

The Effect of the Application of Lean Production and Supply Chain Management on the Quality of Public Administration Services: (Case Study: Hussein Educational Hospital in Thi Qar)

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Abstract- The effect of the use of lean production and supply chain management method to achieve quality of service in public administration unit in Thi Qar was studied in this research using the Hussein Educational Hospital as a case study. The workers in the Hall of operations at the hospital are selected for interview while questionnaires were distributed to the selected workers. After analysis of the results collected, the study found that there is a presence of correlation and significance statistically between the variables of the study: lean production, supply chain management, quality of service. It found that there is an effect of changes in lean production system and supply chain management on the quality of the service. The study of the result analysis also showed that the affected system changes the result of the application of the service quality as an increase in one unit of the independent variables (output slim) affects the increase in the value of the quality of service at the hospital by (1.19) and the value of Beta by (0.766). This signifies the significant relationship between the lean production system and supply chain management and the quality of services in the general hospital. Finally, conclusion and recommendations of the study were presented.

Keywords- *lean production system, supply chain management, applications, quality of service, Hussein Educational Hospital.*

1. Introduction

In contemporary business organizations, lean production and supply chain management are the most well-known and successful manufacturing and management systems. In the 1970s, the Toyota Japan widely used them in the production processes. After the impressive results in the 1980s, American and European companies began to understand the system more.

After seeing the effect of the system on the smooth production and management processes at Toyota auto factories, the method was then implemented. Aftermath of the development, for many service organizations, this method was applied in manufacturing from universities to scientific institutions, hospitals to banks and financial institutions. This method is still superior to any other system to manage operations globally in spite of its existence for the past four decades.

However, this study aimed to examine the possibility of using the lean production and supply chain management system in service operations in the public administration units. Faster task completion, reduction in waste and cost can be achieved by this thereby maximizing the use of resources. The system is therefore adopted by industrial organizations and then by banks and financial institutions. Nevertheless, the chances of success of this method in the management of operations in government work creates a concern due to the specificity of the work in the units of the administration of legislation, laws and strict regulations and the prevalence of values and practices that resist change.

The effect of this study is on the constant production of light and keeping the society in harmony with the conditions currently experienced by the country at all

levels of the sectors in which the hospital service sector is included. The study is motivated in an attempt to get rid of losses that cause wasting of resources of all kinds which can delay the process of the health sector in any form. Therefore, the importance of the study is as follows:

- In order to improve the quality of the health sector, the study contributes to identifying the most important factors that lead to failure.
- It responds to increased attention on health service evaluation and makes an attempt to reduce waste in the health service along with technological development.
- The study also contributes to enriching the knowledge in this field of concentration

The aim of this study is to achieve the following:

- What do lean production and supply chain management as an advanced process management system mean?
- What are the conceptual definitions of quality of service?
- What are the measurements of the impact of lean production and supply chain management system in the quality of service in public administration units of Iraq?

The first part of this study covers the theoretical aspects is designed to review the theoretical aspect of the research, including the definition of the variables of the study such as production of quality and quality of service, especially in public administration while the second part covers the practical aspect of the research such as the methodology and the literature review of the previous studies. The last part is assigned to present the conclusions and recommendations of the study.

2. Literature review

2.1 Lean Production

The beginnings and concept of lean production started since the 1970s, when the business environment in the world as a whole has been seen strong competition. This strong competition has motivated many organizations to look for factors that can give them a competitive advantage that makes them stronger when compared to other organizations [1].

According to [2], the concept of lean production system emerged as one of the most prominent applications in advanced assembly systems and manufacturing in this

fierce competition. The production and storage of the American Production and Inventory Control Society as shortened to APICS spray production Just in Time (JIT) is a philosophy of advanced production based on the pursuit of waste disposal and continuous productivity improvement. It comprises the successful application of all the operational activities needed for production from design engineering to delivery service which includes offering the product or service to use of raw materials [3]. Therefore, many organizations have found the lean production system to be a very important tool for achieving competitive advantage in the global market [4], [5] and to improve the quality of products and services. Moreover, Lean production is the appropriate translation of the common term in the Production; Lean in English means "slim, low fat or thin [6], [7] and [8] stated that waste output and production is undesirable as expressed by Toyota Pal Waste that any elements that increase the cost of production does not add any value.

In the 1950s, attention is drawn to the method of operation management at the Japanese automobile manufacturer Toyota when referring to the concept of lean production as one of the most important methods of managing large-scale operations as provided by the deputy general manager of TaiichiOhno [7]. However, the early study of management showed that it is not entirely new. The majority of its applications are dated back to the early pioneers of administration and management as follows [8]:

- [10] employed the idea of part interchange which allowed meeting the terms of a contract to equip the US military with 10,000 rifles at \$ 13.14 for a gun in 1799.
- In 1890, the work and effort of [15] on industrial engineering confirmed his standardized work as scientific management.
- The efforts of [14] on movement studies and their presentation of process charts. They also attempted to distinguish between the work values of other elements that do not constitute the value of work as Non-Value Added Elements.
- Through the arrangement of working elements of workers, machinery and accessories in the form of a continuous [13] and his distinguished assistant Charles E. Sorensen set the beginnings of the first comprehensive auto industry transition. This has influenced the development of the automobile industry in the early 20th century.

Soft production remains linked to the need to manage operations and the scarcity of natural resources in Japan

after despite all that is said about these efforts [9]. From many well documented studies, the adoption of a lean production system in the management of operations can make the organization achieve by adopting some operations with a quite number of advantage including the reduction in defection or damage [10]. In addition, the system provides a conducive environment of work for the workers with the encouragement and pleasure.

Lean production is a philosophy of operations management based on an idea of the three main elements of work such as: capital, equipment, workers that must be available in the exact amount specified in time. According to [11], lean production is designed to reduce loss in all operations of the organization which is expressed by the western world as they are considered as the most prominent in the field of improvement of operations since it was adopted by Taiichi Ohno in Toyota in the 1950s. [12] added that the Japanese concept goes beyond that of Stelzmat for anything necessary for the work of equipment, materials, parts and timings. However, Americans have developed a concept to express anything that does not add value to the product.

In other word, lean production is considered as a set of practices extending from the flow of raw materials through process design which is unprocessed production, overstocking, excess labor or any pressure [13]. In another vein, it is called lean manufacturing as the success of its application in the service organizations makes it preferable to first name, Lean Production. Lean manufacturing is also called Just In time system, since the latter defines the concept only in manufacturing processes, despite the prevalence of the label. All this has called for the preference of designation Lean Production over other labels. The adoption of a lean production management system within an organization can be done through the following rules:

- Rule 1: this is about how people operate; all activities in an organization must be specific in terms of content, sequence, timing, and results.
- Rule 2: this is about communication issues and states that, any relationship with any supplier or customer must be handled directly and the method of the work must be clear (unambiguous) both when sending requests or upon receipt of any responses.
- Rule 3: this rule about how the production system is outlined simply states that the pathway of each product or service must be simple, straightforward and direct.

- Rule 4: this rule is about improvement. Any improvement must be in accordance with the scientific method under the guidance of a teacher in the lower levels of the organization.

2.2 The Pillars of Lean Manufacturing

Many organizations have called for the application of a lean manufacturing system referred to as "Techniques" or "Tools" or "Element". The methods and support are called the necessities as they are the most implemented tools. However, [14] discussed five main principles as follows:

- i. Total Preventive Maintenance (TPM): this is an effective concept to improve maintenance operations in an organization to avoid breakdowns based on the idea that there is nothing more useless than stopping for no reason. The right way to reach zero breakdowns is the TPM.
- ii. Worksite organization: this organization includes a number of activities for continuous improvement. They are referred to as 5S which include: Sorting and evaluation, which implies sorting of the necessary aspects of work. This comprehensive process begins with products and services through operations to access documents. Secondly, Straightening is intended for adjusting and to organize or arrange any placements of supplies or tools in the right place so that workers can find what they need easily without wasting time. Third, sweeping and cleaning means to make the workplace as the goal is to make the place free from impurities and waste. Fourth, Systemize means the organization or arrangement of the workplace in such a way that makes the workplace orderly and free of obstacles and difficulties. Lastly, to standardize which means any standardization to be adhered to by going through procedures and processes and performs the required tasks.
- iii. Setup Time Reduction: configuring and setting up the key elements for the success of a lean production system has enabled TOYOTA to reduce the setup time to 12 minutes. This is a short time in comparison with the time of preparation in US companies of up to 6 hours. Then, the company has to reach the state in every one minute to change the templates of Single Minute Exchange of Die, which is referred to as SMED [14].

- iv. Cellular Manufacturing: it is a manufacturing system that depends on groups of processes, individuals and machines to produce a specific value of products with in terms of manufacturing characteristics with similar classifications. Cost reduction, reduced handling routes, smooth flow of materials, reduced inventory levels or under-operation and reducing response time are the most important parts of cellular manufacturing.
- v. Continuous Improvement: Continuous Improvement is a system of operations based on the pursuit of continuous progressive improvement, higher levels of performance and better performance of small objects. It is close to a Japanese term which is the combination of two terms, Kai which means change and Zen which means “towards the best” and therefore, the terms can be defined as ‘changing for the better’.

2.3 Quality of Service

Quality of Service can be defined in many terms. In some cases, it is expressed as satisfying a need or the degree of ability to achieve consumer satisfaction or appropriate cost of product specifications. However, the two most appropriate definitions to express quality was first introduced by [4], who defined Quality as conformance to specifications and JM Joran's second definition of quality defined it as fitness to use.

Furthermore, [15] defined Quality of Service as a measure of the extent to which the service satisfies customer

expectations of service. It is important to note the different processes in service organizations prior to entering the service quality dimensions than their counterparts in manufacturing organizations.

It can also be said that, in terms of operations in service organizations, there are a number of aspects in the organization such as: production and consumption correlations and (f) customer participation in the process (permeability or non-storage), heterogeneity and finally the concentration on labor [16].

The difference in the determination of the quality of service dimensions is necessitated by the characteristics of work in service organizations, which made them different in the nature of operations than those in manufacturing organizations.

To determine the quality of service in another context, this study identified five dimensions of quality of service [16]:

- Tangibles in physical facilities, equipment and appearance of personnel;
- Reliability: Ability to deliver good and services with Dependence and accuracy;
- Responsiveness and indication of willingness to meet the service on time;
- Reliability through knowledge and kindness to employees, and their ability to broadcast a spirit of confidence; and
- Empathy and caring.

Table 1 shows the dimensions of quality of service based on the opinions of the selected sample

Table 1: Quality dimensions from the point of view of some researchers

Authors	Quality Dimensions
[15]	Reliability, trust, physical presentation, perfectionism
[14]	Reliability, timing, response, communication
[10]	Reliability, safety, physical presentation, communication, emotion
[8]	Reliability, conformity, durability, aesthetics
[13]	Reliability, conformity, durability, quality, ability, service
[7]	Reliability, trust, flexibility, precision, perfectionism
[20]	Reliability, trust, physical presentation, perfectionism

Source: Table by the Researcher

2.4 Lean Production and Quality of Service

It is widely known that lean production is associated with manufacturing organizations when it is related to the great success of its implementation in the field of operations management for the production of the car in Toyota. With

all the characteristics described above, regardless of the concept, it is doubtful that the same result can be achieved when adopting the service in an organization. However, the facts indicate that the application of Lean Production in the service area is possible for the following reasons [17]:

- The main objective of lean production is to reduce the losses during operations. The elements that do not add value to the process should get rid and make more focus on the process to improve the operation by eliminating the losses. Therefore, regardless of whether the process is in service or not, these losses still exist.
- Lean production is to make the three main elements of the work (capital, equipment, personnel) available in the specified amount as a philosophy of operations management at the specified time limit. With this, the organization can achieve flow of resources material and sequential processes. Therefore, the department can minimize the time spent in the process, whether it is the place where a car factory or an airline is located with accessibility.
- A number of service functions such as maintenance are included in many manufacturing processes. Thus, any industrial organization that implements lean production applies it in all operations, whether the process fall within the manufacturing and service functions. Therefore, service function in an industrial facility can be applied at the whole level of a service organization [18].
- The pizza manufacturing operations are part of the many service operations classified within the service sector. However, the main aspect of the work includes manufacturing of various pizza pies. Thus, many areas of improvement of operations within the restaurant can be achieved by applying the philosophy of lean production.

In the field of services, the use of the philosophy of lean production is expected to attain remarkable outcomes. With some existing facts, the service sector is the most important part of the economies of developed countries. Most developed organizations are ranked through the service organization they establish. Also, the service workers are highly skilled.

The main objective of this study is to study the effect of the systematic use of lean production on the quality of service in one of the units of public administration in Iraq as applied to Toyota Motor Company. The company adapted the use of the system to their field of services while the challenge is to ensure the success of the method

in the field simply represents by public administration units. For the purpose of this study, the objectives are presented in the following questions:

- i. Can the lean production system be applied to the service system in Iraq?
- ii. Can the model be adapted to the Iraqi public administration environment?
- iii. Does the application of lean production practices in the Iraqi service system lead to an added value of the final product of health care for the patients?

Thus, this study developed two hypotheses: Hypothesis 1: there is no significant correlation between the quality of hospital services and lean production practices.

Hypothesis 2: the value of the quality of services is not affected by the changes resulting from the application of the lean production practices in Al Hussein Educational Hospital.

2.5. Supply chain management and Lean Production

Lean production is defined as a set of tools and methodologies focused on continuously improving processes, with the objective of eliminating all non-value adding activities and reducing waste within an organization. Waste is an activity, which does not create any value for the customer or product. In supply chain management, wastes are created by improper information, material and funds flows in the system. Therefore, lean can be considered as an integrated activity into supply chain management designed to achieve high-volume flexible production using minimal inventories of raw materials. Lean SC represents a strategy based on cost reduction and flexibility and it embraces all the processes starting with the product design to the product sale. The principles of lean can be applied throughout the SC from the process of placing orders to suppliers to product distribution and customer delivery. Similarly, the concept of lean can be extended to the downstream or distribution level. Lean is applicable to many SCs, particularly those seeking to improve performance by reducing waste. Lean implementation helps supply chain management by achieving significant improvements in resource productivity, reducing the amount of energy, water, raw materials, and non-product output associated with production processes; minimizing the ecological impact of the industrial activity. Moreover, leanness in an SC maximizes profits through cost reductions. Extending lean

principles from manufacturing to supply chain management can leverage the SC's competitiveness further with increased responsiveness to demand changes and reduced operating costs. Lean may be viewed as a configuration of practices/tools because the relationships among the elements of lean are neither explicit nor precise in terms of linearity or causality. Practices of lean production vary from a company or country to another, however, most if not all focus on minimization and eventual elimination of non-value adding activities. Some practices are related to suppliers; some related to customers' relationship (i.e., supplier involvement in product development); and some practices are related to operations, for example, electronic-enabled supply chains, JIT delivery practices, pull production systems, interorganizational value stream mapping and training in lean initiatives [22].

2. Research methodology

Questionnaires were distributed to thirty employees of Al Hussein Educational Hospital but only twenty eight were retrieved which represents 90% response rate. This is statistically acceptable for the adoption of the results. The data collection methods include primary sources based on the survey questionnaire, which included 35 items and the section is divided into three parts. The first section includes the demography details of the respondents, and the second section comprises the lean production and supply chain management system with 5 dimensions with four items each. The third section includes the quality of services with 5 dimensions where each dimension containing 3 items, and the answer was determined on the basis of five Likert scale. Other sources for the survey were gathered from books, statistics, scientific journals, reports, research and reports from the Internet as presented in table 2 while table 3 shows the scale design.

Table 2: Scale weights used

Likert scale	Do not agree completely	Do not agree	Neutral (do not know) agreed	agree	Completely agree
	1	2	3	4	5

Table 3: Research Design

Research Design	
Lean Production and supply chain management	
The Gateway Number	Variables
1,2,3,4	Comprehensive Continuous Maintenance
5,6,7,8	Organization of the Work site
9,10,11,12	Setup time Reduction
13,14,15,16	Alphabetic Work
17,18,19,20	Continuous Improvement
Quality of Service	
The Gateway Number	Variables
21,22,23	Tangibility
24,25,26	Reliability
27,28,29	Response
30,31,32	Reliability
33,34,35	Sympathy

Source: The Researcher

The study employed the use of statistical package for social science and a number of statistical tools to get results. The statistical descriptive analysis, such as frequency distribution and percentage, graph computation

and standard deviation were performed. The statistical deduction is the second method where the correlation coefficient (Person) was calculated to measure the

relationship between the variables and the multiple linear regressions in Stepwise to measure the effect hypothesis.

The validity and the reliability of the variables were tested to know the ability of the questionnaires to measure what it was designed for. This was established by conducting the virtual reliability so that the scale was presented to a group of competent arbitrators. All the observations and suggestions were taken. From the result, the Cronbach's alpha was 83.5%, which is higher than the acceptable percentage of Cronbach's alpha 60%. This implies that the results can be adopted in order to ensure its credibility in achieving the research objectives.

From the previous studies, [19] studied the role of the manufacturing operations in the achievement of sustainable competitive advantage; an analytical study in a general company for the manufacturing of medicines and medical supplies in Nineveh. The study found that there is a positive relationship between pillars of lean manufacturing and sustainable competitive advantage. The aim of the study is to benefit from the concept of lean production and supply chain management in improving the efficiency of the quality of university performance by developing a hypothesis that: there is a study of the model of the Toyota production system (TPS) to the environment of higher education and measuring its impact in stimulating the university performance. The study aimed at the possibility of adapting the TPS model to the higher education environment. Finally, the study concludes that the model can be adapted and used to improve the quality of higher education in Iraq.

In addition, [20] studied the requirements for the application of lean manufacturing in the Iraqi industry as an exploratory study in the general company for the manufacturing of pharmaceuticals and medical supplies. The study gathered the opinion of the employees in the public company of the manufacture of medicines and medical supplies. It was revealed that company's knowledge on lean production and supply chain management are necessary for utilization of resources.

Similarly, the study of [21] on IT-based quality management from the concepts and implications in Indian context described the analytical experience of Indian

companies in the field of JIT implementation through the knowledge of the impact of reliance on JIT in quality management. The study concludes that there is need for changes in the working environment for Indian companies to be able to benefit from the use of JIT in the field of quality.

Furthermore, the comparative analysis of Japanese Just-in-Time purchasing and traditional Indian purchasing system was examined by [19]. The theoretical comparative study investigated the purchasing system in the application of the JIT and the traditional purchasing system by focusing on the case study of Indian companies. Also, [20] studied the application of the Just-in-Time philosophy in the Chinese construction industry with the aim of identifying the applicability of the JIT to Chinese construction companies. The study identified the main obstacles that come with an application framework in the areas of design, application process, procurement, construction and inspection. The study concluded by presenting a proposal for the role of educational institutions in the application.

Moreover, [18] investigated the challenges of using Just-in-Time purchasing system for publically traded firms in Tehran stock exchange. There are number of challenges from JIT in the procurement system of Iranian companies. The most effective parts of the challenges are inflation, political boycotts, unreliable suppliers, lack of liquidity and weak organizational culture.

4. Result analysis

The Pearson correlation coefficient was chosen to test the relationships between the two variables and to verify the relationship between the two variables (the lean production, supply chain management and the quality of service) in order to indicate the direction, strength and morale of the constituent relationships. By using One-Sample Kolomgrov-Simironov, the analysis showed that the data are equally distributed as the means of each variable is greater than 0.05 as shown in Table 4.

Table 4: Test the normal distribution of data

	Quality of services	Lean production and supply chain management
The Mean	3.642	3.824
Standard Deviation	0.770	0.612
Extreme Positive Value	0.011	0.019
The Negative Value	- 0.15	- 0.20
Absolute Extreme Value	0.14	0.19
Kolomgrov-Simironov	0.127	0.117
Morality	0.64	0.122

Source: By the researcher based on the results of the analysis

From the first hypothesis, there is no significant correlation between the quality of services and the lean production and supply chain management, Table 5 presents the calculated value of t (48.6) and the mean t value (3.59). Thus, the hypothesis is rejected for the fact that the calculated value is greater than the tabular value at a significant level 0.05 while the alternative hypothesis which states that there is a significant relationship between the lean production,

supply chain management and the quality of services is accepted. The results of the table show the high value of R (0.729) of the dependent variable (quality of services) and the value of the modified limiting factor of (0.677) R^2 indicates that 67% of the variables in the dependent variable (quality of service) was as a result from changes in the independent variable (Volant production).

Table 5: the values of Pearson correlation coefficient, coefficient of determination, modified coefficient and tabular t values

R	R^2	R^2 (Rate)	Grading Error	Calculated t-value	The value of tabular t
0.729	0.822	0.677	7.11	48.6	3.59

Source: By the researcher based on the results of the analysis

The effect between the two variables was tested and was examined between the soft production and quality of

services of Al Hussein Educational Hospital using simple linear regression as shown in Table 6.

Table 6: analysis of the simple regression between the two variables

	Non-standard transactions		Beta	T calculated	Morality	Schedule
	B	Std. E				
Fixed	-2.93	3.89		-0.809	0.307	2.488
X	1.09	0.052	0.766	28.142	0	

Source: By the researcher based on the results of the analysis

On the second hypothesis stating that the value of quality of services at Al Hussein Educational Hospital is not affected by the changes that result from the application of lean production and supply chain management, the result of the regression in Table 5 showed the calculated t value (28.142) and the tabular t value (2.488). The elastic output is affected by the changes that result from applying the quality of services, since the calculated t value (0.05) rejects the second null hypothesis and accepts the alternative hypothesis. The simple linear regression equation can be formulated as follows:

$$Y = - 2.93 + 1.09 (X) + 0.052$$

This shows that every single increase in the independent variables (lean production and supply chain management) affects the value of the quality of services in the general hospital by 1.19

5. Conclusion and recommendation

5.1 Conclusion

The following conclusions are drawn from the results and analysis of this study as follows:

- The public administration has not received the appropriate attention despite the frequent talk about the variables of the study (lean production, supply chain management, and quality of service) in the application in Iraq.
- The value of mean t and tabular t were calculated. The tabular value at a significant level (0.05) is lower than the mean value of t which shows a significant correlation between the lean production, supply chain management and the quality of services. The value of the adjusted mean factor (0.822) in the quality of services shows that 67% of the special variables in the dependent variable (quality of services) resulted from changes in the independent variable (lean production).
- The results from the study's analysis indicate that the changes that result from applying the quality of service affected the elasticity of the production. The increase in the quality of service in hospital by (1.19) is affected by an increase of one unit in the independent variables (lean production and supply chain management). This indicates a positive relationship between lean production, supply chain management, and quality of services in the general hospital.
- There were significant differences between the general production and the quality of the services of the hospital using the analysis of the mono-variance and the knowledge of the values of both t-table and computed values.
- Also, the data of the study is naturally distributed with the significance of each variable greater than (0.05). This shows that there is a significant relationship between lean production, supply chain management and quality of services and positive relationship between the variables of the study and quality of services of the Al Hussein General as a case study. Finally, there were significant differences between the general hospital and the quality of services.

5.2 Recommendation

The study made some important recommendation using the above conclusions as follows:

- There is a need for urgent attention on the public administration units in Iraq to adopt the concepts of modern operations management such as quality production, quality services. This will make an

impact on improving the performance of the public administration in Iraq.

- There is also a need to channel research and development to address the opportunities to apply advanced methods in management in solving many of the problems of public administration in Iraq.
- The contemporary applications in the operations management should be taken care of by the management of the Al Hussein General Hospital such as the production of quality and service quality in order to achieve efficiency at work.

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