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# The Challenges of Lean Implementation: A Multiple Case Study in Malaysian Aerospace Companies

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## ABSTRACT

The purpose of this study was to determine the challenges in implementing lean process in Malaysian aerospace companies. Literature indicated that some companies failed to achieve full lean benefit. This study adopted qualitative multiple case study as the methodology. Three main steps in the case study protocol were followed. The data was collected through semi-structured interviews of sixteen respondents from four different companies in the aerospace industry. Thematic analysis was conducted for every case together with the cross-case analysis. The results of this study verified that the companies faced resistance from the employees. However, lack of commitment from the top management to implement lean and the influence of local culture on the companies have excerbated the challenges of lean implementation. The output of the study could serve as a guide for the companies to strengthen their effort of enhancing the employees commitment to implement lean process.

**Keywords:** Lean, challenges, aerospace industry, case study, Malaysia

## INTRODUCTION

Lean manufacturing also known as lean production or simply lean is a philosophy of continuous improvement and waste minimization in a manufacturing environment. Lean manufacturing has been used by many organizations to compete globally, and it is considered an evolution in the continuous improvement process in manufacturing concept (Womack & Jones, 1994; Womack, Jones &1990). Lean started with the visit of the founder of Toyota to America in the 1950s to learn about the widely known Ford mass manufacturing method. Realizing that Ford version of mass production does not suit Toyota, Taichi Ohno adopted the elucidation of mass production and thus, Toyota Manufacturing System (TPS) began to evolve (Liker, 2004; Womack & Jones, 2003; Bowen & Spear, 1999). During the late 1980s, a team from Massachusetts Institute of Technology (MIT) International Motor Vehicle Program headed by Womack coined the term lean to describe Toyota's system. Lean literally means "very little fat". Within an organizational context, lean produces improvements in efficiency, productivity, reduces waste and creates more value to the customers. Womack and Jones (2003) define "value" as "a capability provided to the customer at the right time and at the right price as defined in each case by the customer," whereas "waste" is said to be "any human activity that absorbs resources but creates no value." On the other hand, Ohno (1988) introduced seven types of waste in manufacturing. The seven types of waste are overproduction, transport, inventory, waiting, defect, motion and over processing. The philosophy of lean is to maximize customer value while minimizing waste (Womack & Jones, 1990). Value from the customer's perspective can be translated into specific products or services that meet the customers' need efficiently at the right time and the right price. The translation of value to the product can only be achieved by understanding what every step is doing to

provide value to the next step of the manufacturing process. Another philosophy of lean that is currently forgotten is the "respect for people" (Cardon & Bribiescas, 2005). This principle is deeply embedded in TPS (Liker, 2004). Respect for people promotes trust and communication between employees; humanizing the working environment and empowerment of the personnel (Hines, Holweg & Rich, 2004) and self-directed learning (Puvanasvaran et al., 2008). Respect for people has been around for a long time but slowly overlooked as lean expanded. The most frequently cited lean principles in the literature are from Womack and Jones (2003). The five lean principles (Womack & Jones, 2003) are as follows:

- Specifying value from the customers' perspectives
- Identifying and mapping the value stream
- Creating continuous flow
- Responding to customer pull
- Pursing perfection

The awareness of lean potential has heightened the number of organizations to adopt some forms of lean program. Over the past few decades, lean is used by many industries as a method of process improvement. Among the large organizations that have adopted lean practices are Airbus (Drew, McCallum & Roggenhofer, 2004), Boeing (Dane & Kleiner, 2016; Leitner, 2005), General Motors (Moore, Mothersell & Motwani, 2014; Liker, 2004), Chrysler and Ford (Dane & Kleiner, 2016; Cable, 2009), Porsche (Prakash & Kumar, 2011) and others. Womack and Jones (2003) introduced common terms like value, flow and customer to enhance their understanding of lean and indicated an evolution in the conceptualization and the application of lean. Lean manufacturing has expanded to service industry like healthcare, education, legal and public sector (Bateman, Radnor & Glennon, 2018; Vinodh, & Dhakshinamoorthy, 2018; Patri & Suresh 2018; Nadeau 2017; Bateman, Hines, & Davidson, 2014).

**Malaysian Aerospace Industry**

Malaysian aerospace industry has been selected by the Government as a strategic sector with high growth potential in the country's technological development and industrialization agenda. Currently, Malaysia has an internationally recognized aerospace industry with a well structure ecosystem and has gained respected position in South East Asia. To date, the aerospace industry has attracted more than twenty thousand employees and has listed over two hundred companies in the field of aircraft, aviation, and composites research and manufacturing. Currently, Malaysia is among the leading suppliers for aircraft structure components mainly for the premier Original Equipment Manufacturers (OEM) for Airbus and Boeing.

Being the first and second tier aerospace component manufacturers and the suppliers to the two premier aerospace manufacturing companies, Malaysian aerospace companies are striving to achieve their missions in providing high quality and cost competitive products to the customers. Airbus and Boeing are the two huge companies that are implementing lean manufacturing and have become lean enterprises or moved towards that direction. Today's supply chain is becoming highly interdependent rather than independent, as it has been the case in the past. Being a part of lean enterprise value chain proactively requires the aerospace companies in Malaysia to implement lean prcess. Several studies have been conducted to study lean in this industry (Nordin & Othman, 2014; Abdullah & Ahmad, 2010; Puvanasvaran et al., 2008; Effendi & Mahmood, 2008).

**Criticisms on Lean**

Lean offers tremendous benefits, and it is often considered as one of the most important strategies for companies that wish to obtain global performance. Lean has also been able to improve the productivity substantially, efficiency and overall competitiveness of manufacturing companies in a variety of industrial sectors ─ from automotive, electronics and to aerospace industry (Jadhav, Matha & Rane, 2015; Tuli & Shankar, 2015; Martinez-Jurado & Moyano-Fuentes, 2014; Roslin et al., 2014; Hines et al., 2008; Lewis, 2008; Doolen & Hacker, 2005; Mathaisel, 2005; Liker, 2004; Crute et al., 2003;

Shah & Ward, 2003; Mathaisel & Comm, 2000). Lean also could reduce operational cost to securing competitive advantage and yet many companies failed to reach the full lean advantage.

The downfall of lean implementation can be seen across the globe. A research by Aberdeen Group (2006) stated that sixty-eight percent of the lean companies in the UK sees lean in a narrow manner. Lean objectives should not only focus on cost reduction but more toward producing value to the business and customers. The Manufacturing Performance Institute (MPI) and Census of Manufacturers (2007) conducted a study on lean companies in the United States. Twenty-four percent of the companies reported achieving a significant result, whereas the rest of the surveyed companies are not achieving the lean promise. Another finding by Pedersen and Huniche (2011) reported that up to 70 percent of the companies in Danish public sector that are implementing lean have failed. The same situation occurs in China where more than twenty enterprises implementing lean have failed to achieve its benefit (Chen & Meng, 2010). Panwar, Jain and Rathore (2016) also reported similar result in India. Literature has indicated that the most apparent reason for the derailment of lean is the people-related factor. Based on the findings from literature, the researcher has classified the factors into two categories: organizational culture and people.

**Organizational Culture**

One of the prevailing criticisms of lean is the issue of organizational culture. The issue has been reported in the literature for decades (Bicheno & Holweg, 2016; Zhou, 2016; Bortolotti et al., 2015; Bhasin, 2015; Jadhav et al., 2014; Dombrowski, Mielke, & Engel 2012; Atkinson, 2010; Nordin, Deros & Wahab, 2010; Singh, Garg & Shrama, 2010; Hines et al., 2008; Sim & Rodgers, 2008; Liker, 2004; Womack & Jones, 2003; Boyer & Sovilla, 2003). Culture is a system of shared values, beliefs, and assumptions that people across the organization share. Organizational culture impacts performance because it affects individual behaviors. The problem begins when organization waits for the "physical implementation" to occur before turning to changing the culture. The issue of culture and management should be tackled before the real lean implementation begins. It is imperative to address the organizational culture during lean implementation (Bhasin 2011; 2013). Consequently, the organization failed to engage the employees in creating lean cultural improvement (Liker & Houseus, 2008; Liker, 2004; Spear & Bowen, 1999). Lean requires more than changing the manufacturing process but more of cultural change. It requires a transformation in corporate culture, practices, processes, and management (Womack et al., 2003).

Lean has been adopted in various industries across the globe. Each of these regions is different and unique according to the organizational culture and national culture; therefore, to accomplish successful lean system, each region needs to have the appropriate combination of both organizational culture and lean culture. Misunderstanding can occur due to the cultural differences during the adaptation of lean. Wong (2007) highlights that organizational culture and national culture could not be kept separate in lean transformation. Within lean philosophy, culture is reflected by two core values: respect for the people and continuous improvement. "Respect for the people" represents a belief that employees are a company's greatest asset. Liker (2008) describes the culture in Toyota as the way employees think and act every day. For those who have worked in Toyota for decades, this has become their second character.

**People**

In this study, people are referred to both the top management and the employees in the selected organizations. People are an essential part of the lean philosophy and culture (Liker, 2004; Mann, 2010). The prominent lean thinkers have highlighted the importance of people in lean. Krafick (1988) and Ohno (1988) explain the philosophy of “respect for people” in lean. Womack (1990) discusses teamwork, communication, and continuous improvement. Shah and Ward (2003) explain the importance of human resource management in the lean practices. Liker (2004; 2008) discusses the role of culture, respect for people, communication, leadership, continuous improvement and continuous learning. Both the top management and the employees need to understand and to play their part to sustain lean transformation. There has to be total employee involvement and a clear vision and mission, which the top management should highlight. Empowerment of employees can lead to higher performance (Vidal, 2007) especially when the manager plays the role of a facilitator and it should be made as an imperative requirement (Lee, 2007) in this transformation.

Employee attitude ranks as the main obstacle to lean. This includes resistance to change, opposition and lack of understanding (Zhou, 2016; Jadhav et al., 2014; Rose et al., 2013; Panizzolo et al., 2012; Bhasin, 2011; Saurin et al., 2011; Nordin et al., 2010; Grove et al., 2010; Yang & Yu, 2010, Wong et al., 2009; Lee, 2007; Spear et al., 1999). Wong et al. (2009) states that employees' resistance to lean system is a more significant barrier compared to financial resource limitation and cultural issues. The factors of competency such as lacking and inadequate training among employees (Mc Lean et al., 2017; Zhou, 2016; Jadhav et al., 2014), insufficient workforce knowledge and skills (Dombrowski et al., 2012; Bhasin, 2011; Olatunji, 2008; Achanga, Shehab, Roy & Nelder, 2006) also hinder the implementation of lean. Shah and Ward (2003) and Spear et al. (1999) agree that lean can be implemented by improving the attitudes and values of the employees.

A poor communication (Jadhav et al., 2014; Nordin et al., 2010; Shook, 2010; Sharrer-Rathje et al. 2009; Lee, 2007) between the employees and the top management also contributes the barriers. Shah and Ward (2003) stress the importance of context in lean implementation. Some barriers are specific to certain countries. Bollbach (2014) and Aminpour and Woetzel (2006) discover hierarchical structure in the organization in China that could hinder lean practices. Bhasin (2011) also discusses the importance of supervision in making sure the employees receive adequate knowledge and skill.

To implement lean, Kotter (2007) and Emiliani (2008) assert that top management's commitment is necessary to encourage lower level employees to get involved in the transformation. Top management should also provide support for the change or the resources required. Top management also needs to commit and provide proper support, not only intellectual support but more toward physical engagement. Top management's passive attitude toward lean (Emiliani, 2008) may negatively impact the employees' perception of their leadership. Lack of involvement and commitment can also lead to other issues, including limited access to resources, lengthy decision-making processes and communication breakdowns (Scherrer-Rathje et al., 2009). Other issues from the top management including the insufficient management skill (Jadhav et al., 2014; Bhasin 2011). Emiliani (2004) stresses that information flow also requires the involvement of the "blue collar" to make right decision over responsibility. Leadership skill also influences the successful lean practices (Mc Lean et al., 2017; Jadhav et al., 2014; Grove et al., 2010; Nordin et al., 2010).

## PROBLEM STATEMENT

Lean promises tremendous benefits regarding competitive advantage and sustainability. Organizations are investing heavily in lean initiatives; yet, many have difficulty integrating it successfully with their organization (Bhasin, 2012b; 2012c). Literature has shown that the prominent barrier to lean practices is people related factor. To understand the human mind is best utilized by the interpretivism approach. Interpretivist approach supports qualitative research (Creswell, 2009; Thomas, 2003). Numerous studies on lean implementation barriers in Malaysia have been reported in the literature (Khalili, Ismail, Rahman & Radzi, 2017; Wahab, Mukhtar & Sulaiman, 2017; Zakaria, Mohamed, Ab Rahid & Rose, 2017; Khusaini, Ismail & Rashid, 2016; Rohani & Zahraee, 2015; Nordin, Deros & Wahab, 2010; Rose, Deros & Rahman, 2013). However to the researcher's knowledge, none of the studies were conducted in the context of the Malaysian Aerospace Industries, specifically for the aerospace manufacturing sector.

## THE PURPOSE OF THE STUDY

The purpose of this study was to identify the lean manufacturing implementation challenges in Malaysian aerospace companies through qualitative, multiple case study approach. Based on the objective, two research questions were developed. The research questions are as follows:

1. What are the current status of lean practices in selected aerospace companies?
2. What are the challenges of lean implementation faced by the selected companies?

## METHODOLOGY

This study utilized the qualitative, multiple case study approach. The reason to adopt a case study approach as suggested by Yin (2009) and Eisenhardt (1989) is to gain a more comprehensive understanding and insight of the lean implementation in aerospace companies in Malaysia. This approach enabled the researcher to address the issues concerning why an event happens and how they unfold over time (Denzin & Lincoln, 2005). Furthermore, the utilization of the case study method is suitable for this study because it *explores a real-life, contemporary bounded system (a case) over time* (Creswell, 2007). In addition, adopting multiple case studies analyzes the data within each situation and also across different situations (Yin, 2012). Four case studies were selected comprising of two local companies and two foreign companies. It is because there are only two local companies in tier 1 and 2 supply chain in this industry. Therefore. it is logical to include two more foreign-owned companies in this study for the comparative case study.

This study also utilized the case study protocol (CSP) by Eisenhardt (1989) to structure and to manage the research. Eisenhardt's (1989) CSP was chosen because it provides a clear road map for the study. In the selection of the respondents, the researchers used a purposive sampling method. Sixteen respondents were selected from the four companies. The overview of the respondents is presented in Table 1.

Table 1: The overview of the respondents

| Company | Respondents | Position | Background | Working experience (Years) |
|---|---|---|---|---|
| A | A(I) | Continuous Improvement Manager | Engineering | 16 |
| A | A(II) | Assistant Manager | Engineering | 20 |
| A | A(III) | Engineer | Engineering | 20 |
| A | A(IV) | Group Chief Marketing Officer | Management | 10 |
| B | B (I) | General manager | Engineering | 22 |
| B | B (II) | Production Manager | Engineering | 5 |
| B | B (III) | Engineer | Engineering | 2 |
| B | B (IV | Manager | Engineering | 5 |
| C | C (I) | Chief Executive Officer | Management | 4 |
| C | C(II) | Manager | Management | 10 |
| C | C (III) | Lean Manager | Engineering | 13 |
| C | C (IV) | Production Manager | Management | 13 |
| D | D (I) | Lean Manager | Management | One year in the company<br>15 years in other companies |
| D | D (II) | Engineer | Engineering | 5 |
| D | D (III) | Production Manager | Engineering | 5 |

For this research, respondents are assumed to be knowledgeable to answer the interview questions where most of them having experience of around two years to sixteen years in the aerospace industry. This study utilized semi-structured interview as the main instrument for data collection. Generally, the interview questions are classified into three parts: introduction questions, key questions, which includes some probing questions and the concluding questions. The first part of the questions was to reveal the respondents' background and their involvement in lean. The key questions are specifically design to reveal the overall picture of lean implementation. The questions like why and when lean is implemented, the current status of lean implementation and the resources committed to lean, the employee acceptance of lean, the difficulties faced in implementing lean and other probing questions. The closing questions are related to the efforts and steps taken by the companies to resolve the issue. The researcher employed multiple strategies to establish trustworthiness and to minimize the risk of errors in this study (Lietz et al., 2006; Patton, 2002; Strauss & Corbin, 1998; Strauss & Corbin, 1998). These strategies consist of credibility (internal validity), transferability (external validity) and dependability (reliability).

## COMPANY OVERVIEWS

This section provides an overview of the companies.

**Company A**
Company A is located in the southern state of Malaysia and was established in 1990 to spearhead Malaysia entrée into composites and aerospace industries. With the vision to become the center of excellence in aerospace and composites, company A has become the global partners to premier OEM and other global aerospace companies. Today, Company A represents about twenty percent of the domestic aerospace market and contributes to about thirty-six percent of total employment in the Malaysian aerospace manufacturing industry. Company A has started lean in 2003, focusing on the manufacturing department. A year later the CEO launched lean program to be part of Company A working culture.

**Company B**
Company B, another Malaysian-owned company, commenced its operations in 1992 and located somewhere nearby Kuala Lumpur as a premier manufacturer of metal-based aerospace parts, components, and assemblies. Since its inception, company B has been awarded various contracts from global aerospace companies. A new milestone was achieved in 1995 when the locally manufactured aircraft by company B took off the air on its inaugural flight on the 25th May 1995 at the Subang International Airport in Kuala Lumpur. Company B started implementing lean since 2009 based on customer requirements. Company B is another Malaysian company where the majority of workers are Malay. Company B is a wholly owned subsidiary of the National Aerospace and Defence Industries (NADI) Bhd.

**Company C**
Company C is situated in the northern state of Malaysia with total employment of more than 900 personnel. Initially, when it was established, company C is a joint venture between two global aerospace companies and two Government-linked Companies (GLC) in Malaysia. In 2009, company C became the property of two global companies. Company C is headed by one of the representatives of the parent companies with more than eighty percent of the employees is local. Lean is implemented by the two companies that own company C, so it is common for a subsidiary company to implement lean, as well. Company C that is located in Kedah is also expected to grow its workforce beyond its current employees.

**Company D**
The parent company of D is based in the United States, and it is one of the largest non-OEM manufacturers in the world. The vision to become integrated, global company has initiated the parent

company to open its manufacturing facility in Malaysia. The 242,000-square-foot facility was announced in 2007 in Malaysia and began operating early in 2009. The former Prime Minister of Malaysia officiated the opening ceremony on October 28th, 2009 (AviationPros.com, 2018). It was another milestone for Malaysia on its journey to become one the global players in the aerospace industry. The parent company well establishes lean. Therefore, lean is not foreign to company D even though it is still young compared to the other three companies

## FINDINGS AND DISCUSSION

This section analyzed the data obtained through the qualitative in-depth interviews and to provide empirical findings from the multiple case studies. The researcher adopted Braun and Clarke (2003) thematic analysis in order to develop codes and themes. Braun and Clarke's thematic analysis is simple to use for researchers who are unfamiliar with more complex types of qualitative analysis. It allows for flexibility in the researchers choice of theoretical and conceptual framework. For multiple case study approach , two types of data analysis are required : with-in case analysis and cross-case analysis.

### With-in Case Analysis

This section begins with the findings from the first research question. The first research question is intended to investigate the status of lean implementation in all companies. The finding from research question one is tabulated in Table 2.

Table 2: The findings for research question one

| Company | Status of lean implementation | | | |
|---|---|---|---|---|
| | **How lean started** | **Duration of lean** | **Resources committed to lean** | **Current status** |
| A | Customer persuasion | More than ten years | Internal change agent | Re-launching lean |
| B | Customer persuasion | More than five years | Internal change agent | Re-launching lean |
| C | Since beginning | More than ten years | Internal and external change agent | Re-launching lean |
| D | Since beginning | More than five years | Module from the parent company | Full implementation |

Company A started the lean implementation based on the persuasion from the customer. One of the respondents explained the adoption of lean through the persuasion of the major client ─ Airbus. Company A has a lean department that has a specific task of training the employees and monitoring the lean activities. Lean has been implemented more than ten years in company A, after a while the culture has disappeared. Currently, they are in the process of restarting to implement lean as explained by one of the respondents. Lean in company B started from the customer. Being the customer for the premier lean enterprise has influenced company B to implement lean as well. Regarding resources for lean; company B has a department that is explicitly overseeing any lean activities. The respondents are not certain where the company now regarding lean implementation. From their knowledge, lean has been around for a while, but the benefits are not entirely achieved. Delivery is still slow, as agreed by one of the respondents.

Company C started to implement lean from the moment the company was set up. Company C is a product of a strategic alliance between the premier OEM and another American company. The reason for its establishment is to favour the regional economic growth forecast in Asia. Company C also has a specific lean department to monitor and support any lean activities. The other three respondents also agreed that lean has already been implemented, but it is slowly deteriorating. C (III) as the managing director, took the initiative to re-launch lean with the support from the lean department. When the researcher asked how to re-launch lean, C (III) explained by re-educating the employees on the purpose and vision of the company and deliberating on lean philosophy.

The parent company of company D is one of the biggest key players in the aerospace industry. It is an independent global supplier of multiple customers and platforms. In addition to having its lean department, the parent company of D aided the lean implementation by providing the syllabus, modules, and programs. The parent company has practised lean for the past seventeen years and is the largest non-OEM manufacturer in the aerospace industry. Company D is doing well despite the infant stage of lean adoption. The findings from research question two are tabulated in Table 3.

Table 3: Findings from research question two

| Case study | Challenges faced in implementing lean |
|---|---|
| Case study A | Employee attitude<br>Employee competency<br>Top management<br>Organizational culture |
| Case study B | Employee attitude<br>Organizational culture<br>Existing infrastructure |
| Case study C | Employee attitude |
| Case study D | Employee attitude |

**Case Study A**

All of the respondents agreed that the attitude of the employees creates obstacles to lean. Lean is seen as a curriculum and using tools and techniques rather than the philosophy itself. The respondents also added that there is no ownership feeling of lean. The employees need to adopt lean wholeheartedly for them to have that ownership feeling. One of the respondents explained that the lack of motivation and knowledge contribute to the challenges of lean. He described that people do not practice the concept of continuous improvement as their *self-improvement.* Company A provides training with the expectation that later their employees would be able to disseminate the knowledge that they acquired to another group of employees. Unfortunately, sometimes this does not happen.

During the initial implementation, company A has a smooth lean journey until the top management started some major restructuring two years back. The researcher is made aware that the decision to restructure is not in full agreement with the employees. People and production are clustered based on customers' requirements, or value streams. This restructuring forces the employees to focus on the assigned customer needs, which results in less interaction with other employees from different value stream. It has caused the working culture began to change, and lean culture began to disappear. This restructuring creates silos and islands. Finding also reveals the lack of understanding of lean by the top management. It is like a chain reaction. If the top management does not fully understand lean, the information that transpires to employees will also be vague and incomplete. The implementation of lean in Company A is a bottom-up approach. Lean begins from the production floor. The top management does not understand how lean works. Lack of understanding causes the top management refuses to implement a simple tool like 5S. Another critical issue is within ten years Company A has changed leadership for five times. Each new manager or leader has his way of leading and managing the company. Therefore, it has created confusion and lack of commitment from employees.

**Case Study B**

Initially, when lean is implemented, people were very sceptical about the benefits. To the extent, there are some employees are thinking of resigning from the company. However, the HR manager manages to persuade them to stay and brief them on the extra allowances and incentives that they will be getting. When the managers keep their promises, people are more motivated to do lean. Previously company B is in the business of making rifles. When it embarked on aerospace business, some of the employees are still around. There is a conflict between the senior employees and the newcomers. The senior employees are the most difficult to handle. Most of the respondents agree that senior workers are more experienced, yet they are incognizant and have the negative attitude towards change.

Two of the respondents expressed their concern about the influence of local culture in the company. The respondents revealed that there exist tribes or coterie in the company. They can sense the feeling of jealousy among the employees. Due to this issue; the new employees who mostly are young graduates are intimidated by this and contributed to the high turnover. Another emerging theme that contributes to the challenges is the existing infrastructure in company B. The layout of the plant is designed for the previous rifle production. When this issue is raised by the board of directors, there is a suggestion of relocation.

**Case Study C**

Based on the feedback from the respondents, it is clear that the employees do not understand how lean works. Their perception of lean is additional work. The employees are complaining that their work is already overloaded. The employees also incline to short-term results. This attitude towards lean always fails because it does not account for the time and effort required to remedy the root of the initial problem. Plus, implementing lean is a time commitment all on its own.

**Case Study D**

Similar to other companies, the primary challenge is from the employees. They have become complacent and challenging to accept changes. The employees do not understand the philosophy of lean and what long-term benefits it will bring. Education and training play a crucial role in breaking this resistance. It also requires close monitoring and engagement. Respondents from company D agreed that the challenges are manageable, and they are confident that this can be tackled in time with the support from the top management and the parent company.

**Cross-Case Analysis**

Table 4 shows a cross-case analysis that was conducted to synthesis the overall results. The researcher categorized, tabulated and analyzed the individual cases as windows to compare and give insight for the cross-case analysis. In this analysis, the researcher considered in what areas the cases suggest the same points, and where they differ.

Table 4: The findings from the cross-case analysis

| Findings | Case study | | | |
|---|---|---|---|---|
| | **A** | **B** | **C** | **D** |
| **Challenges faced during lean implementation** | | | | |
| ➢ Top management | ✓ | | | |
| ➢ Culture | ✓ | ✓ | | |
| ➢ Employee attitude | ✓ | ✓ | ✓ | ✓ |
| ➢ Employee competency | ✓ | | | |
| ➢ Existing Infrastructure | | ✓ | | |

The common challenges faced by these companies are the employee attitude. Company A also confronted with the issue of employee competency, top management and culture. Company B, on the other hand, encountered a unique issue; the existing infrastructure. The following are the detailed cross-case analysis of the findings.

**Employee Attitude**

Attitude is a way of thinking that influence personal behavior. The right attitude toward lean resulted in employees' commitment, participation and engagement. The evidence from with-in case analysis exhibited all companies are facing this issue with employees' attitude. Resistance by the employees is found in all companies. Resistance is refusing to comply with something. The opposition may be due to the fear of change. There are many possible reasons why employees fear changes, especially from those who firmly believe the current way of doing thing works. New ways represent moving away from the comfort zone, additional work, more time and added goal. Company A and company B both have senior employees that have been working in the companies for an extended period. Senior

employees are said to be complacent and have entered a comfort zone wherein their position is clearly defined. The reason why employees resist change can also be due to the lack of understanding of lean. Findings from the analysis, discover that the employees are sceptical of the benefits. The attitude of "what is it for me" explains the level of awareness of lean is still at the surface level. Thinking lean as a set of tools reflecting the superficial understanding of lean philosophy. Similar findings can be seen in company C and company D.

The findings from the data analysis with regard to employee attitude corroborates with the outcome from the literature (Zhou, 2016; Jadhav et al., 2014; Bhasin 2011; Panizzolo et al, 2012; Saurin et al., 2011; Wong et al., 2009; Rose et al., 2013; Nordin et al., 2010; Olatunji, 2008; Spear et al.,1999; Grove et al., 2010; Lee, 2007; Yang & Yu, 2010). Another intriguing finding that is not discussed throughout the literature is the challenge posed by the gap between the junior and senior employees. It is apparent in company B. The junior employees that come with higher qualifications and salaries threaten the older generations. They are more tech-savvy, "friendlier' with the new tools and equipment and proactive. The feeling of jealousy and the emergence of tribes added to the already existing problems. Human Resource Department (HRD) should consider taking some initiatives to ensure that these two generations understand that are not competing but complementing each other. The companies should develop diverse teamwork so that both generations can collaborate and customising the rewards.

**Employee Competency**

Finding from company A also reveals the employees are lack of knowledge and skills and lack of supervision. Supervision is when a leader or manager oversees the work done by his subordinates. It is a critical job because it involves coaching, training and developing the subordinates' skills and knowledge. Supervision in lean requires direct observation and immediate attention. Kotter (2007) describes in his book, *Leading Change* explains there must be a sense of urgency for change to be implemented. There is a saying that reflects the role of supervision; "*if the worker has not learned, the instructor has not taught".* This finding also in agreement with Dombrowski et al., (2012), Bhasin (2011), Achanga et al., (2008) and Olatunji (2008) findings.

**Top Management**

Company A acknowledged top management as the contributing factor to the challenges in lean. The other three companies, B, C, and D agreed that their top management is fully supportive of any lean initiatives. This finding produced results, which corroborate the findings of much of the previous work in this field where top management support plays a critical role in implementing lean (Emiliani, 2004, 2008; Kotter, 2007). Even though a company's initiatives for lean manufacturing implementation should come from both senior and middle management, visible and active senior management is critical (Scherrer-Rathje *et al*., 2009). Company A has been implementing lean for more than ten years. By looking at the duration, the implementation should be in full swing. The reason is due to the frequent change of leaders. Standard practice usually requires three or four years to utterly comfortable to lead. Changing leaders frequently within a decade will increase the distance between employees and leaders. Furthermore, it will create leaders who are not committed to lean. Company C and D parent companies are leaders in lean manufacturing practices. Leaders from all company B, C and D are foreigners and coming from the lean background or have a vast knowledge of lean.

**Organizational Culture**

The respondents from Company A and B agree that organisational culture is one of the obstacles in lean. Both companies revealed the same finding, lean is fading. For company A, the main contributor for this issue is the existence of the value streams. The setbacks of this structure are it creates a self-serving island and silo-working environment where interactions and communications across all structures weaken. Lean culture is about working together not silos. Based on the with-in case analysis for company B, a large number of old workers from the previous business are still around. They are the most difficult to handle and has become the leading contributor to this issue. Company C and D do not see organisational culture as the barrier to lean is due to the strong commitment by the top management. One of the enablers for good working culture is the influence of the effective lean leader. The leader leads by setting the vision, providing the roadmap, inspire and shape the behaviour of the

employees. Leadership plays a significant role in cultural change.

**Existing infrastructure**
This is an emerging theme from case study B. Some of the existing infrastructure of the previous industry is not compatible with lean manufacturing layout. As discussed in the findings, the management is considering relocation as one of the possible options.

## IMPLICATION OF THE STUDY

Although the study was not conducted using a new method, it does give a new understanding into the research phenomenon by using a qualitative approach that is a multiple case study. The result of the case study provides a meaningful insight in explaining the difference in findings from the companies (local and foreign) The results explain the differences in practicing lean between the local and the foreign companies. The findings also provide insights on why some obstacles faced by only certain companies and the different pace of lean implementation. Employee attitude is shown to be a universal challenge faced by most organizations that practice lean process. The results are quite similar with the findings from the literature. An important theme that emerged from the study is the issue of the existing infrastructure that contributes to the obstacles in implementing lean. The finding is significant since this theme has not been discussed in the literature. This theme influences the quality of lean implementation.

## CONCLUSION AND RECOMMENDATIONS

The article discussed about the challenges for lean implementation in the specific context of aerospace industry. The aerospace industry is a multi-billion dollar investment and has tremendous pressure to become more efficient. Lean is adopted for addressing challenges and meeting expectations and implemented across the supply chain. The problems faced by the aerospace companies are not necessarily more difficult than that implementing in other manufacturing industries. The findings produced some challenges that are similar to the findings from the literature and one new finding to the current body of knowledge. As the study is limited to the aerospace industry, further studies should be conducted to verify the challenge of infrastructure in lean implementation in other industries.

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