# The Necessity for Precise Estimation: Formulating a Malaysian Labour and Plant Constant for Construction Productivity

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## ABSTRACT

The Malaysian construction industry plays a vital role in driving economic growth and infrastructure development. However, the sector faces significant challenges in achieving accurate productivity measurement and cost estimation due to its reliance on foreign-based Labour and Plant Constants. These metrics, often misaligned with local conditions, lead to budget overruns, project delays, Extension of Time (EOT) claims, and Variation Orders (VOs). The lack of a standardized approach to determine the optimal combination of labour, plant, and machinery further complicates resource allocation and project planning, ultimately affecting the industry's overall efficiency and competitiveness. This paper emphasizes the urgent need to develop a Malaysian Labour and Plant Constant that reflects the unique conditions of the local construction environment, including labour skills, environmental factors, and machinery capabilities. Such localized constants will enhance cost estimation accuracy, improve resource management, reduce project delays, and foster sustainability in Malaysia's construction sector. Additionally, this initiative would align the industry with global best practices, boosting its competitiveness both locally and internationally. Establishing a robust resource optimization methodology will improve cost estimates, reduce project delays, and enhance overall efficiency. This paper emphasizes the necessity for a Malaysian-specific approach to productivity measurement and cost estimation to boost the accuracy and reliability of tender evaluations, ultimately strengthening the competitiveness and sustainability of the Malaysian construction industry.

**Keywords:** Labour Constant, Plant Constant, Malaysia, Productivity

## INTRODUCTION

The construction industry is a vital sector for economic growth and infrastructure development in Malaysia. Despite that, the sector continues to grapple with difficulties in achieving accurate productivity measurement and cost estimation — two key factors for construction project success. The Labour and Plant Constants is one of the tools widely used in the construction industry to measure the productivity index during the completion process with respect to labour, plant and machinery efficiency. At present, Malaysia's Construction Industry has to depend heavily on foreign-based Labour and Plant Constant data, which does not necessarily directly reflect the particular conditions in the local construction environment. Furthermore, reliance on foreign standards often results in incorrect cost estimations, project schedule delays and inefficiencies (Chukwuemeka, Okolie and Ogunoh, 2015). All of the above issues, coupled with the non-standardized and ad hoc way project managers decide on the best combination for labour, plant & machinery, also make it difficult for the right allocation of resources across impact productivity delays in construction projects that lead to high operational costs through extended duration.

Unfortunately, the current costing and productivity measuring practices are inherently flawed, especially in addressing specific concerns facing the Malaysian construction industry. The absence of a uniform methodological approach to identifying the appropriate blend and quantity of labour, plant, and machinery only

adds another layer of complexity in trying to deliver projects as cost-effectively as possible. As a result, there is an urgent requirement to establish a region-specific Labour and Plant Constant that resonates with Malaysia's industry conditions, labour standards and the environment.

To rectify these consistent problems, mechanisms of Labour and Plant Constants metrics should not only be localised according to the nation as a whole but also must accommodate region-specific protocols for the Malaysian construction industry. In this way, the industry could become more representative of local conditions and better able to provide a true reflection of cost estimates in Malaysia. This will support the construction industry, helping to maintain a stable and growing sector that is fundamental to economic growth. In addition, developing a solid approach to optimizing labour, plants and machinery consumption is essential for minimizing inaccuracies in cost estimates and reducing project delays and overall inefficiency. Addressing these issues could enhance the reliability of tender evaluations, thereby boosting the competitiveness and sustainability of the Malaysian construction industry in the global market.

**Problem Statement**

The construction sector is one of the most crucial industries in Malaysia, significantly driving economic growth and infrastructure development across the nation. Establishing productive and cost estimation measures still presents a considerable challenge in the industry. Moreover, productivity metrics also set the pace for construction project milestones. Labour and Plant Constant is a productivity indicator that measures the efficient labour, plant and machinery in construction activities.

Currently, the Malaysian industry widely utilizes foreign-based Labour and Plant Constant data. Yet, these Labour Constant seem in many cases to be based on foreign data and not wholly reflective of the peculiar state of Malaysia's construction industry. In this regard, the use of Labour Constant for evaluation based on foreign data can result in a significant waste or an improper cost estimate as it does not consider local factors like weather conditions and labour skills and technology. It was said that many of these metrics do not correctly account for Malaysia's particular circumstances or those on employment, as well as environmental requirements (Kunkatla and Namburu, 2022); hence, cost estimates cast to be inaccurate representations towards financial commitments faced by contractors and financiers. Such a misalignment results in inaccurate cost estimates, which can lead to several critical challenges. Projects constructed based on overoptimistic productivity metrics or simply old metrics, generally lead to costs much higher than budgeted for. This means that project budgets are likely to be underestimated or overestimated causing the projects to either completely overspend, than have ineffective usage of funding. As stated in Chukwuemeka et. al. (2015), tradesmen often overestimate their productivity, causing discrepancies between claimed and actual labour output, which impacts cost estimation and project timelines. These financial inefficiencies financially stress contractors and project managers to the core, apart from undermining the credibility & reliability of cost estimation process which ultimately affects their market adoptability further jeopardizing sustainability within the Malaysian construction industry.

An immediate impact of these errors would be the appearance of EOT claims and VOs which are one the most critical consequences (Chukwuemeka et. al., 2015). Often contractors win contracts based on what turns out to be undeliverable productivity metrics that can lead to cost increases and resource throttling. These inconsistencies slow down the process and can result in longer project completion times and increased expenses. In order to exacerbate the issues, there is currently no standardized method for determining the optimal combination of labour, plant, and machinery, which can significantly impact productivity levels.

These challenges underscore an urgent need to define and adopt a set of locally relevant productivity metrics that consider Malaysian-specific variables. Whether by these metrics or others, defining such parameters would provide those designing cost estimates with a more accurate and relevant base point on which to work, as they might apply in Malaysia for entities like JKR. Moreover, when combined into an integrated and state-of-the-art Labour Constant, it could make the industry even more dependable, giving architects and quantity surveyors direct advice for construction processes or project planning.

**The Impact of Unreliable Labour Constants**

Kunkatla and Namburu (2022) conducted research analysing the accuracy of standard labour output constants

used for construction activities in Andhra Pradesh, India. The study compares claimed labour outputs with actual measured outputs across 10 different building construction activities. The findings reveal significant discrepancies between the estimated and actual productivity rates, with deviations ranging from 5% to 50%. This misfit leads to project time overruns, cost overruns, and inefficient resources in construction activities (Chukwuemeka et. al., 2015, Kunkatla and Namburu, 2022).

These unreliable constants may ultimately result in a significant financial loss (Kunkatla and Namburu, 2022). The risk of filing Extension of Time claims poses a significant threat. When projects compete based on low and outdated productivity measures, the reality of their inadequacy ultimately manifests itself in the actual costs required to complete the project. The divergence between the budget and the actual cost necessitates an extension of the project completion time. The prolonged construction force to overstay on the project site and incomplete construction strains the building efficiency leading to increased costs. Additionally, needing to deal with Variation Orders as a result of differences between projected and actual costs changes budget forecasting entirely while also further complicating resource management efforts These unreliable constants may ultimately result in a significant financial loss (Kunkatla and Namburu, 2022). The risk of filing Extension of Time claims poses a significant threat. When projects compete based on low and outdated productivity measures, the reality of their inadequacy ultimately manifests itself in the actual costs required to complete the project. The divergence between the budget and the actual cost necessitates an extension of the project completion time.

Okoye, Ngwu, and Ugochukwu (2015) added that estimators in Nigeria faces challenges of making accurate cost estimate, cost plan, pricing and preparing reliable construction programme thereby pushing the contractors to run into cash flow problems due to the nonexistence of reliable and realistic labour standards. The problem is compounded because there is no standardized method for arriving at the best balance of labour, machinery and equipment.

**The Necessity of Formulating A Malaysian Labour and Plant Constant**

Usage of Labour and Plant Constant estimates manpower for a work unit per time period. This insight also helps estimators create a better cost estimate by considering the amount of labour hours, which can be expected depending on historic productivity. But one of the biggest problems with using Labour and Plant Constant is by relying on data that may be outdated and often inappropriate conduct based on different standards imposed by foreign methods. Much of the data used in Labour and Plant Constant are from abroad and may not even be relevant to current conditions faced by Malaysia's construction industry. The Labour and Plant Constant not evaluated for the local environment can run into problems with scheduling and cost management; productivity, and labour costs will differ so much that using the wrong data set will result in inaccurate decision making.

In order to address these challenges, there is an urgent need to develop a Malaysian-specific Labour and Plant Constant that takes into account local industry conditions and practices. This will improve the accuracy of cost estimations, reduce project delays, and enhance the overall efficiency of construction activities (Kunkatla and Namburu, 2022). Furthermore, standardizing methodologies for determining the optimal combination of labour, plant, and machinery is essential to ensure consistency across the industry

A labour and plant constant is a standardized unit used to estimate the productivity rates of labour and equipment (plant) on construction sites. It helps in improving accuracy during project planning, budgeting, scheduling, and resource allocation. The need for such a constant in Malaysia stems from several factors:

**Standardization Across Projects**

In construction, project estimates for labour and plant usage are often inconsistent, leading to variability in project costs and timeframes. Contractors use their own system to measure labour productivity based on their construction site (Hendrickson, Haas and Tung, 2024). This labour productivity is compiled based on parameters such as project size, type, location and other influences. However, a standardized Malaysian Labour and Plant Constant would provide a baseline measurement for labour hours and equipment usage across different construction projects. This would help to ensure that contractors and project managers use uniform benchmarks when estimating the time and resources required for specific tasks. This standardization would also reduce

discrepancies in tendering processes. The developed labour constant would be used by the Quantity Surveyors to estimate using realistic and accurate pricing thereby reducing the tendencies of poor estimates and at the same time serving the purpose of optimizing the client's expenditure through an optimal labour force in the execution of building projects (Okoye et. al., 2015).

**Accurate Cost Estimation and Budgeting:**

The importance of Labour and Plant Constant in cost estimation is significant. It can be used to evaluate labour productivity and assist in establishing a reasonable project budget (Chukwuemeka et al., 2015). Build-up Rates are the costs of every unit of construction work that includes Labour, Materials and Machinery uses. Therefore, build-up rates in the setting of Labour and Plant Constant are an indispensable tool to make sure the cost estimates for construction projects match reality more closely. This means that the determination of correct costs in terms of build-up rates is a comprehensive analysis involving labour productivity, machine efficiency and material at various stages. A system or application can evolve build-up rates faster and facilitate a quicker determination of the best fit for labour machine combination, thereby enhancing bidding accuracy and project efficiency.

By establishing a labour and plant constant, construction companies can more accurately predict costs, including labour wages, equipment rental, and operation costs. To estimate costs and plan projects, Labour and Plant Constant defines a default amount of labour required to complete specific tasks. This is used as a comparative result with the real labour performance and norms set. Currently, construction projects in Malaysia may suffer from inaccurate cost projections due to a lack of consistent measures for labour and machinery productivity. Having a constant would allow companies to develop more reliable budgeting models, reducing the chances of project overruns.

**Improved Time and Resource Management**

The construction industry often struggles with time management due to unpredictable labour productivity and machinery downtime. A labour and plant constant can assist project planners in creating more realistic schedules by providing standardized performance rates for both workers and equipment. This approach can significantly reduce time overruns, especially for projects reliant on foreign labour or operating in areas where equipment availability and efficiency are inconsistent.

Additionally, construction projects frequently encounter resource allocation issues, resulting in wasted labour hours and inefficient equipment usage. Implementing a constant would optimize resource allocation, ensuring workers and machinery are utilized effectively. This not only enhances project efficiency but also aligns with sustainability goals, reducing waste and supporting Malaysia's focus on green construction practices.

**Enhanced Labour Productivity**

According to Nor Janna Tammy, Muhammad Mazasry Medani, Rozaini Ramli, Juzailah Nur Yunus and Raja Nor Husna Raja Mohd Noor (2020), factors that affect labour productivity in the construction industry are Communication, Work culture, Motivational aspects, Leadership and Skills. This shows that labour productivity is mainly affected by the labour factor itself. As similar to Durdyev and Ismail (2016) state, the performance of employees plays one of the dominant roles for successful productivity development in construction industry which is acknowledged as a labour-intensive market. The labour factor is hence a vital component in executing projects (Sawhney, 2010). Researchers identified the most critical labour-related factors affecting productivity as lack of skills, rework, incompetent supervisors, and workers' personal problems (Odesola and Idoro, 2014; Hendrickson et. al., 2024).

Malaysia's construction sector is heavily dependent on both local and foreign labour. However, labour productivity rates can vary widely based on skill levels, experience, and project types (Hendrickson et. al., 2024). In the case of Labour and Plant Constant, the difference between skilled and unskilled labour plays a key role in defining how correctly labour constants are formed. This difference, of course being between skilled and unskilled labour is crucial in cost estimation as the productivity of both will vary. Skilled labour is generally more productive than unskilled, but also more expensive; and the use of an untrained workforce for a highly

skilled job will take longer to do it. Hence, the estimators are supposed to adjust for these differences as they estimate labour and costs. A labour constant would serve as a benchmark for evaluating and improving labour performance. It can be used as a training tool to raise productivity to meet national standards, encouraging companies to invest in skill development.

**Plant and Machinery Utilization**

Likewise, the machinery capabilities achieve its best performance due to site conditions, operator skills and specific maintenance at certain locations. In order to increase job-site productivity, it is beneficial to select equipment with proper characteristics and a size most suitable for the work conditions at a construction site (Hendrickson et. al., 2024).

In conceiving Labour and Plant Constant, machinery is often thought of as an actor that has a bearing on the labour constant. There are some aspects for an estimator to consider and compare the machinery efficiency in order to work out accurate build-up rates considering operating/maintenance costs, as well as site conditions. Henderikson et. al. (2024) explain that when comparing various types of excavation machines, they generally find power shovels to be the most suitable for excavating from a level surface, attacking an existing digging surface, or creating one; additionally, they can directly place the excavated material onto the haulers. Other factors which affect this selection include output of excavators, distance to dump site, average speed, volume of excavated materials and spatial and weight constraints.

This proves that the Plant constants would help assess the expected productivity of machinery, considering factors like maintenance, fuel consumption, and operating conditions. This is especially important for large-scale projects that rely heavily on machinery. Standardizing these metrics would optimize equipment usage, minimize downtime, and improve operational efficiency.

**Government and Industry Regulation:**

The formulation of a national labour and plant constant would provide the government and regulatory bodies with tools to enforce quality and productivity standards across the construction sector. Regulatory agencies could use these constants to monitor project progress, ensure compliance with productivity benchmarks, and improve the overall performance of the industry. This would align with Malaysia's long-term goals for infrastructure development under initiatives like the Construction Industry Transformation Programme (CITP).

**Innovation and Technology**

The introduction of new technologies like Building Information Modelling (BIM) has the potential to significantly enhance construction labour productivity (CLP), thereby affecting existing labour constants. BIM allows for precise virtual modelling of projects, enabling better visualization, planning, and coordination, which leads to more efficient use of labour and equipment (Adebowale and Agumba, 2023). For instance, by identifying clashes in design and offering real-time updates, BIM minimizes errors and rework, directly improving productivity (Chen et al., 2019; Enshassi et al., 2016).

In this context, labour constants, which represent the standard amount of labour required to complete specific tasks, may become outdated due to the increased efficiency brought by BIM. The ability of BIM to integrate digitization, sensors, and algorithms means that tasks traditionally requiring more labour can now be executed faster and with fewer resources (Durdyev & Mbachu, 2011). Consequently, BIM could reduce the time and labour hours needed for specific construction tasks, thus modifying the current labour constant to reflect the more efficient processes.

**Comparison and Benchmarking:**

Countries like the United States, United Kingdom and Singapore already have strong productivity standards for their construction industries, and Malaysia has been using them as a benchmark. However, the establishment of a Malaysian labour and plant standard would significantly transform the industry. This will allow Malaysia to have its own standards taking into consideration the local specifics including productivity of labour, investment

in innovation and technology or even the unique climate. This would help the country compete better on the global stage. Plus, it would give foreign investors a clearer idea of what they can expect in terms of performance from Malaysian construction projects, boosting confidence and investment.

Countries like the United States, United Kingdom and Singapore already produced their own Labour Constant hence Malaysia has been using them as a benchmark. However, by developing a Malaysian Labour and plant constant, it would allow Malaysia to have its own standards taking into consideration local specific including labour productivity, innovation and technology as well as climate.

## CONCLUSION

The Malaysian construction industry's reliance on foreign-based Labour and Plant Constants has led to persistent challenges in accurately measuring productivity and estimating costs. This misalignment often results in project delays, budget overruns, and the frequent occurrence of Extension of Time (EOT) claims and Variation Orders (VOs). These issues stem from the failure of foreign-based constants to reflect the unique conditions and variables of the local construction environment, including labour skills, environmental factors, and machinery efficiency. As a result, inaccurate cost estimations disrupt resource allocation and hinder project completion, ultimately impacting the overall efficiency and competitiveness of the industry.

Formulating a Malaysian Labour and Plant Constant is essential for improving the efficiency, accuracy, and competitiveness of the construction industry. In addition to aligning Malaysia's construction standards with global best practices, it would provide the necessary framework for consistent project planning, resource allocation, and performance benchmarking. Such an initiative would also contribute to the country’s broader economic goals by enhancing productivity, reducing project delays, and improving overall project outcomes.

The significance of these measures lies in their potential to transform Malaysia’s construction industry by improving cost estimation accuracy, minimizing financial risks, and increasing overall productivity. This will not only strengthen the competitiveness of the industry in the local market but also enhance its sustainability and ability to compete globally, reinforcing the construction sector’s role as a key driver of Malaysia’s economic growth.

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