

-RESEARCH ARTICLE-

## THE ROLE OF LEAN PRODUCTION PRACTICES ON THE LOWER QUALITY COST AND HIGH PERFORMANCE OF MANUFACTURING FIRMS IN IRAQ

**Imad A. S. Al Mashkoor**

Department of Accounting, Management Techniques  
College, Southern Technical University, Basra, Iraq  
Email: [emad.almashkor@Stu.edu.iq](mailto:emad.almashkor@Stu.edu.iq)  
<https://orcid.org/0000-0002-9297-1482>

**Raed Majeed Abd Mohammed**

Technical Administrative College, Iraq  
Email: [Raedmajeed1962@mtu.edu.iq](mailto:Raedmajeed1962@mtu.edu.iq)  
<https://orcid.org/0000-0003-1197-4612>

**Ali Abbas Kareem Alkhafaji**

Post Graduate Institute for Accounting & Financial  
Studies, University of Baghdad, Iraq  
Email [Ali.a@pgiafs.uobaghdad.edu.iq](mailto:Ali.a@pgiafs.uobaghdad.edu.iq)  
<https://orcid.org/0000-0002-6749-2543>

### —Abstract—

Lately, lean production approaches have become indispensable for producing high-quality goods cheaply and with superior organizational performance. Researchers and politicians need to prioritize this element. This study explores the impact of lean production strategies such as total quality management (TQM), just-in-time (JIT), and total productive maintenance (TPM) on the high performance of manufacturing firms in Iraq. The study also investigates the function of lower quality cost as a mediator between TQM, JIT, and TPM and the high performance of manufacturing enterprises in Iraq. The researchers employed survey questionnaires to collect primary data from personnel of quality assurance departments in Iraqi industrial companies. Using PLS-SEM and smart-PLS, the researchers analyze the interrelationships between the understudy components.

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TQM, JIT, and TPM were found to have a good relationship with the high performance of Iraqi manufacturing enterprises. The results also revealed that the lower quality cost considerably mediates the relationship between TQM, JIT, and TPM and the manufacturing enterprises' excellent performance in Iraq. The research assists policymakers in formulating strategies to attain high performance at a cheap cost by implementing the finest lean production practices.

**Keywords:** Total quality management, lower quality cost just in time, high performance, total productive maintenance

## 1. INTRODUCTION

As the globe becomes increasingly sophisticated and globalization expands, competition among enterprises on national and international platforms intensifies. To promote brand names, expand company size, and achieve financial objectives, all firms strive to be adaptable to market trends and to compete with other firms in the same industry and even in different industries to increase brand recognition (Wickramasinghe & Wickramasinghe, 2020). Hardcopf et al. (2021) indicate that enterprises must accept difficulties and aggressively compete not only to survive but also to gain ground and establish their footing. And admissibly, the pace of firms' performance influences how firms in new industries can succeed in the marketplace and maintain their position. Only companies that achieve high business performance and maintain steady growth may prosper and preserve their reputation in the business world or marketplace (Hao et al., 2021). So, businesses must understand how to achieve high performance. Firm performance is a catch-all term that encompasses various types of company performance. Firm performance influences organizational, management, social, production, and financial performance. Firms can achieve high performance if there is consistency in their operations, improvement in processes, adoption of innovation in resources, and an increase in potential investment, as well as if they have improved business strategies, increased productivity, improved quality, rising brand demand, and rising profits (Srinivasan et al., 2020).

The firms' shift toward a lean production strategy is a production technique that emphasizes the elimination of waste from manufacturing, where waste is defined as anything that does not provide value to customers. Total quality management (TQM), just-in-time (JIT), and total productive maintenance (TPM) are examples of lean production techniques (Swarnakar et al., 2021). TQM is a management concept that comprises organization-wide efforts to implement and create a climate in which company people may continue to improve the firm's capacity to produce excellent products and services following consumer perceptions and market trends. It enhances the quality of all firm assets, human resource productivity, and business operations to enhance product quality and customer satisfaction. Hence, it enhances organizations' performance (Nayal et al., 2022). JIT is a business strategy in which inventory is

obtained from suppliers at the precise moment of business demand. It decreases holding costs and inventory waste and prevents items and services from degrading. Thus, it results in high company performance (Hadid, 2019). Under Total Productive Maintenance, the assigned personnel and the entire workforce must engage in maintenance tasks. Maintenance of manufacturing processes enables companies to respond to market demands promptly and achieve market dominance (Uhrin et al., 2020).

This study will assess the performance of the manufacturing company in Iraq. Iraq is a developing nation with an economy in the upper middle class. In 2022, the country's nominal GDP was \$297.341 billion, with a GDP growth rate of 9.5%, compared to 5.9% in 2021. Agriculture, industry, and the service sector contribute 3.3%, 51.0%, and 45.8% to the nation's gross domestic product. Iraq's manufacturing sector is an important economic sector. It contributes significantly to the country's gross domestic product and total exports (Ali & Anwar, 2021). It produces substantial funds from overseas sources. The manufacturing industry in Iraq produced \$4.62 billion in 2018, a 13.49% rise from 2017 and \$4.99 billion in 2019, an 8% increase from 2018. Yet because of the devastating effects of the covid-19 epidemic on the economy, manufacturing output decreased by 0.03% from 2019 to \$4.99B in 2020 and \$4.27B in 2021, a 14.45% fall from 2020. (Al-Jumaili et al., 2021).

Even when the frequency of covid-19 has been reduced, there is still work for economic recovery. Despite this, the industrial sector of Iraq is experiencing difficulties, resulting in lower output and less contribution to the country's economy. This study proposes methods that may be valuable to manufacturing companies and simplifies a path to high performance. This study examines the contribution of lean production strategies such as TQM, JIT, and TPM to achieve high company performance. The study also evaluates the effect of reduced quality cost between TQM, JIT, and TPM in achieving high firm performance.

The study contributes significantly to the body of knowledge: 1) Several authors have written about the effect of lean production on the ability to achieve high firm performance. Yet, these authors have evaluated either the function of lean production or one of the lean production strategies, such as TQM, JIT, and TPM, in achieving high firm performance. The study must contribute to the existing body of knowledge by examining the role of all of these lean production strategies on high firm performance. 2) Numerous earlier research has examined the relationship between lower-quality expenses and increased company performance. However, few authors have explored the function of lower quality cost as a mediator between lean production processes and high firm performance. This study contributes to the existing body of knowledge by analyzing lower quality costs as a mediator between lean production strategies such as TQM, JIT, and TPM and achieving high firm performance. 3) This article examines the

performance of manufacturing firms in Iraq and the effect of lean production strategies such as TQM, JIT, and TPM on firm performance.

The study consists of various interconnected parts: The second considers a literature review for analyzing the link between elements and developing hypotheses. The third section clarifies the methodologies used to conduct the study. In the fourth section, the findings of the data analysis are extracted. These results are backed by earlier investigations that have shown comparable conclusions. The study's conclusion, implication, and limitations are presented in the end.

## 2. LITERATURE REVIEW

The growth of an economy, a country's environment, infrastructure, technical advancement, and people's well-being depend on the performance of enterprises operating in the nation. And the performance of a company is decided by the business strategy it employs. A company can achieve more excellent performance by using lean, productive methods such as TQM, JIT, and TPM, in which business operations are meant to increase quality, reduce waste, and overcome expenses (Tupamahu et al., 2019). The link between lean production strategies, such as TQM, JIT, and TPM, lower quality costs, and high firm performance dominates the literature. Some past research examining the association between these factors is cited below.

In a company that employs the TQM business strategy, quality strategies are developed following the nature and operation of the firm's departments. The quality of its resources, infrastructure, procedures, and human talent is maintained. Hence, the quality of the items and services supplied for marketing is enhanced, and the customer's need is met in the shortest time possible. Thus, the firm may perform better (Franco et al., 2020). Abbas (2020) investigates the connection between TQM, CSR, and corporate performance. The primary data were acquired from the managers of medium and big enterprises in Pakistan's industrial sector. Using SEM, the authors tested hypotheses. The study suggests that under TQM, each corporate department's procedures are regulated. All practices are continuously monitored and enhanced. Thus, a company with competitive advantages can enhance its market performance. Abbas (2020) examines the effects of Total Quality Management on knowledge management and business performance. The research sample includes manufacturing and service enterprises operating in Pakistan's major cities, and questionnaires were employed to collect data. The data were analyzed using SEM, and hypotheses were tested. The results demonstrated that TQM ensures the availability of high-quality knowledge, paving the way for the company to achieve more outstanding performance. The above assessment of relevant material suggests the following hypothesis:

**H1:** TQM has a positive association with high firm performance.

JIT is one of the lean production strategies in which large quantities of inventory are not purchased in advance and are held for future use. Instead, such contracts are made because inventory is obtained only when necessary. This reduces the total manufacturing costs of the firm, which impacts the product's price level. When consumers discover discounted products, demand increases. Hence, business performance is enhanced (Karim & Qamruzzaman, 2020). Nugroho et al. (2022) investigate the relationship between JIT, quality management, supply chain management, and enterprise performance. Using surveys, primary data were acquired from Indonesian businesses. The study indicates that JIT entails rapid delivery of inventory from suppliers and innovative inventory quality.

The time it takes to deliver products to clients and the quality of those products according to customer specifications expand the market for the company's goods and services. Hence, the JIT enhances the performance of the company. Agyabeng-Mensah et al. (2021) investigate the relationship between JIT, TQM, GSCPs, and firm performance. Ghana data were acquired using the quantitative research methodology and questionnaires sent to managers at 140 manufacturing businesses. PLS-SEM was used to analyze survey data and locate relevant research. This study also asserts that new goods and services resulting from JIT execution. Hence, it enhances business performance. Based on the above literature, we can propose the following hypothesis:

**H2:** JIT has a positive association with high firm performance.

Under TPM, where production sustainability is ensured, human resources, materials, and other resources and processes maintain productivity. The resulting productive culture improves businesses' operational and financial success (Chaabane et al., 2021). Valente et al. (2020) examine the impact of lean manufacturing strategies such as total productive maintenance, customer interaction, statistical process, and continuous flow on business success (financial and operational performance). 329 Portuguese SMEs in the manufacturing industry were sent online surveys, and their responses were collected. The data were analyzed using PLS-SEM, and hypotheses were tested. The study suggests a constant inventory flow from suppliers and products to customers, ending consumers in TPM.

This minimizes lead time and improves the performance of businesses. Khalfallah and Lakhal (2021) studied the effects of lean manufacturing strategies, including TPM, JIT production, JIT purchasing, and TQM, on agile manufacturing and company performance. This relates to operational and financial firm performance. The authors studied data from 205 Tunisian industrial companies using SEM. According to the study, in TPM, when there is consistency in production processes, managers maintain the entire system with the help of employees so that they do not have to deal with difficulties that cause a halt. This enhances the operational success of the company. Based on the studies covered previously, we can conclude that:

**H3:** TPM has a positive association with high firm performance.

Using TQM, managers maintain vigilance regarding the quality of all objects, situations, and processes and strive to maintain it through various changes and innovations. Although quality maintenance is routine, companies do not have to suffer high-quality charges. The firm's operational and financial performance is enhanced by maintaining quality and lowering costs (van Kemenade & Hardjono, 2019). Pambreni et al. (2019) determine the association between Total Quality Management, lower quality costs, and business performance. 350 executives and owners of service-based small and medium-sized enterprises (SMEs) in Selangor, Malaysia, provided the data for the relevant parameters.

Multiple linear regression analysis was conducted using SPSS 23. The study suggests that when TQM is implemented, the quality of resources and products is prioritized, and quality expenses are reduced. This enables the tagging of cheap product prices and attaining more revenues. Hence, organizations may have improved financial success. Kharub et al. (2019) investigate the impact of TQM on quality cost and business performance. A systematic questionnaire was developed, and copies were delivered to 45 ISO 9000-certified MSMEs in India to collect data. The SEM-based partial mediating model was utilized to test the hypothesis's validity. According to the data, enterprises that implement TQM experience a significant reduction in quality-related expenses, and these businesses may exhibit more excellent performance. The aforementioned literary arguments aid in the development of the following hypothesis.

**H4:** Lower quality cost significantly mediates TQM and high firm performance.

In JIT, companies do not acquire inventory in bulk, hold it, or let it go to waste. In this case, businesses save money by minimizing their storage needs, trash management, and product quality. Maintaining product quality and reducing quality costs assists businesses in achieving their operational and financial objectives (Chebet & Kitheka, 2019). Saini and Singh (2020) examine the relationship between JIT, lower quality costs, and business performance. 183 Northern Indian SMEs participated in a qualitative survey and provided data. The canonical analysis, correlation, regression, and ANOVA tests were utilized to examine the postulated relationships. The report emphasizes that JIT ensures the innovative acquisition of resources or commodities.

The innovation ensures that product quality will improve following consumer demands without requiring enterprises to incur additional costs. Lower costs and improved quality both contribute to increased performance. Aityassine et al. (2021) examine the relationship between just-in-time, reduced quality cost, and business performance. The authors identified 218 manufacturing companies in Jordan and gathered primary data. Path analysis is used to confirm or refute the study's hypotheses. This study further asserts that JIT execution in the production department automatically improves product

quality and decreases quality costs. This ultimately improves business performance. The above discussion demonstrates the following hypothesis:

**H5:** Lower quality cost significantly mediates between JIT and high firm performance.

TPM regulates all aspects of a company's operations, from product procurement through production, competent leadership, or supervision. The employed resources are cost-effective, have a high quality of operation, and are simple to use; the applied methods produce optimal production with improved quality; however, this diminishes quality. As a result, the company's offer to provide high-quality goods at a lesser price increases sales and improves its performance (Ribeiro et al., 2019). The study by Delvika and Silvina (2021) examines the connection between TPM, lower quality cost, and firm performance. The data regarding TPM practices, quality cost, and company performance was acquired through case studies of Southern Brazilian manufacturing firms. According to the study, human resources are educated to maintain the quality of resources, effectiveness of processes, and quality of resources when TPM techniques are applied. When all company departments demonstrate successful performance, there is a decrease in the cost of quality, which stimulates the firm's financial performance. Valamede and Akkari (2020) believe that TPM is a lean, productive approach that reduces quality costs and boosts market performance. Hence, we can say:

**H6:** Lower quality cost significantly mediates TPM and high firm performance.

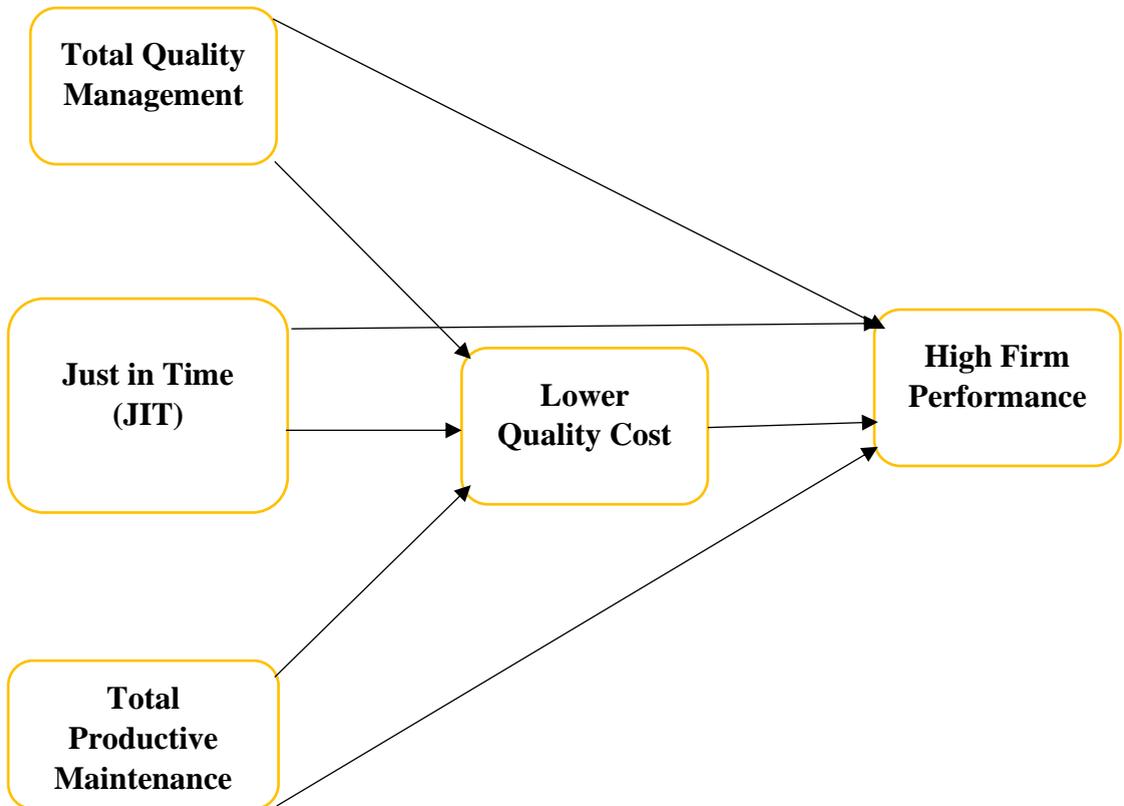
## Research Methods

This study studies the effects of TQM, JIT, and TPM on high performance and the impact of lower quality costs as a mediator between TQM, JIT, TPM, and high performance in Iraqi manufacturing enterprises. The researchers employed survey questionnaires to collect primary data from personnel of quality assurance departments in Iraqi industrial companies. The survey was derived from previous research. TQM is measured with eight items (Jermisittiparsert et al., 2019); JIT is measured with five items (Phogat & Gupta, 2019); and TPM is measured with seven items (Chen et al., 2019). Moreover, the reduced quality cost is measured with five items (Singla et al., 2020). Still, the high firm performance is measured with six items (Santoro et al., 2021).

As respondents, the researchers recruited quality assurance department personnel at Iraqi industrial businesses. They were chosen using an essentially random selection. The surveys were distributed through email. The researchers mailed over 673 questionnaires, but only 374 were returned and analyzed. These legitimate responses have a response rate of around 55.57 percent.

Moreover, the researchers employ PLS-SEM with smart-PLS to analyze the interrelationships between the understudy components. It is the best tool for analyzing primary data, producing significant results with large and small data sets and basic and sophisticated frameworks (Hair Jr et al., 2020). Three independent variables, including

TQM, JIT, and TPM, as well as one mediating variable, reduced quality cost (LQC), and one dependent variable, good firm performance, were utilized by the researchers (HFP). These structures are shown in [Figure 1](#).



**Figure 1.** Theoretical model

### 3. RESEARCH FINDINGS

The research results demonstrated the link between items. According to the data, the composite dependability (CR) and Alpha values are greater than 0.70. In addition, the data revealed that both the average variance extracted (AVE) and factor loadings exceed 0.50. These numbers indicated a strong link between items. These numbers are shown in [Table 1](#).

The research results demonstrated the link between factors. The Fornell Larcker and cross-loadings are utilized to examine the relationship between variables. The numbers indicated that the values revealing the association with the variable were more significant than those revealing the association with other variables. These numbers suggested a weak relationship between factors. These numbers are presented in [Tables 2 and 3](#).

**Table 1. Convergent Validity**

Constructs	Items	Loadings	Alpha	CR	AVE
High Firm Performance	HFP1	0.784	0.853	0.891	0.576
	HFP2	0.774			
	HFP3	0.762			
	HFP4	0.766			
	HFP5	0.737			
	HFP6	0.729			
Just in Time	JIT1	0.844	0.848	0.892	0.623
	JIT2	0.778			
	JIT3	0.827			
	JIT4	0.762			
	JIT5	0.728			
Lower Quality Cost	LQC1	0.772	0.846	0.891	0.621
	LQC2	0.852			
	LQC3	0.797			
	LQC4	0.794			
	LQC5	0.716			
Total Productive Maintenance	TPM2	0.788	0.873	0.904	0.611
	TPM3	0.769			
	TPM4	0.832			
	TPM5	0.751			
	TPM6	0.745			
	TPM7	0.800			
Total Quality Management	TQM1	0.889	0.928	0.944	0.737
	TQM2	0.813			
	TQM3	0.823			
	TQM4	0.886			
	TQM7	0.873			
TQM8	0.863				

**Table 2. Fornell Larcker**

	HFP	JIT	LQC	TPM	TQM
HFP	0.759				
JIT	0.745	0.789			
LQC	0.655	0.543	0.788		
TPM	0.650	0.620	0.503	0.781	
TQM	0.610	0.519	0.465	0.434	0.858

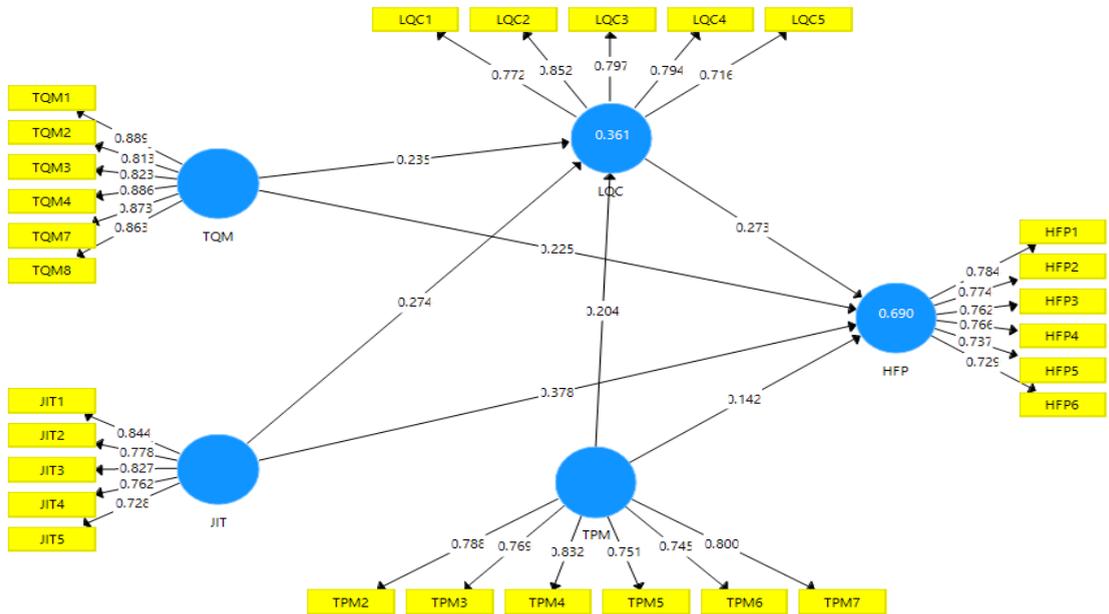
**Table 3. Cross-loadings**

	<b>HFP</b>	<b>JIT</b>	<b>LQC</b>	<b>TPM</b>	<b>TQM</b>
HFP1	<b>0.784</b>	0.572	0.385	0.493	0.440
HFP2	<b>0.774</b>	0.673	0.466	0.499	0.483
HFP3	<b>0.762</b>	0.545	0.558	0.492	0.444
HFP4	<b>0.766</b>	0.500	0.668	0.395	0.454
HFP5	<b>0.737</b>	0.560	0.463	0.544	0.504
HFP6	<b>0.729</b>	0.537	0.432	0.537	0.449
JIT1	0.613	<b>0.844</b>	0.415	0.725	0.383
JIT2	0.651	<b>0.778</b>	0.505	0.461	0.510
JIT3	0.605	<b>0.827</b>	0.449	0.641	0.429
JIT4	0.503	<b>0.762</b>	0.307	0.641	0.312
JIT5	0.543	<b>0.728</b>	0.433	0.389	0.381
LQC1	0.607	0.461	<b>0.772</b>	0.477	0.373
LQC2	0.515	0.393	<b>0.852</b>	0.370	0.377
LQC3	0.545	0.503	<b>0.797</b>	0.423	0.435
LQC4	0.443	0.348	<b>0.794</b>	0.334	0.313
LQC5	0.432	0.404	<b>0.716</b>	0.347	0.312
TPM2	0.548	0.639	0.406	<b>0.788</b>	0.431
TPM3	0.406	0.465	0.394	<b>0.769</b>	0.274
TPM4	0.603	0.631	0.459	<b>0.832</b>	0.383
TPM5	0.534	0.579	0.344	<b>0.751</b>	0.349
TPM6	0.371	0.440	0.358	<b>0.745</b>	0.232
TPM7	0.534	0.579	0.386	<b>0.800</b>	0.331
TQM1	0.564	0.433	0.428	0.366	<b>0.889</b>
TQM2	0.514	0.433	0.392	0.360	<b>0.813</b>
TQM3	0.479	0.460	0.373	0.418	<b>0.823</b>
TQM4	0.527	0.467	0.390	0.366	<b>0.886</b>
TQM7	0.546	0.418	0.434	0.367	<b>0.873</b>
TQM8	0.506	0.468	0.373	0.364	<b>0.863</b>

**Table 4. Heterotrait Monotrait Ratio**

	<b>HFP</b>	<b>JIT</b>	<b>LQC</b>	<b>TPM</b>	<b>TQM</b>
HFP					
JIT	0.868				
LQC	0.758	0.624			
TPM	0.740	0.831	0.573		
TQM	0.684	0.578	0.518	0.475	

Moreover, the Heterotrait Monotrait (HTMT) ratio is employed to examine the connection between variables. The numbers suggest that the values are less than 0.90. These numbers suggested a weak relationship between factors. These numbers are shown in Table 4.

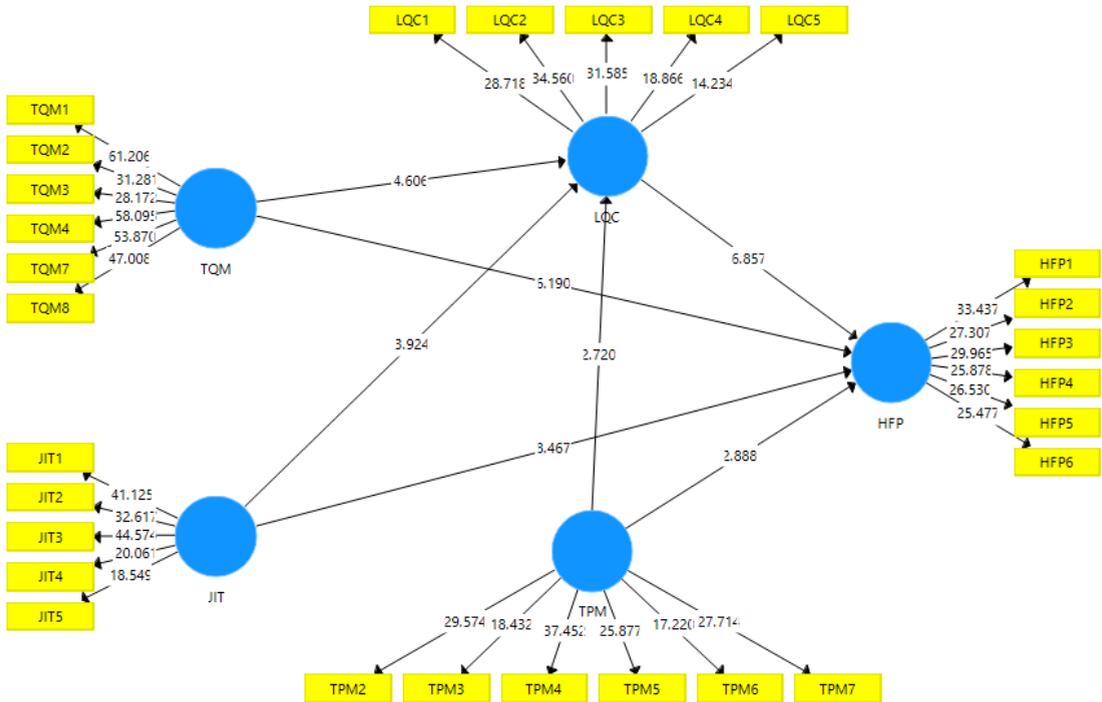


**Figure 2.** Measurement Model Assessment

The results indicated that TQM, JIT, and TPM had a favorable relationship with the high performance of manufacturing enterprises in Iraq and supported hypotheses H1, H2, and H3. In addition, the results revealed that the lower quality cost strongly mediates the relationship between TQM, JIT, and TPM and the high performance of manufacturing enterprises in Iraq, accepting H4, H5, and H6. These numbers are shown in Table 5.

**Table 5.** A Path Analysis

Relationships	Beta	Standard Deviation	T Statistics	P Values
JIT -> HFP	0.378	0.045	8.467	0.000
JIT -> LQC	0.274	0.070	3.924	0.000
LQC -> HFP	0.273	0.040	6.857	0.000
TPM -> HFP	0.142	0.049	2.888	0.004
TPM -> LQC	0.204	0.075	2.720	0.007
TQM -> HFP	0.225	0.036	6.190	0.000
TQM -> LQC	0.235	0.051	4.606	0.000
JIT -> LQC -> HFP	0.075	0.023	3.317	0.001
TPM -> LQC -> HFP	0.056	0.023	2.409	0.016
TQM -> LQC -> HFP	0.064	0.016	3.980	0.000



**Figure 3.** Structural Model Assessment

#### 4. DISCUSSIONS

The findings revealed a correlation between TQM and good business performance. According to [van Kemenade and Hardjono \(2019\)](#), if TQM is effective, the quality of resources is maintained through cautious purchase, storage, resource allocation, and resource consumption. Higher quality resources enhance the production performance of businesses. These findings concur with [Al Shraah et al.'s \(2012\)](#) assertion that effective TQM improves resource quality and procedures, improves goods, decreases costs, shortens lead time, and boosts the firm's market performance.

The results demonstrated a correlation between JIT and company performance. According to [Siagian and Tarigan \(2021\)](#), JIT does not involve the acquisition and storage of goods before the occurrence of a demand. This decreases holding expenses, reduces waste, and mitigates the danger of inventory quality loss. Hence, companies' finances improve. These results are also consistent with [Ganiyu et al.'s \(2019\)](#) assertion that JIT ensures the availability of supplies and resources whenever required without wasting time and that business activities would continue uninterrupted. Hence, operational performance is enhanced.

The results demonstrated a correlation between TPM and high business performance. These findings are consistent with [Nurprihatin et al.'s \(2019\)](#) investigation of the

influence of TPM on firm performance. The study suggests that TPM enhances each employee's ability to resolve problems, manage corporate operations, and increase the output of goods and services. According to [Aghaee et al. \(2021\)](#), if TPM is appropriately applied, total operating expenses will fall, the lead time will be shortened, and market responsiveness will increase firm performance.

Lower quality costs were also a significant mediator between TQM and business performance. These findings are consistent with [Basheer et al.'s \(2019\)](#) assertion that TQM reduces total costs by enhancing the quality of all company procedures and resources. The decrease in quality cost increases the firm's performance. Hence, lower quality costs influence the relationship between Total Quality Management and good business performance. These findings concur with [Abdallah and Al-\(2020\)](#) and Ghwayeen's assertion that successful TQM reduces quality costs, increasing company performance.

Lower quality costs were a critical mediator between JIT and high company performance. These outcomes are consistent with the findings of [Sharma and Modgil \(2020\)](#): implementing JIT reduces the costs associated with compensation and quality deficiencies, and the resulting decrease in quality costs enhances firm performance. These results are also consistent with [Yang et al.'s \(2021\)](#) assertion that under JIT, when inventory is not held for an extended duration, the quality of the inventory meets customer expectations, and the quality cost is lowered. Hence, managerial and financial performance is enhanced.

Lower quality costs were a critical mediator between TPM and high firm performance. These outcomes are consistent with [Sukma et al. \(2022\)](#). The study hypothesizes that TPM implementation enhances the quality of products and services at a lower cost. Because quality costs less, a company's performance is excellent. These results concur with [Robinson and Ginder's \(2020\)](#) assertion that TPM decreases quality expenses and enables firms to meet performance objectives.

## 5. IMPLICATIONS

The current study guides the future actions of researchers writing on the performance of businesses. This study examines the contribution of lean manufacturing methods such as TQM, JIT, and TPM to achieving high company performance. This study contributes to the literature by examining the reduced quality cost as a mediator between TQM, JIT, and TPM and high business performance. This study examines the contribution of lean production strategies such as TQM, JIT, and TPM to the high performance of Iraqi manufacturing companies.

Because it focuses on the performance of manufacturing firms, which are the engine of an economy, the current study has significant implications for long-term economic development. The study provides a roadmap for company management to attain high

firm performance by implementing lean manufacturing strategies. According to the report, TQM must be executed successfully to increase business performance. Also, the study directs management to focus on JIT execution to improve business performance. A rule also states that TPM should be implemented throughout the organization, resulting in great firm performance. It is suggested that companies implement TQM to reduce quality costs and achieve high performance. The research assists policymakers in formulating strategies to attain high performance at a cheap cost by implementing the finest lean production practices. The research indicates that JIT should be implemented with difficulty to reduce quality costs and enhance business performance. In addition, the analysis indicates that TPM should be beneficial in lowering quality costs. That would enhance company performance.

## **6. CONCLUSION**

The study aimed to investigate the effects of lean production strategies such as TQM, JIT, and TPM on achieving high firm performance. It was also intended to investigate the relationship between lean production strategies such as TQM, JIT, and TPM and high company performance. The research survey was administered to Iraqi manufacturing enterprises to collect information regarding TQM, JIT, and TPM, as well as firm performance. The findings demonstrated a correlation between lean manufacturing strategies such as TQM, JIT, and TPM and excellent company performance. The findings revealed that if TQM is effective, the resources, infrastructure, processes, and communication are maintained, among other things. This enhances the overall output performance of businesses. In a good JIT system, materials, resources, and services are obtained only when required. They decrease total expenses, waste, and quality problems. Hence, firm performance increases.

Similarly, if TPM is efficiently applied, there is a timely flow of money with reduced cost, lead time, and waste. The responsiveness enhances the performance of the firm. Lower quality costs confirm a substantial mediating effect between lean production strategies such as TQM, JIT, and TPM and business performance. Implementing TQM, JIT, and TPM minimizes quality expenses and, as a result, improves the firm's performance.

## **7. LIMITATIONS**

The writers evaluated several lean production strategies such as TQM, JIT, and TPM, as drivers of good firm performance. The authors disregard other essential elements such as financial resources, human resource management, firm size, etc. Thus the study's message is limited. Future scholars must focus their efforts on the most crucial aspects. In addition, the current research survey was limited to Iraqi industrial enterprises. The economic conditions in Iraq are unique, and the study may lose its relevance in other

economies. So, the authors must perform a study survey in several nations to obtain results with broad applicability.

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