An Investigation of Factors Affecting Lean Implementation Success of Thai Logistics Companies

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Abstract
The purpose of this paper is to investigate factors affecting the success of lean implementation in Thai logistics companies. Data was collected from the logistic companies implemented lean. Questionnaire survey was used to collect the data. Factor analysis and multiple regression analysis were conducted to understand the relationship between these factors and lean implementation success. The results of this study highlight the importance of leadership and management, financial capabilities, and organization culture as the critical success factors of lean implementation. The results also provide practitioners with guidelines in implementing lean more efficiently and effectively for enhancing their capability and competitiveness towards globalized market.

Keywords: critical success factors, lean, logistics

Introduction
Considering the importance of globalization and technological changes, the global business competition has become more highly intense. The logistics industry becomes increasingly important to the world economy which has gained much attention from researchers and practitioners worldwide. Thailand will become part of ASEAN Economic Community (AEC) in 2015, it is imperative that Thai Logistics industry needs to improve their capabilities in order to gain higher competitive advantage compared to other competitors among AEC. Becoming the logistics hub in Southeast Asian countries is therefore of interest for Thailand. The logistics industry in Thailand has, however, been neglected for a long time, concerning the problematic issues of infrastructure, high operating cost, and the lack of awareness regarding the good logistics practices (Mohan, 2008). This calls for the importance in developing the logistics as the key strategic industry for enhancing the global business competitiveness of the country.

In Thailand, increasing attention has been emphasized on the improvement of logistics cost concerning the inventory cost, transportation cost and administrative cost (Boonpattarakan, 2012). The logistics cost in Thailand is estimated around 18-20 percent of its gross domestic product, GDP (Thailand Logistic Report 2010). Compared to other

countries in South East Asian, the Thai logistics cost is much higher than those of Singapore and Malaysia which is approximately 8 -13 percent (Mohan, 2008). This raised an urgent issue of enhancing the logistics service capabilities and efficiency. In order to gain higher competitive advantage, logistics companies attempt to adopt many quality initiatives such as lean and/or Six Sigma to improve their service operations. Implementing such process improvement efficiently and effectively would ultimately help in delivering the highest value to customers at the competitive price.

Having been successfully applied in manufacturing, Lean thinking is considered appropriate to adopt to various service sectors (i.e. health care services, financial services) with the aim of improving the quality of service and operational performance (Russell and Taylor, 2009). Lean applied to service sector helps in enhancing value added along the operational process and high speed service performance through elimination of waste, thereby reducing the overall cost of operations (George, 2003). Considering the differences from manufacturing, Hines et al. (2004) and LluÍs Cuatrecasas ArbÓs (2002) pointed out that implementing lean to service may confront with difficulties regarding standardization of operations, overlooking of people issues, operating times, which are all subjected to a variability of service which is much higher than that of manufacturing operations. Having been successfully adopted in various services, adopting lean to the logistics seems to be at the early stage in the academic research. Hence, it is of interest that we understand the important factors affecting the success of lean implementation for improving the operational performance in the logistics services context. This leads to important questions of which factors are imperative ingredients in implementing lean successfully.

Hence, the purpose of this study is to investigate factors affecting the success of lean implementation. Thai logistics companies implemented lean projects were selected as key respondents. In Thailand, implementation of lean in the service sector is still at a fairly early stage, the available literature being dominated by manufacturing-related work. There appears to be little number of empirical research that investigated critical success factors of lean implementation, particularly in the context of logistics companies which becomes apparently important concerning the rapidly growth of this sector. In order to achieve the research objectives, questionnaire survey is considered appropriate. Hence, this paper contributes to a growing body of research into lean implementation within services sector by presenting an Asian perspective in service organizations in the context of Logistics Company. This paper is organized as follows. The following section summarized a literature review of enabling factors of lean implementation. In Section 3, the research methodology is presented. Research findings are discussed in Section 4. In the last section, the conclusion and future research are provided.

Literature Review

In this section, we summarized relevant literature on factors contributing to the success of lean implementation, the success of lean implementation, and the research framework used in this study.

Factors Enabling the Success of Lean Implementation

Comprehensive literature review on critical factors affecting the success of implementing lean concepts was conducted, five main factors are defined as follows;

Leadership and management

An excellence leadership and management is one of the crucial factors that drive the success of lean implementation (Anchanga *et al*., 2006). Without the continuous support and commitment from top management, the true importance of the initiative will be in doubt and the energy behind it will be weakened (Pande *et.al.*, 2000). Some companies implemented lean were not success resulted from the poor management supports (Jeyaraman and Teo, 2011). Hence, leadership and management are considered the most essential prerequisites in successfully adopted the desired improvement initiatives (Antony and Banuelas, 2001; Coronado and Antony, 2002; Henderson and Evans, 2000). In order to understand the relationship and management, two sub factors are categorized including management engagement and management commitment.

Communication

Communication is considered another crucial factor of lean implementation. Antony and Banuelas (2001) emphasized that efficient and frequent communications provide employees a guideline and maintain the momentum in implementing lean towards continuous improvement efforts. Implementing lean requires the effective top-down communication in order to provide employee with clear objectives and consistent mission statements (LluÍs Cuatrecasas ArbÓs, 2002). Rather than working individually, successful lean implementation required cross-functional teamwork of all employees in the organization. Brainstorming and frequent communication are typically considered important ingredients of successful implementation of various improvement initiatives (Staats *et al.*, 2011; Jeyaraman and Teo, 2010). Hence, it is important that organization pay attention to communication both in terms of vertical and horizontal communication.

Financial Capability

Financial capacity is a critical success factor in the determination of any successful projects. Implementing the lean initiative needs some significant investment of company in developing resources, training materials, statistical software licensing purchase, seeking consultation advice, rewards and recognition systems and others in order to cultivate and sustain the culture (Anchanga *et al*., 2006). The importance of financial capability towards the success of lean implementation can be considered in terms of reward and compensation (Bhasin, 2011) and infrastructure (Jeyaraman and Teo, 2006).

Skills and Expertise

Considering the high degree of customer contact in services, employees play important roles in delivering valued service to customers. The highly skilled labors of the organization are important to ensure company growth and success (Jeyaraman and Teo, 2010). Hence, it is necessary that service company pays more attention on skills and training for employee in order to achieve the goal of lean implementation. With this regards, three dimensions, pertaining to the skills and training, include employee sufficiency, employee training, and employee learning.

Organizational Culture

Organizational culture is one group of people's behavior and attitude. Building lean culture guides and changes the way people think and act. Lean culture means the changing of employee's behavior, emotion and political process. Organizations have little chance in successfully implementing lean unless paying attention to culture. Anchanga *et al.* (2006) stated that the creation of supportive organizational culture is an essential platform for the implementation of lean concept. Antony and Banuelas (2001) agreed that

successful implementation required adjustments of organizational culture and changes in employee attitude. Bhasin (2011) mentioned that collaboration is required in order to achieve and sustain the success of lean implementation. Bhasin and Burcher (2006) and Dahlgaard and Dahlgaard-Park (2006) considered critical success factors for lean adoption, towards the cultural implications. Overall, it is imperative that organization considers important aspects of cultural factor, including openness, collaboration, receptivity, and data sharing.

The Success of Lean Implementation

To understand how the factors mentioned above affect the success of lean implementation, two important measures are defined as follows.

Operational Performance

The success of lean is typically measured by operational performance. The term of internal process is used interchangeably with operational performance in some studies. Operational performance reflects the performance of internal operations of the company in terms of cost and waste reduction, product quality improvement, delivery performance, flexibility and productivity improvement (Jeyaraman and Teo, 2010). The success of lean directly benefits the internal operations process. The success of lean implementation directly benefit to operational performance.

Organizational Performance

Organizational performance is considered another measure of lean implementation. Excellent and smooth carry out of lean implementation will benefit the organizational performance. Organizational performance reflects revenue growth, net profits, profit to revenue ratio and return on assets, and non-financial aspects, such as investments in research and development, capacity to develop a competitive profile, new products development, market development and market orientation (Jeyaraman and Teo, 2010).

After reviewing literature on factors contributing to the success of lean implementation explained earlier, the research question was established and examined:

Is there any significant relationship between these factors to the success of lean implementation?

Research Framework

Conceptual Model

To answer the research question, the research model is conceptualized in order to understand the proposed relationship between enabling factors to the success of lean implementation as shown Figure 1.

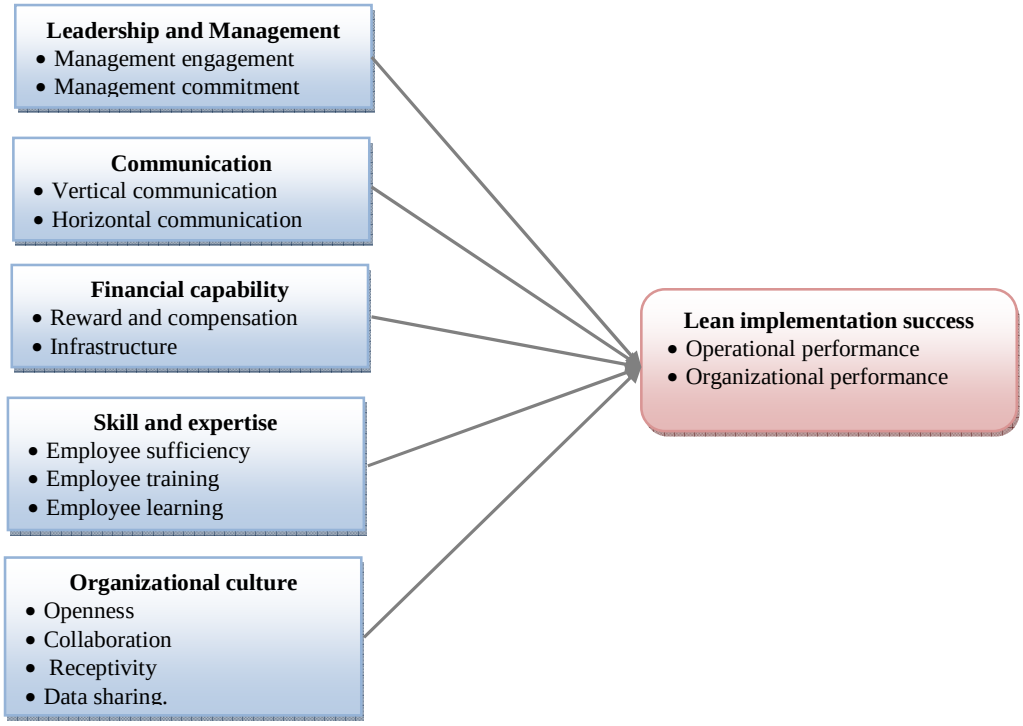

Figure 1 – The proposed model of critical success factors to the success of lean implementation

Research Methodology

To answer the research question on investigating critical factors that influence the success of lean implementation, the research methodology is described in this section.

Survey Instrument and Data Collection

Based on the research conceptual model addressed in the previous section, five constructs were determined as critical factors of lean implementation. 46 items from five constructs were obtained from literature. This study used pre-test scales from past studies to ensure their validity and reliability. Based on the literature review addressed in the previous section, the questionnaire was developed. The questionnaire consisted of four sections in order to covering objectives of the research including demographic factors, organizational pressures and challenges, lean performance and further comment on the challenges of lean improvement. Organizational pressure and challenges constructs were determined based on previous literature. The survey consisted of 46 items that were classified into 5 constructs: leadership and management, communication, financial capability, skills and expertise, and organizational culture. We used two criteria of the operational performance and organizational performance to measure the success of lean implementation. These measures were derived from several criteria, which have been used in previous studies. Two academic and one practitioner helped in refining the survey instrument for this study. A five-point Likert scale was used to ask respondents for scoring (items) ranging from 1 = strongly disagree to 5 = strongly agree. The pilot test was conducted with 30 respondents from the local logistics company to ensure that the survey instruments are easy to understand by the respondents. Modification of the questions was done upon the experts' advice.

Considering the purpose of the exploratory study, the convenience sampling method was used to collect data. The questionnaire was sent to logistics companies

located in Bangkok, Thailand. Given that operations managers generally have clear understanding of critical success factors affecting lean implementation and operational and organization performance, experienced operations managers to top management staffs working in logistics companies were the target respondents. A survey was conducted among the managers who have been working at least one year in logistics companies in Thailand. A total of 404 completed survey questionnaires were received from the logistics companies in Bangkok during 2012, implying a 62.15 percent response rate. The number of satisfactorily completed questionnaires returned was 378.

With regard to respondents' profile, the majority of respondents (93.6%) have ever involved with lean implementation. Only 6.4 % of the respondents never experienced with lean implementation projects. From those who involved with lean implementation, approximately thirty percent of the respondents had experience with 3-4 lean projects, another thirty percent of the respondents involved with 4-5 lean projects. In the other words, more than sixty percent of respondents had experienced with 3-5 lean projects implementation. The majority of respondents worked in the companies that have established for more than twenty years but less than thirty years. Considering business activities in logistics companies, more than thirty percent of respondents worked in container haulage, sixteen percent of respondents worked in warehousing, and the remaining worked in cargo consolidation and shipping agency.

Reliability and Validity of the Survey Instrument

Both validity and reliability tests were conducted in order to comprehend the survey instrument. The Item-Objective Congruence used to measure the validity of questionnaire (Rovinelli and Hambleton, 1977). IOC is the process where content experts rate individual items on the degree to which they do or not do measure specific objectives listed by the test developer. The context experts will evaluate each item by giving the rating of 1 (mean clearly measure); -1(mean clearly not measuring); or 0 (mean degree to which it measure the content area is unclear). The IOC form of this study was presented to three experts to evaluate. The items which IOC rate greater than 0.75 is considered valid, the items which IOC rate below 0.75 are required to be revised.IOC forms were sent out for experts to evaluate the validity. The IOC index of all constructs, which include leadership and management, communication, financial capability, Skills and expertise, organizational culture, and lean implementation success, are higher than 0.75, represented the high validity of survey instrument.

The constructs were empirically validated by using reliability analysis (Cronbach's alpha) and principal components analysis with varimax rotation. In the other words, exploratory factor analysis with principle component analysis was conducted to investigate the uni-dimensionality of the scales. All 46 items were entered principle component analysis (PCA), then varimax rotation was used to extract orthogonal components. Seven items with loading factors less than 0.4 were removed. The results of a subsequent factor analysis after items removal are shown in Table 1. Factor loadings of items within each scale were above 0.3, providing support for the validity of measuring the latent variables using the respective sets of indicators.

Reliability analysis was conducted by examining the value of Cronbach's alpha to test instruments' reliability. The internal consistency of measures used in this study is verified by considering Cronbach alpha. The rule of thumb for Cronbach's alpha is that a

value greater than 0.9 means the internal consistency is excellent. A value greater than 0.7 is generally considered acceptable. The Cronbach's alpha of all constructs was calculated to test the reliability of the scale used in the study.

Table 1 shows the results of exploratory factor analysis with the Varimax rotated component matrix. All items loaded at more than 0.40. Values of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy in excess of 0.50 (Kaiser 1974; Falk and Miller 1992) indicated that the use of factor analysis was appropriated, and that extracted factors were distinct and reliable. This is reaffirmed by the fact that for each scale, Bartlett's sphericity test for the null hypothesis that the correlation matrix is an identity matrix, was rejected ($\alpha = 5\%$).

The result shows that the reliability coefficients were acceptable (> 0.7) for all constructs. The five constructs are leadership and management (LM), communication (CM), financial capability (FC), skills and expertise (SE), and organizational culture (OC). Then, each of the constructs was formed by adding the scores of each of the items included in the construct.

Table 1-Principal Component Analysis of leadership and management (LM), communication (CM), financial capability (FC), skills and expertise (SE), and organizational culture (OC) (Rotated Component Matrix)

	Component				
Item	**LM**	**CM**	**FC**	**SE**	**OC**
engage2	**.590**	.090	-.100	.089	.121
engage3	**.631**	.235	.119	.046	.077
commit1	**.493**	.389	.096	.071	.072
commit2	**.494**	.256	.041	.203	.007
commit3	.092	**.623**	.055	.077	.055
commu1	.245	**.499**	.070	.084	.294
commu2	.104	**.552**	.056	.071	.074
commu3	.223	**.596**	.179	.143	.121
commu4	.126	**.616**	.153	.090	.105
reward1	-.008	**.513**	.267	.240	-.046
reward3	-.122	.322	**.500**	.221	.164
infrastr1	-.026	.123	**.568**	.208	-.022
infrastr2	.087	.209	**.581**	.046	.233
infrastr3	.092	.125	**.677**	.203	.158
suffiec1	.137	.065	**.410**	.358	.105
suffiec2	.010	.164	.248	**.585**	.067
suffiec3	.212	.186	.321	**.441**	.072
train1	.072	.225	.284	**.460**	.155
train2	.154	.123	.294	**.459**	-.042
learn1	-.068	.053	.041	**.530**	.182
learn2	.104	.065	-.021	**.628**	.127
learn3	.051	.007	.044	**.597**	.090
learn4	.128	.130	.148	**.567**	.252

Item	Component				
	LM	**CM**	**FC**	**SE**	**OC**
open2	-.085	.301	-.010	.052	**.363**
colla2	-.048	.041	.020	.312	**.475**
colla3	-.021	.132	-.050	.212	**.540**
recep1	-.108	.123	.086	.139	**.527**
recep2	.131	.004	.224	.075	**.621**
recep3	.006	.129	.106	.198	**.497**
share1	.101	.010	.139	.091	**.620**
share2	.167	.127	-.025	.073	**.574**
share3	.177	.024	.161	-.025	**.563**
share4	.185	.074	-.101	.137	**.360**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Note: MS = management support and commitment, CM = communication, FN = finance capability, ST = skill & training, CT = organizational culture

Data Analysis

The obtained data were analyzed with SPSS for Window 17.0 software. Data were tested by using statistical inference; the correlation analysis and multiple regression analysis were conducted to investigate relationship between critical factors and lean implementation success.

Findings and Discussion

The results is presented and discussed in this section.

Correlation

Correlations between critical factors are examined. Table 2 shows the bivariate correlation of the five independent variable factors. There is some relationship between factors. The correlation coefficients were generally between 0.3-0.4, all factors seem to be related to the other factors. This indicated that firms which are advanced in their practices on some factors tend to be more advanced on others.

Table 2-Correlation matrix between variables for the whole sample (n = 378)

	LM	CM	FC	SE	OC
LM	1	.452**	.308**	.332**	.286**
CM	.452**	1	.456**	.453**	.373**
FC	.308**	.456**	1	.556**	.395**
SE	.332**	.453**	.556**	1	.449**
OC	.286**	.373**	.395**	.449**	1

**p < 0.01 correlation is significant at the 0.01 level 2-tailed).

The relationships between critical success factors and lean implementation success

The relationship between critical success factors and lean implementation success were analyzed by using multiple regression analysis. The multiple regression model was statistically significant (significant level = 0.05), 30.4 % of variation in data explained by

the model. This model fit is satisfactory. The F value was 32.517 and p value was .000 indicated that the critical success factors have positive influence on the success of lean implementation. Table 3 shows the result of the multiple regression of all five critical success factors regressed on the dependent variable lean implementation success.

Table 4 displays the multiple regression of all five critical success factors regressed on the success of lean implementation. Factors contributed to success of lean implementation are presented. According to Table 4, the equation of this study as below:
Lean implementation success = 8.160 + .205 leadership and management + .132 finance capability + .246 organizational culture
Results demonstrated that leadership and management, financial capability and organizational culture have significant relationship with the success of lean implementation.

Table 3-Multiple regression analysis on lean implementation success

Variables	Lean implementation success			
	Unstandardized Coefficients	Standardized Coefficients(beta)	t	Sig.
(Constant)	8.160		5.844	.000
LM	.205	.162	3.270	.001
CM	.020	.022	.406	.685
FC	.132	.129	2.354	.019
SE	-.004	-.005	-.096	.923
OC	.246	.401	7.986	.000
R = .551, R-Sq = .304, Adjusted R-Sq= .295, F = 32.517, Sig. = .000				

The success of lean implementation with respect to CSFs, i.e., leadership and management, communication, financial capability, skill & expertise and organizational culture are demonstrated in Table 3. This model exhibited significant relationship between leadership and management, financial capability, and organizational culture to the success of lean implementation. Interestingly, there was no significantly relationship between communication, skills and expertise to the success of lean implementation. Among these five factors, results suggested that organizational culture strongly contributed to the success of lean implementation. It was followed leadership and management and financial capability, respectively. This implied that organizational culture is the most important factors to the success of implementing lean project. This result is consistent with studies of Bhasin and Burcher (2004), Dahlgaard and Dahlgaard-Park (2006) that cultural issue is considered important for adopting and implementing lean in organizations.

Conclusion

The paper reviewed and identified critical factors enabling to the success of lean implementation in service operations. Five critical success factors were identified including leadership and management, communication, financial capability, skills and expertise, and organizational culture. The aim of this paper was to examine the relationship between these critical success factors and the success of lean implementation in Thai Logistics companies. Dataset collected during 2012 was analyzed by using

multiple linear regression. The key statistical finding suggested that there is a significant relationship between some factors to the success of lean implementation. There were three critical success factors significantly related to the success of lean implementation in Logistics Companies in Thailand. These critical success factors included leadership and management, finance capability and organizational culture. In summary, this study helped in broadening the literature related to critical success factors in a particular context of logistic companies. The results provide managerial implications particularly for Thai logistics companies intended to implement lean for pursuing higher competitive advantage before entering into ASEAN Economic Community in 2015.

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