects identified from the literature. After computation, the issues and challenges identified were sorted from the highest to lowest in terms of their mean item score (MIS). This helped this study assess issues and challenges affecting lean-guided M&E practices in construction projects within the study area. The study adopted descriptive statistical tools using MIS to analyse how participants rated various questions in the survey questionnaire. According to Pallant (2020), means are significant in descriptive research since they reveal average participant scores on a given measure.

## RESULTS

Figure 1 reveals the respondents' gender. The result shows that 69.44% (25) of respondents are male, while 30.56% (11) are female construction professionals within the study area.

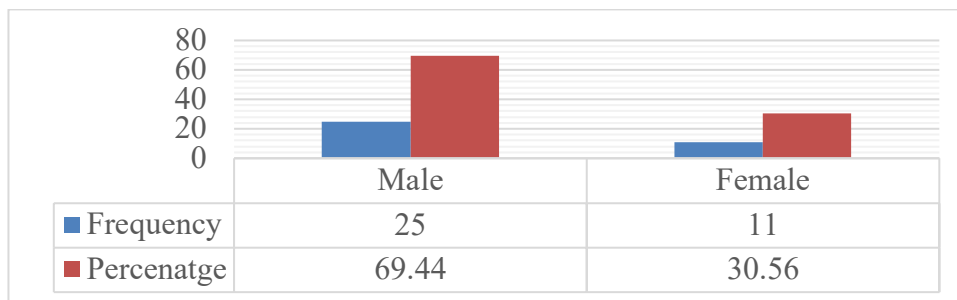


Figure1: Respondent's gender

Figure 2 reveals the respondents' years of experience in M&E within the construction industry. The result reveals that 25% (9) of respondents have 0-5years of experience, 41.67% (15) have 6-10 years of experience, 19.44% (7) have 11-15 years of experience, while 13.89% (5) of the respondents have above 16 years of experience.

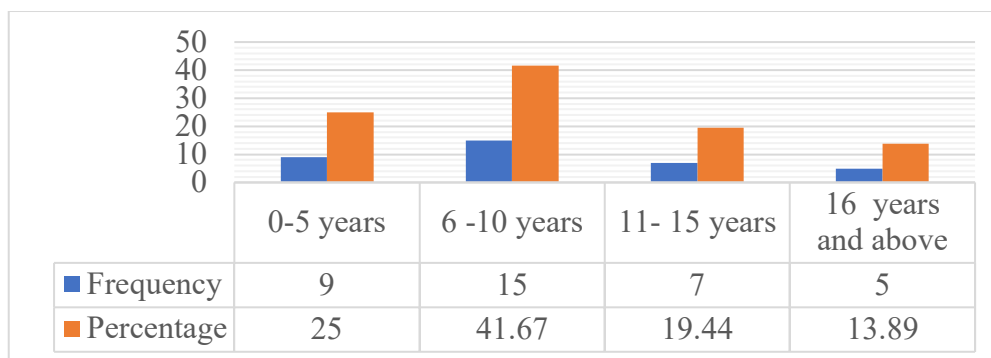


Figure 2: Respondents' years of experience

Figure 3 shows the respondent's profession in the construction industry. As shown in Figure 3, 22.22% (8) of the respondent are civil engineers, 27.78 % (10) of the respondents are construction managers, 19.44% (7) are construction project managers, 25% (9) are quantity surveyors, while 5.56% (2) are other comprises of an architect and a consultant.

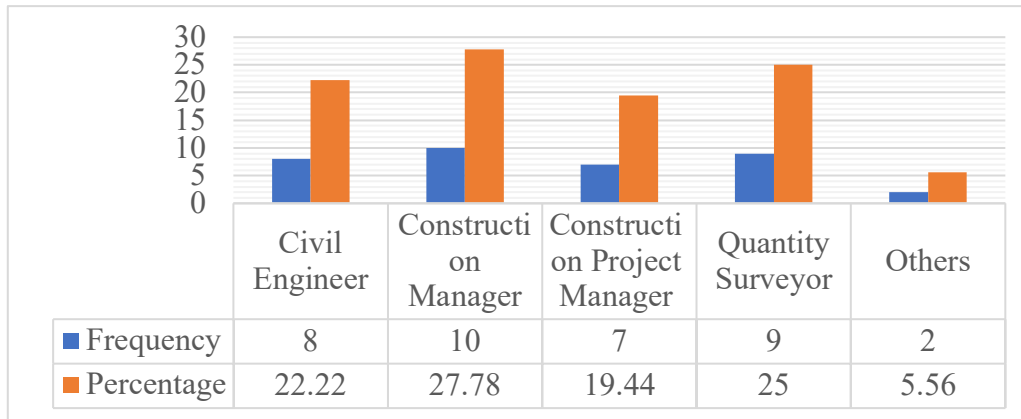


Figure 3: Respondents' professions

Figure 4. reveals the type of construction projects where respondents carried out their M&E practices within the construction industry. The outcomes indicate that 22.22% (8) of the respondents carried out their M&E practices in residential buildings projects, 16.67% (6) of the respondents are involved in civil and road projects, 33.33% (12) of the respondents are engaged in private and commercial projects, while 27.78% (10) are involved in government projects within the construction industry.

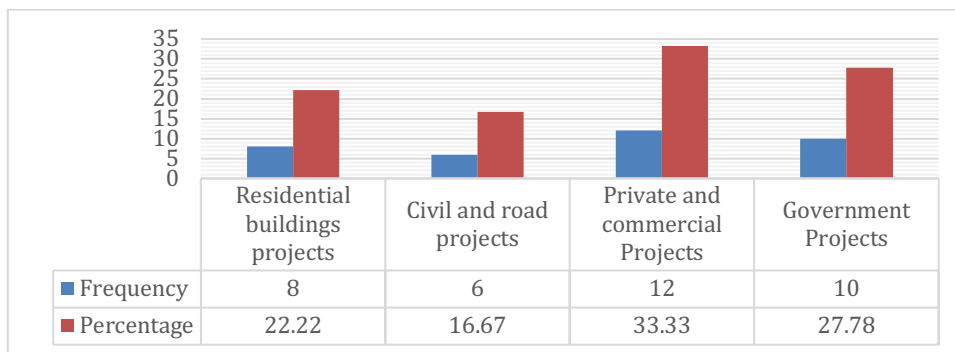


Figure 4: Type of construction projects respondents carried out their M&E practices.

Table 2; Ranking of issues and challenges facing lean-guided M&E practices by respondents

s/n	Issues and Challenges	$\bar{x}$	$\sigma X$	R
1	Lack of dedicated management staff	4.44	0.773	1
2	Lack of proper construction documentation	4.25	0.937	2
3	Lack of construction project goals	4.19	1.009	3
4	Corruption in construction projects tender process	4.11	0.854	4
5	Lack construction objectives	4.08	0.874	5
6	Problem of economic expansion of the construction industry	4.03	0.774	6
7	Lack of M&E policy by the government	4.00	0.828	7
8	Corruption among government personnel	3.89	1.008	8
9	Corruption among construction workers	3.83	1.000	9
10	Lack of standard guide for the construction industry	3.83	0.845	9
11	Unethical behaviour of construction workers	3.81	0.951	11
12	Shortage of skilled M&E team	3.75	1.317	12
13	Lack of knowledge of implementing M&E	3.75	1.052	12
14	Political conflicts	3.75	0.967	12
15	Lack of construction resources	3.72	1.031	15
16	Insufficient data gathering	3.69	1.238	16
17	Lack of proper construction methodology	3.64	0.990	17
18	Insufficient construction funding	3.61	1.128	18

Mean of the values =  $\bar{x}$ ; Standard Deviation (SD)=  $\sigma X$ ; Rank = R

Table 2 illustrates the respondent ranking of issues and challenges facing lean-guided M&E practice within South African construction projects. The outcomes show the top and low ranked issues and challenges facing lean guided M&E practice within construction projects delivery and they include; lack of dedicated management staff ranked first with a  $\bar{x}$  of 4.44 and a  $\sigma_X$  of 0.773; ranked second was lack of proper construction documentation with a  $\bar{x}$  of 4.25 and a  $\sigma_X$  of 0.937; while lack of construction project goals was ranked third with a  $\bar{x}$  of 4.19 and a  $\sigma_X$  of 1.009; corruption in construction projects tender process was ranked fourth with a  $\bar{x}$  4.11 and  $\sigma_X$  of 0,854; lack of construction objectives was ranked fifth with a  $\bar{x}$  of 4.08 and a  $\sigma_X$  of 0.874; ranked sixth was problem of economic expansion of the construction industry with a  $\bar{x}$  of 4.03 and a  $\sigma_X$  of 0.774; while lack of M&E policy by the government was ranked seventh with a  $\bar{x}$  of 4.00 and a  $\sigma_X$  of 0.828; corruption among government personnel was ranked eighth with a  $\bar{x}$  of 3.89 and a  $\sigma_X$  of 1.008; while corruption among construction workers with a  $\bar{x}$  of 3.83 and a  $\sigma_X$  of 1,000 was ranked ninth; lack of standard guide for the construction industry was also ranked ninth with a  $\bar{x}$  of 3.83 and a  $\sigma_X$  of 0.845. In addition, unethical behaviour of construction workers was ranked eleventh with a  $\bar{x}$  of 3.81 and a  $\sigma_X$  of 0.951; shortage of skilled M&E team was ranked twelfth with a  $\bar{x}$  of 3.75 and a  $\sigma_X$  of 1.317; lack of knowledge of implementing M&E was also ranked twelfth with a  $\bar{x}$  of 3,75 and a  $\sigma_X$  of 1,052; ranked twelfth was political conflicts with a  $\bar{x}$  of 3,75 and a  $\sigma_X$  of 0,967; lack of construction resources was ranked fifteenth with a  $\bar{x}$  of 3,72 and a  $\sigma_X$  of 1,031; while insufficient data gathering was ranked sixteenth with a  $\bar{x}$  of 3,69 and a  $\sigma_X$  of 1,238, ranked seventeenth was lack of proper construction methodology with a  $\bar{x}$  of 3,64 and a  $\sigma_X$  of 0,990; and insufficient construction funding was ranked lastly with a  $\bar{x}$  3,61 and a  $\sigma_X$  of 1,128.

## DISCUSSION OF FINDINGS

The study assessed the issues and challenges in construction project M&E practices in construction project delivery within the South African construction industry. The result of the study indicated that lack of dedicated management staff, lack of proper construction documentation, lack of construction project goals, corruption in the construction project tender process, lack of construction objectives, and the problem of economic expansion of the construction industry were the highest-ranked (1st - 6th) issues and challenges facing lean guided M&E practice. The finding aligns with Prensushu et al. (2002) and Crawford and Bryce (2003) that lack of project goals, corruption in the tender process of projects, and absence of objectives for construction projects were challenges facing lean-guided M&E practices in construction work. Similarly, the finding agrees with Kusek and Rist (2004), Waithera and Wanyoike (2015), Badom (2016), and Masoetsa et al. (2022) that improper construction documentation, economic expansion of the construction industry, and lack of dedicated management staff were issues affecting lean-guided M&E practices in the construction industry. The study's findings imply that poor management processes in contract documents, such as bills of quantity, construction agreements, general conditions, special conditions, and drawings, affect M&E practices for construction projects if not well guided by lean principles.

The findings also showed that lack of M&E policy by the government, corruption among government personnel, corruption among construction workers, lack of standard guide for the construction industry, unethical behaviour of construction workers, shortage of skilled M&E team, lack of knowledge of implementing M&E and political conflicts were mediumly ranked (7th – 12th) issues and challenges facing the M&E practice in the construction industry. The study affirmed Bhagavan (2004), Oloo (2011), and Masoetsa et al. (2022) that issues and challenges facing M&E practices in the construction projects were poor government policy on M&E, corruption among government officials in the M&E documentation process, corruption among construction workers in the production process, absent of M&E specialist, and poor

knowledge on the implementation of M&E procedures. This study findings also agree with Crawford and Bryce (2003) and Zhou and Hardlife (2013) that the lack of a standard guide for the construction industry, unethical behaviour of construction workers, and political conflicts and instability were issues and challenges facing M&E practices in construction projects. The study findings imply that M& E of construction projects guided by lean principles will not be effective in the construction projects if issues such as corruption in the construction process and operation are not deterred. This can also lead to substandard work caused by unethical behaviour among construction workers and poor understanding of the lean principle.

Further, the findings indicated that lack of construction resources, insufficient data gathering, lack of proper construction methodology, and insufficient construction funding was the least ranked (15th -18th) issues and challenges facing the M&E practice in construction projects. This supports Kusek and Rist (2004), Waithera and Wanyoike (2015), and Tengan and Aigbavboa (2019) that poor funding of the construction industry, scarce construction resources, inadequate data gathering, and dearth of proper construction methodology were issues and challenges facing the M&E practices in the construction projects. The study findings imply that poor understanding of the lean principles in the M&E practices can lead to poor handling of the construction methods and resources. This might affect the use of digital tools, especially in gathering enough data information for the construction process and operation. Moreover, lack of understanding and usage of the lean construction principle among M&E practitioners in construction projects might discourage clients or project sponsors, especially in mega construction projects, from being conscious of providing projects funding because of the poor establishment of the lean principle on M&E practice for the construction projects.

## **CONCLUSIONS**

The study assessed issues and challenges facing lean-guided M&E practice in construction projects in the South African construction industry. The study identified a lack of dedicated management staff, lack of proper construction documentation, lack of construction project goals, corruption in the construction project tender process, lack of construction objectives, and the problem of economic expansion of the construction industry as major issues and challenges facing M&E practice in construction project delivery. These issues and challenges were caused by the construction professionals' poor understanding of lean construction principles. The study suggested that to avoid issues and challenges in lean-guided M&E practices in construction project delivery, government personnel and construction professionals involved in construction M&E should be trained on lean construction principles and their application to different aspects of construction management planning. The study concluded that construction project M&E practice should be guided by proper government policy enacted through the Act of the parliament. Government agencies such as the Construction Industry Development Board (CIDB) and other construction professional bodies in South Africa and other developing countries should establish monitoring and enforcement units guided by lean construction principles to monitor the implementation of M&E practices on construction projects. The study contributes to the body of knowledge by making the professionals and government agencies involved in construction project delivery identify issues and challenges anticipated in lean-guided M&E practices and the need to understand the importance of lean construction principles toward achieving efficient construction production and control.

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