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Model of Leadership and the Effect of Lean Manufacturing Practices on Firm Performance in Thailand's Auto Parts Industry

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ABSTRACT

Automotive industry has played an important role in both regional and global economies. Thailand has become a significant center for automotive parts manufacturing due to its low labor and production costs. In the new era, business leaders and managers are important in creating organizational success in the competitive environment and in implementing change. Also, lean manufacturing has become a critical management tool because it offers an efficient system that enhances operations processes by reducing waste, which results in sustainable growth. This research aims to analyze the relationships among leadership, lean and performance in Thailand's auto parts industry. The survey was conducted by administering questionnaires to 540 managers. Then, structural equation modelling was employed for the analysis. The latent variables were leadership, lean manufacturing practices and firm performance. The results suggest significant relationships among leadership, lean manufacturing practices and firm performance. Performance was most affected by lean manufacturing practices followed by leadership. Leadership also had more of an indirect influence on firm performance than a direct effect. This research contributes to the knowledge regarding the relationships among leadership, lean manufacturing practices and firm performance, facilitating executives and business owners in their process of obtaining desirable organizational performance. To achieve a high level of firm performance in quality, timeliness and efficiency, the organization must concentrate on idealized influence, inspirational motivation, intellectual stimulation, low setup, controlled processes and productive maintenance.

Key words: Leadership, lean, performance, Thailand's auto parts industry

INTRODUCTION

The global automotive industry and the global auto parts industry have been converging into Global Production Network (GPN) patterns where manufacturing bases are located in only some countries. Asia is an important center for automotive and auto parts manufacturing because of its low labor and production costs. This region has high demand for automobiles and high economic growth rates (Kohpaiboon and Yamashita, 2011; Sturgeon *et al*., 2009; Techakanont, 2011). In 2011, Thailand was the number 1 automotive manufacturer in the Association of Southeast Asian Nations (ASEAN) and number 14 in the world (Office of Industrial Economics, 2011; Ueda, 2009). The sector has experienced continuous growth and in 2012 it moved into ninth place in the world and was again number 1 in ASEAN (OICA, 2013). By 2015, due to free trade and formation of the ASEAN Economic Community (AEC), opportunities are projected to increase for the Thai

automotive and auto parts markets (ASEAN-EU Business Summit, 2012; Eurocham, 2012; USITC, 2010). For the stated reasons, the Thai automotive and auto parts industry has been crucial to the country's economic development, especially in manufacturing, marketing, employment and technology, with links to other industries in the country (Haraguchi, 2009; Office of the National Economic and Social Development, 2012). The continuous growth of Thailand's automotive and auto parts industry can be attributed to the Thai government's support, which has addressed factors such as the availability of many suppliers with close locations and policy that encourages various foreign investments. Accordingly, many important first-tier suppliers have established bases in Thailand (Office of the National Economic and Social Development, 2004). Thailand's automotive and auto parts industry is structured as follows: (1) Assemblers, which are automotive manufacturers, (2) First-tier suppliers, which send components directly to assemblers that have the technological capability to produce components that comply with the standards of the assemblers (this group of suppliers has grown to be an important industry in Thailand) and (3) Second and third-tier suppliers, which deliver components to first-tier suppliers and receive a technology transfer from first-tier suppliers (Araya, 2011).

The 21st century requires a new management paradigm where management concerns and management responsibility drive the organization's performance and results (Drucker, 1999). In addition, every organization must compete for its most essential resources: qualified, knowledgeable people (Drucker, 1992).

Business leaders and managers are important factors in the organization's success in establishing a sustainable competitive advantage and enabling the organization to achieve its goals. Leaders have direct responsibility for planning, directing and controlling the organization's human resources in performing different tasks until personnel accomplish their goals and objectives (Carmeli and Tishler, 2006; Kathuria *et al*., 2010; Ling *et al*., 2008). Nevertheless, an organization needs effective leaders and managers if it is to achieve change (Kotter, 1995, 1996). Furthermore, sustainable growth is attributed to efficient production systems, which in turn are a result of technological advancements and scientific knowledge that increase productivity and/or reduce costs (Barney and Hesterly, 2010; Porter, 1980, 1985). Thus, many organizations have struggled to enhance their operations processes by adopting management tools and techniques such as lean manufacturing practices to add value to their products, with the goal of reducing all types of waste (Spear and Bowen, 1999; Woehl, 2011; Womack *et al*., 1990). In the past two decades, lean manufacturing has received considerable attention with successful examples such as the Toyota production system (Womack and Jones, 1994; Womack *et al*., 1990). In addition, some researchers have found that internal lean practices are associated with high operational performance (Shah and Ward, 2003); however, some have suggested otherwise (Sakakibara *et al*., 1997). This may be attributed to the general complexity of the manufacturing practices-performance link, which is not well understood and demands further investigation (Skinner, 1969; Swink *et al*., 2005).

Therefore, the goal of this study was to investigate the relationships among leadership, lean manufacturing practices and firm performance in Thailand's auto parts industry. The results of this study offer insight into an efficient form for an organization's operational system, which in turn will create sustainable development despite sudden or severe changes in the global competitive environment.

LITERATURE REVIEW

In this study, the concepts of leadership, lean manufacturing practices and firm performance are discussed to establish the conceptual model for the study.

Concept of leadership: Leadership is a process whereby a person influences others to achieve the group's or the organization's goal (Ivanovic and Collin, 2006; Goleman, 2000; Kotter, 1995,1996; Judge and Piccolo, 2004; Mester *et al*., 2003). It is a process in which a leader influences and enables others to reach a common goal. It is a skill that facilitates a person's ability to manage others (Ivanovic and Collin, 2006; Helm, 2006; Schermerhorn *et al*., 2010). The current trend in leadership has focused on transformational leadership. This theory, proposed by Burns (1978), aims to describe how leaders can achieve a high level in motivating people, gaining organizational commitment from employees, receiving inspiration and assuring employees' loyalty (McShane and Von Glinow, 2008; Muchinsky, 2005). Transformational leaders motivate employees to produce exceptional performance by changing their attitudes, beliefs and values by idealized influence, inspiration motivation, intellectual stimulation and individualized consideration (Bodla and Nawaz, 2010; Rafferty and Griffin, 2004). Burns (1978) suggested that leaders and followers can interact in the manner of transformational leadership. The degree to which leaders exhibit or practice transformational leadership has been associated with a wide variety of positive individual and organizational outcomes (Erkutlu, 2008; Gumusluoglu and Ilsev, 2009; Ismail *et al*., 2009; Tipu *et al*., 2012; Yukl, 2002). In this research, transformational leadership is described as 4I with the following characteristics (Bass, 1990; Bodla and Nawaz, 2010; Judge and Piccolo, 2004; Ling *et al*., 2008; Mester *et al*., 2003) (1) Idealized influence or charismatic leadership. Leaders act as role models for employees by cultivating admiration, respect and trust. Followers feel proud to be like them, (2) Inspiration motivation. Leaders motivate and inspire followers by explaining meaning and elaborating challenges. They arouse team spirit with a sense of optimism and enthusiasm, (3) Intellectual stimulation. Leaders stimulate followers' efforts to be creative and innovative by questioning the logic of assumptions, restructuring problems and approaching solutions in new ways, (4) Individualized consideration. Leaders try to provide special attention to individual followers' aspirations and needs for growth and achievement by acting as a mentor or coach.

Concept of lean manufacturing practices: The recent global economic recessions have created heightened business competition with which most organizations must cope (Alsmadi *et al*., 2012; Bonavia and Marin, 2006; Scherrer-Rathje *et al*., 2009; Sharma, 2012). Adding value in the production or operational processes while maintaining product quality from the customer's viewpoint has become many organizations' focus so as to improve the cost-effectiveness of their products and services (Agus and Hajinoor, 2012; Alsmadi *et al*., 2012; Nordin *et al*., 2010; Shahin and Janatyan, 2010). Organizations have applied various management and operational tools and techniques to improve business processes and to upgrade their competitive level in maintaining profitability and surviving in fluctuating markets (Alsmadi *et al*., 2012; Nordin *et al*., 2010; Scherrer-Rathje *et al*., 2009; Sharma, 2012).

Toyota introduced the lean manufacturing concept in the 1950s, when it was known as the Toyota production system. The lean concept has evolved from an efficient production system to become a management philosophy in which waste of all types is reduced by eliminating inefficient activities in the value chain (Alsmadi *et al*., 2012; Anvari *et al*., 2011; Castro *et al*., 2010; Chavez *et al*., 2012; Hasle *et al*., 2012; Nordin *et al*., 2010; Salvendy, 2001; Shah and Ward, 2007; Shahin and Janatyan, 2010; Taj, 2008). In addition, the lean concept has been developed into a management practice with the goal of achieving maximum economic value (Alsmadi *et al*., 2012; Hallgren and Olhager, 2009; Salvendy, 2001; Womack *et al*., 1990). Many organizations have employed lean practices as a change management technique due to their effectiveness in continuous improvement. The most widely accepted lean manufacturing constructs are as follows

(Alsmadi *et al*., 2012; Brown *et al*., 2005; Hasle *et al*., 2012; Shah and Ward, 2007) (1) Supplier feedback, meaning the firm has close contact with suppliers and gives its suppliers feedback on quality and delivery, (2) Just-in-time delivery (JIT), or key suppliers delivering on a time basis, (3) Developing suppliers, referring to the firm maintaining corporate-level communication on important issues with suppliers. Suppliers become committed to annual cost reduction, product quality enhancement and delivery improvement, (4) Involved customers, meaning that the firm has close contact with customers, (5) Pull, referring to production in which the manufacturer produces goods only according to the quantity required by the buyer, (6) Continuous flow, or equipment being grouped to produce a continuous flow of families of products. The speed of production is directly linked to the rate of customer demand, (7) Low setup, meaning that the firm has a short time to go from making one item to another, (8) Controlled processes, or most equipment/processes on the shop floor being under statistical process control, (9) Productive maintenance, or regular schedules for equipment maintenance, (10) Involved employees, meaning that shop-floor/front-line employees are keys to problem-solving teams and they drive suggestion programs.

Concept of firm performance: Organizations, especially in the private sector, must cope with tough competition and the need to survive and grow. While the external business environment comprises competitive forces, internal competency relies on limited resources. Recently, business executives and researchers have focused on investigating the relationships between competitive priorities and firm performance. Operational measures, which are usually used as firm performance measures, include quality, cost, timeliness, efficiency and accuracy (Ahmad and Schroeder, 2003; Boyer and Lewis, 2002; Butler and Leong, 2000; Carmeli and Tishler, 2006; Chavosh *et al*., 2011; Hallgren, 2007; Kathuria, 2000; Kathuria *et al*., 2010; Kroes, 2007). This study proposes the constructs of firm performance measures as follows: (1) Quality: Product features meet customer needs and thereby provide customer satisfaction (Hallgren, 2007; Juran, 1998; Oakland, 2003; Omachonu and Ross, 2004), (2) Cost: Cost refers to the analysis and management of activities necessary to make a product or deliver a service (Hansen and Mowen, 2006; Hallgren, 2007; Swamidass, 2000), (3) Timeliness: Performance criteria can be used to assess the firm's ability to meet the needs of customers within an expected timeframe or by a due date (Swamidass, 2000), (4) Efficiency: Efficiency is a measure of the output with reference to the input (Hallgren, 2007; Shingo, 1989; Swamidass, 2000), (5) Accuracy: Accuracy refers to the degree of conformity to recognized standard values (Everitt, 2002; Kathuria, 2000; Kathuria *et al*., 2010).

Conceptual framework: The main purpose of this study was to investigate the effects of leadership (Leadership) and lean manufacturing practices (Lean) on performance in Thailand's auto parts industry (Performance). The conceptual framework of this study is illustrated in Fig. 1.

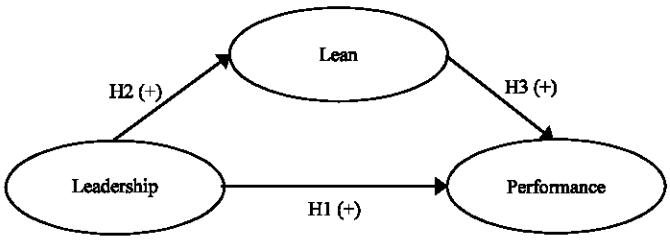

Fig. 1: Representation of the framework

Hypotheses: In this study, each construct of leadership and lean manufacturing practices is thought to contribute to each construct of firm performance in Thailand's auto parts industry. Thus, the following hypotheses were formulated:

- **H1:** Leadership has a positive influence on firm performance
- **H2:** Leadership has a positive influence on lean manufacturing practices
- **H3:** Lean manufacturing practices has a positive influence on firm performance

METHODS

Questionnaire design: The variables of all constructs in the conceptual framework were based on the aforementioned research. This research adopted four measures of leadership proposed by Bodla and Nawaz, 2010 and Shah and Ward (2007). Also, the research derived 10 measures of lean manufacturing practices from Alsmadi *et al*. (2012) and Shah and Ward (2007). Five additional items of firm performance were based on Butler and Leong (2000), Boyer and Lewis (2002), Chavosh *et al*. (2011), Kathuria (2000), Kathuria *et al*. (2010) and Kroes (2007). Narrative structure items were measured on 5-point Likert-type scales (1-strongly agree to 5-stongly disagree). All 19 measurement items are displayed in Table 1.

Before the questionnaire was deployed, it was developed in several stages. First, a draft questionnaire was tested for validity by five experts, including academics and practitioners, using the Internal Objective Congruence (IOC) technique. The questionnaire achieved an IOC value of 0.97, which exceeded the minimum value of 0.5. Second, the draft questionnaire was pre-tested with a group similar to the actual sample to verify its appropriateness. Then, the results from the questionnaires were analyzed and tested with Cronbach's alpha coefficient.

Population and samples: Managers of first-tier suppliers in Thailand's automotive parts industry comprised the population for this study and the representative sample of this study was 540 managers in this industry. Questionnaires were used as the instrument for collecting data.

Data analysis: For this study, Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were developed to investigate the direct and indirect influences of leadership variables and lean manufacturing practice variables that affect firm performance in Thailand's auto parts industry.

Table 1: Variables of all constructs

Variables	Cause	Mediator	Effect
Latent	Leadership	Lean	Performance
Observed	Idealized influence	Supplier feedback	Quality
	Inspiration motivation	Just-in-time delivery	Cost
	Intellectual stimulation	Developing suppliers	Timeliness
	Individualized consideration	Involved customers	Efficiency
		Pull	Accuracy
		Continuous flow	
		Low setup	
		Controlled processes	
		Productive maintenance	
		Involved employees	

RESULTS AND DISCUSSION

Validity and reliability of construct: After calculating the values of each observed variable, the researchers employed reliability analysis and CFA in evaluation. In this research, Cronbach's alpha was used to test the reliability. An acceptable value of Cronbach's alpha should be greater than 0.7 (Hair *et al*., 2010); the reliability of each instrument was greater than (0.7), as shown in Table 2. For discriminant validity, the Average Variance Extracted (AVE) of each construct exceeded 0.5 as the recommended minimum value, which indicates strong convergent validity (Fornell and Larcker, 1981; Wong *et al*., 2011), as summarized in Table 2.

Structural equation modeling: The result of structural equation analysis was estimated by using AMOS software (version 21). From Table 3, regarding the estimation of regression coefficient, standardized error, critical ratio and probability, every path had statistical significance. Accordingly, the results provide evidence supporting the proposed hypotheses that leadership has a significant and positive influence on firm performance (H1) and a significant and positive influence on lean manufacturing practices (H2). The results also confirmed that lean manufacturing practices have a significantly positive influence on firm performance (H3).

Results shown in Table 4 revealed that performance was mostly affected by Lean (0.701), followed by Leadership (0.479). It is also evident that leadership provides a more indirect effect on performance than direct influence, with a value of (0.307) and (0.172). Leadership also provides a direct effect on Lean (0.438).

Table 2: Values of factor loadings, reliability and validity

Latent variables	Observed variables	Factor loading	Alpha	AVE
Leadership	Idealized influence	0.893	0.933	0.89
	Inspiration motivation	0.916		
	Intellectual stimulation	0.912		
Lean	Low setup	0.778	0.828	0.64
	Controlled processes	0.810		
	Productive maintenance	0.806		
Performance	Quality	0.852	0.867	0.69
	Timeliness	0.796		
	Efficiency	0.837		

Table 3: Regression weights: (Group No. 1-default model)

Structural path		Estimate	SE	CR	p-value
Leadership	Performance	0.120	0.028	4.241	***
Leadership	Lean	0.286	0.031	9.129	***
Lean	Performance	0.749	0.055	13.547	***
Leadership	Idealized influence	1.000			
	Inspiration motivation	0.977	0.031	31.832	***
	Intellectual stimulation	1.036	0.033	31.631	***
Lean	Low setup	1.000			
	Controlled processes	1.206	0.065	18.590	***
	Productive maintenance	0.834	0.045	18.511	***
Performance	Quality	1.000			
	Timeliness	0.898	0.043	21.003	***
	Efficiency	0.863	0.039	22.334	***

*Significant at p-value <0.05, **Significant at p-value <0.01, *** Significant at p-value <0.001

Table 4: Standardized regression weights: (Group No. 1-default model)

			Standardized coefficients		
Structural path		Hypotheses	Direct	Indirect	Overall
Leadership	Performance	H1	0.172	0.307	0.479
Leadership	Lean	H2	0.438	0.000	0.438
Lean	Performance	H3	0.701	0.000	0.701
Leadership	Idealized influence		0.893		
	Inspiration motivation		0.916		
	Intellectual stimulation		0.912		
Lean	Low setup		0.778		
	Controlled processes		0.810		
	Productive maintenance		0.806		
Performance	Quality		0.852		
	Timeliness		0.796		
	Efficiency		0.837		

Table 5: Squared multiple correlations: (Group No. 1-default model)

Variables	Estimate
Lean	0.192
Performance	0.627
Idealized influence	0.798
Inspiration motivation	0.838
Intellectual stimulation	0.832
Low setup	0.606
Controlled processes	0.656
Productive maintenance	0.650
Quality	0.725
Timeliness	0.634
Efficiency	0.700

Table 6: Measurement results of SEM

Goodness of fits	Model fit
χ^2/df	1.3
p-value	0.148
RMSEA	0.024
GFI	0.988
AGFI	0.977
PGFI	0.527
CFI	0.998

Represent a significant at χ^2/df≤3, p-value≥0.05, RMSEA≤0.05, GF I≥0.90, AGFI≥0.90, PGFI≥0.50, CFI≥0.90

Based on Table 5, considering the squared multiple correlation, performance was influenced by Lean and Leadership at 0.627 (or 62.7%), whereas Lean was influenced by Leadership at only 0.192 (or 19.2%).

The overall analysis shown in Table 6 indicates that the chi-square (31.2), degree of freedom (24) and goodness-of-fit measures of the proposed model are: The normed chi-square (1.3), p-value (0.148), RMSEA (0.024), GFI (0.988), AGFI (0.977), PGEI (0.527) and CFI (0.988), which are all considered excellent and significantly above the acceptable thresholds suggested by Hair *et al*. (2010) and Prasith-Rathsint *et al*. (2008).

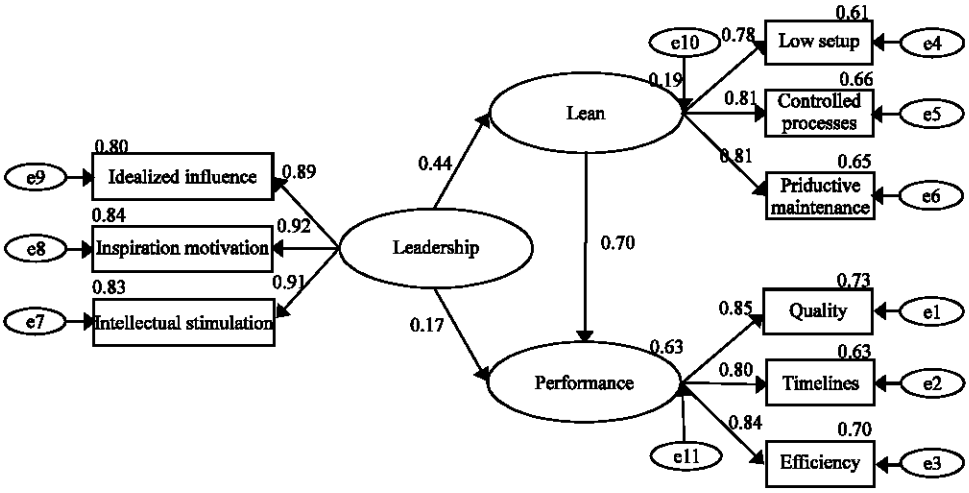

Fig. 2: Overall structural equations

Figure 2 shows an overview of the structural equations, including the results of our SEM linking leadership, lean manufacturing practices and firm performance.

Lean performance has a significant impact on business performance (Shah and Ward, 2003; Spear and Bowen, 1999; Woehl, 2011; Womack *et al*., 1990). This can be clarified as follows:

- Low set-up, which means the firm improves its operations by shortening its lead time for changing from one model to another (Alsmadi *et al*., 2012; Shah and Ward, 2007; Shingo, 1989). This is achieved when a firm encourages its employees in practicing production set-up, which results in lower manufacturing costs, higher efficiency and better response for delivery to the customer. Otherwise, longer set-up times obstruct on-time delivery to the customer
- Controlled process in which the production process is controlled and the performance of machines and facilities is enhanced by using Statistical Process Control (SPC), which reduces variability in all production processes (Alsmadi *et al*., 2012; Shah and Ward, 2007; Shingo, 1989). Associated with SPC are quality improvement tools that can be applied for problem solving related to both product characteristics and process parameters. Firms with superior controlled processes can achieve higher product quality as determined by the specifications, better process performance, higher return on investment and reduced risk in delivery to the customer
- Productive maintenance, which means that all machines and apparatuses have a diminished number of breakdowns because they have a suitable system of maintenance. Firms need to allocate appropriate time for periodic machine maintenance and inspection, to include recording maintenance results and maintaining a machine and apparatus history to use later for future improvements. Reductions in machine breakdowns can result in reductions in quality defects within the manufacturing process and in smoother delivery of goods to customers (Alsmadi *et al*., 2012; Shah and Ward, 2003)

Leadership positively influences both lean and firm performance (Vinodh and Joy, 2012; Woehl, 2011), but it has a greater indirect influence through lean performance than direct influence. It is therefore suggested that the leader of the firm should utilize leadership

characteristics with a concentration on idealized influence, inspirational motivation and intellectual stimulation to drive the lean system in their organizations and to compete successfully. This can be explained in more detail as follows:

- Idealized influence, which means that the leader must affect the organization by explaining the firm's vision, demonstrating commitment and establishing a sense of unity to implement lean practices across the whole organization and all employees, ensuring that the firm will be able to achieve its goals (Bass, 1990; Bodla and Nawaz, 2010)
- Inspirational motivation through which the leader clarifies the meaning of lean and the challenge of its practice to all employees. The leader must establish expectations and communicate them throughout the firm. Furthermore, the leader must inspire employees across the organization to achieve a high level of employee motivation. Finally, a leader must create eagerness for carrying out lean practices in all employees so that the desired behavior is sustained and superior performance can be achieved (Judge and Piccolo, 2004; Ling *et al*., 2008; Mester *et al*., 2003)
- Intellectual stimulation means the leader must educate employees so that they have the required knowledge of lean practices and are aware of the operational problems if lean practices are not implemented. Nevertheless, the leader should stimulate employees in new and creative ways of solving problems, provide feedback and encouragement to accomplish the job and overcome obstacles and support employee development so that employees are able to solve problems by themselves (Bodla and Nawaz, 2010; Chitwood, 2010; Judge and Piccolo, 2004; Ling *et al*., 2008; Vinodh and Joy, 2012; Woehl, 2011)

It is evident from the results of this study that, when a leader appropriately applies leadership characteristics, he is creating an atmosphere of motivated workforce and a competitive enterprise. From this positive atmosphere, the leader will be able to drive lean practice implementation and the organization will achieve superior performance and will be able to survive and grow in the current era of fiercely competitive business environment and economic fluctuations. The resulting firm will have more opportunities and more profitability due to efficient operation processes and motivated and inspired employees.

CONCLUSION

This research examined the structural relationships among leadership, lean manufacturing practices and firm performance of first-tier suppliers in Thailand's auto parts industry. By employing the SEM technique, simultaneous linkages and relative strength of relationships among variables can be investigated. The results indicate significant relationships among leadership, lean manufacturing practices and firm performance. The crucial characteristics of leadership have a direct effect on firm performance and an indirect effect through the mechanism of lean manufacturing practices. Leadership has an indirect effect on lean practices at a high level. Thus, managers should emphasize the characteristics of leadership, including idealized influence, inspiration motivation and intellectual stimulation, to foster the success of lean manufacturing practices and firm performance. This research suggests that low setup, controlled processes and productive maintenance are significant criteria in applying lean manufacturing. It was clear that leadership can enhance lean practices and create an exceptional level of firm performance in Thailand's auto parts industry. Therefore, leadership and lean manufacturing practices play a vital

role in coordinating everyone in the firm so that all employees have an aligned goal focused on developing quality in the products. This role not only guides actions according to the market mechanisms, but also facilitates the company's survival in a business environment where the economy fluctuates.

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