



Just-In-Time Importance in the Construction Industry

Muhammad Waheed^{1*}, Mutahir Abbas¹, Aftab Hameed Memon¹

¹ Quaid-e-Awam University of Engineering Science and Technology, Nawabshah, Pakistan.

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Corresponding Author:

Muhammad Waheed

waheedkumboh94@gmail.com

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Abstract: Pakistani construction industry has gained a reputation as being both highly competitive and dynamic in recent years. The construction sector has been seeking to apply cutting-edge business strategies to survive in the increasingly competitive market. Organizations must try to offer clients high-quality, inexpensive products that do so in the shortest length of time. This is where creative concepts like Just-In-Time, which emphasizes cost reduction by reducing non-value-added processes, come into action. This study evaluates the JIT method to the traditional approach of material management, identifies the advantages and disadvantages of the JIT method through a questionnaire survey, and assesses the significance of the JIT method in the construction of multistory buildings.

Keywords: Construction Scheduling; Demand Forecasting; Modular Construction; on-Site Inventory Control; Procurement Strategy; Resource Optimization

Introduction

Pakistan is a developing country, and its industry has a strong ability to compete in the world market. A major sector of the economy of Pakistan is the construction industry. Construction is a project-based industry; therefore, each project may require the same type of material, but different quantities depending on the site, location, weather, etc (Gupta et al., 2024). vary depending on the location. When viewed through the lens of manufacturing, the building industry's biggest difficulty is to establish order and control to save costs through the elimination of waste and to maintain time schedules due to postponements during the defined time. The fact that the building business heavily involves activities that do not directly affect the final client is a contributing cause to the problem. Therefore, to provide better project results, the construction sector needs better project management techniques (Ghadiri & Zhuge, 2024).

The Just-In-Time (JIT) philosophy was developed by Taichi Ohno and his fellow employees at Toyota in the Graceful chain area of Japan in the middle of the

1950s (Soliman, 2023). It has been employed in the manufacturing sector for many years, contributing to both a rise in project quality and industry productivity. A JIT system creates the requested item at the appropriate time and in the required quantities (Kilic & Er kayman, 2021).

According to the JIT principle, inventories are not more significant and should be viewed as waste. Defects can cause the construction project to be abandoned in addition to producing waste. Perfect quality is needed in a JIT system since there is no inventory to hide mistakes. Instead of hiding mistakes with inventories, the JIT approach is intended to reveal problems and force their correction. A manufacturing concept known as just-in-time (JIT) production is based on the planned elimination of waste and continuous productivity improvement (Nwatu, 2024).

JIT is a production system that will deliver a custom product at the precise moment when it is required by reducing nearby inventories and insufficient working hours (Ogunyankinnu et al., 2024). It does this while maintaining quality standards and reducing manufacturing cycle time. "Company produces only

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what is needed, when it is needed, and in the quantity that is needed," according to the JIT concept. The business just makes what the consumer orders, not what is anticipated. Producing the necessary units, with the appropriate quality, in the necessary quantities, at the last safe time, is another definition of JIT. It implies that the business can simply manage and allocate its resources.

Method

The Just-In-Time method employed in the construction sector was the main topic of the literature review, which was drawn from many international publications and a thesis that was thoroughly investigated to understand previous studies on this topic.

Comparison between the Conventional Method with the JIT Method of Material Management

Conventional Method

The method used in the intermediate stage of construction is where traditional JIT methods fundamentally diverge. The conventional method focused on keeping inventory on hand throughout the procedure and keeping a reserve in case of unforeseen demand or shortages. Inventory is present throughout the procedure, allowing managers to work around daily chores and issues as decisions are made and issues are resolved. When a problem occurs, such as a failure of a piece of construction equipment or a procedure, it is fixed, and work continues until the next issue emerges. Since most challenges become a routine part of working life, they are rarely viewed as serious issues. Implemented solutions frequently consist of just temporary remedies. Ten to fifteen days before the start of any activity, buffer stock is provided on-site. The two primary organizational structures for production are the pull and push systems. In the push system, stocks are pushed ahead under the planned schedule, i.e., the organization forecasts the demand or maintains stock levels.

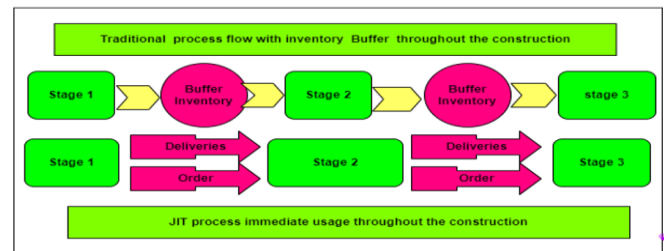


Figure 1. Shows the concept of the Conventional and JIT Methods

Just-In-Time Method

A just-in-time inventory system is an organizational strategy that immediately connects supplier material orders with the building timetable (Choi et al., 2023). JIT integration or implementation into any construction organization is difficult and requires careful planning. JIT main goal is to minimize resource usage while maximizing efficiency. When issues develop in a JIT environment, the process 'STOPS'. Since there is no buffer inventory, JIT exposes any productivity issues, delays, process failures, etc., and demands rapid and long-lasting fixes so that the issues do not recur. Any equipment or construction process failure, for instance, turns into a major failure. As a result, management, technical, and administrative workers are immediately focused on finding and putting up a solution. As a result, the issues are resolved and vanish forever. Strong relationships between customers and suppliers will be the focus of JIT. Customers, suppliers, and the organization itself must rely on one another to be adaptable, dependable, and on time because the JIT mindset implies virtually no extra inventory. Inventories go through the process as a result of organizational demand.

Case Study

A survey was conducted in Lahore to learn more about the current material management procedures used in five construction projects, specifically multi-story building construction. This survey was conducted using a questionnaire. The survey was conducted to determine the acceptance of JIT, its advantages, and its possible limitations.

Table 1. Analysis of surveyed construction companies for material management

Name of Project	Project 1	Project 2	Project 3	Project 4	Project 5
Type of project	Multistoried Residential	Multistoried Residential	Multistoried Residential	Multistoried Residential	Multistoried Residential
Is material management (MM) carried out?	Yes	Yes	Yes	Yes	Yes
The total cost of material (%)	70	60	70	60	60
Method adopted for MM Process	Manually	Software	Manually	Software	Software
Software used	-	ERP	-	ERP	ERP
For 1 type of work only 1 vendor has been assigned	Yes	No	No	No	No

Name of Project	Project 1	Project 2	Project 3	Project 4	Project 5
Inventory stock (no. of days)	12	15	10	12	15
Is any problem faced regarding order placing?	Yes	No	Yes	No	No
Responsible person for quality	Quality Engineer	Quality Engineer	Quality Engineer	Quality Engineer	Quality Engineer
Satisfaction of current MM used	Yes	No	No	No	Yes
Benefits/problem facing of current MM	Less cost but more manual error, more paperwork, easily detail cannot find	Get details easily, gives current stock but problem of storage	Easy to understand, the nontechnical person can operate but more manual errors, easily cant update	Reduce wastage, easily find delay if any, technical person required to operate	Get detail easily, and easily update, but the problem with storage
Awareness of JIT Concept	No	No	No	Yes	No
JIT concept used	No	No	No	Yes (for some material)	No
Delay in Project	Yes	Yes	Yes	Yes	Yes

Result and Discussion

Following the completion of the questionnaire survey, it was advised to compare the JIT approach with the conventional method for various construction projects. Advantages of the conventional method: If only one project is active on a small site or in any construction company, it is helpful; Because non-technical or unskilled workers can complete the task, skilled personnel are not as necessary, which reduces the cost of labor; It is simple to understand because it is a classic strategy that has been used for many years; Appropriate for secluded areas; No formal training is needed. The conventional method is a versatile choice because it doesn't require any training or prior expertise to start the job (Abielmona, 2025).

Disadvantages of the conventional method: On certain sites, all work is still done manually without the use of any software. As the amount of paper increases, the likelihood of human error increases: Finding specifics are tough, learning the current material stock is challenging, etc; The traditional approach will take longer than expected because the client's expectations are unclear (Coslett, 2022). Changes can also be thrown off the order, stopping the following task until the one before it is finished: Increased storage costs and the need for greater space; Lack of central authority; Due to a lack of mutual teamwork, unity, and progress, the time management issue can occur traditionally.

Benefits of JIT method

Lower stock holdings imply less storage space, which is a major problem in urban areas like Lahore. Additionally, it reduces expenses like rent, insurance, guarding, and supervision; Since stock is only acquired, when necessary, less operating capital is invested in it;

The likelihood of stock expiring, becoming out of date, or becoming obsolete is decreased; Reducing waiting times and transportation expense; In JIT, the main focus is on the final product's quality, and businesses strive to produce all things "first time right." Additionally, everyone has a responsibility to improve quality and address issues connected to quality; Less inventory equals less waste and less expiration for the project at every point of the supply chain.

Limitations Of JIT method

Since there is little stock held to repair defective goods, there is limited room for error; Because there is little knowledge of JIT, top-management support is necessary; The JIT philosophy can only be implemented when all parties in the supply chain are working closely together and in coordination.

Conclusion

JIT is a philosophy that aims to produce the most with less input. This is possible if all parties involved in the full ecosystem of the supply chain are dedicated to doing so and collaborate closely. The backing of senior management is also essential. This philosophy needs to be shared throughout the entire organization.

JIT will require careful planning and prompt chain communication. Implementing JIT is therefore challenging in situations where there is a high degree of variance in the quantity, the design, the project's location, etc. JIT applies to structural construction projects such as building housing developments, police stations, metro structures, bridge superstructures, etc.

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Author Contributions

The research was conceptualized by Authors M. W., M. A., and A. H. M. The methodology, data analysis, and manuscript writing were conducted by Author M. W., while Authors M. A., A. H. M contributed to the review and supervision of the study.

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Conflicts of Interest

The authors declare no conflict of interest.

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