

# A Theoretical analysis of Lean implementation in Airline industry

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## **Abstract**

Lean production has a potential to strengthen the competitive advantage of the companies. As the airline business sector proceeds to quickly extend and advance; the current aircrafts management is facing a challenge of having to balance the long term goals with short term answers. Satisfaction of the clients has turned out to be altogether critical for airline operations and this resulted to more focus on the service quality. Lean's client centered topic for enhancing service quality has picked up a drive in services; but, the implementation of Lean in this industry is way behind health and manufacturing services. Although a number of studies have been conducted over the past few decades to address these issues but there is still a gap in the current literature review, therefore the aim of this paper was to theoretically assess the lean implementation in airline industry. The results of the critical analysis of the current literature clearly indicate that there are flaws related to the country and area of the studies. Most of the studies are based in UK and USA and the previous researchers have focused more on manufacturing companies.

Keywords: Lean, Lean production, Airline, Quality improvement, Service

## **1.0 Introduction**

The airline industry has made a positive impact in the world and recognized for being one of the fastest growing sectors worldwide, Scholtz A, 1998. South Africa is listed amongst top emerged republics worldwide, known for fascinating tourists, business people, scholars and persons from all works of life, Luke RJ, 2015. SA has various airports catering for both international and domestic airlines, allocated in several. These airports play a significant part in the economy and certainly the African economy as a whole. OR Tambo is a primary airport in South Africa for International and domestic travel located in the city of Johannesburg. It is South African Airlines' center offering non-stop flights to over 20 South African destinations and to six continents globally.

SA has an immense number of aircrafts that fly between its enormous urban communities, and littler ones, with rates that range from top notch to cut-value economy. The airline environment in SA was lightly regulated from 1934,

although the SA Railways & Harbors Administration (SAR&H) pursued to secure their railway services at the cost of air travel. During World War2, the domestic airlines were offered by overseas carriers, like SABENA, BOAC and Southern Rhodesia Air Services, at affordable rates. This stopped when South African Airways (SAA) took over domestic services and increased all rates by over 25%. The reduction of rates was quickly enforced upon SAA, but the government decided to continue with regulation and implemented an air traffic policy favoring the national airline for all main domestic routes. South African domestic air services were controlled in 1949 over the Air Services Act (ASA). This stayed in force for 41 years. Later the Domestic Air Transport Policy was issued and in 1991 it became an Act of Parliament effectively deregulating the industry. In 1993 the South African international air policy was liberalised, as also witnessed by Scholtz A, 1998. This resulted to a change in South African air transport environment. Among these changes, the country started experiencing an increase of international carriers flying to and from South Africa and more airlines started competing on the domestic market. These are the changes that were not previously experienced and which in turn, they placed further pressure on the South African airlines to increase the service quality and minimize costs Scholtz A, 1998.

With more airlines entering into this sector, the competition began and the travellers started to have a freedom of choosing their preferred airlines, depending on the preference and quality of service, Huang et al, 2006. For the survival of organizations in any service sector, organizations constantly attempt to ascertain ways of improving the overall organisation performance with the object of improving their turn over. The core purpose of these improvement plans is to improve the systems, processes, overall customer experience and the organization baseline. Lean approach being one of the improvement tools has been well recognized in the manufacturing industry for its ability to improve processes, which is not the case in the service sector. This paper wishes to explore and examine the impacts of implementing lean in this sector. The main aim of the Lean thinking is continual process improvement by removing non-value added steps, and increasing customer value, Vermeulen, Harm, Pretorius, Kruger,2014. Lean is viewed as a controlling process, centered on on-going improvement by reducing discrepancy in the processes and poor work conditions Vermeulen et al, 2013. Continuous improvement seeks to remove non-value added steps or waste.

This research introduces impacts of implementation and knowledge framework to enable service organisations to implement lean processes towards sustainable performance and excellence. Lean methodology is implemented because it ensures a smooth, quick flow of resources or materials, Vermeulen et al. Vermeulen et al defines waste as any movement that adds no add value to the business practices, to products & services. In other words, it is any movement that increases cost instead, but not significance to services and products. The main goal of any business is to be lean due to its ability to eliminate unproductive resources with the aim to enhance processes, systems and supply chains, Bosilj-Vuksic et al, 2008 & Demin, 2007. According to the researches done by Berry, Christiansen, Bruun & Ward 2007 & Bosilj-Vuksic, Ljubica, Skrinjar, & Stemberger 2008, waste contributes to underperformance of the organizations, process capability. As highlighted by Vermeulen et al. It is also noted that to reduce waste, organisations must implement a continuous improvement system mainly concentrating on the lessening of waste, achieving operating rate reductions and the determination to improve the effectiveness of business processes, Denim 2007.

## **1.1 Background**

The lives of human beings have been improved and how they conduct their businesses by the Air travel. Air travelling is the well-known model of travel. People use it for Leisure, business, it is convenient for people who want to reach their destination fast, Button (2008). This mode of transport has made it easy and possible to travel very long journeys, like crossing countries in a very short time and there is an increased demand for long trips. Airline industry has made a huge impact on the countries development, economy, and an impact upon the tourism industry, Basnet (2015). This has stimulated governments to develop and advance the necessary infrastructure, like modern airports as means to get attention from tourists. Airline industry is worldwide known for its constant improvements, all in the pursuit of satisfying their customers. This is the reason that has led all researchers to focus their studies more on service dimensions and satisfaction of the customers.

In air travel industry, to offer the best service to travelers is extremely significant for the continued existence of the organisation, effectiveness and continuous growth, Suki (2014). It has always been recommended that providing the best service quality to customers is an essential element to succeed and company survival in today's competitive business environment Basnet (2015). Airline industry is not only offering services, but also customer-centered and it always finds ways of understanding the customer needs better in different stages of their services. It is believed that in the airline industry, customer satisfaction is more critical because they do not offer any tangible items but just a service. For this reason service quality is vital in this industry because of its ability to attract and retain customers (Chang & Yeh, 2002; Liou & Tzang, 2007). To measure passenger satisfaction has been a standard practice in the last two decades, Lin, 2003. Very few studies have been done to explore the impact of lean implementation in this sector. For this reason, this paper aims to analyze the impacts of Lean implementation of the air travel industry. Most researchers have attempted to analyze and understand the service dimensions that matter to airline passengers. Researchers like Suki (2014) and Tolpa (2012) have analyzed and measured the passengers' expectations in terms of the dimensions of reliability; assurance; facilities; employees; flight patterns; customization and responsiveness.

## **2. Gap identification in the current literature**

To begin with the critical assessment of the existing literature on Lean, the ISI web of science data base was used with 'Lean manufacturing' as a key word. The search only focused on peer reviews articles published in English, falling under certain research areas. The search resulted in 1 750 studies that were critically assessed by means of titles and abstract with the purpose of developing additional boundaries and eliminating incorrect or unrelated entries (screening phase). Precisely, articles assessed are those, which focus on the lean. It should be pointed out that the studies that did not meet these requirements were not taken into account. This stage generated 305 studies focusing on lean manufacturing mainly in automotive industry, health care, electronics and general manufacturing. These studies were labelled on basis of set of standards, for example in this paper; the studies that were assessed were selected based on the citation. The underneath studies were chosen, ranging from 1997 - 2017 as they were cited the most.

**Table 1: critical assessment of previous studies**

Author	Type of manufacturing			Research Methodology		Country
	Automotive	Airline	Electronics	Qualitative	Quantitative	
Holweg (2007)	x			x		UK
Lewis (2000)				x		UK
Eckel & Neary (2010)					x	UK
Liker and Morgan (2006)	x			x		U.S.A
Simpson and Power (2005)	x			x		Australia
Dickson et al, (2009)				x		U.S.A
Doolen & Hecker (2005)			x		x	U.S.A
Seth & Gupta (2005)	x				x	India
Kim et al, (2006)				x		U.S.A
Sanchez et al, (2001)	x				x	U.S.A
Rothenburg et al, (2001)	x			x	x	U.S.A
Agarwal et al, (2005)					x	India
Alford et al, (2008)	x			x		UK
Vonderembse et al, (2005)	x			x		U.S.A
Yang ,Hong & Modi (2010)					x	U.S.A

The above studies have been grouped according to their sectors and we have observed that the majority of the studies conducted to explore the effectiveness of lean have focused more in the automotive industry. This is because the management philosophy and tools of “lean production” originate from the manufacturing sector, in which they were founded by Toyota Motor Corporation, viewed as the leader in making use of these performance improvement approaches. The studies have been categories in three groups, i.e. Automotive, general industrial companies; and electronics, below is the critical assessment of each study.

## **2.1 Automotive industry**

Liker and Morgan (2006) conducted a qualitative study in USA to understand the lean production system in Toyota. They noted that the “Toyota’s production system” (TPS) is based on “Lean” philosophies; these include emphasis on clients, on-going improvements and quality through reducing waste, and strongly incorporated upstream and down-

stream process as part of a lean value chain. Many industrial firms have implemented some kind of “lean initiatives.” Lately “Lean” has been adopted by many sectors including service sectors. However, a majority of these attempts represent limited, disorganised methods, speedy resolutions to lessen lead time, costs and to improve quality. They explained the management principles of Toyota production system that can be implemented across all industries. In addition they mentioned that most companies can learn from the Toyota approach, but the process is very complex than just attending a class. They explained this journey is a cultural transformation and a PDCA learning process. They concluded that, it is true system approach that effectively joins in individuals, practices and technology, thus this system must be implemented as an on-going, inclusive and synchronised approach for change and learning of the entire organisation.

In a similar way, Seth & Gupta (2005) conducted a research focusing on the Indian automotive sector. Their research noted that most of the manufacturing companies have been trying to be lean for the last few years. A rush to provide value to clients by adopting lean has generated determination for scholars and practitioners to use new approaches to attend to various wastes. Value stream mapping (VSM) has been effective in classifying and reducing wastes in a facility with related or same product routings, like in assembly amenities. They attempted to use value stream mapping as a tool to attain supplier productivity improvement in automotive industry. They concluded that all the suitable models and techniques must be applied in a manner that everybody who is linked in the value stream could work as a team to advance the overall flow to the clients with minimised or no waste at all.

Also Holweg (2006) performed a study to understand the lineage of “lean production” in UK automotive industry using a qualitative analysis. The purpose was to analyse an old research that resulted to the revolution of one the most powerful manufacturing paradigms of current times. He realised that the “lean production” did not only well challenged the recognised mass production processes in this sector, significantly moving the trade-off amongst productivity and quality. “Lean production” also resulted to reconsidering of a comprehensive range of industrial and service processes further than the high-volume repetitive industrial environment. The book called “The machine that changed the World” presented the term “lean production” in 1990, is the highest widely quoted references in operations management. Even though the just-in-time (JIT) manufacturing model was recognised earlier, the book played a significant part in distributing the concept outside of Japan. Although the practical façades of “lean production” have been extensively argued, the author wanted to examine the growth of the study at the MIT International Motor Vehicle Program (IMVP) that resulted to the commencement of the term “lean production”. Regardless of the previous existing information of JIT, the program was so strong in encouraging the “Lean production” idea. The research done by Holweg (2006) presents a historic account of the study that resulted to the construction and distribution of best powerful industrial paradigms of modern times and this is due to repeating sequence of interviews done with the writers, contributors and academics of the time.

Another study done by Simpson and Power (2005) aimed to explore the connection amongst a supplier & company’s level of environmental management. The study was done in Australia’s automotive industry using a qualitative analysis. They presented a theoretical framework and intensely looked at previous studies to examine this connection.

Through literature review, they found that attempts to advance or influence a supplier's environmental handling processes result to serious matters of transaction rates and efficiency of approach for the buyer. The literature permitted the improvement of a model for approaching issues of supplier environmental performance through lean supply. They agreed that the environmental performance of suppliers to the supply function can be an expensive attempt when not handled in a correct manner and the supplier has to be certain that their utmost interest lies in accepting direction and support from their customers.

Rothenburg et al, (2001) also conducted a study to explore 'Lean production'. They performed 2 different surveys from 31 automotive manufactures in North America and Japan. In depth interviews were also conducted with 156 staff from the assembly plants from 17 different plants. The results from both surveys and interviews suggested that lean management and reduction of air emission of volatile organic compounds are adversely connected. Lean manufacturing processes add to more effective use of paints and cleaning solvents, but these in process changes are insufficient to meet the most stringent air regulations. They established suggestion to support the relationship among lean processes and resources effectively. The findings were in theorised direction, they were not statistically significant. On the other side, the interviews recommended a stronger connection. They utilised them to define some mechanisms by which buffer minimization, work system and HR management, which is the three aspects of lean management, may be linked to environment management processes and performance. In both qualitative and quantitative methods, they found a complex connection among lean manufacturing and environmental performance that relied on the measure of environmental performance being assessed. They found proof that many lean manufactures have been willing to compromise some of the lean management principles so that they can reduce emissions. For instance, increasing painting batch sizes so that they reduce the voc emission in the pant, even though this is against the JIT principle of the pant.

Vonderembse et al, (2005) conducted a research in UK automotive industry using a qualitative analysis. They discussed the types of supply chains that are required for triumph across 3 categories of products: standard, innovative, and hybrid. This study provides understandings for discrete part manufacturing firms that design, implement, and participate in supply chains, based on the literature review, theory development, and case studies. It describes the features for standard, innovative, and hybrid products, and it provides a framework for understanding lean and agile supply chains. Lean Supply Chains (LSCs) employ on-going development efforts and emphasise on the reduction of non-value added steps across the supply chain. Agile Supply Chains (ASCs) respond to fast changing, recurrently fragmenting global markets by being active, context- specific, growth- focused, and agile supply chains to build a supply network that meets the product needs and requirements.

Another study was conducted by Alford et al, (2008) in UK to investigate the mass customisation in automotive industry. They noted that the automotive industrialists are progressively targeting for mass customisation, producing a number of products that almost every individual can get what they want. A number of product varieties are causing increasing rates and complication in manufacturing. How the manufacturing system produced by lean production will

react to this challenge is still unclear. Alford et al, (2008) recommended that an effective method must be built to back up decisions on initiatives intended at supporting customisation and stopping increasing rates and complications in manufacturing. The study recognised the significance of knowing the relationships in assembly and its supporting supply chain, and to shape an effective approach to inform investment decisions in technology and process management, to make a best system for mass customisation.

Sanchez et al, (2001) conducted a quantitative analysis using survey results obtained from automotive and industrial machinery plants situated in the Spanish region of Aragon in the beginning of 2000. The sample covered 107 organizations with 50 and above workers. They chose automotive and machinery sectors because other researches indicate that they are the most serious adopters of just-in-time and other lean production techniques. “Lean production” was more utilized to measure the organisation’s improvements, focusing on their production system and the determinants on the use of the indicators. They felt that there are not enough practical studies performed to measure the use of intermediate indicators to evaluate manufacturing changes towards lean production. Hence their study is planned to add to the practical literature on lean production making use of lean indicators my industrial organizations. They defined lean production as a theoretical context based on a few recognised philosophies and procedures. They recommended that some production indicators should be included in the company’s manufacturing information system.

## **2.2 General (Other sectors)**

Lewis 2000 conducted a study of Lean production in SMEs based in UK. A qualitative methodology was used where he interviewed 27 superiors in three different companies. The objective was to establish the influence it had on the total competitive spots of adopter companies. He felt that Lean nowadays is not fashionable but its principles are the model for a lot of companies, i.e. manufacturing and service companies. The author urged that lean production has a potential to strengthen the competitive advantage of the companies. According to the author, the uncertainty of lean assembly in practice can mean that the Lean application practice has the ability to make tactical resources to strengthen sustainable competitive advantage. He also recommended that applying Lean can limit the company’s capacity to attain long-term flexibility. He concluded with recommendations for further work.

Another study was done by Yang et al, 2010 in USA to explore the impact of “lean production” on business performance. They explored connections among “lean manufacturing practices”, “environmental management” and “business performance outcomes” using a quantitative analysis. AMOS was used to collect information from 309 global industrial companies to test theorised connections of this model. Past lean industrial practices are absolutely linked to environmental management processes as suggested by the results. They also discovered that these environmental management processes solely are badly linked to market and financial performance. However, the negative influence of environmental management practices on market and financial performance can be significantly decreased by the enhanced environmental performance. Their study further provided experiential proofs that environmental management practices are now a significant facilitating factor to solve the battles among environmental performance and lean manufacturing. The existing variances are due to strong points and statistical significance of a

number of suggested connections as recommended by background analyses. They concluded that to implement environmental management effectively, companies must quantify the environmental performance, and that the influence of environmental administration on further business performance results needs to be studied.

Agarwal et al, (2005), conducted a research of showing the metrics of lean, agile and leagile supply chain in China. They agreed that nowadays businesses embrace change as one of the main characteristics; as a result, it is becoming tougher ensuring the success and survival of the business. They emphasized the ability of the business environment to be flexible to changes, also to address market and customer requirements in a proactive approach. A supply chain adjusts to alterations if they are flexible and agile in nature. Their study further summarises the sensitiveness of the market, practice incorporation, information driver and flexibility measures of supply chain performance. They further investigated the link between lead-time, rates, quality, service level and the leanness and agility of a case supply chain in rapid moving consumer goods business. They concluded with the explanation of the context, which examines the influence of market winning criteria and market qualifying criteria on the three types of supply chains: lean, agile and leagile.

Kim et al, (2006) conducted a research on “lean production” in USA health care services using a qualitative methodology. They noted that as health care rates continue to increase, a range of practice development approaches have been suggested to attend to the described incompetence in health care services. The management principle and tools of “lean production” originate from the industrial sector, in which they were founded by Toyota Motor Corporation (TMC), regarded as the leader in making use of these performance development approaches. They agreed that lean has already experienced the incredible success in enhancing quality and effectiveness in both the industrial and the service industries. Their findings showed that, even though lean methods are new in health care services, the improvements reports are starting to show in the literature. They described some of the basic philosophies and principles of “lean production” approach and the ways in which these ideas can be implemented in health care services. They further described a number of achievement stories and continuous activities of “lean production” in several health care companies. They highlighted that hospitals are the perfect setting to implement lean production methods, because this approach could make a positive impact on patients. They concluded by clarifying a number of possible encounters in presenting and applying lean production methods in this sector. They added that Lean production is a unique tactic to bringing improved quality and effective attention to patients, and it is said that the health care environment can expect the same extent of triumph as industrial and service sectors when applying this approach. Health care organisations are informed to ensure that they deliver caution of superior quality with extra competence by applying these new values in their environment.

Another research in the healthcare industry based in USA was done by Dickson et al, (2009) using a qualitative analysis. They noted that ‘lean’ is a set of philosophies and methods that lead firms to repeatedly improve the products they offer by improving the necessary process steps while reducing the ones that do not add value. This improvement methodology has been applied in industrial for years and has always been linked with improved product quality and



largely company triumph. The main objective of their study was to assess if the implementation of “Lean” philosophies by an Emergency Department (ED) will improve emergency delivery services. They implemented a range of Lean techniques as means of improving patient and employee satisfaction in December 2005. The process redesign step emphasised mainly on producing development concepts from the forefront employees from all departments. Satisfaction of patients, expenditure per patient, time spend by patients/ length of admission, and number of patients were compared for calendar year 2005, i.e. before “Lean” and periodically after 2006 i.e. after Lean. Results showed that patient appointments went up by 9.23% in 2006. Even though this increase, the length of stay reduced to some extent and there was a massive increase in patient satisfaction. They concluded that lean enriched the value of the care they offered to patients. They noted that gathering information and ideas from the front employees was a better start to the success of the lean program. They further added that even though Lean signifies an important change to the way their services were delivered, the particular procedure modifications they did, tended to be easy to understand, small procedure modifications specific to unique people, process, and place. Lastly, they recommended that organisations that plan to implement “Lean” should put their emphasis on the basic principles of “Lean” rather than imitating certain process modifications made by other companies.

Eckel & Neary (2010) conducted a research on multi-product firms (MPFs). The scale and scope of MPFs are affected by globalization through competition and demand effects. They established a new model of MPFs, which emphasises the part of flexible manufacturing. Alterations in the range of products manufactured by companies are a significant factor of deviations in the final product and exports, this is in line with the increasing practical proof; this new model highlighted this hitherto-neglected channel of adjustment. Their emphasis was on the intra-firm adjustments within Multi Product Firms, they found that economy-wide shocks have an extensive influence on scale and scope. Furthermore, their investigation confirmed that general-equilibrium response, over fluctuations in salaries, are a significant factor of changes in product ranges. Their results suggested that modification practices within MPFs are very different from adjustments through exit and entry. Empirical evidence suggests that MPFs are an important feature of modern industries.

### **2.3 Electronics**

Doolen & Hecker (2005) conducted a study to review the lean assessment in organizations. The study focuses on electronics, using a quantitative methodology. They described the development of survey instrument to evaluate the implementation of lean processes. They used the literature review to classify lean industrial processes. Their findings were synthesized to make an instrument to measure level of implementation. An empirical study was completed using the survey across electronic organizations in the Pacific Northwest. It was discovered that even though electronic manufacturing organizations have applied a wide series of lean processes, the degree of implementation does not differ and may be linked to economic, operational or organizational factors.

### **2.4 Summary**

A lot of studies focused more on automotive manufacturing enterprises, electronics, healthcare and other manufacturing organisations. Unfortunately, from the above fifteen best studies that were selected, none of them

focused on the Airline industry. And again none of the studies were done in Africa; instead the majority of the studies were done in USA followed by UK. We have also noted that the researchers have tried to explore both the quantitative and qualitative methodologies on their studies, with qualitative methodology being used in 60% of the studies and followed by quantitative at 40%. Therefore future researchers have an option to combine both methodologies or use only the quantitative as it wasn't used as many times as qualitative analysis. The studies highlighted that, management principles of Toyota production system can be implemented across all industries. In addition they mentioned that most companies can learn from the Toyota way, but the process is far complex than just attending a class. They explained this journey as a cultural transformation and a PDCA learning process. The management philosophy and tools of lean production originate from the manufacturing sector, in which they were founded by Toyota Motor Corporation, viewed as the leader in making use of these performance improvement approaches. They agreed that lean has already experienced the incredible success in enhancing quality and effectiveness in both the manufacturing and the service industries. The results received from service companies that are already implementing Lean, showed that even though lean methods are new in this sector, but the improvements are noted. In line with changing success aspects, companies are moving from mass production to lean or agile. Lewis 2000 highlighted that applying Lean can limit the company's capacity to attain long-term flexibility. This is also agreed by Yusuf & Adeleye (2002) when they carried out a comparative research of lean and agile. They discovered the threats to lean and the drivers of agile manufacturing. Assessments performed to test the important difference in performance measures, showed that agile organisations always outperform the lean organisations. This is a philosophy that can be explored in future studies.

## **Conclusion**

As much as the lean concept is new in the service sector, some of the companies have adopted it already. The studies highlighted that, management principles of Lean can be implemented across all industries. The management philosophy and tools of lean production originate from the manufacturing sector. The principles of Lean are the model for a lot of organizations; these include Industrial and service organizations. Lean production has the ability to toughen the competitive advantage of the organisations. Airline industry is not only offering services, but also customer-centered and it always finds ways of understanding the customer needs better in different stages of their services. It is believed that in the airline industry, customer satisfaction is more critical because they do not offer any tangible items but just a service. For this reason service quality is vital in this industry because of its ability to attract and retain customers. This is the reason the study was aimed to theoretically assess the lean implementation in airline industry. The airline industry has made a positive impact in the world and recognized for being one of the fastest growing sectors worldwide. This is a main service sector that provides support to other key economic sectors such as tourism, manufacturing, international trade and business, it is therefore of utmost importance that the current researchers put their emphasis on this sector while closely monitoring the adoption and management of the quality improvement tools to advance the airline performance.

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