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Total Quality Management Lean Practices and Firm Performance: Integrated Approach Using MBNQA Criteria in the Thai Automotive Industry

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Abstract
In an increasingly competitive global automotive landscape, the strategic integration of Total Quality Management (TQM) and Lean Practices (LP) has emerged as a crucial determinant of operational excellence and sustained organizational performance. Grounded in empirical evidence from the Thai automotive sector, this study explores the intricate synergies between TQM with Malcom Baldrige National Quality Award (MBNQA) dimensions, lean implementation, and firm performance. This study employs the quantitative research method, where the measurement scales for each construct were adopted from the literature and reviewed by academics. Data were collected from 854 manufacturing firms in Thailand through a mail survey method. This study applied a two-step structural equation modeling (SEM) process. The findings reveal a robust direct effect of TQM (leadership, strategy planning, customer and workforce focus) on firm performance, underscoring its pivotal role. Notably, TQM also exhibited a substantial indirect effect on business performance, mediated sequentially through lean practices including continuous flow, 5S, and total preventive maintenance. Lean practices similarly demonstrated significant direct and indirect effects on firm performance. Collectively, the combined effects of MBNQA and lean practices on firm performance was also observed, substantiating their complementary contributions. These findings hold significant implications, both from an academic and a practical standpoint. From a theoretical perspective, this research enriches the discourse by providing empirical insights into the mediating roles of lean practices, elucidating the paths through which TQM's performance-enhancing effects can be transmitted. Concurrently, the magnitude of the impact these practices have on firm performance underscores their practical relevance, and insights derived from this study could play a key role in guiding automotive firms and suppliers to align critical components to drive performance excellence.

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1. Introduction

In the rapidly evolving landscape of global automotive manufacturing, firms face mounting pressures to enhance product quality while optimizing operational efficiency and cost-effectiveness (Jasti and Kodali, 2015). The Thai automotive sector, a key player in Southeast Asia's manufacturing ecosystem, is not immune to these challenges (Laosirihongthong et al., 2013). In the wake of financial crises and the COVID-19 pandemic, Thai automotive enterprises must critically evaluate and bolster their competitive advantages to thrive amidst turbulence.

Two management paradigms, Total Quality Management (TQM) and Lean Practices (LP), have gained prominence as potential catalysts for operational excellence and enhanced organizational performance in automotive production engineering (Bortolotti et al., 2015; Psomas and Jaca, 2016). While TQM emphasizes customer-centricity and the holistic integration of quality management principles (Aquilani et al., 2017), LP focuses on the systematic identification and elimination of non-value-adding activities in production processes (Womack

and Jones, 1997). Both approaches aim to optimize resource utilization, elevate customer satisfaction, and improve financial outcomes in automotive manufacturing (Fullerton et al., 2014). Thus, it is clear that despite their distinct theoretical origins and perspectives, TQM and LP share a common overarching objective: driving operational excellence and organizational performance through systematic quality improvement and waste reduction strategies.

A comprehensive analysis of the extant literature reveals a complex mosaic of research gaps in our understanding of TQM and LP within the context of the Thai automotive industry. While these paradigms have been extensively studied in isolation, there remains a significant void in research exploring their potential synergistic effects on firm performance within this specific industrial ecosystem (Furlan et al., 2011). The well-documented efficacy of TQM and LP in Western automotive manufacturing contexts has not been adequately examined within Thailand's unique industrial landscape, leaving questions about their contextual applicability unanswered (Laosirihongthong et al., 2013).

Furthermore, the reliance on generic performance metrics in previous studies necessitates a shift towards more nuanced, industry-specific indicators to accurately capture the multifaceted nature of automotive manufacturing performance (Nawanir et al., 2016). The causal mechanisms through which TQM and LP influence firm performance, particularly in emerging markets such as Thailand, remain insufficiently elucidated, presenting a critical area for further investigation (Sadikoglu and Zehir, 2010). While the short-term benefits of these practices have been documented, their long-term implications for sustained competitive advantage in the automotive sector warrant rigorous longitudinal analysis (Netland and Ferdows, 2016). Significantly, there is a notable absence of research examining the intragation of TQM and LP principles into concrete operational practices within Thai automotive firms (Panizzolo et al., 2012). This gap between theoretical frameworks and practical implementation represents a significant barrier to the effective adoption of these management philosophies.

Addressing this interconnected web of research gaps is not merely an academic exercise but a strategic imperative for advancing our understanding of production engineering in the Thai automotive sector. By filling these knowledge voids, we can provide valuable insights that may enhance the global competitiveness of Thai automotive manufacturers and contribute to the broader discourse on quality management and lean manufacturing in emerging economies.

To address these gaps, this study adopts the Malcolm Baldrige National Quality Award (MBNQA) criteria as a structured framework for evaluating TQM practices (Evans and Jack, 2003). The MBNQA's seven categories provide a comprehensive lens for assessing quality management processes and outcomes, rendering it particularly germane to the complex production systems inherent in the automotive industry (Prajogo and Sohal, 2004). This research endeavors to answer the following questions:

1. How do TQM practices, as delineated by MBNQA criteria, influence the implementation of Lean Practices in Thai automotive firms?
2. What are the individual and combined impacts of TQM and LP on firm performance in the Thai automotive industry?
3. How do these practices contribute to firm performance in Thai automotive firms?

To address these questions, we employ a rigorous quantitative research methodology, utilizing surveys and advanced statistical analyses to measure the relationships between TQM, LP, and firm performance indicators specific to automotive production (Shah and Ward, 2003; Fullerton and Wempe, 2009).

By focusing on the Thai automotive industry, this study contributes to the understanding of how global production engineering concepts manifest in a specific regional context (Chiarini and Vagnoni, 2015). It also explores how Thai automotive manufacturers can leverage these practices to enhance their position within the global automotive supply chain (Panizzolo et al., 2012).

The findings of this research have significant implications for production engineering in the automotive sector. They will provide actionable insights for managers seeking to optimize their quality management initiatives and operational strategies (Netland, 2016). Moreover, by examining the integration of TQM and LP through the theoretical lenses of the Resource-Based View (RBV) and Practice-Based View (PBV), this study aims to reconcile theoretical perspectives with practical applications in automotive manufacturing (Bromiley and Rau, 2016 ;Teece, 2019).

The remainder of this paper is organized as follows. Section 2 reviews the literature related to TQM, lean practices and firm performance. We present the restructured organizational framework and related hypotheses pertaining to the relationships within the framework in Section 2. Section 3 also describes research methodology, the development of the survey instrument and sample. Subsequently, we present the results of testing the structural model in section 4. Finally, we discuss the results, empirical findings, and discuss their implications for both theory and practice in automotive production engineering, limitations, and future research directions in section 5.

2. Literature Review

2.1. Total Quality Management (TQM) with Malcolm Baldrige National Quality Award (MBNQA)

Total Quality Management (TQM), as conceptualized within the Malcolm Baldrige National Quality Award (MBNQA) criteria, has emerged as a comprehensive framework for organizational excellence and performance improvement. The MBNQA model, established by the National Institute of Standards and Technology, provides a holistic approach to quality management, encompassing leadership, strategic planning, customer focus, measurement, analysis, knowledge management, workforce focus, and process management (Peng and Prybutok, 2015).

Empirical evidence substantiates the efficacy of the Malcolm Baldrige National Quality Award (MBNQA) framework in enhancing organizational performance across diverse industrial and cultural contexts. Prajogo and Sohal's (2004) seminal research revealed robust positive correlations between MBNQA criteria adherence and both product quality and innovation performance in Australian manufacturing and service sectors. This finding was corroborated and extended by Lee, Rho, and Lee (2003), who identified significant associations between MBNQA criteria implementation and a spectrum of performance metrics in Korean manufacturing enterprises. The congruence of these findings across disparate geographical and industrial landscapes underscores the MBNQA framework's versatility and cross-cultural applicability. Such empirical consistency not only validates the framework's theoretical underpinnings but also suggests its potential as a universally applicable paradigm for quality management and organizational excellence. The demonstrated capacity of MBNQA-aligned practices to drive performance improvements in both product quality and innovation further emphasizes the framework's multifaceted impact on organizational competitiveness.

The Malcolm Baldrige National Quality Award (MBNQA) model presents a holistic framework for examining the intricate interplay between diverse organizational activities and their consequent outcomes (NIST, 2015). This comprehensive paradigm delineates six pivotal performance dimensions: leadership, strategy planning, customer focus, workforce focus, operational management, and outcomes. These dimensions are interconnected through the foundational elements of measurement, analysis, and knowledge management, which serve as catalysts for organizational learning and continuous improvement as shown in Figure 1.

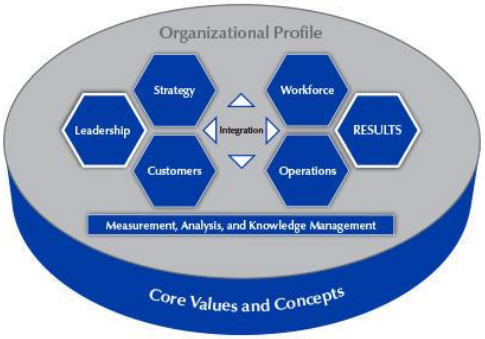

Fig. 1. MBNQA Model for Performance Excellence (NIST, 2015)

Despite previous studies examining the link between the practice of MBNQA and organizational performance, the results have been inconsistent (Dubey et al., 2018; Psomas and Jaca, 2016). Previous literature has not been able to clearly identify which factors (primary, support, or strategic) have the most significant impact on business results, nor have they determined which factors directly or indirectly influence results through other factors (Karimi, et al., 2014). However, Alanazi (2021) posited that the MBNQA framework provides a comprehensive approach that enables enterprises to eliminate waste and streamline their production processes. As such, lean practices can effectively address opportunities within all of the MBNQA criteria.

In conclusion, the MBNQA model offers a robust and holistic approach to assessing and improving organizational performance. By addressing the seven critical aspects of management and performance, organizations can leverage the MBNQA framework to drive continuous improvement, eliminate inefficiencies, and achieve superior results in an increasingly competitive global market.

In addition, the common main principle between lean practices and MBNQA is continuous improvement, a practice that Mahmud et al. (2019) strongly recommends should play a major role in the model. Due to the significance of this approach, it needs to be considered as a systematic driver for all other organizational activities. Table 1 below show how lean practices can be deployed based on the MBNQA model.

Table 1. MBNQA Dimensions in Resource-Based View

MBNQA Dimensions	Definition	Literature review for MBNQA
Leadership	The roles and responsibilities of all senior leaders is to support all business activities and ensure that everyone within the organization is aware of the importance of organizational objectives at all levels.	Panizzolo et al. (2012) Zargun and Al-Ashaab (2014), Netland (2016)
Strategy and Objective	The specific goals of the company. Implementing a strategy entails the elimination of everything that does not add value to the product or service.	Womack and Jones (1997), Zargun and Al-Ashaab (2014), Netland (2016)
Customer value	Voice of the customer (customer listening, customer and market knowledge, customers' satisfaction with competitors) and customer engagement (engagement as a strategic action, complaint management).	Mohammad et al. (2019)
Workforce training and development	Workforce capability and workforce support to drive performance and lean development of needs and learning.	Zargun and Al-Ashaab (2014)
Process management	Work processes, process improvement, process effectiveness and efficiency measures.	Netland (2016) Zargun and Al-Ashaab (2014)
Result	The measures of business or firm performance	Netland (2016), Mohammad et al. (2019)

2.2. Relationship between Six Dimensions of MBNQA and Firm Performance

Previous studies have shown that leadership, strategy, workforce, process management and customer focus are positively related to the business results of an organization (Alanazi, 2020; Peng and Prybutok, 2015; Rahman and Bullock, 2005). These supporting factors for the MBNQA criteria are essential preconditions to develop and implement other MBNQA practices effectively and efficiently, particularly by concentrating efforts on continual improvement. Leadership specifically plays a key role in determining values, providing guidance and communication and focusing an organization on actions including transforming the structure and culture of an

organization (NIST, 2015). Moreover, research shows that the success of MBNQA is closely linked to workforce and their related practices, including workforce empowerment, education, and involvement (Alanazi, 2020; Dubey et al., 2018). Initiatives would fail without employee commitment and engagement (Ahire et al., 1996). On the contrary, customer focus is one of the most important practices, since it is a key predictor of performance (Alanazi, 2020; Rahman and Bullock, 2005). The MBNQA Model emphasizes the importance of engaging with customers through ways such as listening, relationship building and the effective use of customer information, all of which underline the importance of customer satisfaction (NIST, 2015). Furthermore, information and data analysis and management of knowledge have a substantial impact on organizational results. Meanwhile, the management of operations should be focused on design and management and the development and improvement of key customer value products, services and processes (NIST 2015). The use of quality information also has a direct effect on business results, as the aim is to guide business operations and activities towards desired results by metrics measurement, data analysis and knowledge management. Through the integration of employee management, process management, and quality information management, leaders should thus strive to gain employee commitment (Evans and Jack, 2003). In summary, efficient and integral management of organizational resources by supportive and primary MBNQA criteria has positive impacts on a firm's competitive advantage and financial and non-financial outcomes (Rochmatullah et al., 2023). Hence, the study proposes the following hypothesis:

H1: The higher the level of MBNQA, the higher the level of Firm Performance.

2.3. Lean Practices

Lean Practices (LP) have been extensively studied in the context of automotive manufacturing, with research highlighting their significant impact on firm. Shah and Ward's (2003) seminal work provided a comprehensive framework for understanding lean manufacturing, identifying 22 key lean practices and their effects on operational performance in the automotive industry. Their study empirically demonstrated that these practices, when implemented cohesively, lead to substantial improvements in manufacturing efficiency and quality outcomes. According to Shah and Ward (2007), lean practices are grouped into four groups, often referred to as bundles. Each bundle (group) consists of different lean practices and include: Just-in-Time (JIT), TQM, Total Productive Maintenance (TPM) and Human Resource Management (HRM) bundles. In their study, Shah and Ward (2007) concluded that these four groups have a positive effect on operational performance. Meanwhile, Dal Pont et al., 2008 identified three JIT bundles, TQM and HRM. Tortorella, (2021), on the other hand, grouped together twenty lean production practices which are frequently referenced in literatures. These are further categorized into six bundles associated with Just-in-Time, Continuous Improvement, Quality, Elimination of Waste, People Management, and Visual Management. Sanders, Sanders et al (2016) classified ten LP dimensions into four factors including supplier factors, process factors, control and human factors, and customer factors.

The implementation of lean practices in the automotive industry has been a subject of extensive research, with scholars often focusing on groups of lean tools rather than individual practices. This approach is largely influenced by the seminal work of Shah and Ward (2003), who developed well-established lean bundles. These include Pull system, Single-Minute Exchange of Die (SMED), Continuous flow, Heijunka, Cellular manufacturing, Takt time, and JIT delivery by suppliers. Notably, researchers such as Fullerton et al. (2014) and Nawanir et al. (2016) have incorporated the majority of these practices in their empirical analyses, underscoring their perceived significance in lean implementation.

However, the literature seems to allocate less attention to employee involvement and human resource management within lean practices. This discrepancy may have arisen because "soft" lean tools, which pertain to behavioral and social aspects, are sometimes perceived as less critical by companies compared to technical lean tools (Sahoo, 2020). For instance, Hadid and Mansouri (2014) categorized lean practices into two distinct groups: lean technical practices and lean supportive practices. And indeed, empirical evidence has demonstrated that lean technical techniques have significant impact on both operational and financial success.

The technical system encompasses tools, techniques, devices, artifacts, methods, configurations, procedures, and knowledge utilized by organizational members to obtain inputs, convert them into outputs, and deliver services to clients or customers. Lean approaches largely focus on system-oriented technical and analytical tools to enhance production processes (Abdallah et al., 2021). Technical practices concentrate on managing processes and utilizing methods to meet specific objectives (Belekoukias et al., 2014), and the tools associated with technical practices are aimed at enhancing quality systems and management, including technology utilization, just-in-time (JIT) concepts, and continuous flow enablers (Rahman and Bullock, 2005). This study has identified the most frequently referenced technical lean management practices from the literature, including set-up time reduction, JIT, continuous flow, total productive maintenance (TPM), and 5S.

2.4. The Relationship between MBNQA and Lean Practices

The MBNQA is a comprehensive framework that promotes organizational excellence and continuous improvement, which aligns well with the principles and objectives of lean practices (Mohammad and Oduoza, 2019). The MBNQA criteria emphasize the importance of leadership, process management, customer focus, and employee involvement, which are key elements of successful lean implementation. Research has shown that organizations that have adopted the MBNQA framework are more likely to implement lean practices effectively and achieve superior performance outcomes (Lapoint, 2022). The MBNQA's focus on leadership, strategic planning, and data-driven decision-making creates a supportive

environment for the successful deployment of lean practices, such as value stream mapping, kaizen events, and visual management (Netland, 2016). Moreover, the MBNQA's emphasis on customer satisfaction and market responsiveness encourages organizations to adopt lean practices that enhance flexibility, reduce lead times, and improve quality (Mohammad and Oduoza, 2019). By aligning lean practices with the MBNQA criteria, organizations can develop a holistic approach to continuous improvement that encompasses all aspects of their operations, from product design and development to manufacturing and customer service (Lapoint, 2022). In conclusion, the hypothesis that the MBNQA positively affects lean practices is well-supported by the literature. Therefore, the proposed hypothesis for testing is:

H2: The higher the level of MBNQA, the higher the level of Lean practice.

2.5. The Relationship between Lean Practices and Firm Performance

The literature suggests that implementing lean practices generally translate into higher firm performance, (Fullerton et al., 2014; Nawanir et al., 2016) and numerous empirical studies have found support for the positive association between lean practices and dimensions of firm performance including (1) Unit Cost of Manufacturing (2) Return on Investment (3) Profit and (4) Market Share. This is shown in Table 3 (Abdallah et al., 2021; Fullerton et al., 2014; Hadid and Mansouri, 2014; Sahoo and Yadav, 2018; Shah and Ward, 2003; Shah and Ward, 2007; Thunyachairat et al.,2023). More specifically, a positive relationship was observed between 11 operating indicators and kaizen, single-minute die exchange, supplier development, pull system, total productive maintenance, and customer involvement practices; cellular manufacturing, human resource management and continuous flow improved the performance of 10 indicators, and supplier delivery of JIT resulted in improvements in 9 indicators. Other practices that are substantially linked to operational performance were heijunka, 5S and visual management. These activities have resulted in an increase of at least six operational indicators among the 11 operational performance measures. According to Table 2, all 18 studied practices showed positive relationships to one or more of the five indicators of financial performance.

Table 2. The Relationship between Lean Practices and Financial Performance

Practices	Financial performance (FP)				
	UCM (1)	ROI (2)	Profit (3)	Market Share (4)	Total
Kaizen	PS	PS	PS	PS	4
HRM	PS	PS	PS	PS	4
Cell Mfg	PS	PS	PS	PS	4
JIT	PS	PS	PS	PS	4
Pull	PS	PS	PS	PS	4
SMED	PS	PS	PS	PS	4
TPM	PS	PS	PS	PS	4
Flow	PS	PS	PS	PS	4
Heijunka	PS	PS	PS		4
5S	PS	PS	PS	PS	4
TQM	PS	PS	PS	PS	4
Custinv	PS		PS	PS	3

Most importantly, the works of Belekoukias et al. (2014), Fullerton et al. (2014), Nawanir et al. (2016) and Shah and Ward, (2007) note that the greater the number of lean practices implemented, the greater the number of positive impacts observed within the firm. This underscores the importance of implementing lean practices holistically as opposed to implementing only isolated tools. Thus, another hypothesis is expressed as the following:

H3: The higher the level of lean practices, the higher the level of firm performance.

2.6. The Relationship between MBNQA, Lean Practices and Firm Performance

Organizational performance stands as a central measure for evaluating firms' performance, yet scholars often face challenges in defining and measuring it effectively. Moreover, the use of internal measures by companies and their impact on management decisions can affect the associations between different variables and performance. Organizational performance also tends to vary over time, leading to ambiguity regarding which indicators differ and how. Furthermore, there are practical challenges and ambiguities regarding the type and nature of performance measures, such as subjective versus objective measures or financial versus non-financial measures.

Dess and Robinson (1984) emphasized two key challenges in studying organizational performance: defining organizational performance within a conceptual framework and identifying valid measures for its operationalization. Venkatraman and Varadarajan and Ramanujam, (1990) distinguished between financial performance and non-financial performance, with financial performance being the narrowest concept and non-financial performance encompassing broader aspects of business performance. They proposed that organizational effectiveness is relevant only when various objectives regarding stakeholders are incorporated. This study adopts a broader notion of organizational performance that includes both financial and non-financial performance.

In the performance management literature, various approaches have been used to operationalize organizational performance. Examples include assessing return on investment, margin on sales, capacity utilization, customer satisfaction, product quality, and other indicators (Sahoo and Yadav, 2018; Zargun and Al-Ashaab, 2014). When considering the relationship between lean manufacturing and performance, it's essential to distinguish between practices and performance. Practices refer to activities or approaches undertaken to achieve specific goals, while performance represents outcomes achieved after implementing those practices (Flynn et al., 1995). Lean practice's success depends on the implementation of its practices as a cohesive system, rather than piecemeal adoption (Shah and Ward, 2007), and implementing only parts

of lean practices will not lead to significant improvements in organizational performance. Scholars such as Dal Pont et al. (2008), Hadid and Mansouri (2014), and Shah and Ward (2003, 2007) have proposed the concept of lean practices bundles, suggesting that all practices should be implemented together as a bundle to achieve their potential benefits. Therefore, this research hypothesizes that:

H4: Lean practices have a mediating effect on the relationship between MBNQA and a firm's performance.

2.7 Resource-based View (RBV) and Practice-based View (PBV)

The Resource-Based View (RBV) of the firm posits that firms can achieve sustainable competitive advantage through the acquisition and control of valuable (V), rare (R), inimitable (I), and organization (O) exploitable VRIO resources and capabilities. Resources can be both tangible or intangible, and the distinctiveness and capabilities within a firm form the basis of its strategy and ability to generate above-average returns. VRIO resources offer economic value and are difficult for competitors to imitate, contributing to a firm's competitive advantage (Hitt et al., 2012).

Lean practices themselves can be considered as VRIO resources, as they enable the procurement of strategic resources and foster sustainable operational performance (Manzoor, et al., 2022). RBV provides a theoretical basis for lean practices by guiding benchmarking processes and strategies so that firms are able to overcome competitors' performance disadvantages (Barney and Clark, 2007). However, RBV has been criticized for its ambiguity and lack of specificity regarding resource value, inimitability, and competitive advantage measurement (Bromiley and Rau, 2016). Additionally, RBV overlooks the dynamic nature of resources and their context dependency, leading to a static environment. Despite these limitations, RBV remains valuable when applied dynamically and in conjunction with other theories.

Practice-Based View (PBV), in contrast to RBV, focuses on explaining firm performance through the adoption of practices within a firm. PBV suggests that imitable practices can lead to performance differences among firms, acknowledging that not all beneficial practices are adopted universally (Bromiley and Rau, 2016). While RBV assumes that alluseful practices are adopted by all firms, PBV recognizes that firms may not know or use all beneficial practices. The PBV provides a framework for understanding the impact of specific techniques on firm performance, acknowledging that the adoption of practices can vary across firms and industries (Kaynak, 2003). Therefore, it is implied that lean practices, while valuable, may not be suitable for all firms, highlighting the importance of considering industry context and firm-specific factors (Srinivasan et al., 2020).

In summary, PBV emphasizes the role of imitable practices in explaining performance differences among firms, offering a complementary perspective to RBV. While RBV focuses on the value of resources and capabilities, PBV considers the adoption and impact of practices on firm performance, acknowledging the dynamic nature of organizational practices.

It can be seen that the PBV strategy, introduced by Bromiley and Rau (2016), addresses a gap in the RBV literature by offering practical methods for improving business processes and performance. PBV is particularly relevant to operational management, as it emphasizes the impact of daily operations on overall performance and efficiency. While RBV focuses on how a company's assets or capacities contribute to performance, PBV recognizes the importance of practical techniques that managers and businesses can apply directly. PBV acknowledges the complexity of sustainability as a multifaceted construct encompassing economic, environmental, and social dimensions. Unlike RBV, which primarily focuses on economic performance, PBV considers sustainability as the outcome of cooperation, experimentation, and experiential learning. Numerous studies have demonstrated the applicability of PBV in explaining sustainability performance, highlighting its suitability for addressing the complexities of sustainability management. Therefore, incorporating both PBV and RBV into a comprehensive framework will allow researchers to better understand the dynamics of sustainability within organizations and develop more effective strategies for sustainable management.

The primary goal of this research is to examine the effect of MBNQA on firm performance. The research framework underpinning the resource-based view theory (Barney and Clark, 2007, Netland, 2016) and practice based-view theory (Bromiley and Rau, 2016) is shown in Figure 2. A thorough literature review discloses that the variables chosen in this study have been underpinned by the RBV. Specifically, MBNQA is considered as one of the primary sources of firm performance (Mohammad and Oduoza, 2019).

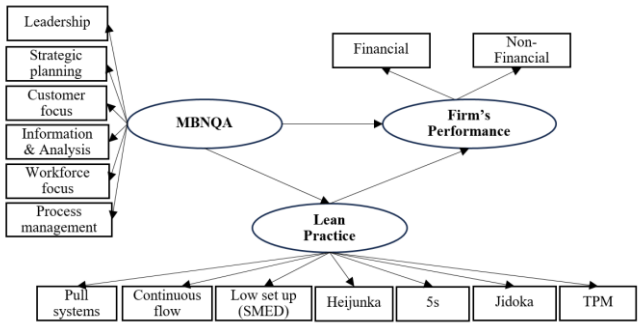

Fig. 2. Conceptual Framework

3. Method

This study employed CBSEM to test the hypothesis and confirm our theory. Several notable CBSEM is employed to specify and test the relationships among latent variables based on a priori theoretical knowledge (Kline, 2023). It provides various global fit indices to evaluate the overall fit of the hypothesized model to the observed data, explicitly models and accounts for measurement error, and enables researchers to compare alternative models and assess construct validity (Kline, 2023; Hair et al., 2010).

Meanwhile, EFA allows the researcher to explore the nature and number of underlying factors (dimensions) in a battery of

items (questions) (Henson and Roberts, 2006). Hair et., (2010) suggested that for testing EFA, the sample size should be more than 100. The KMO index ranges from 0 to 1, with 0.50 considered suitable for factor analysis (Hair et., 2010), While the Bartlett's Test of Sphericity should be significant ($p < .05$) for factor analysis to be suitable. Hence, before the extraction of the factor, the KMO and Bartless's test was estimated in this study.

Confirmatory Factor Analysis (CFA) and structural-equation modeling (SEM) were used to assess the scales and test the hypotheses. For a thorough assessment of the scales, the CFA was conducted to test the measurement model, which involved examining the relationship between latent and manifest variables. CFA have assumptions and expectations based on prior theory regarding the number of factors (Brown and Moore, 2012). SEM was employed for the structural model which comprised of lean practices, MBNQA and firm performance. Before subjecting the data to structural equation modeling, we needed to further assess the validity of the measure by using confirmatory factor analysis.

3.1. Questionnaire Development

The questionnaire is developed for pretest purposes. As most of the constructs' measurement are adopted from studies conducted in Western and Eastern countries, cross-cultural adaption was necessary to ensure the meaning of words and phrases in Thai had an equivalent meaning. We followed the phases of cross-cultural adaptation recommended by Sperber A.D. (2004).

After completing the cross-cultural adaptation, pretesting of the questionnaire was conducted by sending the questionnaire to supply chain management/production/plant managers with knowledge of Total Quality Management and lean practices in the automotive industry. All questionnaires were tested for reliability in order to evaluate the stability of the instrument. This study used a five-point Likert scale for s constructs of main factors, leadership, strategic planning, customer focus, workforce focus, mediating effect on lean practices and one dependent variable (firm performance). Moreover, the composite reliability (CR) of constructs were checked by Cronbach's alphas as follows: Total Quality Management = 0.944, Lean Practices= 0.900, Competitive Advantage= 0.890, Firm Performance= 0.874 The coefficient alphas of all constructs were acceptable, as they were over the recommended cutoff point of 0.70 (Nunnally,1978). The modified questionnaire was then pilot tested to determine its suitability for the target population before large-scale mailing.

For the pilot testing, the instrument underwent the Item Objective Congruence (IOC) procedure. This is achieved by inviting three experts in the areas of quality control and lean practices to review the developed questionnaire. The validating sheet was adapted from the sheet designed by Turner and Carlson (2003), with responses ranging from +1 (agree) to 0 (undecided) and -1 (disagree). The sheet is provided in appendix A. The three subject matter experts were asked to put a check mark on the rating scale in order to validate the degree of item-objective congruence.

3.2. Data Collection Process

The aim of survey research is to make generalizations from a sample to a population (Creswell, 2009). Data for this study was collected using self-administered questionnaires, in which participants fill out the questionnaire independently. Data from the survey were collected during April – September 2023.

Data collection in this study involved two phases consisting of the pretest study and the main study. The purpose of the pretesting stage was to check the content and face validity of the scales and to check for any ambiguity in the wording of the items in the questionnaire. The modified questionnaire was pilot tested to determine its suitability for the target population before large-scale mailing. After the pretest study, minor adjustments were made to the questionnaire.

The unit of analysis in this study was limited to firm level, and the survey was restricted to the automotive industry in Thailand as the automotive sector has been the leader in terms of implementing lean practices in the Thai industry. The most common way of conducting self-completion questionnaires is collecting data through mail survey and e-mail. These methods have many advantages, such as low cost compared to other approaches like telephone or face to face interviews. It also helps minimize possible bias caused by interviewers (Czaja and Blair, 2005).

3.3. Sampling Plan

The tiered supplier system in the automotive industry, consisting of Tier 1, Tier 2, and Tier 3 suppliers, operates similarly worldwide with regional adaptations. In Thailand, Tier 1 suppliers are closely linked to Japanese automotive firms, reflecting Japan's substantial investment in the Thai market, and often deal with complex assemblies directly supplied to OEMs (Pavlínek,2018). Tier 2 suppliers in Thailand manufacture fewer complex components, benefiting from Thailand's strategic location to serve ASEAN markets. Tier 3 suppliers, crucial in providing raw materials like rubber, capitalize on Thailand's status as a major rubber producer. While the basic structure of supplier tiers is consistent globally, differences arise from specific regional economic policies, market demands, and available natural resources (Sytche et al.,2022).

The unit of analysis of this study is at firm level. The target respondents were managers or middle managers who can evaluate MBNQA dimensions, lean practices, and firm performance in tiered supplier system in the automotive industry. These key informants should be in charge of such functions as production, manufacturing, supply chain management, material planning and logistics. To identify participants, company databases derived from the Thai Auto-Parts Manufacturers Association and The Thai Automotive Industry Association were used. The population from this source is approximately 1,800 firms in total,854 firms out of which were chosen as the sample of this study.

4. Results and Discussion

4.1. Descriptive Statistics Results

In survey-based research, the response rate typically significantly influences the quality of study findings and their generalizability. A low response rate may indicate participants' aversion to completing the surveys or imply issues with the questionnaire (Bell and Bryman, 2007). This study sent out a total of 854 questionnaires via postal mail. The data collection process spanned over 4 months, beginning in the first week of April 2023 and ending in the last week of August 2023. A total of 453 questionnaires were received, resulting in a response rate of 24.61 percent of the original sample that was sent out. The survey's response rate was lower than expected, but it was similar to response rates observed in other studies within the field of operations management, such as those conducted by Shah and Ward in 2007. Subsequently, a total of 53 questionnaires were unusable due to missing data or lack of information. Hence, a total of four hundred questionnaires were available for use.

Classified by a Tier system, the majority of participants were those from a Tier 1 supplier, which accounted for 57.8% of all participants, followed by Tier 2 suppliers who account for 26.3%, and Tier 3 suppliers at 16%. There were only 56 participants, or 14%, who were from a Thai-owned company with no foreign ownership. Among those who had foreign partnerships, the majority of them had partnerships with a foreign company from Japan (52.8%), followed by China (10.8%), USA (7.3%), South Korea (5.8%), Germany (3.8%), Sweden (3.8%), and Malaysia (2%).

Firms with more than 30 years of business experience in the automobile industry were the largest group of participants, accounting for 38.3%. This was followed by participants who worked in supplying firms with 21 – 30 years of business experience (29.3%), participants working in supply firms with 11-20 years (19%), and less than 10 years of experience (13.5%). The supplying firms also varied in terms of number of employees. Small-sized business operators account for 1.5% of respondents while medium-sized operators account for 11.3% of whom employ 50 – 100 employees and 24.5% employ 101 – 200 employees. Large-size business operators comprised of 29.0% and 33.7% hire more than 300 employees. In terms of revenue, the majority of firms generated average annual sales of more than 300 million baht (55%), followed by the income group of 201-300 million baht (34.3%), 101-200 million baht (8.7%), and 50-100 million baht (2%), respectively.

4.2. Exploratory Factor Analysis

Exploratory factor analysis (EFA) was employed to explore how different variables measure a particular concept. The items of measures were subject to EFA to extract fewer and more significant factors used in the study before data is entered in the structural equation model. Hair et al. (2010) suggest that the Kaiser-Meyer-Olkin (KMO) index should be significant ($p < 0.05$) for factor analysis. Thus, this study uses the Statistical Package for the Social Sciences (SPSS) to assess the suitability of the data for factor analysis prior to factor extraction. The Barlett's Test of sphericity of all the measures have significance at $p < 0.05$. The KMO index, ranging from 0.640-0.755, is above the minimum standard for conducting factor analysis. It was thus appropriate to employ EFA.

The MBNQA Scale consists of 29 items and six subscales which includes leadership (5), strategy planning (5), customer focus (6), information & analysis (4), workforce focus (4), and processes (5). Factor loading using PCA for six components in related theory are presented with four sub scales: (1) leadership (2) strategy planning (3) customer focus and (4) workforce focus. Higher factor loading scores of scale items no. LE1 (0.85), LE2 (0.85), LE3 (0.86), LE4 (0.88), ST2 (0.73), ST3 (0.80), ST4 (0.76), ST5 (0.84), ST6 (0.80), CF1 (0.91), CF3 (0.90), CF4 (0.64), CF5 (0.92), CF6 (0.79), WF1 (0.69), WF2 (0.77), WF3 (0.66) were considered for the subscale of leadership, strategy planning, customer focus, and workforce focus.

The Lean Practices Scale consists of 26 items and seven subscales, including pull system (3), continuous flow (4), low set up (4), Heijunka (3), 5S (5), Jidoka (3), and total productive maintenance (4). Factor loading using PCA for seven components in related theory are presented with three sub scales: (1) continuous flow (2) 5S and (3) total productive maintenance. Higher factor loading scores of scale items no. CO1 (0.83), CO2 (0.84), CO3 (0.85), CO4 (0.71), SS1 (0.77), SS2 (0.67), SS5 (0.92), TP1 (0.83), TP2 (0.89), TP3 (0.86), TP4 (0.83) were considered for the subscale of continuous flow, 5S and total productive maintenance.

The Firm Performance Scale consists of 12 items and one subscale. Factor loading using PCA for twelve items in related theory are presented with two sub scales: (1) financial performance and (2) non-financial performance. Higher factor loading scores of scale items no. FP1 (0.77), FP2 (0.79), FP3 (0.73), FP4 (0.61), FP5 (0.73), FP6 (0.66), FP7 (0.83), FP8 (0.83) were considered for the subscale of financial performance and non-financial performance.

4.3. Validity & Reliability

In this step, the remaining items of MBNQA, Lean Practices, Firm Performance were assessed through measurement model analysis to check the model fit indices. Confirmatory factor analysis (CFA) and Cronbach's alpha analysis were conducted to assess reliability and convergent validity. All indicator loadings should be more than 0.5 (Hair et al., 2010). The cut-off value of average variance extracted (AVE) is 0.5 and the cut-off value for composite scale reliability (CR) and Cronbach's alpha test is 0.7 (Hair et al., 2010). The AVE for each construct is in the acceptable range of 0.625 to 0.811, while the CR for each construct is in the acceptable range of 0.779 to 0.945; and the Cronbach's alpha for each construct is also in the acceptable range of 0.896 to 0.964. The final improved measurement model following the guideline from the modification indices showed a good fit. Table 3 shows the good fit indices of each of the constructs.

Table 3. Confirmatory Factor Analysis Model Fit Indices and Item Deleted

Model	χ2/df	GFI	NFI	CFI	**RMSEA**	Item deleted
MBNQA	4.90	0.90	0.91	0.93	0.08	LE1 ST3 ST6 CF4
LEAN	4.70	0.91	0.92	0.93	0.08	CO4 TP2
FIRM	2.17	0.97	0.98	0.98	0.05	FP7

After that, the final model of CFA including MBNQA, lean practices, and firm performance was assessed. The initial model fit indices of χ2/df= 4.95, GFI=0.852, NFI=0.856, CFI=0.842, and RMSEA =0.08 showed a poor fit. Therefore, further model modification was done to achieve better fit based on modification indices (MI). Leadership_LE1, Strategy_ST3, Strategy_ST6, Customer focus_CF4, Continuous flow_CO4, TPM_TP2, non-financial peformance_FP7 were removed from the constructs because of their low factor-loading. Also, MI provided evidence that they should be deleted. Post adjustment, the final model fit indices improved significantly to χ2/df= 4.00, GFI=0.94, NFI=0.94, CFI=0.95 and RMSEA 0.08, resulting in a good fit model. In brief, the measurement model from CFA showed the proof of convergent validity as shown by the regression coefficients or standardized factor loadings and p-values. All factor loading was statistically significant (p<0.01), and they were higher than 0.50 as recommended by Hair et al. (2010). Additionally, the average variance extracted (AVE) of all constructs were above 0.50, which as per rule of thumb suggested there was adequate convergence (Hair et al., 2010).

4.4. Hypothesis Testing (Coefficient Path Analysis)

As a next step, SEM was employed to integrate the models from Hypothesis 1 – 4 with maximum-likelihood estimation. The results revealed the statistics of model fitness with the value of relative chi-square (CMI/df), RMSEA, NNFI (TLI), and CFI. the results and the cut-off are demonstrated in Table 4 below.

Table 4. Model Fit

Fit Statistics	Model value	Cut-off	Reference
Relative chi-square	4.003	If the value is ≤ 5, it indicates a reasonable fit	Marsh and Hocevar (1985)
Root mean square error of approximation (RMSEA)	0.080	0.08-0.10 mediocre fit	Hu and Bentler (1999)
Non-normed fit index (NNFI) or Tucker-Lewis's index (TLI)	0.927	>0.90	Byrne and Van, 2010
Comparative fit index (CFI)	0.938	>0.90	Hu and Bentler (1999)

The results showed the ratio of relative chi-square of 4.003, which is less than the maximum recommended value of 5, indicates a reasonable fit as Marsh and Hocevar (1985) suggested that the score should be between 2.00–5.00. The RMSEA of the model in this study is 0.080, where the value of less than 0.05 indicates a good fit of the model (Hu and Bentler, 1999). The NNFI (TLI) is 0.927. This value is above the cut-off value of 0.90 (Byrne and Van, 2010), representing a good model fit. The CFI of this study is 0.938, which is recognized as indicative, as Hu and Bentler (1999) suggested that a minimum recommended value of CFI ≥ 0.90.

The results from SEM's path analysis showed the results of coefficients and hypothesis testing decision as the outcome appearing in Table 5 and Figure 3 below.

Table 5. Results of Coefficient Path Analysis

	Relationship	Estimate	P Decision
H1	MBNQA → FP	.618 .000	Accepted
H2	MBNQA → LP	.588 .000	Accepted
H3	LP → FP	.445 .000	Accepted
H4 (Partial Mediation)	MBNQA→LP→FP .377	.007	Accepted

According to the standardized path coefficients, which are indicated by arrows in Table 6, the results showed a direct and positive effect of MBNQA criteria on firm performance (β=0.618, p < .01). Thus, H1 is accepted. There is a relationship between MBNQA criteria and firm performance.

The results also revealed a direct and positive effect of MBNQA criteria on Lean practice (β=0.588, p < .01). Thus, H2 is accepted. There is a relationship between MBNQA criteria and lean practices.

Further, the results indicated a direct and positive effect of lean on a firm's performance (β=0.445, p < .01). Thus, H3 is accepted, suggesting that the implementation of lean practices has a positive effect on firm performance.

Finally, the results showed the indirect effect of firm performance. The estimate of 0.377 with a p-value of 0.007 indicates a statistically significant indirect effect of MBNQA on firm performance, mediated through lean practices. This partial mediation suggests that MBNQA practices influence firm performance both directly and indirectly by facilitating the implementation of lean practices.

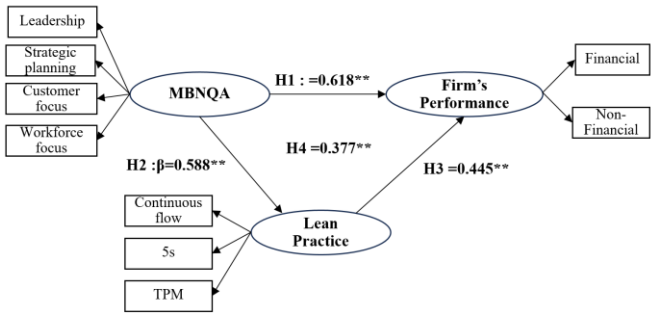

Fig. 3. Results of Assessment of Structural Model

5. Conclusion

In Thailand, there are approximately 1,800 companies in the automotive sector. This includes 30 to 40 major car makers, around 700 Tier 1 automotive part producers, and over 1,000 Tier 2 and 3 producers. The sample characteristics suggest a conducive environment for the implementation of lean

practices and soft aspects of MBNQA including leadership, strategy planning, workforce focus and customer focus. The present study yields noteworthy empirical insights that advance the understanding of the intricate interplay between MBNQA practices, lean practices (LP), and firm performance in the automotive industry. The findings resoundingly corroborate the hypothesized positive relationships among these constructs, underscoring the synergistic benefits of harmoniously integrating MBNQA philosophies and lean principles for operational excellence (Alanazi, 2020; Rahman and Bullock, 2005).

Notably, the research illuminates the pivotal mediating roles of lean practices in transmitting the performance-enhancing effects of MBNQA initiatives (Adem and Virdi, 2020; Khalili et al., 2018). This elucidation of the underlying mechanisms not only contributes to the theoretical discourse, but also offers pragmatic guidance for organizations seeking to optimize their quality management and operational strategies.

Furthermore, the study's revelations concerning the sequential mediation path, wherein MBNQA facilitates lean adoption, subsequently bolstering in superior firm performance, constitute a significant theoretical extension (Mohammad and Oduoza, 2019). This comprehensive perspective enriches the existing body of knowledge by elucidating the intricate interdependencies and sequential impacts of these critical organizational factors. Concurrently, the proposed integrated model, synthesizing MBNQA and Lean Practices, offers a holistic conceptual framework to guide future investigations and practical applications.

Ultimately, the study's contributions transcend the theoretical realm, presenting actionable insights to inform strategic decision-making processes within automotive firms and their suppliers. By elucidating the pathways through which MBNQA and lean practices implementation drive organizational success, this research empowers industry stakeholders to formulate comprehensive strategies that synergistically align these critical components, thereby optimizing performance outcomes and sustaining a competitive edge in the ever-evolving global market.

Collectively, these contextual factors - supply chain positioning, foreign ownership dynamics, operational maturity, and economies of scale - constitute a fertile landscape for the proliferation of lean practices and the softer dimensions of MBNQA, such as leadership commitment, employee engagement, and customer-centric orientations. However, as the literature underscores, while such organizational traits may facilitate the implementation journey, sustaining lean and quality excellence hinges on cultivating a corporate culture that embraces continuous improvement as a core tenet, championed by steadfast leadership and grounded in unwavering customer-focused values.

The integrated model with good fitness consisted of four constructs for MBNQA based on the resource-based view approach including leadership, strategy planning, customer focus, and workforce focus; three constructs for lean practices based on Practical-based view of lean practices including continuous flow, 5S, and total productive maintenance; and another two constructs for firm's performance including financial performance and non-financial performance.

While these findings provide valuable insights, it is important to acknowledge the limitations of this study. The research focused specifically on the Thai automotive industry, which may limit the generalizability of results to other sectors or geographic regions. Additionally, the cross-sectional nature of our data collection prevents us from drawing definitive conclusions about causality over time.

Despite these limitations, the significance of this study lies in its comprehensive examination of the interplay between TQM, lean practices, and firm performance in a crucial industrial sector of an emerging economy. The findings underscore the importance of integrating quality management principles with lean practices to achieve superior organizational outcomes. This research contributes to the broader understanding of how manufacturing firms can leverage these practices to enhance their competitiveness in the global marketplace.

5.1. Managerial Implications

The findings of our study offer profound insights for executives in the automotive manufacturing sector, particularly in emerging economies. The critical implication is the necessity for a holistic integration of Total Quality Management (TQM) and Lean Practices (LP). Our research demonstrates that TQM, as embodied in the MBNQA criteria, serves as a foundational platform that significantly enhances the efficacy of lean implementations. This synergistic relationship necessitates a strategic approach to quality and efficiency initiatives, where robust quality management systems are established in concert with lean deployment efforts.

Furthermore, our findings underscore the importance of leadership in fostering a quality-centric organizational culture, the need for sophisticated performance measurement systems that capture both direct and indirect effects of quality and lean initiatives, and the critical role of targeted human resource development strategies. The partial mediating role of lean practices in the TQM and firm performance relationship suggests a need for nuanced resource allocation strategies. Managers should also consider extending these practices throughout their supply chain and leveraging their proficiency in integrated TQM-lean practices msystems as a source of competitive differentiation in the global marketplace. By addressing these implications, automotive firms can enhance their operational effectiveness, financial performance, and competitive positioning in an industry characterized by relentless competition and rapid technological change.

5.2. Future Research Directions

This study, which is based on a multicausal model of resource-based and practical-based views of a firm's competitive advantage, paves the way for future research in the area of business success, particularly in the manufacturing sector. As the main aim of the research was the development, testing, and validation of a multicausal model of competitive advantage, the most important subsequent research was the testing of this model on different samples of manufacturing firms beyond the

automotive industry. The model could be tested in different manufacturing industries, both nationally and internationally. Testing the model would help establish the generalisability of the research findings. Furthermore, a number of research directions were indicated based on the findings of the model. Firstly, more research is needed on the differential prediction of a firm's competitive advantage and performance with different organizational factors. Future research could investigate these differences in terms of competitive advantage and performance across firms' ages, sizes, annual sales, and core products.

In addition, future research could focus on establishing the conditions under which key resources or lean practices can be taught, motivated, and implemented in their organizations.

This research would be extremely important for both managers and authorities to improve the Thai industry's competitiveness. Finally, the concept of a perceived firm's performance could be examined in relation to the numeric data, in which managers have different notions of what successful performance means to them. Future research could also further examine the managers' perspectives about the firm's performance management in the manufacturing sector.

Reference

Abdallah, A. B., Alkhaldi, R. Z., Aljuaid, M. M. 2021. Impact of social and technical lean management on operational performance in manufacturing SMEs: the roles of process and management innovations. Business Process Management Journal, 27(5), 1418-1444.DOI: 10.1108/bpmj-06-2020-0252.

Adem, M. K., Virdi, S. S. 2020. The effect of TQM practices on operational performance: An empirical analysis of ISO 9001: 2008 certified manufacturing organizations in Ethiopia. The TQM Journal, 33(2), 407–440. DOI:10.1108/TQM-03-2019-0076.

Ahire, S. L., Golhar, D. Y., Waller, M. A. 1996. Development and validation of TQM implementation constructs. Decision sciences, 27(1), 23-56.DOI: 10.1111/j.1540-5915.1996.tb00842.x.

Alanazi, M. H. 2020. The mediating role of primary TQM factors and strategy in the relationship between supportive TQM factors and organisational results: An empirical assessment using the MBNQA model. Cogent Business & Management, 7(1), 1771074. DOI: 10.1080/23311975.2020.1771074.

Aquilani, B., Silvestri, C., Ruggieri, A., Gatti, C. 2017. A systematic literature review on total quality management critical success factors and the identification of new avenues of research. The TQM Journal, 29(1), 184-213.DOI: 10.1108/TQM-01-2016-0003.

Barney, J. B., Clark, D. N. 2007. Resource-based theory: Creating and sustaining competitive advantage. Oup Oxford.

Belekoukias, I., Garza-Reyes, J. A., Kumar, V. 2014. The impact of lean methods and tools on the operational performance of manufacturing organisations. International Journal of Production Research, 52(18), 5346-5366.DOI: 10.1080/00207543.2014.903348.

Bell, E., Bryman, A. 2007. The ethics of management research: an exploratory content analysis. British journal of management, 18(1), 63-77.DOI: 10.1111/j.1467-8551.2006.00487.x.

Bortolotti, T., Boscari, S., Danese, P. 2015. Successful lean implementation: Organizational culture and soft lean practices. International Journal of Production Economics, 160, 182-201.DOI: 10.1016/j.ijpe.2014.10.013.

Bromiley, P., Rau, D. 2016. Operations management and the resource based view: Another view. Journal of Operations Management, 41, 95-106.DOI: 10.1016/j.jom.2015.11.003.

Brown, T. A., Moore, M. T. 2012. Confirmatory factor analysis. In R. H. Hoyle (Ed.), Handbook of structural equation modeling, 361–379. The Guilford Press.

Byrne, B. M., Van de Vijver, F. J. 2010. Testing for measurement and structural equivalence in large-scale cross-cultural studies: Addressing the issue of nonequivalence. International Journal of Testing, 10(2), 107-132.DOI: 10.1080/15305051003637306.

Chiarini, A., Vagnoni, E. 2015. World-class manufacturing by Fiat. Comparison with Toyota production system from a strategic management, management accounting, operations management and performance measurement dimension. International Journal of Production Research, 53(2), 590-606.DOI: 10.1080/00207543.2014.958596.

Czaja, R., Blair, J. 2005. Designing surveys. Pine Forge Press.

Creswell, J. W. 2009. Mapping the field of mixed methods research. Journal of mixed methods research, 3(2), 95-108. DOI: 10.1177/155868980833088.

Dal Pont, G., Furlan, A., Vinelli, A. 2008. Interrelationships among lean bundles and their effects on operational performance. Operations Management Research, 1, 150-158.DOI: 10.1007/s12063-008-0010-2.

Dess, G. G., Robinson Jr, R. B. 1984. Measuring organizational performance in the absence of objective measures: the case of the privately-held firm and conglomerate business unit. Strategic management journal, 5(3), 265-273.DOI: https://www.jstor.org/stable/2486280.

Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Hazen, B. T., Roubaud, D. 2018. Examining top management commitment to TQM diffusion using institutional and upper echelon theories. International Journal of Production Research, 56(8), 2988-3006. DOI: 10.1080/00207543.2017.1394590.

Evans, J. R., Jack, E. P. 2003. Validating key results linkages in the Baldrige performance excellence model. Quality Management Journal, 10(2), 7-24.DOI: 10.1080/10686967.2003.11919060.

Flynn, B. B., Sakakibara, S., Schroeder, R. G. 1995. Relationship between JIT and TQM: practices and performance. Academy of management Journal, 38(5), 1325-1360.DOI: http://www.jstor.com/stable/256860.

Fullerton, R. R., Kennedy, F. A., Widener, S. K. 2014. Lean manufacturing and firm performance: The incremental contribution of lean management accounting practices. Journal of Operations Management, 32(7-8), 414-428.DOI: 10.1016/j.jom.2014.09.002.

Fullerton, R. R., Wempe, W. F. 2009. Lean manufacturing, non-financial performance measures, and financial performance. International journal of operations & production management, 29(3), 214-240.DOI: 10.1108/01443570910938970.

Furlan, A., Vinelli, A., Dal Pont, G. 2011. Complementarity and lean manufacturing bundles: an empirical analysis. International Journal of Operations & Production Management, 31(8), 835-850.DOI: 10.1108/01443571111153067.

Hadid, W., Afshin Mansouri, S. 2014. The lean-performance relationship in services: a theoretical model. International Journal of Operations & Production Management, 34(6), 750-785.DOI: 10.1108/IJOPM-02-2013-0080.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. 2010) Multivariate Data Analysis. 7th Edition, Pearson, New York.

Henson, R. K., Roberts, J. K. 2006. Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. Educational and Psychological measurement, 66(3), 393-416.DOI: 10.1177/0013164405282485.

Hitt, M. A., Ireland, R. D., Hoskisson, R. E. 2012. Strategic management: Concepts and cases: Competitiveness and globalization. Cengage Learning.

Hu, L. T., Bentler, P. M. 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural equation modeling: a multidisciplinary journal, 6(1), 1-55.DOI: 10.1080/10705519909540118.

Jasti, N. V. K., Kodali, R. 2015. Lean production: literature review and trends. International Journal of Production Research, 53(3), 867-885.DOI: 10.1080/00207543.2014.937508.

Karimi, A., Safari, H., Hashemi, S. H., Kalantar, P. 2014. A study of the Baldrige Award framework using the applicant scoring data. Total Quality Management & Business Excellence, 25(5-6), 461-477.DOI: 10.1080/14783363.2013.830386.

Kaynak, H. 2003. The relationship between total quality management practices and their effects on firm performance. Journal of operations management, 21(4), 405-435.DOI:10.1016/S0272-6963(03)00004-4.

Khalili, A., Ismail, M. Y., Karim, A. N. M., Daud, M. R. C. 2018. Soft total quality management and lean manufacturing initiatives: model development through structural equation modelling. International Journal of

Productivity and Quality Management, 23(1), 1-30.DOI: 10.1504/IJPQM.2018.088605
Kline, R. B. 2023. Principles and practice of structural equation modeling. Guilford publications.
Laosirihongthong, T., Teh, P. L., Adebanjo, D. 2013. Revisiting quality management and performance. Industrial Management & Data Systems, 113(7), 990-1006.DOI: 10.1108/IMDS-02-2013-0058.
Lapoint, P. A. 2022. Malcolm Baldrige National Quality Award winners: A quantitative analysis between strategic planning and human resource variables. Quality Management Journal, 29(4), 289-298. DOI: 10.1080/10686967.2022.2112929.
Lee, S. M., Rho, B. H., Lee, S. G. 2003. Impact of Malcolm Baldrige National Quality Award criteria on organizational quality performance. International journal of production research, 41(9), 2003-2020.DOI: 10.1080/0020754031000077329.
Mahmud, N., Hilmi, M. F., Mustapha, Y. A. A., Abu Karim, R. 2019. Total quality management and SME performance: the mediating of innovation in Malaysia. Asia-Pacific Management Accounting Journal (APMAJ), 14(1), 201-217.DOI: 10.24191/apmaj.v14i1.913.
Manzoor, U., Baig, S. A., Hashim, M., Sami, A., Rehman, H. U., Sajjad, I. 2022. The effect of supply chain agility and lean practices on operational performance: a resource-based view and dynamic capabilities perspective. The TQM Journal, 34(5), 1273-1297.DOI: 10.1108/TQM-01-2021-0006.
Marsh, H. W., Hocevar, D. 1985. Application of confirmatory factor analysis to the study of self-concept: First- and higher order factor models and their invariance across groups. Psychological Bulletin, 97(3), 562–582. DOI: 10.1037/0033-2909.97.3.562.
Mohammad, I. S., Oduoza, C. F. 2019. Lean-excellence business management for manufacturing SMEs focusing on KRI. International Journal of Productivity and Performance Management,69(3), 519-539.DOI: 10.1108/IJPPM-11-2018-0389.
National Institute of Standards and Technology (NIST. 2015), "Baldrige Excellence Framework", available at https://www.nist.gov. (accessed 25 October 2017) Oliver, R. K., Webber, M. D. 1982. Supply-chain management: logistics catches up with strategy. Outlook, 5(1), 42-47.
Nawanir, G., Lim, K. T., Othman, S. N. 2016. Lean manufacturing practices in Indonesian manufacturing firms: are there business performance effects?. International Journal of Lean Six Sigma, 7(2), 149-170.DOI: 10.1108/IJLSS-06-2014-0013.
Netland, T. H. 2016. Critical success factors for implementing lean production: the effect of contingencies. International Journal of Production Research, 54(8), 2433-2448.DOI: 10.1080/00207543.2015.1096976.
Netland, T. H., Ferdows, K. 2016. The S-curve effect of lean implementation. Production and Operations Management, 25(6), 1106-1120.DOI: 10.1111/poms.12539.
Nunnally, J. C. 1978. An overview of psychological measurement. Clinical diagnosis of mental disorders: A handbook, 97-146.
Panizzolo, R., Garengo, P., Sharma, M. K., Gore, A. 2012. Lean manufacturing in developing countries: evidence from Indian SMEs. Production Planning & Control, 23(10-11), 769-788. DOI: 10.1080/09537287.2011.642155.
Pavlínek, P. 2018. Global production networks, foreign direct investment, and supplier linkages in the integrated peripheries of the automotive industry. Economic Geography, 94(2), 141-165. DOI:/10.1080/00130095.2017.1393313.
Peng, X., Prybutok, V. 2015. Relative effectiveness of the Malcolm Baldrige national quality award categories. International Journal of Production Research, 53(2), 629-647.DOI: 10.1080/00207543.2014.961207.
Prajogo, D. I., Sohal, A. S. 2004. Transitioning from total quality management to total innovation management: an Australian case. International journal of quality & reliability management, 21(8), 861-875.DOI: 10.1108/02656710410551746.
Psomas, E. L., Jaca, C. 2016. The impact of total quality management on service company performance: evidence from Spain. International Journal of Quality & Reliability Management, 33(3), 380-398.DOI: 10.1108/IJQRM-07-2014-0090.
Rahman, S. U., Bullock, P. 2005. Soft TQM, hard TQM, and organisational performance relationships: an empirical investigation. Omega, 33(1), 73-83.DOI: 10.1016/j.omega.2004.03.008.
Rochmatullah, M. R., Rahmawati, R., Probohudono, A. N., Widarjo, W. 2023. Is quantifying performance excellence really profitable? An empirical study of the deployment of the Baldrige Excellence Measurement Model in Indonesia. Asia Pacific Management Review, 28(3), 287-298.DOI: 10.1016/j.apmrv.2022.10.006.
Sadikoglu, E., Zehir, C. 2010. Investigating the effects of innovation and employee performance on the relationship between total quality management practices and firm performance: An empirical study of Turkish firms. International journal of production economics, 127(1), 13-26.DOI: 10.1016/j.ijpe.2010.02.013.
Sahoo, S. 2020. Lean manufacturing practices and performance: the role of social and technical factors. International Journal of Quality & Reliability Management, 37(5), 732-754.DOI: 10.1108/IJQRM-03-2019-0099.
Sahoo, S., Yadav, S. 2018. Lean implementation in small-and medium-sized enterprises: An empirical study of Indian manufacturing firms. Benchmarking: An International Journal, 25(4), 1121-1147. DOI: 10.1108/IJLSS-01-2017-0002.
Sanders, A., Elangeswaran, C., Wulfsberg, J. P. 2016. Industry 4.0 implies lean manufacturing: Research activities in industry 4.0 function as enablers for lean manufacturing. Journal of Industrial Engineering and Management (JIEM), 9(3), 811-833.DOI: 10.3926/jiem.1940.
Shah, R., Ward, P. T. 2003. Lean manufacturing: context, practice bundles, and performance. Journal of Operations Management, 21(2), 129-149.DOI: 10.1016/S0272-6963(02)00108-0.
Shah, R., Ward, P. T. 2007. Defining and developing measures of lean production. Journal of Operations Management, 25(4), 785-805. DOI: 10.1016/j.jom.2007.01.019.
Sperber, A. D. 2004. Translation and validation of study instruments for cross-cultural research. Gastroenterology, 126, S124-S128.
Srinivasan, M., Srivastava, P., Iyer, K. N. 2020. Response strategy to environment context factors using a lean and agile approach: Implications for firm performance. European Management Journal, 38(6), 900-913.DOI: 10.1016/j.emj.2020.04.003.
Sytch, M., Kim, Y., Page, S. 2022. Supplier-selection practices for robust global supply chain networks: a simulation of the global auto industry. California Management Review, 64(2), 119-142. DOI:10.1177/0008125621107033
Teece, D. J. 2019. China and the reshaping of the auto industry: A dynamic capabilities perspective. Management and Organization Review, 15(1), 177-199.DOI: 10.1017/mor.2019.4.
Tortorella, G. L., Narayanamurthy, G., Thurer, M. 2021. Identifying pathways to a high-performing lean automation implementation: An empirical study in the manufacturing industry. International Journal of Production Economics, 231, 107918.DOI: 10.1016/j.ijpe.2020.107918.
Thunyachairat, A., Jangkrajarng, V., Theeranuphattana, A., Ramingwong, S. 2023. Lean Practices, Perceived Environmental Uncertainty, and Business Performance: a Quantitative Study of SMES in Thailand. International Journal of Professional Business Review: International Journal of Professional Business Review.8(5), 1-16.
Turner, R. C., Carlson, L. 2003. Indexes of item-objective congruence for multidimensional items. International journal of testing, 3(2), 163-171.DOI: 10.1207/S15327574IJT0302_5.
Varadarajan, P. R., Ramanujam, V. 1990. The corporate performance conundrum: a synthesis of contemporary views and an extension. Journal of Management Studies, 27(5), 463-483.DOI: 10.1111/j.1467-6486.1990.tb00257.x.
Womack, J. P., Jones, D. T. 1997. Lean thinking—banish waste and create wealth in your corporation. Journal of the Operational Research Society, 48(11), 1148-1148.DOI: 10.1038/sj.jors.2600967.
Zargun, S., Al-Ashaab, A. 2014. Critical success factors for lean manufacturing: a systematic literature review an international comparison between developing and developed countries. Advanced Materials Research, 845, 668-681.DOI: 10.4028/www.scientific.net/AMR.845.668