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The Mediate Effect of Lean Manufacturing on the Relationship between Transaformational Leadership and Sustainability Performance in Thai SMEs

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Abstract

This study proposes to examine the structural relationship model among transformational leadership, lean manufacturing, and sustainability performance. In addition, this study is aimed to explore the relationship between transformational leadership and sustainability performance through lean manufacturing. Moreover, this study is intended to explore the moderate effect of type of industry and length of lean adoption. The research design is based on the mixed method gathering data from middle and senior managers working in small and medium enterprises of Thai manufacturing industry. Regarding the quantitative approach, the data were collected from 598 respondents by means of survey. Considering the proposed theoretical model, the results reported that transformational leadership associated with lean manufacturing and sustainability performance, and lean manufacturing related to sustainability performance. In addition, the results further reported that lean manufacturing has a partial mediated effect on the relationship between transformational leadership and sustainability performance. Moreover, the results showed that the relationship between transformational leadership and lean manufacturing is difference in terms of type of industry while no difference in term of length of lean adoption. The results further presented that the relationships between lean manufacturing and sustainability performance, and between transformational leadership and sustainability performance are no difference in terms of both type of industry and length of lean adoption. Qualitative approach was employ to collect data from 40 participants who informed that lean practices were appropriate for automotive industry, though less attention and implementation in other industries. The company takes the most attention on customer involvement, some attention on employee and supplier involvement, which is consistent with quantitative results. Managers tend to give advices and exchange ideas with their followers rather than inspire and give them opportunities to make decision. The first thing to do before launching lean program to all process is that the company should buy-in the understanding of managers about lean concept and implementation. Willingness with well understanding and realizing importance of lean program will lead to superior results, especially operational, economic, and sustainability performance.

Keywords: transformational leadership; lean manufacturing; sustainability performance; manufacturing industry; small and medium enterprises

INTRODUCTION

Currently, globalization leads to free communication without borders; this results in high competition in both national and global markets. In addition, labor wages of Thai labors are nearby Malaysian workers; however, Malaysian productivity is of double value compared to Thailand's. Meanwhile, Thai employee wage is 5 times higher than that of Vietnamese workers but Thai productivity is only twice compared to Vietnam's. Meanwhile, Singapore wage is double of Thai wage but Singapore productivity is 5 times higher than Thailand's [1]. In addition, Thailand's labor productivity is raised by 2% per year, which is very poor once compared to other nations such as China and Vietnam, with the increase by 10% and 4%, respectively [2]. The unit labor costs of Thailand increased by 3% while Indonesia fell by 12% [2]. Inventory is one of the most expensive assets of many firms, representing as much as 50% of total invested capital. Therefore, managers have long recognized that good inventory management is important. Furthermore, a firm can decrease costs by decreasing inventory. On the contrary, production may stop and consumers become discontented when a product is not enough [3].

According to high competition, low productivity, and high inventory, firms operating in manufacturing industry are imperative to explore strategies to raise profit, productivity and quality while decreasing costs, defects, and lead time delivery to end users, all of which need the mutual support of all supply chain members from suppliers, subcontractors, employees, management teams, distributors, and customers. Although 70% of all manufacturing firms take much attention on lean manufacturing, only 26% are significant success [4]. Successful lean program is associated with management attention, clarifying goals and directions, seriously involvements and practices of all members, employees' empowering, clear measurement criteria, obvious plan for improved process [5,6].

The existing researches place an emphasis on the relation of leadership behaviors and practices that leads to successful lean implementations. The research literature falls short of considering that one leadership model might be more appropriate for success within lean implementations. The study reveals that transformational leadership augments transactional leadership by building on the exchanges between leaders and followers [7]. In summary, the findings of the study add to the existing empirical data, suggesting that the transformational leadership model is useful when trying to lead change. Although several studies focus on the effect of leadership on lean practice, they pay attention to only one industry; the simultaneous study on overall industry is lacking. Therefore, this study extends current knowledge by examining the influence of transformational leadership on lean manufacturing practices in manufacturing industry.

The most regularly cited advantages associated with lean manufacturing are development in labor productivity and quality, along with the decrease in lead time to customer, cycle time, and production costs [8,9]. However, some studies presented that some lean manufacturing aspects were connected organizational performance. Moreover, some studies revealed that there is no connection between lean manufacturing and performance [10, 11]. In addition, some studies reported that lean manufacturing has an effect on financial performance through operational performance [12, 13]. Furthermore, few investigations studied on relationship between lean practices and social and environmental performance [13].

Regarding the above concepts, the relationships among leadership style, lean manufacturing, and performance are equivocal. Thus, this study intends to investigate the simultaneous relationships among transformational leadership, lean manufacturing, and sustainability performance in Thai SMEs operate in manufacturing industry. Furthermore, this study intends to examine the relationship between transformational leadership and sustainability performance through lean manufacturing. The results of this study provide insight information in an efficient form for a company's operational system, which in turn will create sustainable development despite sudden or severe changes in the international competitive environment.

LITERATURE REVIEW

A. Transformational Leadership

Over the last 25 years, transformational leadership has occurred as an extremely essential model for organizational leadership academicians [14]. Burns [15] explained that transformational leadership emerges when one or more individuals engage with others in such a way that leaders and followers raise one another to greater motivation and morality levels. Bass [16] suggested four characterized transformational aspects including idealized influence and charisma (strong role models with high ethics), inspirational motivation (high team spirit and shared vision), intellectual stimulation (stresses problem solving and creativity), and individualized consideration (supportive climate and use of delegation). Meanwhile, Northouse [14] explained that transformational leaders have a clear vision of the future state of their company. Transformational leaders are also noted to be social architects who are able to communicate and transform organizations' values. In addition, Northouse [14] defined transformational leadership as the leaders who engage with followers in a cooperative effort to raise their level of motivation and morality. To sum up, transformational leadership's intention is to raise the consciousness of followers' understanding of what is important, and tends to move followers to transcend their own self-interest in favor of what is important to their organization [17]. Transformational leadership theories suggested the importance of visionary goals, ideological values, intellectual stimulation, symbolic behaviors, and intellectual stimulation [18]. Transformational leadership is highly relevant and ideally suited to help transform firms and individuals during lean-system deployments [19].

B. Lean Manufacturing

Lean production or lean manufacturing, frequently conceived as Toyota production system (TPS) in scholarly publications, began in Toyota Motor Manufacturing Company after the 2nd World War when almost all Japanese companies which include Toyota Manufacturing Company were encountered with the challenge of tackling production resources with restricted assets and facilities [20]. This challenge inspired managers worked for Toyota to initiate a variety of TPS's elements purposed at eliminating waste. Therefore, lean manufacturing is about manufacturing the same product quantity with lower resources (working hours, working area, machine hours, material, instruments, and equipment). Recently, lean practice has advocated Toyota accomplish the difference of being the best manufacturer in the world who produce car [21].

Lean manufacturing is a strategy used to improve the manufacture and delivery of a product (to a customer's expectation) by means of a purpose-designed facility and process, utilizing an interconnected array of supply chains. Lean production is classified by the academician community mostly into three levels. The first level associates with wasted elimination from the production process [22,23] and the efficiency to make the excellent quality products that can fulfill the need of final buyers. For the second level, some researchers construe lean as a rule controlling production process [24]. The final level is seen as a combination of techniques and means [25,26] intended to remove waste. Regarding well-known study, Shah and Ward [27] separated lean production into ten aspects, including supplier feedback, just in time delivery by suppliers, supplier development, customer involvement, pull system, continuous flow, set up

time reduction, total productive/preventive maintenance, and employee involvement.

C. Sustainability Performance

Since the expanding attention of all kinds of stakeholders in company activities in recent rivalry situation, there have been crowded studies in area of corporate sustainability performance evaluation. Firms are struggling to succeed long-term benefits by applying sustainability activities as principal organizational strategy [28]. The firms, whose aim is outstandingly seen as being one of economic return, might be greater readily excused for separately reporting voluntary sustainability assesses.

Takala and Pallab [29] proposed that corporate sustainability performance generally focuses on the environmental, social, and economic performance of sustainable development. Meanwhile, sustainability performance is described by Schaltegger and Wagner [30] as the performance of a firm in all aspects and for all corporate sustainability drivers. Fiksel, Mcdaniel & Mendenhall [31] mentioned that it extends beyond the single organization boundaries and typically addresses the performance of both upstream suppliers and downstream consumers in the value chain. To sum up, sustainability performance involves performance in related with: level of emission and natural resource saving; other environmental activities and initiatives; employment features; occupational health and safety; relationships with society and community; involvement of stakeholder; and economic impacts of the organization other than those financial assesses applied in the financial accounts. The previous study presents the scarcity of accountability for environmental and social performance. Although there has been a gush of studies in corporate sustainability performance evaluation area, there is still no concurred universal guideline or standard. Generally, there are some measures commonly mentioned or applied by companies in opting sustainability performance assesses.

RESEARCH METHODOLOGY

The objective of this study is to examine the structural relationship model among transformational leadership, lean manufacturing practices, and sustainability performance, to explore the mediate effect of lean practice on the relationship between transformational leadership and sustainability performance, and to explore the moderate effect of type of industry and length of lean adoption, which was conducted from Thai SMEs operated in manufacturing industry. The study was conducted and accomplished by quantitative method using random sampling and snowball sampling from 598 current middle and top managers together with qualitative method using in-depth interview from 40 current middle and top managers. The results were analyzed by descriptive statistics, confirmatory factor analysis, and the structural equation modeling by using statistical software programs.

The instrument is composed of five parts. The first part is demographic information of respondents and information of the companies. The latter two parts are transformational leadership which was created by Bass and Avolio [32], and sustainable leadership which was created by Avery and Bergsteiner [33]. Next, lean manufacturing was created by Shah and Ward [27]. The last part is sustainability performance separated into three dimensions; operational performance scale taken from Rahman, Laosirihongthong and Sohal [34], financial performance scale developed from Griffin, Huergo, Mairesse and Peters [35], Wiklund and Shepherd [36], and Hung, Lien, Fang and McLean [37], and environmental and social performance developed from Global Reporting Initiative [38] index. Qualitative e information was gathered by semi-structural in-depth interview.

RESULTS

The 598 of total 1740 questionnaires (response rate 34.4%) were obtained to do analysis. The majority of respondents were male (56.2%) of the age above 40 years old (31.4%), factory/production manager (38.8%), bachelor's degree (75.6%), working in nonautomotive (63.9%), and company age above 15 years (46.2%).

Before conducting any statistical analysis, the rule of normal distribution of collected responses should be examined. The skewness and kurtosis values, which evaluate the normal distribution, should vary from -3 to +3 [39, 40]. The results presented that the skewness values vary from -0.972 to 0.603, and the kurtosis values vary from -1.857 to 1.870. Meanwhile, the Pearson's bivariate correlations of all relationships were significant. Therefore, it could be summarized that the normal distribution and linearity principle were accepted.

The Chi-square is important statistics; however, a statistical significance test is responsive to sample size [41, 42], which presents that when the large samples are applied, the Chi-square statistic nearly always denies the framework [43, 44]. Therefore, several academicians mentioned that a framework could also be accepted if most of the fit indices report good evaluation results and only a few quantities of indices are less than the lowest threshold [45, 46].

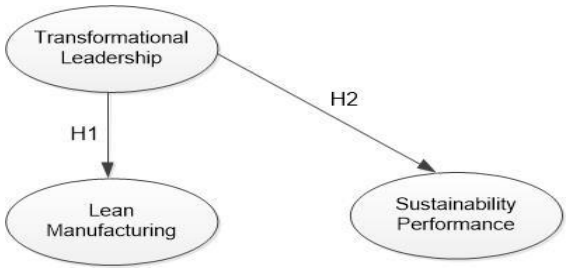

Figure 1: The Competing model.

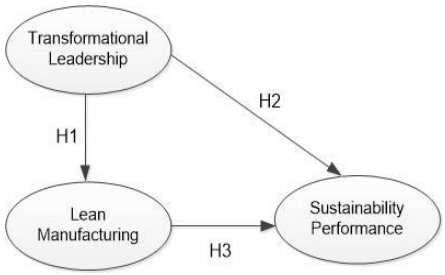

Figure 2: The proposed theoretical model.

A. Model Fit Testing

Although the finding of Chi-square statistics of the proposed theoretical model showed significance at 0.05 level, the remained results were higher than the minimum criteria displayed in table I. Thus, it could be claimed that the structure of sustainable leadership, lean manufacturing, and sustainability performance were reasonable to illustrate the interrelationships among items and latent variables.

Table I. Model Fit Indexes of the Competing and the Proposed Theoretical Model

Model	**CMIN**	***p*-value**	**df**	**CMIN/df**	**CFI**	**IFI**
Competing	533.573	0.000	98	5.445	0.931	0.932
Proposed	459.054	0.000	97	4.733	0.943	0.943

Model	**AGFI**	**NFI**	**PGFI**	**TLI**	**RMSEA**	**AIC (default)**
Competing	0.863	0.917	0.649	0.916	0.086	609.573
Proposed	0.878	0.929	0.651	0.929	0.079	537.054

B. Direct Effect Testing

The value of *t*-test including the estimated value, standard error (S.E.), critical ratio (C.R.), and *p*-value, indicates that there is a significant positive relationship between transformational leadership and lean manufacturing, transformational leadership and sustainability performance, and lean manufacturing and sustainability performance. Thus, it could be summarized that H1, H2, and H3 were supported.

Table II. Hypotheses Testing Results of the Proposed Model

Relationship			**Estimate**	**S.E.**	**C.R.**	***p*-value**
H1: Transformational leadership	-->	Lean manufacturing	0.940	0.072	13.105	***
H2: Transformational leadership	-->	Sustainability performance	0.386	0.060	6.422	***
H3: Lean manufacturing	-->	Sustainability performance	0.323	0.038	8.417	***

***P-VALUE< 0.001 (P-VALUE LESS THAN 0.001 WAS AT THE SIGNIFICANT LEVEL OF 0.001)

C. Mediate Effect Test

The mediate effected was tested by using Kenny approach [47] and comparing model fit indices between competing and proposed theoretical model.

The competing model was to investigate the direct effect of transformational leadership on lean manufacturing and sustainability performance, which is depicted in figure 1. The proposed model was to investigate the direct effect of transformational leadership on lean manufacturing and sustainability performance as well as the indirect effect of lean manufacturing on the relationship between transformational leadership and sustainability performance, which is depicted in figure 2. Comparing the model fit statistics of the competing model and the proposed theoretical model, which is presented in table II, these results confirmed that the model fit statistics of the proposed theoretical model are greater than those of the competing model. Thus, it could be asserted that the relationships among transformational leadership, lean manufacturing, and sustainability performance are better described by an effect of transformational leadership on sustainability performance through lean manufacturing.

Table III. Standardized Direct, Indirect, and Total Effects of the Competing Model

Relationship			Standardized Direct Effect	Standardized Indirect Effect	Standardized Total Effect
Transformational leadership	-->	Lean manufacturing	0.606	0.000	0.606
Transformational leadership	-->	Sustainability performance	0.691	0.000	0.691

Table IV. Standardized Direct, Indirect, and Total Effects of the Proposed Model

Relationship			Standardized Direct Effect	Standardized Indirect Effect	Standardized Total Effect
Transformational leadership	-->	Lean manufacturing	0.589	0.000	0.589
H4 Transformational leadership	-->	Sustainability performance	0.374	0.294	0.668
Lean manufacturing	-->	Sustainability performance	0.499	0.000	0.499

Considering Kenny approach, all three direct effects were significance at 0.001 level. Regarding the competing model, the standardized direct effect between transformational leadership and sustainability performance was 0.691. In contrast, the findings from the proposed theoretical model revealed that standardized direct effect between transformational leadership and sustainability performance was 0.374 while the standardized indirect effect was 0.294, and standardized total effect was 0.668. Since the standardized direct effect of the proposed theoretical model was less than that of the competing model, it could be summarized that there is an effect of transformational leadership on sustainability performance through lean manufacturing.

Due to the greater model fit statistics and the low level of the standardized direct effect, it could be summarized that the relationships are better described by a partial effect of

transformational leadership on sustainability performance through lean manufacturing. Thus, H4 was supported.

Regarding the results in table IV, the equations for the proposed theoretical model were conducted as followed.

$$\hat{Z}\ \text{Lean manufacturing} = 0.589\ \text{Transformational leadership} \quad (1)$$

$$\hat{Z}\ \text{Sustainability performance} = 0.668\ \text{Transformational leadership} + 0.499\ \text{Lean manufacturing} \quad (2)$$

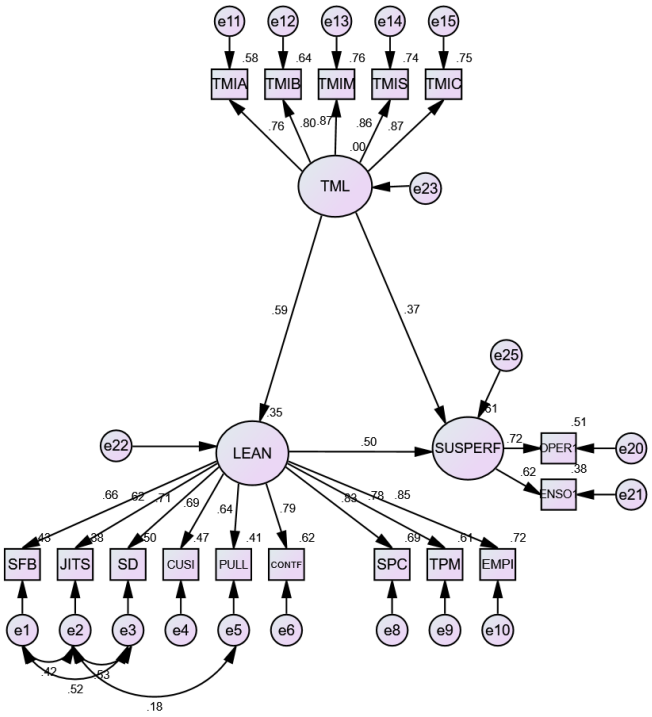

Figure 3: Structural model of the proposed theoretical model

D. Moderate Effect Testing

Considering the moderate effect of automotive and nonautomotive industry, the Chi-square of the unconstrained was 752.719 and degree of freedom was 194, whereas the Chi-square of the fully constrained was 780.755 and degree of freedom was 210. The difference of the Chi-square was 28.036 and degree of freedom was 16. The *p*-value was 0.031 which could be summarized that the model is different across type of industry. After checking each specific path, the results reported that industry has moderate effect on the path from transformational leadership and lean production at 95% confidence whereas industry has no moderate effect on the rest of all path levels. Thus, it can be concluded that H5 are partial support.

Considering the moderate effect of lean adoption less than 5 years comparing to more than 5 years, the Chi-square of the unconstrained was 671.728 and degree of freedom was 194, whereas the Chi-square of the fully constrained was 701.810 and degree of freedom was 210. The difference of the Chi-square was 39.082 and degree of freedom was 16. The *p*-value was 0.001 which could be confirmed that the model is different across length of lean adoption on the structural relationships. After checking each specific path, the results reported that length of lean adoption has no moderate effect on the all path levels. Thus, it can be concluded that H6 are partial supported.

E. Qualitative Results

1) *Supplier feedbacks and involvements :* Participants informed that the company takes some attention on supplier involvement, which is consistent with quantitative results. There are many reasons that the relationship between company and suppliers is at low level and suppliers do not encourage just in time policy. First, due to material prices had been changing frequently depending on market prices. Purchasing in bulk raw materials resulted in a risk of loss from the price difference. Second, materials for some industry such as plastic, garment, and OEM industry had to be ordered from suppliers which were determined by customers. Therefore, suppliers had high level of bargaining power to ask maximum purchased volume, leading to high level of raw material inventory. Third, raw materials inventory for some industry such as electric and electronic, automotive, and garment industry was very high because the companies needed to import raw materials from Germany, America, and Japan, the process of which took a long time for transportation. Therefore, the company selected to purchase in bulk raw materials, in order to avoid the shortage of materials.

2) *Customer feedbacks and involvements:* Participants informed that the company takes the most attention on customer involvement, which is consistent with quantitative results. Customers are the most important for organization success therefore company need to operate well to meet customers' requirements including superior quality, reasonable cost, and on time delivery. For instance, some companies measured performance based on the measurement by using cycle or takt time received from customers, defect rate for all industry was controlled by customer at 2-3% using 3 stations of quality control points, i.e. incoming point, in-process point, and outgoing point, and some companies were evaluated and received certificate from customers. Most participants work with Japanese customers who often visited manufacturing production line.

3) *Process standardization and work instruction:* Participants informed that the company takes the most attention on customer involvement, which is consistent with quantitative results. Due to some companies especially OEM companies must to follow process and work instruction received from customers. In addition, most of companies were ISO 9001 qualified, guaranteeing the productivity control for all processes by using work instructions.

4) *Employee feedbacks and involvements:* Participants informed that the company takes some attention on employee involvement, which is consistent with quantitative results. Some managers informed that due to low educational degree of their employees as well as most foreigner employees from Myanmar, Laos, Vietnam, and Cambodia, thus managers do not trust and do not give them opportunity to exchange ideas and potentials. In addition, SMEs companies operating in fierce competition with small number of employees did not have enough resources to encourage lean implementation. Managers do not take more attention and explanations before lunch lean program resulted in misunderstanding with employees. Employees perceived lean practices as extra work without extra pay. In addition, most companies were located in an area with many factories; thus, employees had an opportunity to compare the compensation, welfare, and benefits offered in the companies nearby. Due to managers avoided problem occur from staff turnover rate; therefore, managers do not much force employees to join lean program.

5) *Leadership skills:* Most participants informed that they proficient in technical skills, human, and communication skills whereas scarce in conceptual skills. Moreover, most participants informed that they cannot work well in decision making and cannot be representative for their company. In addition, most participants informed that due to low skill and dedication employees; thus, difficult to create teamwork, culture, and innovation.

6) *Organizational success:* Participants informed that lean practices were appropriate for automotive industry though less attention and implementation in other industries. Two companies, get TPS training program from Thailand Automotive Institute, informed that fully success which come from electric and plastic industry. Due to fully success companies do not come from automotive industry which supported quantitative results that lean practices can apply in any industry. Most participants informed that they have some knowledge and skills associate with lean practices; thus, they do not work well for lean implementation. Participants from automotive industry informed that the company implement lean program for long time; however, the program fails due to implement without continuous and serious policy. On the other hand, participations from nonautomotive industry informed that the company implement lean practices due to popular program but do not success due to execute in early stage.

DISCUSSIONS AND CONCLUSIONS

After the data has been analyzed, the paper is ready for the discussions and conclusions.

A. Discussions of Findings

The finding fulfills the ambiguous knowledge about influence of leadership on lean manufacturing and performance. Due to transformational leadership comprised of idealized influence and charisma (strong role models with high ethics), inspirational motivation (high team spirit and shared vision), intellectual stimulation (stresses problem solving and creativity), and individualized consideration (supportive climate and use of delegation). Presently, business cannot survive with only one skill such as technical, operational, human relationship, and conceptual skill; however it requires combination of these skills. Moreover it requires advanced technological, forefront innovation, quick adaptation, as well as employee and all supply chain members engagement [48, 49]. These characteristics are necessary factors to enhance of lean manufacturing resulted in organizational performance. According to lean practice relates to elimination of wastes; thus, the results confirms connection between lean and sustainability performance including operational, economic, and social and environmental performance [12, 50, 51].

The quantitative results reported that the model is partial difference between companies which operated in automotive and non-automotive companies, and the model is partial difference between companies which implemented lean program less than 5 years and above 5 years. The results showed that the relationship between transformational leadership and lean manufacturing is difference in terms of industry type. Automotive companies familiar with lean practices for long time thus leaders can improve lean level easier than nonautomotive which implement lean in early stage which is consistent with qualitative results. transformational leaders encourage lean level by respect employees and customers. Heizer and Render [3] proposed that lean production respects employees by giving them the opportunity to enrich both jobs and their lives. Company recognizes that employees know more about their jobs than anyone else. Employees are empowered to make improvements. Lean production begins externally with a focus on the external customer including end users and society. Understanding what the external customer wants and ensuring they input and feedback are starting points for lean production. Lean operations means identifying external customer value by analyzing all the activity required to produce the product and then optimizing the entire process from the external customer's perspective.

In addition, the results revealed that the relationship between lean manufacturing and sustainability performance is no difference in terms of both industry type and length of lean adoption. This confirms the concept that lean can be applied in any industry, any size, or anyplace [8, 25, 52]. Since the managers informed that they realized that lean practices are appropriate for automotive industry, though less attention and implementation in other industries. Moreover, qualitative results reported that two companies informed that fully success which come from electric and plastic industry. Due to fully success companies do not come from automotive industry which supported quantitative results that lean practices can apply in any industry. The first thing to do before launching lean program to all process is that the company should buy-in the understanding of managers about lean concept and implementation. Willingness with well understanding and realizing importance of lean program will lead to superior results, especially operational [53, 54, 55, 9], economic [56, 11, 57, 58], and environmental and social performance [59, 60, 13].

Finally, the results reported that the relationship between transformational leadership and sustainability performance is no difference in terms of both industry type and length of lean adoption. The results confirmed that both of them appropriate for all companies and all industries. Consistent with Gurr [61] proposed sustainable leadership takes into deliberation a comprehensive scope of complex interconnections among personals, the business community, worldwide demands and the natural environment, with the essential objective that a company accomplishes well-being by concerning social values, obtaining success in long-term based on strategic decision-making value and preservation the ecosystem, of which we all form an integral part. In addition, sustainable leadership creates communities, encourages cooperation among stakeholders and fosters value in long-term. The relevance of sustainable leadership for chargeable strategic decision making in sustainable companies is obvious in the method it directs the sustainable leaders attentions with regard to four fields of deliberation when making decisions. It requires that top executives adopts a macro view of the company [62] due to sustainability associates with a variety dimensions of development and performance [63]: (1) on a individual level: keeping physical health and individual psychological; (2) at the business level: keeping a workplace surrounding that permits workers to improve manifold knowledge with the goal of accomplishing the company's purposes, which are linked up with the goals of stakeholders; (3) at the social level: socially-responsible handling in the broader community; and (4) on the ecological level: preservation and sustainable environmental change.

B. Managerial Implications

The findings provide some implications for the practitioners and entrepreneurs. The results show that lean manufacturing will result in high level of both operational and financial performance, which is worth taking more attention. In addition, Thai managers tend to understand that lean manufacturing is suitable for only automotive industry. Nevertheless, the results confirmed that it can be applied for any manufacturing as well as any company size. Moreover, at present, there are many studies asserting that it can also be applied in service industry. Successful lean production requires serious cooperation and attentions of all employees across company; thus, managers should create the good two-way relationship, sharing, caring, bottom up communication, and free-rein culture with their employees. Effective supply chain management is imperative by close communications and relations with suppliers, distributors, and customers.

C. Suggestions for Future Research

The results offer several implications for scholarly researchers. First, due to the scarce studies of sustainability performance, the future study should augment knowledge by investigating the antecedent and consequence of this variable. Second, the literature on leadership paradigms, organizational performance and corporate sustainability, and key mediating variables, particularly shared vision and values, self-leadership, an organizational team orientation and consensual decision-making, affecting their relationships should be examined. Third, due to leadership have effect on lean practices resulted in higher performance thus the future study should be focused more on effect of other type of leadership. Finally, the successful lean production required cooperation across all members of supply chain, which takes time; thus, it requires longitudinal studies.

D. Limitations

There are some expected potential limitations. Firstly, the effect of external factors which may involve sustainable leadership, lean manufacturing, and sustainability performance, such as political issues, macroeconomics, microeconomics, and economic crisis. Secondly, as the study applied self-report and cross-sectional data, the summarizations could not only make causal extrapolations but also increase some concerns about common bias. Therefore, a study in long term is required to offer greater definitive summarization. Thirdly, the results explain the small and medium manufacturing firms' situations and activities which may not be corresponding with the service companies as well as large companies. Lastly, the results describe situations and activities of firms operating in Thailand, which may not be compatible with international and multinational corporations.

E. Conclusions

This study fulfills the vague knowledge by confirming the relationships among sustainable leadership, lean manufacturing, and sustainability performance. In addition, this study augments the comprehension that lean manufacturing can be applied in any industry [8, 25, 52]. Accomplished lean implementation requires serious and much attention from all members across company, suppliers, distributors, and customers [48, 49]. Successful lean managers need insight comprehension about lean concept and implementation before persuading their employees to do with higher willingness and cooperation. Referring to the scarcity of lean manufacturing success at present time [4], it is likely to be a challenge for the future research to explore antecedent, consequent, and intervention factors, which will result in superior understanding of the lean production notions and utilizations. Successful lean implementation will generate better financial outcomes and lower cost thanks to the willingness of all employees and efficient processes which lead to all of sustainable competitiveness, including operational [9, 51], financial [57, 58], social and environmental performance [13].

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