Organisational Change Framework for Lean Manufacturing Implementation

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***Abstract*— Lean manufacturing system is a proven approach for success in manufacturing companies worldwide. However, several companies have failed in their attempt to implement this system. The transition to lean manufacturing system requires a radical change which involves a total reshaping of purpose, system, and work culture. This paper develops a framework that may assist manufacturing companies to implement lean manufacturing system. This study has employed explanatory mixed method approach, which begins with survey distribution and is followed by in-depth interviews at Malaysian automotive companies to further refine the general picture attained from the survey. Both quantitative and qualitative results show that the key factors to managing a smooth transition to lean manufacturing are: change readiness, leadership and management, the change-agent system, team development and empowerment, communication, and the review system. The results also serve as the basis for developing organizational change that aids the framework implementation for lean manufacturing system. This framework has strong theoretical significance because of its explicit focus on the relationship between lean manufacturing and the management of its implementation. This framework may also provide practitioners with a better understanding of the transition process to lean manufacturing, which will minimize potential resistance and conflicts and thus improve the system's chances of success. Failure to recognize the organizational changes towards lean manufacturing system may hinder the system's long-term benefits to organization.**

***Keywords*—** *lean manufacturing, organizational change, mixed method research, framework development, automotive industry*

1. Introduction

Challenges created in today's global competition have prompted many manufacturing firms to adopt new methods of manufacturing management to improve their overall efficiency and competitiveness. Lean manufacturing, as a manufacturing management tool, has been adopted by many manufacturing industries in different forms and under many different names.

It has been reported that despite many attempts to implement a lean manufacturing system, even by organizations with the best of intentions, those attempts often succumbed to failure [1-3]. There have been numerous studies on the issues involved in failures to implement lean manufacturing. [1] identified the piecemeal adoption of lean manufacturing, cultural differences (i.e., Western and Asian) and health and safety issues as the reasons for unsuccessful implementation of lean manufacturing. [2] and [4] stressed that problems occurred due to skewed focus of lean tools and implementation methods. [5] believes that many organizations focus only on the application of tools and techniques in short-term problem solving or on quick results, and neglect the true essence of the lean manufacturing philosophy. In other words, the main problem involved in implementing a lean manufacturing system lies in the misunderstanding of the fundamental purpose of the transition to lean system [2,5,6].

In fact, lean manufacturing should be implemented comprehensively and holistic in scope and content [7]. Many researchers have argued that the transition to a lean manufacturing environment requires cultural change within the organization rather than a change in manufacturing or technical processes [5,8]. The transformation to lean manufacturing often involves a radical change in the structure, strategy and culture of an organization [9]. A clear understanding is required to manage the change to ensure successful implementation of lean manufacturing practices. It appears that many of the relevant literature have discussed the transition to lean manufacturing systems in great detail, but a little has been studied to address the change management issues.

There have been a few studies on the mechanisms involved in a transition to a lean system. However,

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there is clear evidence that a successful transition to a lean manufacturing system follows an emergent change approach to organizational change. The characteristic of emergent strategy of change necessary for transition to a lean manufacturing system appears to be underdeveloped. Thus, it indicates a need to understand the effects of emergent change approach on an organization. Implementing lean manufacturing system requires significant cultural and structural changes within an organization, which can cope with dynamic and unpredictable environments. Issues such as change readiness, change drivers, internal and external organizational conflicts, and sustainable improvements should be taken into account to ensure a successful transition to lean manufacturing. This study takes a modest step toward bridging the interdisciplinary and theoretical gap that exists between the organizational change literature, especially that concerning emergent change and the lean manufacturing literature. The aim of this paper is to develop a framework to change an existing manufacturing system to make it lean.

2. Literature Review

Today, change is not an exception but an on-going process. The practice of organizational change management ensures personal elements that are aligned with a firm's business strategy and business processes. [10] defined organizational change as a process by which Organizations move from their present state to some desired state in order to increase their effectiveness. [11], on the other hand, pointed that organizational change is the change in the requirements and distribution of power, skills, information or communication. [11] suggested that a company must change the way it values different dimensions of work in order to change to a lean manufacturing system.

So far, there has been little discussion about the link between organizational change management and lean manufacturing implementation. In fact, one of the major challenges in implementing lean manufacturing systems is guiding the process of change as detailed in an implementation plan. This is because lean manufacturing requires change in the firm's structure, system, process, and in its employee's behaviour [12].

The change to lean manufacturing system is a radical process and not an easy task [9,13]. To create the foundation for lean manufacturing to take place, significant changes must occur within an organization. In a study of managing the change toward a lean enterprise, [9] propose that the changes require an emergent strategy. This is because lean manufacturing involves dynamic change and improving of the process for continuous waste reduction. [14] suggest that the required changes toward lean manufacturing can be divided into four categories. Table 1 shows the changes required during the transition to lean manufacturing.

Table 1: Organizational changes required in lean manufacturing

Categories in organisational change	Changes in lean manufacturing	Authors
Changes in process	Application of the full set of lean tools, multi-skilled workers	[15-16]
Changes in function, co-ordination, and control	Teamwork building, cross-functional movement, network relationships with suppliers and customers, information transparency, participative management, ~~teamwork~~ rewarding teamwork	[16-18]
Changes in values and human behaviour	Teamwork, open communication and information sharing, continuous--improvement culture, knowledge learning and sharing	[16-17, 18]
Changes in power within the organisation	Decentralized responsibilities, autonomous leadership	[20-21]

Among all of the emergent change approaches, Kotter's eight-step model has a long-standing high reputation and also has flexibility in dealing with a vast number of problems and issues that may be experienced during the change [22]. Kotter's model proposes eight steps for successful organizational change as shown in Table 2.

Table 2: Kotter's eight-steps model [23]

Kotter's eight steps to successful change	
Step 1	Establishing a sense of urgency
Step 2	Creating a guiding coalition
Step 3	Developing a vision and strategy
Step 4	Communicating the change vision
Step 5	Empowering broad-based action
Step 6	Generating short-term wins
Step 7	Consolidating gains and producing more change
Step 8	Anchoring new approaches in the culture

Kotter's eight-step model can be divided into three categories, namely, preparation (steps 1 – 4), action (steps 5 – 7), and grounding (step 8) [24]. In the preparation stage, creating a feeling of change is crucial to get the required cooperation of employees and managers. The formation of such a guiding coalition is an essential component for the development and subsequent implementation of a change strategy. A company's vision and strategy can only be unleashed when all the people in the company have a common understanding through effective communication. In the action stage, the detailed implementation of the change strategy takes place. Meanwhile, the grounding phase is to ensure that the changes are anchored in the company's culture. Regular checks must be made, as the reinforcement of these steps may require a long period of time.

3. Research Method

For this study, an explanatory mixed design method was employed. The necessary organizational change factors for lean manufacturing implementation were first investigated by using a quantitative method and then, further refined by a qualitative approach. The advantage of this research approach is that the survey distribution provides data that renders a general picture of the research problem; and then further analysis is done through collecting qualitative data that will refine, extend, and explain the general picture gathered by the quantitative results [25]. The scope of this study is limited to manufacturing companies in the automotive industry in Malaysia. This is because these companies have a high prospect to implement lean manufacturing system. This is evidenced by the high reputation of the founder of the system, Toyota Motor Corporation, which has achieved very high quality and reliability in manufacturing system.

3.1 Survey

In this stage, a set of questionnaire was developed for data collection. To achieve the objectives of the study, Malaysian automotive manufacturing companies were selected as the target population. The list of manufacturing companies consisted of electrical, electronic, metal, plastic, rubber, and other automotive components. The manufacturing companies involved in this study ranged from medium to large companies, all with more than 50 employees [26]. The decision made to include only companies of this minimum size in the study was based on the studies performed by [27-29]. Findings from the studies showed that small manufacturing companies are less likely to implement lean manufacturing concepts due to certain limitations and barriers. The personnel involved in the survey were those from managing directors, manufacturing and/or production managers and executives, as well as quality managers and executives.

The questionnaires consisted of four parts: (a) the background information of the organization (year of establishment, ownership, number of employees, and quality system certification); (b) the lean manufacturing implemntation (implementation of lean practices); (c) organizational change factors; and (d) the background information of the respondent (job title, department and years of employment). Questionnaire reliability test results proved the instrument to have a high degree of internal consistency with Cronbach's alpha values ≥ 0.70.

The initial emails containing the questionnaires were sent to 150 target respondents. Of the original emails, 17 could not be delivered, either because the email addresses were wrong or the respondents left the company. Follow-up emails were sent a week later to remind those who had not yet responded or to thank those who had already returned their questionnaire. A total of 19 responses were returned, 11 were via online survey and the remaining eight were sent via email. This gives an exceptionally low response rate of 12.7%. However, the authors were unhappy with the initial response rate and seek other method, such as postal mail for sending the questionnaire. As a result, the number of responses rose to 61 and consequently improved the response rate to 40%.

3.2 Case Study

Three Malaysian automotive manufacturing companies were selected for in-depth interviews based on their willingness to participate and their experience in implementing lean initiatives. The authors prepared the data collection by first contacting each company to be studied to gain their cooperation, explain the purpose of the study, and record key contact information. Prior to the case study, a semi-structured interview guide was developed from the review of literature and the previous quantitative data analysis. The interview guide consists of the interviews were done from February to June 2010. The purpose of the interview guide was to probe and determine what actions each case company had taken to implement the lean manufacturing system successfully. In order to improve the reliability, for triangulation purposes, the same interview guide was used to all case respondents. The need for triangulation is due to the ethical needs to confirm the validity of the obtained data [30]. The subjects for interview were questioned in regard to their actual experiences.

The interviews lasted for approximately two hours for each respondent. They were the key personnel who were directly involved in the implementation of lean manufacturing in their company as shown in Table 3.

Table 3: Summary of the Case Companies' Respondent

	Position	Year of employment in the company
Company A	Assistant General Manager	18
Company B	Manager – Manufacturing & Production Department	5
Company C	Plant Manager	3

4. Results and Discussion

4.1 Survey

4.1.1 Respondent profile

The first aspects to be investigated were the general background of the respondents and the companies involved. Table 4 shows the general background of the respondents such as the job position and years of employment in the company. It was found that the respondents were mainly Production and QC/QA personnel. Most of them (36.1%) have been working more than 10 years in that particular company. They were selected because they have the first hand knowledge and experience and they were directly involved to the implementation of lean manufacturing program in their companies. The result is similar to findings made by the [31], in which the majority of respondents also consists of mid-level managers. This respondent group is best to use in a survey research in this field since the mid-level managers are the ones who carry out the decisions of top management. In addition, they are also in the position of communication between top management and production operators. Therefore the mid-level managers are able to understand the performance of subordinates and reaction with regard to the implementation of lean manufacturing system.

Table 4: General background of the respondents in their company (N = 61)

	n	%
Position in the company		
Production Manager & Executives	26	42.6
QC/QA Manager & Executives	26	42.6
Others	9	14.8
Years of employment		
<5 years	20	32.8
5-9 years	18	29.5
>10 years	22	36.1

Table 5 shows the general background of the companies involved in the study. The factors investigated were the types of product, age, ownership, and size of the company. Most of the respondent companies manufacture metal parts for automotive industries (44.3%). Majority of the companies involved in this study are categorised as intermediate and old companies with 42.6% each. The old company defined in this study are those which were established more than 20 years ago. By comparison, the intermediate companies are those which have been established between 11 to 20 years. New companies are defined which established less than 10 years ago. The percentage of new companies was only 13.1%.

Other than the company age, respondents were also asked about the size and ownership of the companies. In Table 5, it is shown that respondents were mostly from large companies with more than 150 full-time employees, which exhibits 77.1%. In addition, half of the respondent companies have local ownership (49.2%), whereas 36.1% of the total respondent company have joint venture and the remaining 14.9% have fully foreign ownership.

Table 5: General background of the companies involved in the study (N = 61)

	n	%
Types of product produced		
Assembly	10	16.4
Plastic parts	11	18.3
Metal parts	27	44.3
Electronic parts	10	16.4
Electrical parts	9	14.8
Rubber parts	2	3.3
Company age (year)		
New (<10)	8	13.1
Intermediate (11-20)	26	42.6
Old (>20)	26	42.6
Company ownership		
100% local	30	49.2
100% foreign	9	14.8
Joint venture	22	36.1
Company size (no. of employee)		
Medium (151-250)	14	22.9
Large (> 251)	47	77.1
Quality management system employed		
ISO9001	35	57.4
QS9000	6	10.0
ISO/TS16949	43	70.5
ISO14000	38	62.3
OHSAS18001	12	19.7

4.1.2 Lean Status

In order to identify the lean status of each respondent company, cluster analysis was performed to classify whether the companies are into lean, in-transition towards lean, or non-lean. Cluster is a group that is computed from the average values of the lean practices variables for all

the firms and signifies the extent of the lean manufacturing implementation of that group. Companies were classified as non-lean, in-transition towards lean or lean based on the hierarchical cluster analysis of their mean scores for each individual lean practice using the squared Euclidian distance between variables. Ward's method is used to optimize the minimum variance between clusters. Table 6 shows the mean scores for the three cluster solutions.

As a result of the cluster analysis, the first group (A) has 14 firms and it is characterised having low mean values for all five lean practices variables. This suggests that the firms forming this cluster implement little lean manufacturing practices and for this reason they are categorised as non-lean firms. The second group (B) has 30 firms, and is characterised having moderate mean values for each of the five variables. This group is categorised as in-transition towards lean manufacturing system. Finally, the third group (C), which has 17 firms, are classified as lean firms because they have high mean values of each lean manufacturing practices variables. The values suggest that in these firms lean manufacturing practices are extensively implemented in their organisation's operation and management.

The results in Table 6 also show one-way independent ANOVA to determine the significance of the difference between means of cluster. The purpose of this test is to examine the cluster predictive validity and consistency with expected practice levels within groups. To test the homogeneity of variance, Levene test is used for equality of variances. The Levene's test showed that all lean practices are not significant ($p>0.05$) except for *Process and equipment.*

It is assumed in Levene's test that the population variances for each group are relatively equal. Again the F-ratio is used to represent whether the group means are the same. Results for all lean practice show that, $p< 0.05$, which significantly states that the mean scores of lean manufacturing practices were different across the lean groups. This proves that the ANOVA results contribute to evaluate the validity of the cluster analysis.

Table 6: Mean values for three cluster analysis solutions for lean practices

	Non-lean (A)	**In-transition (B)**	**Lean (C)**	**ANOVA**	
	n=14	n=30	n=16	F	p-value
Total Lean practices	2.81	3.64	4.29	164.92	.00
Process and equipment	2.81	3.50	4.27	57.36	.00
Manufacturing process and control	2.90	3.54	4.44	47.08	.00
Human resources	3.10	3.50	4.39	36.80	.00
Supplier relationship	2.47	3.25	4.05	57.54	.00
Customer relationship	2.74	3.47	4.35	36.51	.00

In order to further verify the LM implementation in respondent companies, the implemented tools were also analysed based on the firm status of lean implementation. It is found that non-lean firms show more emphasis on *human resources* during lean tools implementation. On the other hand firms which are in-transition towards lean and lean spend more resources in *manufacturing process and control*. According to [32], as the companies become stable and become more knowledgeable in their field, they can apply more advance lean tools in order to support the end goal of the production system.

4.1.3 Organizational change in lean manufacturing implementation

In order to create a strong foundation for lean manufacturing to take place, significant organizational changes must occur within the organization. A correlation test was conducted to ensure that a relationship existed between organizational change factors and lean implementation status. However, this study produced data that violated parametric assumptions, such as a non-normal data distribution for organizational change factors. Hence, to correct this problem a non-parametric statistic, Kendall's tau coefficient was used. As suggested by [33] Kendall's tau should be used rather than Spearman's coefficient when a small data set was involved because Kendall's tau could provide a better estimation of the correlation between change factors and lean implementation status in an organization.

Table 7 provides the correlations between each of the organizational change variable and lean implementation status. The results illustrate a significant positive relationship of change factors to

lean status, as most of them are significant at p<.01 except for Review System, which is significant at p<.05. However, Reward System does not shown to have any significant relationship with lean implementation status. Therefore, it is clear that higher lean implementation status can be associated with higher organizational change factors except for reward system. The highest correlation appeared between the lean implementation status and production team (*r*= .464), followed by effective communication (*r*= .441), and leadership and management support by middle management (*r*= .422).

Table 7: Kendall's tau correlation coefficient of organizational change variables and lean implementation status

Organisational change factors	**Lean status (r)**
Change readiness: the management	0.394**
Change readiness: the employees	0.335**
Production team	0.464**
Leadership and management support: the top management	0.301**
Leadership and management support: the middle management	0.422**
Worker empowerment	0.438**
Effective communication	0.441**
Employee training	0.384**
Change agent system	0.354**
Reward system	0.109
Review process	0.211

Table 8: Kruskal-Wallis test results on organizational change factors for non-lean, in-transition and lean companies

		Mean			Kruskal-Wallis	
Description		Non-lean	In-transition	Lean	df	Result
1.	Change readiness: the management	3.32	3.39	4.25	.010	Sig
2.	Change readiness: the employees	3.66	3.85	4.37	.002	Sig
3.	Production team	3.51	3.82	4.44	.001	Sig
4.	Leadership and management support: the top management	3.46	3.79	4.19	.017	Sig
5.	Leadership and management support: the middle management	3.40	3.65	4.33	.004	Sig
7.	Effective communication	3.30	3.43	4.23	.000	Sig
8.	Employee training	3.19	3.43	4.10	.007	Sig
9.	Change agent system	3.40	3.69	4.07	.029	Sig
10.	Reward system	3.43	3.35	3.70	.219	Not sig.
11.	Review process	4.00	3.89	4.36	.044	Sig

Another important finding of this quantitative study was the Kruskal-Wallis test result concerning organizational change factors in lean clusters, as shown in Table 8. The results showed that there are statistically significant differences between organizational change factors in different types of lean clusters except for reward system.

4.2 Case Study

The analysis of the case companies yielded interesting results. Table 9 presents a summary of the background of each case company involved in the study, which shows that the three companies are clearly different compared to each other.

Table 9: Summary of the Case Companies' Background

	Company A	**Company B**	**Company C**
Type of product	Electronics	Metal	Electrical
Company age (years)	27	11	31
Company ownership	Foreign	Local	Joint Venture
Company size	Large	Large	Large
Lean effort	1996 (1st attempt), 2002 (2nd attempt)	2004 (1st attempt), 2007 (2nd attempt)	Aug 2009

The data collected from interviews were analyzed using NVivo8. Theme derived from the analysis is based on the research questions which focus on organizational changes factors in the implementation of lean manufacturing systems. Next, the coding allows the theme to be divided into several categories, known as the parent node in the tree node structure. The development of the theme to the child node is shown in Table 10. Child

node is generated from text or key phrase in an interview that has been done. The percentage of coverage for each child node represents the node coverage throughout the interview. The development of this theme was to provide a basic analysis related to a thought among respondents on the question of the study.

The qualitative data gained from interviews resulted in seven categories and 88 child nodes as shown in Table 10. Those categories included change readiness, leadership and management, communication, change agent system, team development, workers empowerment, and review system. The most influential factor on organizational change was change readiness. The keywords "create awareness of lean manufacturing", "ample attention and time for change process" and "create sense of need and urgency for change" appeared in almost all interviews with approximately 17% coverage. Organizational change factors such as change agent system, workers empowerment, and team development also have shown prominent coverage among the interview data. The interview participants agreed, with approximately 16% coverage, that these factors lead to a smooth transition to a lean manufacturing system. Although the percentage coverage of the leadership and management category was small at 11.7%, all of the interview participants overwhelmingly agreed that management support is very important in lean manufacturing implementation. The keywords "clear direction and planning", "visible management support and commitment", and "clear understanding of lean manufacturing" appeared prominently in the interviews. These findings further support the survey results, which indicate that the highest correlation is between the lean clusters and production team.

Table 10: Progression from Themes to Child notes for organizational change factors

Categories (Parent Nodes)	Child Nodes	Percentage of coverage	
Change readiness	• Ample attention and time for change process • Create sense of need and urgency for change • Create awareness of lean manufacturing	4.5 3.3 9.1	16.9
Leadership and management	• Clear direction and planning • Provide resources such as time, materials and money • Visible management support and commitment • Clear understanding of lean manufacturing	5.9 0.8 2.6 2.4	11.7
Communication	• Provide more information on lean manufacturing initiatives • Get feedback from workers • Acknowledgement of lean achievement • Information sharing between departments • Information sharing between management and workers	3.7 2.9 0.8 2.1 5.4	14.9
Change agent system	• Permanent staffs • Competent in lean knowledge and experience • Creative • Formal lean manufacturing department • Support from outside expertise	2.2 5.0 0.6 3.1 4.9	15.8
Team development	• Existence of lean team • Cross-functional team • Teamwork • Focus on continuous improvement • Autonomous team	3.5 1.9 5.2 4.1 0.7	15.4
Workers empowerment	• Training on principles of lean and lean tools • Reward system	11.4 4.2	15.6
Review system	• Internal review • External review • Periodical review	5.9 2.3 5.6	13.8

In order establish an organizational change framework that supports a smooth transition to a lean manufacturing system, a cross-case analysis was performed on the data obtained from each of the case companies. The findings were discussed based on Kotter's eight-step change model. Table 11 shows the summary of the analysis of the case studies that shows the organizational change elements in the case companies according to Kotter's change model during lean transition. The signs for each step in the Kotter's change model were determined from the analysis done using NVIVO8. The sign '+' shows the company has fully fulfilled the Kotter's step. Whereas '+/-' and '-' indicate middle and low observation according to Kotter's change model respectively.

The cross-comparison among the case studies shows that all of the companies followed Kotter's eight-step model to a certain extent in managing the change during lean transition. Apparently, Company A had a much more positive experience transitioning to lean manufacturing than Company B and Company C. The main elements in managing a change to a lean manufacturing system are readiness for change and implementing change. All of the case companies indicated a readiness to change by establishing the urgency for change, especially among the different levels of management. The management of each company was able to develop this readiness in their employees by promoting a transition to lean manufacturing and training for it. Thus, the workers were ready to accept the new changes. All respondent companies claimed that their top management was very supportive to the lean manufacturing implementation, especially in Company A. The role of leadership and management is critical in the conversion to lean manufacturing. During the transition to a lean manufacturing system, the successful managers have given clear directions and detailed tasks to respective departments. In order to spread the motivation for change and ensure that lean manufacturing principles can be understood by all people in the company, a change agent system was initiated.

The successful implementation of lean manufacturing requires announcing, explaining and preparing people for change and its effects; especially in the early stages of the transition to become lean. Company A managed to ensure that the lean manufacturing concept was conveyed to the entire company. In companies B and C, the communication process was only able to revolve among managerial-level employees and supervisors.

Table 11: Summary of the case studies results

Change Process step	Company A	Company B	Company C
Increase urgency for change	+	+	+
Built a team for the change	+	+	+
Construct the vision	+	+/-	+/-
Communicate	+	+/- (only to selective level)	+/- (only to selective level)
Empower	+	+/-	+
Create short-term wins	+	+/-	+
Be persistent	+	+/-	+/-
Make the change permanent	+	+/-	+/-

The next step after communication is worker empowerment. Appropriate trainings on the basic principles and concepts of lean manufacturing, as well as the reasons for implementing the system create a greater level of understanding of lean manufacturing philosophies. It can also encourage motivation and innovation in a company's work culture and in its employees' attitudes. Among three respondent companies, Company A created a well-developed lean training program when compared to Companies B and C. Generating short-term wins is also crucial to implementing lean systems. Companies A and C conducted some initial lean projects conducted by their lean transition team. The purpose of these projects was to show some visible achievement of lean implementation to motivate and gain more support from the lean team, management, and operators.

The surveys and case studies were set out with the aim to assess the existence of organizational change factors in lean manufacturing implementation. It is apparent from the results reported that organizational change factors have some critical effects on the transition to a lean manufacturing system. The key factors in creating a smooth transition to lean manufacturing are change readiness, leadership and management, change agent system, team development and empowerment, communication, and review system. By identifying these series of lean implementation factors, they can serve as the basis for the development of an organizational change framework in lean manufacturing implementation.

4.3 Framework Development

[33] defined a framework as a "prospective set of things to do". According to [34], a framework from an organizational perspective can be described as a guiding torch that helps a manager in providing the necessary direction when managing the change programs that are implemented in an organization. Such a framework may consist of various elements or blocks that an organization needs to follow when it tries to implement a change in the way it is currently functioning. A framework can also be

communicated through diagrams, graphical representations or descriptions.

Based on the insights that were identified through the mixed-method research discussed in the previous sections, lean manufacturing implementation framework has been developed as shown in Figure 1. The proposed change framework has two interacting cycles: *Readiness for Change* and *Implementing Change*. The top circle of the proposed framework is concerned with strategic alignment, while the lower circle stresses the need for workers to be understood, measured, and approved. For the change to take hold and succeed, the organization and the people who work in that organization must be ready for the transformation. The *Readiness for Change* is addressed by identifying and understanding the *Need for Change*, having clear and consistent *Vision and Strategies*, and creating a strong *Change Agent System*. In the initial stage, it is the responsibility of the top management to ensure that the *Need for Change* is well communicated and established. This creates a sense of urgency to change to a lean manufacturing system. Next, the top management should create and communicate the *Vision and Strategies* that everyone in the company can relate to. Strong leadership should be capable of exhibiting excellent program management styles, communicating the vision and strategy for a change program, and motivating the workforce. The third stage in creating the readiness to change is the development of a strong *Change Agent System*. *Change Agent System* is one that assists the translation of change processes so that lean manufacturing concepts can be understood by all people in the company. The role of a lean change agent is crucial because most of the employees are not familiar with the new lean work environment and because it requires a behavioural and mindset change due to the different expectation for performance and value. Therefore, it is important that those who lead change projects should have the skills, competencies and aptitude to implement lean manufacturing.

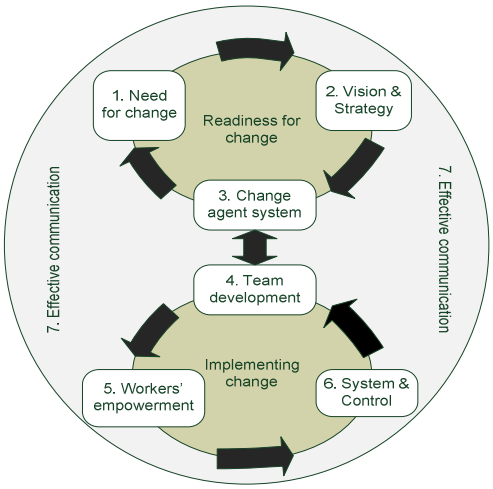

Figure 1: Organizational Change Framework for lean manufacturing system implementation

Implementing Change is very crucial in lean manufacturing implementation. The implementation of change must be aligned with operational issues so that people in the company can understand how they will be affected by the changes and what must be done to address the challenges in the transition and the impact they have on the organization. *Team Development*, *Workers' Empowerment*, and *System and Control* are the essential sources for lean success. The fourth stage in implementing a lean manufacturing system is creating cross-functional teams as a support structure for lean implementation. Team building is a key factor for successful plans of action. In teams, the employees will form continuous-improvement activity groups and learn new methods of doing work. In the next stage, the *Workers Empowerment* of lean culture can be nurtured through training, motivation and a reward system. Appropriate training on the concept and basic principles of lean manufacturing, as well as the reasons for implementing a lean system can create a greater level of understanding of lean manufacturing and encourage motivation and innovation in the work culture and in the attitudes of employees. The sixth step is *System and Control*. The ability to quantify the effort and progress towards implementing a lean system should enable more successful and long-lasting change. The processes that are typically monitored and analysed are performance measurement, communication systems, business and physical processes, and improvement records.

Following the framework through its circles another time will verify the change process and anchor lean manufacturing in an organization's culture, where changes have become part of the "way we do things around here". To ensure successful and sustainable change processes,

Effective Communication is crucial. Information transparency, knowledge sharing, continuous learning, and continual evaluation of lean implementation efforts will ensure the smooth transition to a lean manufacturing system. Miscommunication may lead to a misunderstanding of lean philosophy and concepts or a misapplication of lean tools and techniques or create confusion concerning the roles and responsibilities of employees.

Organizational change should be seen as a dynamic process and lean manufacturing should be regarded as the direction for intended outcome rather than as a stable status quo. Lean manufacturing represents a unique culture that grows and improves with time. For a successful transformation towards a lean system, people need have a detailed understanding of lean manufacturing. They also need to be aware of the principles of organizational change management.

The framework was then validated by using Delphi technique. The Delphi technique focuses on the overall framework structure and its practicality within automotive parts manufacturing firms in Malaysia. The technique validates the proposed framework by asked the panel of experts to describe what they would do in particular circumstances. The experts were confronted with the results after each round, until consensus or stability of results is reached. In this study, the Delphi technique was used to find out whether the lean experts could reach consensus on the stages of lean manufacturing implementation as described in the proposed framework [35]. Based on the results from the technique, the framework has been modified and refined.

5.0 Conclusion

This study is among the few to link the implementation of lean manufacturing systems with organizational change management. The results of this study suggest that a company that intends to implement a lean manufacturing system should put emphasis on change readiness, leadership and management, change agent systems, team development and empowerment, communication, and review systems. Both the quantitative and qualitative results of this study indicate an interesting finding: successful lean manufacturing implementation significantly emphasises organizational change factors. A fundamental shift in an organization's management is required in order to introduce lean manufacturing system. Therefore, a framework of organizational change management developed may represent a novel framework for explaining the overall concept of implementing lean manufacturing systems.

This study responds to the need for a greater understanding of organizational change when implementing lean manufacturing system. The empirical evidence from qualitative study validates the notion that the successful implementation of lean manufacturing follows the emergent change approach in organizational change management. The findings of this study are also in alignment and support the work of [9], which report that the changes involved in lean manufacturing implementation follow an emergent strategy because the transformation requires a paradigm shift in the structure, strategy and technical capabilities of an organization. Furthermore, from a practitioner's point of view, the results of this study have important implications. Practitioners are often very keen to implement lean manufacturing systems, but they also exhibit a great deal of uncertainty about the process of implementation. Failure to recognize the organizational changes required to adapt to a lean manufacturing system will hinder the long-term benefits of lean manufacturing to an organization. This framework of organizational change is intended to provide practitioners with a better understanding of the transition to lean systems as well as clear guidance on how to minimize conflicts and resistance to the implementation of lean systems, thus improving the chance of success.

For future study, the authors recommend that an action research study may be beneficial for any future research. Problems faced by a case-study company could then be incorporated into the framework for further improvement and modification. It could also include the element of culture in the organizational change towards lean manufacturing implementation. The element of culture is also important since the change can operate in different ways within various cultures. Therefore, in the future research, the authors would like to recommend a thorough investigation could be done in this issue.

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