Review Paper on Development of an Empirical Economic Feasibility Model for MIVAN Technology in High-Rise Buildings in India

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Abstract — The rapid growth of urbanization and increasing demand for residential and commercial infrastructure in India have created a need for faster, economical, and sustainable construction technologies. MIVAN technology, also known as the Aluminium Formwork System, is an advanced construction technique that facilitates the monolithic casting of reinforced concrete walls, slabs, beams, and other structural components. It offers several advantages over conventional formwork systems, including faster construction cycles, improved surface quality, reduced labour requirements, dimensional accuracy, and repeated utilization of formwork panels. However, the adoption of MIVAN technology involves substantial initial investment, transportation costs, maintenance expenses, skilled labour requirements, and limitations associated with architectural flexibility. This review paper focuses on developing an empirical economic feasibility model for evaluating the suitability of MIVAN technology in high-rise buildings in India. The study examines existing research on construction costs, project duration, labour productivity, formwork reusability, material consumption, maintenance, and finishing requirements. It also identifies the major economic parameters influencing the selection of MIVAN technology compared with conventional formwork systems. An integrated evaluation framework is proposed using cost-benefit analysis, break-even analysis, life-cycle costing, and sensitivity analysis. The proposed model aims to identify the minimum number of repetitions and building characteristics required to achieve economic benefits through MIVAN technology. The review indicates that MIVAN technology is particularly promising for high-rise residential buildings and mass housing projects with repetitive floor layouts. However, its economic feasibility depends on project size, construction schedule, local labour conditions, initial investment, and the number of formwork repetitions. The proposed empirical framework can support contractors, developers, and construction professionals in making informed decisions regarding the economic adoption of MIVAN technology in the Indian construction industry.

Keywords: MIVAN Technology, Aluminium Formwork, Economic Feasibility, High-Rise Buildings, Construction Cost Analysis, Conventional Formwork, Break-Even Analysis, Life-Cycle Costing, Construction Productivity, Formwork Reusability, India

I. INTRODUCTION

The construction industry plays a significant role in the economic and infrastructural development of India. Rapid urbanization, population growth, industrialization, and increasing demand for residential and commercial buildings have increased the need for efficient construction techniques. Traditional construction methods generally involve conventional formwork systems made of timber, plywood, and steel, which require considerable labour, time, and material consumption. These methods may also result in longer construction periods, higher finishing requirements, and difficulties in maintaining consistent quality across repetitive building floors.

To overcome these challenges, modern construction technologies such as MIVAN formwork have gained considerable attention in the Indian construction sector. MIVAN technology is an aluminium formwork system that enables the monolithic casting of reinforced concrete structural elements, including walls and slabs. The system uses prefabricated aluminium panels that are assembled according to the structural and architectural requirements of a building. After concrete placement and achieving the required strength, the panels are removed, cleaned, and reused for subsequent construction cycles.

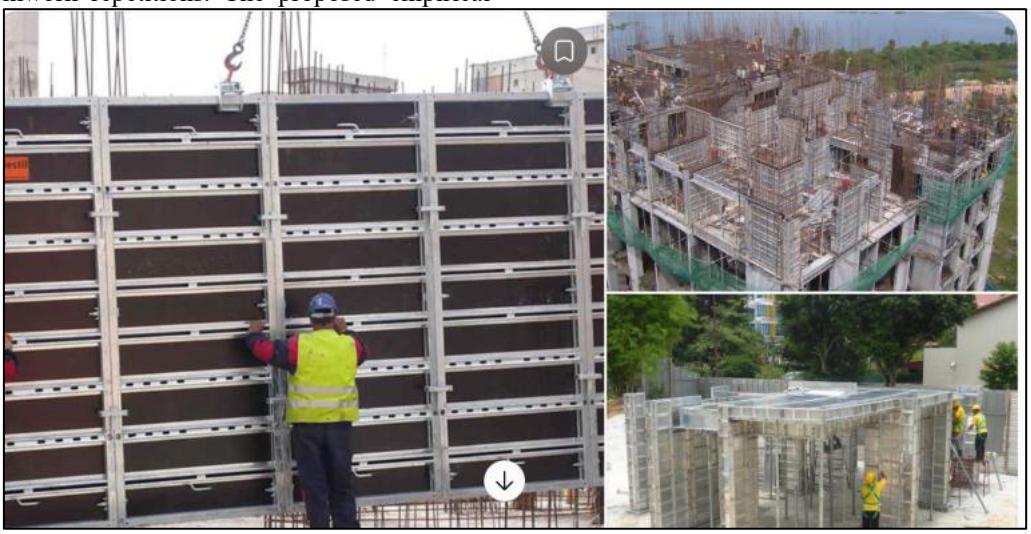


Fig. 1: MIVAN technology Structure

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One of the major advantages of MIVAN technology is its ability to accelerate construction activities through repetitive floor cycles. In high-rise buildings, where similar floor layouts are repeated across multiple storeys, aluminium formwork can be reused several times, reducing the effective formwork cost per unit of construction. The monolithic construction technique also provides dimensional accuracy, better surface finish, and improved structural continuity.

Despite these advantages, the implementation of MIVAN technology requires considerable initial capital investment. The cost of aluminium panels, accessories, transportation, installation, maintenance, and specialized labour can influence the overall project budget. Therefore, selecting MIVAN technology solely on the basis of construction speed may not provide an accurate assessment of its economic performance.

Economic feasibility is an important factor in selecting an appropriate construction methodology. It requires a systematic evaluation of initial investment, recurring expenditure, labour costs, construction duration, equipment utilization, material wastage, maintenance, and finishing costs. The economic benefits of MIVAN technology become more significant when the number of repetitions is sufficiently high.

Several researchers have investigated the comparative cost and time performance of MIVAN and conventional formwork systems. Ansari and Kudale [1] examined the cost and duration of MIVAN and conventional formwork in G+21 buildings. Similarly, Ganar and Patil [2] conducted a comparative analysis for G+12 buildings. Sreenath et al. [3] investigated the suitability of modular aluminium formwork in reinforced concrete framed structures and highlighted the importance of repeated utilization in determining long-term economic benefits.

Ashwin and Paul [4] further examined aluminium and tunnel formwork systems in Indian high-rise construction and emphasized the influence of initial investment, labour costs, reusability, and project requirements on formwork selection.

Although existing studies provide useful information regarding the advantages and limitations of MIVAN technology, there is a need for an integrated empirical economic feasibility model that considers different project conditions and economic parameters.

Therefore, the present review focuses on developing a systematic framework to evaluate the economic feasibility of MIVAN technology for high-rise buildings in India.

II. LITERATURE REVIEW

The literature review examines previous studies related to MIVAN formwork technology, conventional construction methods, construction cost optimization, labour productivity, formwork reusability, and economic feasibility. Previous research indicates that the selection of an appropriate formwork system depends on project size, building height, repetition of structural components, construction duration, labour availability, and initial investment.

Ansari and Kudale (2016) [1] conducted a comparative analysis of MIVAN and conventional formwork systems for a G+21 high-rise building. Their study considered construction cost, building area, and project duration. The research highlighted the importance of evaluating both cost and time while selecting a suitable formwork system for high-rise construction.

Ganar and Patil (2015) [2] investigated the cost and duration of MIVAN and conventional formwork systems for a G+12 building. Their analysis involved quantity calculations and comparisons of construction activities. The study demonstrated the importance of systematic cost estimation when evaluating alternative formwork technologies.

Mistry and Pitroda (2021) [5] reviewed the comparison between MIVAN and conventional formwork technologies. Their study discussed construction efficiency, economic considerations, and time-saving potential. The authors highlighted the suitability of aluminium formwork for large-scale construction projects requiring repetitive structural components.

Patel et al. (2022) [6] reviewed the comparative performance of MIVAN and conventional formwork systems. Their research emphasized construction speed, cost-effectiveness, quality, and reliability. The study suggested that MIVAN technology can provide advantages in repetitive construction projects, particularly where the benefits of formwork reuse can be realized.

Sreenath et al. (2018) [3] investigated the suitability of modular aluminium formwork in reinforced concrete framed structures through a case study of a residential and commercial development in Bangalore, Karnataka. The project included residential towers of G+21 floors. The researchers evaluated construction quality, speed, labour requirements, and cost. Their findings indicated that MIVAN technology could become more economical over the long term because of the repeated utilization of aluminium formwork.

The study also highlighted that the initial cost of aluminium formwork may be comparatively high. However, improved construction speed, reduced finishing requirements, and increased productivity can contribute to overall economic benefits.

Ashwin and Paul (2025) [4] conducted a comparative study of aluminium and tunnel formwork systems for high-rise construction in India. Their research considered formwork cost, reusability, labour efficiency, and construction duration. The findings indicated that the economic suitability of a formwork system depends significantly on the number of repetitions and initial investment. The study also identified project scale and construction requirements as important factors in formwork selection.

Patekar and Shaikh (2023) [7] examined the impact of conventional and MIVAN formwork on construction productivity and efficiency. Their study considered construction duration, labour productivity, material consumption, and project costs. The research emphasized that improved productivity and reduced construction time are important factors in evaluating the overall performance of MIVAN technology.

Tingare (2022) [8] investigated time and cost optimization in construction projects using MIVAN technology. The study discussed the importance of advanced

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formwork systems in mass housing and repetitive construction projects. It highlighted the potential of MIVAN technology to improve construction efficiency and reduce project completion time compared with conventional methods.

Mahale et al. (2024) [9] studied the optimization of construction efficiency using the MIVAN formwork system. Their research discussed aluminium panels, construction speed, and comparative cost considerations. The study emphasized the role of repetitive construction activities in improving the performance of aluminium formwork.

III. Research Gap

The literature indicates that several studies have compared MIVAN and conventional formwork systems based on construction cost, duration, labour requirements, and productivity. However, many existing studies focus on individual projects and specific building configurations.

The following research gaps have been identified:

1) Limited development of an integrated empirical economic feasibility model specifically for Indian high-rise buildings.
2) Insufficient consideration of the relationship between building height, floor repetition, and formwork investment.

IV. Conclusion

The present review paper examines the economic feasibility of MIVAN technology for high-rise buildings in India, with particular emphasis on construction cost, project duration, labour productivity, formwork reusability, and overall economic performance.

Based on the reviewed literature, the following conclusions are drawn:

- MIVAN technology offers an efficient alternative to conventional formwork systems, particularly for high-rise residential buildings and large-scale mass housing projects.
- The initial investment in aluminium formwork is relatively high compared with conventional formwork. However, repeated utilization of aluminium panels can reduce the effective cost per floor.
- Construction speed is one of the major advantages of MIVAN technology. Faster construction cycles can reduce project duration, site overheads, equipment rental expenses, and financing costs.
- The use of aluminium formwork can improve dimensional accuracy, surface quality, and consistency in concrete construction. It may also reduce certain plastering and finishing requirements.
- The economic feasibility of MIVAN technology depends on several factors, including building height, number of repetitive floors, formwork investment, labour cost, maintenance, transportation, and construction duration.
- Break-even analysis is an important technique for determining the minimum number of repetitions required to make MIVAN technology economically competitive with conventional formwork.

Overall, MIVAN technology has considerable potential for improving construction productivity and economic efficiency in Indian high-rise building projects. However, its selection should be based on comprehensive economic evaluation rather than construction speed alone. The proposed empirical model can serve as a decision-support tool for developers, contractors, consultants, and construction engineers in selecting the most suitable formwork system.

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