

The Implementation of Lean Supply Chain Management to Improve Business Performance at a Balikpapan Public Hospital

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Abstract

This study investigates the relationship between Total Quality Management (TQM), Human Resources Management (HRM), Total Productive Maintenance (TPM), efficiency performance, operational performance, and business performance in Balikpapan public hospitals. Utilizing a Likert scale, indicators are used to assess TQM, HRM, TPM, efficiency, quality, and business performance. Eight hypotheses (H1-H8) are proposed to examine the connections between these variables. The study aims to provide insights into the healthcare sector's operational and business dynamics in the context of Balikpapan public hospitals

Purpose

This paper aims to investigate the influence of lean management on the operational performance within the context of Balikpapan public hospitals. Lean Management is assessed through the utilization of three key components: total quality management, human resource management, and total productive maintenance. Additionally, the study delves into the repercussions of operational performance on the business performance of hospitals.

Methodology

A systematic literature review was conducted following the methodology outlined by Tranfield et al. (2003). A total of 1285 peer-reviewed journal articles published between 2013 and 2023 were selected, profiled, and examined.

The research based on survey data obtained from participants who were associated in two public hospitals located in Balikpapan. To ensure the quality of the data, validity and reliability assessments were conducted using PLS software. The research hypotheses were then evaluated through the utilization of structural equation modeling techniques.

Practical implications

This research represents one of the pioneering efforts to take the three lean management principles, which have gained prominence in the manufacturing sector, and implement them within the healthcare domain. It investigates the impact of these three lean management on the operational performance of hospitals, focusing on aspects such as efficiency, and quality. Furthermore, the study underscores the significance of operational performance metrics in enhancing the overall business performance of public hospitals.

Research/limitation

This study's limitations include its focus on public hospitals in Balikpapan, suggesting future research should broaden to include private hospitals in Balikpapan and various industries for broader applicability. Diversifying Lean Management measures and involving a wider range of stakeholders in data collection could enhance future research.

Keywords

Business performance, Human resource management, Operational performance, Health care, Hospitals, Lean management.

1. Introduction

In today's highly competitive business environment, organizations across various sectors, including healthcare, face immense pressure to enhance their operations, reduce costs, and deliver higher-quality services and products. Recent research has provided evidence of the successful application of LM principles in healthcare operations (Simons et al., 2017). The promise of LM in healthcare lies in its patient-centric approach and its effective redesign of clinical procedures to achieve high-quality care through efficient resource utilization (Jorma et al., 2016).

Different studies have focused on varying aspects of Lean Management, including technical perspectives, social aspects (Drotz and Poksinska, 2014), and socio-technical perspectives (Clark et al., 2013). These studies have examined selected Lean Management practices, often overlooking important dimensions. Therefore, there is a need for a more comprehensive model that investigates the impact of a broader range of Lean Management dimensions on hospital Operational Performance. Interestingly, despite the extensive literature on Lean Management in manufacturing, no previous studies, to the best of our knowledge in Indonesia, have applied this comprehensive model with its four bundles in the healthcare context.

Furthermore, existing healthcare literature has presented conflicting and inconsistent results regarding the expected outcomes of Lean Management practices on operational performance. Some studies have reported positive effects of Lean Management on operational performance (Chiarini and Baccarani, 2016). The total quality management (TQM) has a positive impact on operational performance but does not significantly affect efficiency and accessibility performances (Alkhalidi, R. Z., & Abdallah, A. B. 2019).

The present study aims to fill these gaps in the existing literature by investigating the effects of the four lean bundles (TQM, HRM, and TPM) on hospital Operational Performance. To gain a deeper understanding of this relationship, hospital Operational Performance is measured across three dimensions: efficiency performance, quality performance, and accessibility performance. Moreover, the study examines the impact of these dimensions of hospital OP on hospitals' overall business performance (BP). To achieve these objectives, data were collected from staff and managers and supervisors working in 2 public hospitals in Balikpapan.

The implementation of Lean Hospital contribute to improved performance in various areas, including patient safety, quality of care, reduced waiting times, cost-effectiveness,

enhanced working conditions, heightened employee motivation, and improved inter-departmental communication (Graban, 2016)

2. Literature Review and Hypotheses Formulation

2.1 Total Quality Management

The implementation of Total Quality Management (TQM) is anticipated to enhance overall quality and boost business performance within the service industry (Haque et al., 2014). Numerous researchers have explored and assessed this approach extensively. According to Goetsch and Davis (2016), Total Quality Management is a business strategy that aims to enhance an organization's competitiveness through the ongoing enhancement of product and service quality, as well as the development of its people, processes, and environments. Total Quality Management (TQM) comprises 11 essential elements, including strategic orientation, customer-centricity, unwavering commitment to quality, scientific methodologies, long-term dedication, collaborative teamwork, continual process refinement, education and training, empowerment through structured control, shared objectives, and active employee engagement (Goetsch & Davis, 2016). In this research, the key TQM elements under consideration as variables are customer focus, continuous improvement, strategic orientation, and total employee involvement.

The relationship between Total Quality Management (TQM) and the performance of Small and Medium-sized Enterprises (SMEs) is positively influenced by both operational performance and innovation speed. Operational performance plays a crucial role in SMEs, and it is closely connected to TQM. Additionally, the speed at which innovation occurs also has a significant impact on this relationship (Anifowose, O., Ghasemi, M., & Olaleye, B 2022)

2.2 Human Resource Management

Human Resource Management encompasses practices that promote operational flexibility and facilitate communication among staff members within the workplace. This, in turn, helps reduce barriers that hinder organizational progress (Albuhisi and Abdallah, 2018). It revolves around the human element and embodies the softer aspects of Total Quality Management (TQM) and Lean Management (LM).

Human resource management, top management, and process management were the most significant components of quality management (QM) practices that had a positive impact on productivity. Furthermore, it was observed that a substantial 89% of the factors influencing internal productivity were connected to the specified QM constructs.

This implies that quality management can be considered a determining factor for productivity (Bertha et al. 2019)

2.3 Total Productive Maintenance

Total Productive Maintenance (TPM) is a comprehensive maintenance approach that goes beyond traditional maintenance practices. It intervenes in a company's management policies and aims to enhance overall equipment effectiveness (OEE) by minimizing breakdowns, quality defects, and production time losses

The selection of maintenance strategies to enhance business efficiency in the construction industry. These factors include productivity, quality, reliability, cost, safety and work environment, morale, inventory, and flexibility. Among the maintenance strategies considered, the Total Productive Maintenance strategy was found to yield the most desirable outcome (Martin, H., et al, 2019).

2.4 Operational Performance

Performance indicators play a vital role in healthcare organizations, serving as benchmarks to identify best practices and assess the value, quality, and effectiveness of healthcare operations (Shazali et al., 2013). Consequently, effective measurement of operational performance (OP) in healthcare is essential for guiding evaluation processes and assessing the impact of positive changes aimed at enhancing the level of service delivery.

Various OP measures have been employed in existing healthcare literature. For example, Miller and Chalapati (2015) assessed hospital OP using indicators such as outpatient wait times and labor productivity. Harrison et al. (2016) adopted operational efficiency, care quality, and organizational culture as OP measures. Toussaint and Berry (2013) utilized quality, efficiency, and cost as metrics for hospital OP, while Clark et al. (2013) considered productivity, quality (in terms of error reduction), cost-effectiveness, and turnaround times.

In this study, two dimensions are utilized to gauge hospital OP: efficiency performance and quality performance (Cheng et al., 2015). These three dimensions were chosen due to their widespread adoption as measures of hospital OP in healthcare literature. Furthermore, they provide comprehensive coverage and encompass various indicators that have been described using different terms in the literature.

2.4.1 Efficiency Performance

Efficiency stands out as a crucial criterion for assessing and gauging the performance of organizations, including hospitals. Consequently, over the past few decades, scholars across diverse domains in economics and management have concentrated their efforts on evaluating and measuring performance, often with a primary emphasis on efficiency levels (Rezaei et al. 2019).

2.4.2 Quality Performance

Quality performance in healthcare is often linked to enhancing patient satisfaction by delivering appropriate, timely, and high-quality services through flexible operational processes. Additionally, it involves minimizing mistakes and errors, reducing patient wait times, and enhancing the performance of staff members (Hussain et al., 2015)

2.5 Business Performance

In today's competitive business landscape, effective information management plays a pivotal role in driving and enhancing process management. This study, based on data from 202 manufacturing firms in Australia, establishes positive relationships between internal and external information management, process management, and operational performance, ultimately impacting overall business performance (Daniel Prajogo, 2018)

No	Author (s) and year	Research Object	Approach Adopted	Setting	Major Findings
1	Soares et al. (2017)	Examine the Influence of Supply Chain Quality Management Practices on Operational performance	Survey	Manufacturing firms from the UK	Practices related to supply chain quality management, including a focus on customers, suppliers, supply chain integration, and quality leadership, have a significant effect in influencing the quality of products. The development of an effective supply chain quality management network is contingent on the product quality surpassing customer expectations.
2	Jayalath et al. (2017)	Explore the Link Between Quality Management, Supply Chain Management Practices, and Organizational Performance	Survey	Rubber Industry from Sri Lanka	Top management commitment, human resource management, communication, information analysis, and customer focus were found to be associated with quality management, while supplier partnership, lean systems, customer relations, and information management fell under the category of supply chain management practices. Quality management practices were observed to have a direct positive impact on operational performance through the improvement of supply chain management practices. Organizations that prioritize quality management initiatives are more inclined to adopt effective supply chain management practices.
3	Anifowose, O., Ghasemi, M., & Olaleye, B. (2022)	This study contributes to a broader comprehension of innovation in the context of Total Quality Management (TQM), particularly with a focus on the aspect of innovation speed and	Cross-sectional survey and data analysis	Nigerian small and medium-sized manufacturing enterprises.	The effectiveness of TQM practices positively affects both the day-to-day operations and the pace of innovation within SMEs. These two factors, operational performance and innovation speed, are key drivers that enhance the overall performance of SMEs in the context of TQM implementation.

No	Author (s) and year	Research Object	Approach Adopted	Setting	Major Findings
		its associated metrics.			
4	Bertha Viviana Ruales Guzmán, Alessandro Brun, Oscar Fernando Castellanos Domínguez (2019)	The research aimed to explore the relationship between Quality Management (QM) and productivity as a performance indicator.	The study employed a systematic literature review as its research methodology.	-	The study found that the following QM constructs were positively affects to productivity: human resource management, top management, and process management. Additionally, a substantial portion (89%) of the internal determinants of productivity were linked to the proposed QM constructs, suggesting that QM can indeed be considered a determinant factor of productivity.
5	Goran Kutnjak, Dejan Miljenović, Ana Mirković (2019)	The research focuses on improving the competitiveness of Small and Medium-Sized Enterprises (SMEs) through the application of a Quality Management System (QMS).	The research paper employs a quantitative approach and presents a survey conducted in the Primorsko-goranska county in Croatia during July 2018	Primorsko-goranska county in Croatia.	The study found that the application of quality management systems in SMEs has both positive and negative outcomes. On the positive side, it contributes to improving business processes, product quality, services, increasing market share, enhancing reputation, and achieving sustainable business results. However, the research also identified relatively high negative quantifications related to the application of quality management systems in some cases, indicating challenges and areas for improvement. The mixed findings suggest the need for further scientific research in this area to better understand the impact of quality management systems on SMEs and their competitiveness.
6	Sanjay Sharma and Sachin Modgil (2019)	The research focuses on investigating the impact of Total Quality Management (TQM) and Supply Chain Management (SCM)	Identifying critical constructs related to pharmaceutical quality and supply chain management through a review of relevant	Indian pharmaceutical industry	The major findings of the study are as follows: <ul style="list-style-type: none"> - TQM practices have a direct positive impact on operational performance. - TQM practices also directly influence supply chain components. - Supply chain practices, in turn, have an influence on overall operational performance.

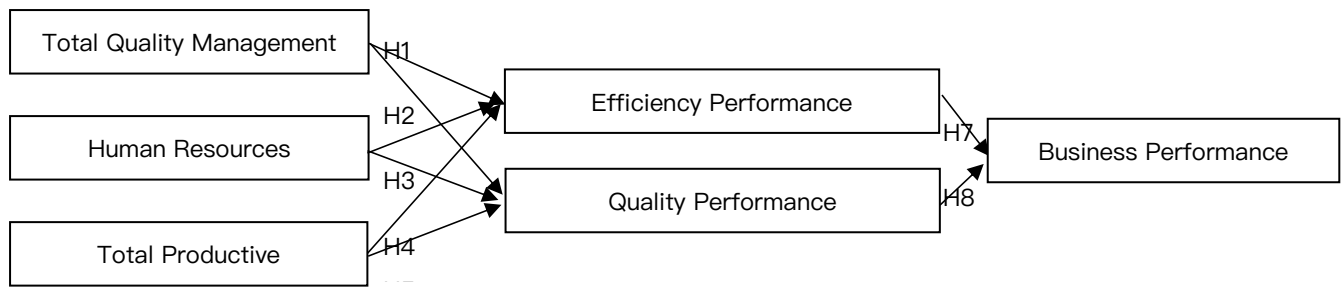
No	Author (s) and year	Research Object	Approach Adopted	Setting	Major Findings
		practices on operational performance within the context of the Indian pharmaceutical industry.	literature and consultation with industry experts		<ul style="list-style-type: none"> - Among the tested alternate models, the one where TQM practices affect supply chain practices and supply chain practices further impact operational performance is found to be the most appropriate. - The study emphasizes the critical role of TQM practices in the pharmaceutical industry and highlights how TQM practices contribute to the effectiveness of supply chain processes, ultimately leading to improved operational performance.
7	Rasha Zuhair Alkhalidi and Ayman Bahjat Abdallah (2019)	The research examines the impact of lean management (LM) on operational performance (OP) in the context of healthcare	The study is based on survey data collected from 260 respondents representing 25 private hospitals in Jordan	Jordan private hospitals	<p>The study's findings suggest the following:</p> <ul style="list-style-type: none"> - The total quality management (TQM) bundle has a positive impact on operational performance but does not significantly affect efficiency and accessibility performances. - The human resource management (HRM) bundle positively influences all OP dimensions (efficiency, quality, and accessibility). - The just-in-time system (JIT) bundle contributes positively to both efficiency and accessibility performances. - Furthermore, the study demonstrates that the dimensions of operational performance (quality and accessibility) have a significant and positive impact on the business performance of private hospitals.
8	Rahmat Nurcahyo, Zufadlillah, Muhammad Habiburrahman (2021)	The study focuses on the impact of ISO 9001:2015 on the operational and business performance	Multiple linear regression analysis to assess the impact of ISO 9001:2015 on operational and	The sample consists of 50 automotive component manufacturing	<p>Major Findings: The study reveals several significant findings:</p> <ul style="list-style-type: none"> - Implementation of ISO 9001:2015 has a positive and significant impact on both operational performance (including productivity, customer satisfaction, and product quality) and business performance (including sales growth, profit rate, and

No	Author (s) and year	Research Object	Approach Adopted	Setting	Major Findings
		of manufacturing industries in Indonesia	business performance	industries in Jakarta, Bogor, Tangerang, and Bekasi regions..	<p>market share) within Indonesian automotive component manufacturing industries.</p> <ul style="list-style-type: none"> - Operational performance also has a positive and significant impact on business performance, suggesting that improvements in operational aspects can lead to enhanced overall business performance. - Major obstacles to the effective implementation of ISO 9001 in the manufacturing industry are identified, including a lack of qualified personnel, inadequate training, employee resistance, and a lack of commitment among top-level management executives. - The study emphasizes the importance of strategic management decisions, resource allocation, and performance enhancement for managers looking to improve the effectiveness of ISO 9001 implementation in their firms.
9	Daniel Prajogo, Jordan Toy, Ananya Bhattacharya, Adegoke Oke, T.C.E. Cheng (2018)	The research investigates the relationships between information management, process management, and operational performance in the context of manufacturing firms in Australia.	The study employs an empirical approach, utilizing data collected from 202 manufacturing firms in Australia.	The research focuses on manufacturing firms in Australia	<p>The key findings of the study are as follows:</p> <ul style="list-style-type: none"> - Both internal information management and external information management have positive relationships with both internal process management and external process management. - Internal process management has positive effects on both internal and external operational performance. - External process management only has a positive effect on external operational performance. - Both internal and external operational performance have positive effects on business performance.

No	Author (s) and year	Research Object	Approach Adopted	Setting	Major Findings
10	Huiming Liu, Su Wu, Chongwen Zhong, Ying Liu (2020)	Evaluates the sustainable effects of operational performance on financial benefits, focusing on Chinese quality awards winners.	The study employs a PSM-DiD (propensity score matching and difference-in-difference) model to analyze the relationship between quality award effects and financial benefits, specifically return on assets.	The research was conducted in China, with a focus on Chinese quality award winners	<p>Major Findings:</p> <ul style="list-style-type: none"> - Quality awards alone do not guarantee higher returns on assets for the winning firms. - Operational performance indicators, such as reduced lead time and increased inventory turnover, have a significant positive impact on firms' profitability. - The study highlights the moderating effects of operational performance, suggesting that firms should focus on translating quality management practices into business improvements for sustainable development and continuous improvement in financial performance.

3. Theoretical Framework and Hypotheses

3.1 Research Framework



Independent Variables:

- 1) Total Quality Management (TQM)
- 2) Human Resources Management (HRM)
- 3) Total Productive Maintenance (TPM)

Mediator Variable:

- 1) Efficiency Performance
- 2) Quality Performance

Dependent Variable: Business Performance

In this framework, Total Quality Management (TQM), Human Resources Management (HRM), and Total Productive Maintenance (TPM) influence Efficiency Performance and Quality Performance, which, in turn, impact Business Performance. The mediator variables, Efficiency Performance and Quality Performance, help explain the relationship between the independent variables and the dependent variable.

3.2 Hypothesis

Based on the framework outlined above, the hypotheses can be formulated as follows:

- H1. Total Quality Management is related to efficiency performance in Balikpapan public hospitals.
- H2. Total Quality Management is related to quality performance in Balikpapan public hospitals.
- H3. Human Resources Management is related to efficiency performance in Balikpapan public hospitals.
- H4. Human Resources Management is related to quality performance in Balikpapan public hospitals.
- H5. Total Productive Maintenance is related to efficiency performance in Balikpapan public hospitals.
- H6. Total Productive Maintenance is related to quality performance in Balikpapan public hospitals.
- H7. Efficiency performance is related to business performance in Balikpapan public hospitals.
- H8. Quality performance is related to business performance in Balikpapan public hospitals.

Operational Definition of Variables

Variable	Indicators	Closed-Ended Question (Likert Scale)
Total Quality Management (Sharma, S., & Modgil, S. .2019)	TQM1 Strategic orientation	The hospital is committed to ongoing enhancement of its process quality, rather than adopting a stagnant approach.
	TQM2 Customer focus	Continuous customer feedback is consistently utilized to enhance the workflow.
	TQM3 Continuous improvement	Numerous hospital services have seen enhancements in the recent period.
	TQM4 Employee participation	Statistical process control is employed for the surveillance of hospital procedures.
Human Resources Management (Alkhalidi, R. Z., & Abdallah, A. B. 2019)	HRM1 Allocation of resources and time	The hospital management provides suitable resources (financial and time resources) to achieve objectives and handle tasks effectively.
	HRM2 Supportive work environment	The hospital's management fosters a work environment that nurtures and enhances the capabilities of its staff.
	HRM3 Comprehensive training plan	The hospital possesses an extensive training program that aligns with the requirements of employees for enhancing their job-related skills.
	HRM4 Employee empowerment and involvement	Employees are given the authority and actively participate in decision-making processes aimed at enhancing hospital services.
	HRM5 Employee rewards and recognition	Hospital staff receive rewards and acknowledgments, which may include financial incentives, for their contributions to enhancing hospital processes.
Total Productive Maintenance (Alkhalidi, R. Z., & Abdallah, A. B. 2019)	TPM1 Critical foundation of maintenance system	The hospital's maintenance system is a critical foundation.
	TPM2 Regular equipment inspections	The maintenance team conducts regular inspections of equipment and supplies to ensure they comply with operational standards.
	TPM3 Employee training for maintenance	Employees receive training to carry out daily maintenance and required calibrations for the equipment in their respective work areas.
	TPM4 Prompt equipment replacement	The hospital promptly replaces faulty equipment components efficiently.
Efficiency performance (Alkhalidi, R. Z., & Abdallah, A. B.	EP1 Service Errors Reduction	The quantity of service errors, mistakes, and rework in the hospital has shown a decline.
	EP2 Waste Reduction	Various forms of resource and material waste throughout the hospital have been minimized.

2019)	EP3 Reduced Hospital Overhead	There has been a reduction in the hospital's overhead costs.
Quality Performance (Sharma, S., & Modgil, S. .2019)	OP1 Product/ performance quality	There is an enhancement in product quality/performance after TQM, HRM, TPM Implementation.
	OP2 Improved Capacity	Staff capacity to perform work has increased
	OP3 Cost Effective	Operations and processes are cost effective after TQM, HRM, and TPM Implementation.
	OP4 Customer Satisfaction	Customer Satisfaction Hospital is increasing
	OP 5 Waiting time	Waiting time for daily service has reduced
Business Performance (Alkhalidi, R. Z., & Abdallah, A. B. 2019)	BP1 Uniqueness	Hospital offers unique services that differentiate it from competitors.
	BP2 Service Range	Hospital provides a more extensive range of services compared to its competitors.
	BP3 Reputation	Hospital has a favorable reputation when compared to its competitors.

Sample

The study's population comprises the entire workforce in medical-related positions within public hospitals in Balikpapan. This encompasses all employees within the Rumah Sakit Umum Daerah Dr. Kanujoso Djatiwibowo Balikpapan hospitals, of which 1,301 individuals hold positions as managers, supervisors, and medical staff, making them the representative population for this research and 430 employees in Rumah Sakit Umum Beriman. The focus of this study is on managers and supervisors due to their roles as departmental leaders, possessing knowledge and experience in quality and Lean Management practices, as well as a comprehensive understanding of their hospitals' performance levels. The relevant departments encompass nursing floors, laboratory departments, quality assurance units, pharmacy facilities, emergency rooms, and clinics.

4. Data Collection Method

4.1 Data Analysis

Structural Equation Modeling (SEM) is a statistical analysis method employed in this research to model the relationships between latent variables and observed variables measured by multiple indicators. There are two models within SEM, namely the outer model and the inner model. The outer model is used to validate the constructs of observed variables by testing their reliability and validity.

SEM analysis can be utilized to examine the relationships between constructs by analyzing the indicators of variables within a given model. Standardized and unstandardized path coefficients are used to measure the influence of one variable on another within the model. Path coefficient t-statistics and p-values are used to evaluate the strength and significance of relationships between variables in the model. A larger t-statistic and a p-value less than 0.05 indicate a statistically significant influence of the path coefficient at a 95% confidence level.

Designing the measurement model (outer model) using SEM, as outlined by Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017), involves several stages:

1. Selecting the construct variables to be measured by indicators.
2. Choosing appropriate indicators to represent these construct variables.
3. Testing the reliability and validity of indicators through Cronbach's alpha test, convergent validity test, and discriminant validity test.
4. Refining the model if any indicators fail to meet reliability and validity standards.

4.2 Questionnaire and measures

The data collection method employed in this research involves the use of a survey. Surveys are the most commonly utilized data collection method. They entail gathering data from randomly selected respondents through questionnaires or interviews.

In this study, surveys are conducted using questionnaires, which are a structured data collection technique comprising a series of written or verbal questions responded to by participants (Maholtra, 2017). The questionnaire used in this research is of the online survey method with closed-ended questions.

The instrument utilized for obtaining primary data is a questionnaire created based on the Likert Scale, which includes a range from very positive to very negative, expressed through words such as strongly agree, agree, neutral, disagree, and strongly disagree.

For quantitative analysis purposes, responses can be assigned scores as follows:

- (5) strongly agree;
- (4) agree;
- (3) neutral;
- (2) disagree; and
- (1) strongly disagree.

4.3 Measurement validity and reliability

In Structural Equation Modeling (SEM), discriminant validity is a concept that emphasizes the necessity for distinct concepts to exhibit sufficient differences. This means that a set of indicators combined should not be unidimensional.

Discriminant validity measurement employs criteria such as Fornell-Larcker and crossloadings. According to the Fornell-Larcker postulate, a latent variable should share more variance with its underlying indicators than with other latent variables. This implies that the Average Variance Extracted (AVE) for each latent variable should exceed the highest squared correlation (R^2) with any other latent variable.

Assessment of the measurement model involves:

- Composite reliability (ρ_c) with values ≥ 0.6 .
- Indicator reliability with loadings > 0.7 .
- $AVE > 0.5$ for convergent validity.
- Fornell-Larcker criterion for discriminant validity.
- Cross-loadings for further discriminant validity checks.

5. Limitations and Future Research

In addition to successfully achieving its objectives, this study has identified certain limitations that should be addressed in future research.

The study's confinement to public hospitals in Balikpapan limits its applicability to a specific healthcare context. Therefore, future research should consider expanding the scope to encompass public hospitals and other healthcare facilities in Balikpapan. Furthermore, the study could serve as a foundational framework for subsequent investigations in private hospital and across various industries to enhance the generalizability of its findings.

Moreover, the study employed to assess Lean Management, which may inadvertently overlook certain Lean Management practices and tools. Future research endeavors could explore alternative Lean Management measures and their effects on hospital performance.

Data collection primarily involved managers and supervisors in the selected hospitals. While this approach is conventional in similar empirical studies, it may have missed valuable insights from lower-level employees, patients, suppliers, and other stakeholders. Additionally, this approach limited the study's sample size. Future research could expand the pool of respondents to include a broader range of stakeholders, thereby increasing both the sample size and the applicability of the results.

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