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INTEGRATION OF THE ACCELERATED SUPPLY CHAIN AND THE LEAN MANUFACTURING SYSTEM - A CASE STUDY IN THE BAGHDAD SOFT DRINKS COMPANY

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ABSTRACT

The study aims to provide a theoretical and practical framework on the topic of "Integration of the Accelerated Supply Chain and Lean Manufacturing System" to know the level of application of the dimensions of the accelerated supply chain represented by (speed, flexibility, and responsiveness) and the dimensions of the Lean manufacturing system (worksite organization, comprehensive productive maintenance, improvement Continuous preparation, preparation and preparation of machinery and equipment, and cellular manufacturing), where the Baghdad Company for Soft Drinks - Al-Furat Factory was chosen as a site for the study. With a high response and flexibility, and to identify the Lean Manufacturing system, which works to end all kinds of waste within the company, and analyze the results extracted using the Pareto chart to determine which dimensions have the greatest impact on the size of the application gap than the rest of the dimensions, and one of the most important conclusions he reached "through the results of a list Examination The company in question possesses the qualifications that enable it to implement the accelerated supply chain and the lean manufacturing system.

INTRODUCTION

The Lean Manufacturing System is an industry tool that seeks to create economically competitive products by reducing production costs resulting from the rational use of resources and energy. This resulted in a wide interest by researchers in the field of production and operations management in the subject of the supply chain in both the academic and applied fields, which moved it from the operational level of operations management concerns to the level in which the management of operations is thought of at the entrance to the chain, but rather dealing with business organizations as Part of supply chains that compete with other supply chains, and from here, researchers have made an effort to present new

concepts of the chain, its management and components. This effort has resulted in new and diverse models of the chain in an attempt to adapt to the challenges of the environment and the rapid and continuous development of methods and tools for its management.

The importance of the study is manifested by providing an applied framework for the integration of the accelerated supply chain with the Lean manufacturing system in the research sample company. It works to end all kinds of waste within the company.

The most important questions of the study are:

What is the possibility of applying the term Accelerated Supply Chain integration

with the Lean Manufacturing System in the study sample company?

FIRST TOPIC: RESEARCH METHODOLOGY

First: Research Problem

The main problem of the study centered on the lack of interest in the production environment within the Baghdad Company for Soft Drinks / Al-Furat Factory. It has to determine the sequence of work logically, in addition to the large number of sudden stops due to faults and defects in the raw materials used, which results in bottlenecks and long waiting times in some work stations, as well as the presence of obsolete machines and some of them are very advanced, causing confusion in the work of some production lines, as well as The presence of traditional systems, which causes delays in taking tasks in some stations, as well as the lack of attention to the work environment, which negatively affects the workers.

Based on the foregoing, the study problem can be formulated through the following questions:

1. Does the study sample company have a clear understanding of the Lean Manufacturing System concept?

2. Does the Lean Manufacturing Approach contribute to eliminating waste in the study sample company?

3. To what extent does the accelerated supply chain integrate with the lean manufacturing system in the study sample company?

Second : Importance of Research

The importance of the study is manifested by shedding light on the concept of the accelerated supply chain and the extent to which it can be strengthened by adopting a modern production system that works to remove all kinds of waste through the application of its dimensions represented by (worksite organization, comprehensive productive maintenance, continuous improvement, preparation and preparation of machines and equipment, and cellular manufacturing).

Third : Research Objectives

Based on the questions of the study problem, the researcher seeks to achieve several goals, the most important of which are:

1. Introducing the study sample company to the concept of Lean Manufacturing System.

2. Eliminate all kinds of waste within the study sample company by adopting the Lean Manufacturing System.

3. Measuring the possibility of integrating the accelerated supply chain with the lean manufacturing system in the research sample company.

Fourth : Research Community and Sample

The Baghdad Company for Soft Drinks was chosen as an area for applying the study and obtaining the required information and data through frequent visits, field visits to the workflow and personal interviews with company officials.

Fifth : Sources of Data Collection

1. The theoretical aspect of the study: where the researcher relied on the literature related to the subject of the study (the supply chain, the accelerated supply chain, the lean manufacturing system) from books, scientific articles, theses, university theses, Arab and foreign periodicals and on solid websites in the Internet that are concerned with publishing research, articles and periodicals.

2. The practical aspect of the study: For the purpose of obtaining information and

data, the researcher relied on many methods, including:

- Frequent field visits to the company, especially its production halls, quality department, projects department and sales department.
- Personal observation of production lines and monitoring of the progress of the production process.
- Conducting personal interviews with directors of departments and officials of relevant departments.
- Official records and documents of the company.

Sixth : Search Tools

1. The checklist is a descriptive list that analyzes the variables of the study, as it was used as a main tool for collecting data and information related to the practical side and measuring the gap level for the application based on the weighted arithmetic mean and the percentage of the application. Where a pentagonal scale was adopted (fully applied, partially applied, somewhat applied, weakly applied, not applied) and by allocating a weight to each of the scale's paragraphs, as shown in Table (1) :

Table (1) The approved measure for measuring the percentage of application and the size of the gap

| Scale paragraph weight | Five Scale Paragraphs | ت |
|------------------------|-----------------------|---|
| 4 | fully applied | 1 |
| 3 | Partially applied | 2 |
| 2 | somewhat applicable | 3 |
| 1 | poorly applied | 4 |
| 0 | Not Applicable | 5 |

THE SECOND TOPIC: THE THEORETICAL SIDE

First : Accelerated Supply Chain

1. The concept of accelerated supply chain

Many factors and influences on the management of production companies (such as the type of product, the size of the company, or the nature of the industry) require that they adopt different strategies

to deal with suppliers, such as building partnerships or concluding agreements in various forms. Those strategies referred to are accelerated in a way that secures the preservation of strategic compatibility in the complex and changing environment. A number of definitions contained in the administrative literature that explain the concept of the accelerated supply chain can be shown through Table (2) :

| No | Reference | The concept |
|----|--------------------------------------|---|
| 1 | Arno Meyer et al ,2017:4 | A company's ability to quickly adjust tactics and operations within its supply chain to respond or adapt to changes, opportunities, or threats in its environment |
| 2 | Aurelie Charles et al ,2018 : | The flexible chain, which represents the organization's ability to modify production systems and return to its original state or move to a new, more desirable state according to environmental variables. |
| 3 | Ismail Gölgeci, 2019 :7 | The ability for the organization to carry out its operational activities with suppliers and partners in order to adapt or respond to market changes in a rapid manner. |
| 4 | Ahmad Arslan ,2019 | The basis of the organization's competitive ability, which gives it the advantage of establishing a distinguished position in the mission environment, is built according to the basis of effective response to market fluctuations in a timely manner and appropriate formula. |
| 5 | Eias Al Humdan & Peter Shi ,2020:290 | The ability of the organization to respond to market changes such as variations in demand patterns, in terms of quality, quantity and diversity, as well as patterns of supply, in terms of shortages and interruptions. |

Source: Prepared by the researcher based on the sources provided

Accordingly, the researcher believes that the accelerated supply chain can be defined as: all the procedures, programs and mechanisms adopted by organizations in securing the inputs and resources of the various production lines, which are characterized as being able to adapt and respond quickly to the changes of the private industry environment and the general environment within which the organization operates and what puts it in a position capable of dealing With the fluctuations of supply and demand, which provides the advantage of exploiting opportunities and avoiding threats.

2. Dimensions of the accelerated supply chain

There are many models that have been developed by researchers in order to show the sub-dimensions of the accelerating supply chains, depending on the background of the researchers or according to the nature and specificity of the organization and the sector that the model deals with. In addition, there is no model that is applied in all its dimensions in all sectors and organizations. The matter follows the size and dependence of the organization. The nature of work affects the dimensions of the chain, as is the case in non-profit organizations and other factors, and the following is an explanation

of the dimensions of the accelerated supply chain:

- Flexibility

The readiness of companies to face crises varies according to their assessment of the challenges that may face their business. Although these estimates differ, there is a basic formula, which may not yet be known to some companies, that supply chain operators around the world rely on to ensure that emergency crises are absorbed. The elements of that equation consist of determining the ability of the supply chains to absorb shocks, withstand and continue working without being affected for a specified period, in addition to calculating the expected cost of implementing this. There is no value for achieving business continuity at a high operational cost that leads to financial losses that exceed returns. It should be noted that the nature and requirements of each sector determine the initial framework for maintaining the performance balance of the supply chains supporting it. For example, the supply chains in the chemical industry are different from the supply chains in the apparel manufacturing and trading sector, in terms of the cost of production, warehousing, shipping, etc. There is also a big difference between the complete cessation of service provision to

customers, as is the case in the aviation sector, and the delay in meeting the needs of customers, as happens in the automobile industry, and other influencing factors (Khair and Abu Zaid, 2014: 629).

Flexibility can be expressed as the ability of the supply chain to provide products and services in a timely and cost-effective manner to a volatile and rapidly changing global environment” (Abdul Hakim, 2016: 43) and there are those who refer to it as “the ability to reconfigure existing resources to match Changing requirements, adapting to change, and reaching organizational goals (Al-Ajili, 2018: 45).

- Response

The speed of the organization's response to customers is necessary to assess success and a measure of the work of the organization as a whole and supply chains in particular, and it is the core competitive priorities that witness customer satisfaction at the present time and in the future, and it is defined as "the organization's ability to deal with changes in the environment and the market quickly, effectively and in time The right fit with the ability to adjust the mix and quantity of products and the required quality without the organization incurring additional costs (Gouda, 2010:53).

Responding to customer needs is the most common reason for organizations to invest in time-based methods to improve performance. Many elements of customer service depend on time. This includes the time it takes to provide a product or service, achieve on-time delivery, and the time it takes to deal with customer inquiries, estimates, and complaints. High levels of customer responsiveness tend to correlate with more loyalty, and thus more business, over time. Such a response causes addiction to the customer, which leads to customer security (Harrison & Hoek, 2008: 142).

- The speed

Speed is an explanatory characteristic of the Agile workforce as one of the important goals of a light workforce is to achieve goals faster. If an employee is transitioning from one role to another, the employee must quickly acquire new skills and knowledge to speed up the completion of certain tasks. Product design and development cycle periods are very short, in terms of on-time learning and training, redistribution or recall, faster completion of products, faster service delivery and faster problem-solving. Currently, the speed of the supply chain in delivering value to the customer is becoming increasingly important, that is, customers Not ready to wait for the product anymore.

This may have led to the development of different types of supply chain strategies and is at the forefront of acceleration. Therefore, distribution centers that are based on accelerated supply chains must be able to meet customer demands quickly, whether from their own inventory or from other sources. However, the organization also needs to provide a range of lead times, in light of the growing realization that a "one-size-fits-all" supply chain is not appropriate in many situations (Koski, 2016: 12-13).

- Enough

Efficiency is defined as the ability to achieve the desired results, with a clear economy in effort, time and expenditures" (Hassan Al-Tabini, 2018: 10), and Ezgi Şahin et al, 2017 indicated, 338: that the organization must possess a number of competencies for the supply chain, including: Technological competencies, operational competencies, and administrative competencies) and the following is a summary for each of them:

a. Technological competencies: Information technology is one of the main elements that support the supply chain, as employing modern technology is an important way to manage information flows and a means of communication between the producing organization and external parties. It must be noted that

modern technology directly contributed to the formation of global supply chains, and led to The emergence of relationships between the producing organization and its customers, sensing and response, and developing products according to global or local demand, as well as contributing to the management of accurate information flows (Al Shaar, 2014: 493).

B. Operational competencies: the ability of the production organization to use operating systems that contribute to facilitating the ability of the supply chain to build an integrated and flexible operating system that meets the needs of the organization (Marei, 2013: 34).

c. Administrative efficiency: It indicates the organization's ability to use its human resources to facilitate the ability of the supply chain to achieve a high degree of acceleration. Administrative competence is limited to determining the role and vision of senior management and the efficiency of workers as enabling elements in the supply chain (Younes, 2020: 49).

Second : Lean Manufacturing System

1. Lean manufacturing system concept

Administrative concepts evolve with the succession of years and with the development of application mechanisms, which requires researchers to develop conceptual frameworks that accommodate

these variables in a way that expands with the expansion of application circles. From the study, and Table (3) shows the

researchers' views on defining the concept of Lean Manufacturing :

Table (3) Researchers' views on defining the concept of Lean Manufacturing

| No | Reference | The concept |
|----|---|---|
| 1 | Zbigniew Prusak,2017,1009 | A set of productive practices aimed at generating an effective and organized system dedicated to the continuous improvement of the manufacturing process and the elimination of all forms of waste. |
| 2 | Vinicius Mitsuo Kojima Campos et al , 2017 :153 | A flexible system that adopts the minimum resources required for the production process, which provides products with a high level of quality. |
| 3 | Al-Rubaie, 2019: 9 | A mixture of many and varied tools that aim to get rid of activities that do not add value to products, whether goods or services, and to achieve a state of continuous improvement in production. |
| 4 | Hassan, 2019: 30 | The production system aimed at providing products at the right time and quality, using continuous improvement processes to eliminate all kinds of waste. |
| 5 | Vanessa Rodríguez Cornejo et al ,2020:3 | Operations systems that raise the level of added value for each activity in the organization by ending cases of waste and delays. |

Through this, the researcher believes that the Lean Manufacturing System is the philosophical orientation that governs the convictions and work of the organizations' departments of different activities, which includes the adoption of processes and procedures that contribute to providing added value to the consumer and excluding the ineffective ones, as well as enabling the administration to provide outputs at a higher quality level with less inputs. By eliminating all wastage and loss.

2. Lean manufacturing system tools

Through the researcher's review of many sources that dealt with the philosophy of the Lean Manufacturing System, many of the tools mentioned in the book were diagnosed and mentioned in various studies, but the most prominent of them

will be reviewed in our current study, which was characterized by wide fame on the academic and field intellectual levels, which can be clarified by the following points:

- Work site organization (5s)

This element is an important tool and is known in the literature as (5s) among the prominent elements in understanding and applying the Lean Manufacturing system in all fields. Shitsuke, Seiketsu, Seiso, Seiton) means (sorting, simplifying, glossing, unifying, enhancing) and in some literature the following expressions are used (organization, arrangement, cleaning, maintenance, discipline), and they are defined as (an organized process for managing property and securing equipment). and services to achieve a calm

environment in the workplace) (Al-Kiki, 2012: 120).

- Total Productive Maintenance (TPM)

Industrial companies are now seeking to obtain a competitive advantage that results from low costs, high work efficiency, and customer-oriented processes, and due to changing conditions and increasing customer demands on the one hand, and the desire of customers to implement new methods of operations management on the other hand, companies have to search for ways. Another approach is to improve operations and increase production efficiency. One of the most important of these methods is total productive maintenance. This approach appeared in Japan as a strategy for equipment management designed to support the total quality management strategy. Japanese companies, and defined (Abhishek Jain et al, 2014: 295)” as a systematic approach to understanding the function of the machine and the relationship of the machine to product quality and the possible cause of frequent failure of critical parts of the machine, while he defined it as Venkatesh J, 2015 :2)) a maintenance system that covers the entire Equipment life in every department, including planning, production, and maintenance.” Specialists refer to TPM as the practice of managing physical assets by involving operators and

1 Maintenance is the cleaning and maintenance of equipment to reduce downtime due to machine failure “preventing maintenance” instead of preventive maintenance.

- Kaizen continuous improvement

The roots of the concept of continuous improvement or Kaizen, according to what is known in the Japanese language, go back to the period after World War II. This country started with what was called the reconstruction process, as many Japanese companies such as Toshiba and Toyota applied and adopted continuous improvement programs. Studies confirm that the philosophy of continuous improvement appeared and developed As a result of an urgent need felt by the Japanese to excel and excel in global markets, a term consisting of two syllables (kai - change - Zen - good), which refers to change for the better (Shaman Gupta & Sanjiv Kumar, 2014: 25).

- Preparation and preparation of machinery and equipment

With regard to this tool of Lean manufacturing tools, it turns out that in many companies today a large amount of a specific product is produced and the reason for this is due to the long preparation times for the production of this product, which may reach 50% of the total production

time and the accompanying increase in inventory levels, and reducing energy when production lines stop during preparation, in addition to the fact that the final assembly operations must wait to complete the preparation to start production, and since the Lean Manufacturing system aims to reduce the time of unnecessary stops for the machine resulting from either setting up and preparing the machines or changing the product models, because the time Machine downtime is an important source of waste, so companies are constantly seeking ways to reduce preparation and configuration time (Antonio Carrizo Moreira, 2014: 386)

In this context, SMED (Single Minute Exchange Of Die) technology, which is expressed by replacing the template with single minutes (single configurations and numbers), is referred to as one of the most important technologies adopted by Shigeo Shingo in his famous book *Revolution In Manufacturing: The SMED System*, which It shows the mechanisms of reducing the preparation time of the machine in less than 10 minutes, and (Filla Jan, 2016: 62) defines the (SMED) as a technology that can be applied in any company or any machine, and the first step to implement it is to separate the internal setup, which cannot be accomplished until it stops The machine is different from the external

preparation, which can be implemented while the machine is working.

- cellular manufacturing

Today's companies face great challenges represented in reducing costs and providing quality products that meet the desires and needs of customers as well as maintaining the competitive advantage.

Therefore, these companies started moving towards the application of cellular manufacturing because of its role in facing these challenges, especially when it participates with the elements of the Lean Manufacturing System. Cellular manufacturing is defined as (a group of machines and processes in the work center or in work cells, which produce identical products with similar requirements), 2007: 4) Jainarine Bansee & Boppana V. Chowdary)

And (GUNNHILDUR JÓDÍŚ ÍSAKSDÓTTIR, 2015:44) defines it (as an entrance used to produce a variety of products with the least possible waste, so that equipment and work stations are arranged in an infiltrated manner that facilitates the flow of materials and components during the production process while maintaining the minimum delivery and delay).

THIRD TOPIC: PRACTICAL SIDE**First : Analyze the Results of the Checklist**

The study deals with the analysis of the results using Pareto diagrams :

1. Accelerated Processing Chain

Where we find that the company is able to apply it through the results shown by the

checklist and the availability of the dimensions of this variable in the researched company. Table (4) shows the final results of the checklist for the dimensions of the accelerated supply chain, as well as the percentage of application and the size of the gap between these dimensions in the Baghdad Company for Soft Drinks.

Table (4) the final results of the checklist for the dimensions of the accelerated supply chain

| Gap size | Percentage of application % | Weighted arithmetic mean (application rate) | Dimensions of the accelerated supply chain | No |
|----------|-----------------------------|---|---|----|
| %33 | %67 | 2.7 | Flexibility | 1 |
| %50 | %50 | 2 | the speed | 2 |
| %62 | %38 | 1.5 | response | 3 |
| %48 | %52 | 2.07 | Total percentage of application rate of accelerated supply chain dimensions | |

Source: Prepared by the researcher.

Based on the results of Table (4), the rate of application of the dimensions of the accelerated supply chain in the company in question was (2.07), with an application rate of (52%) and a gap size of (48%), which is the amount of departure from the

ideal case. Figure (1) shows the average for each of the volume The gap and percentage of the application of the dimensions of the accelerated supply chain.

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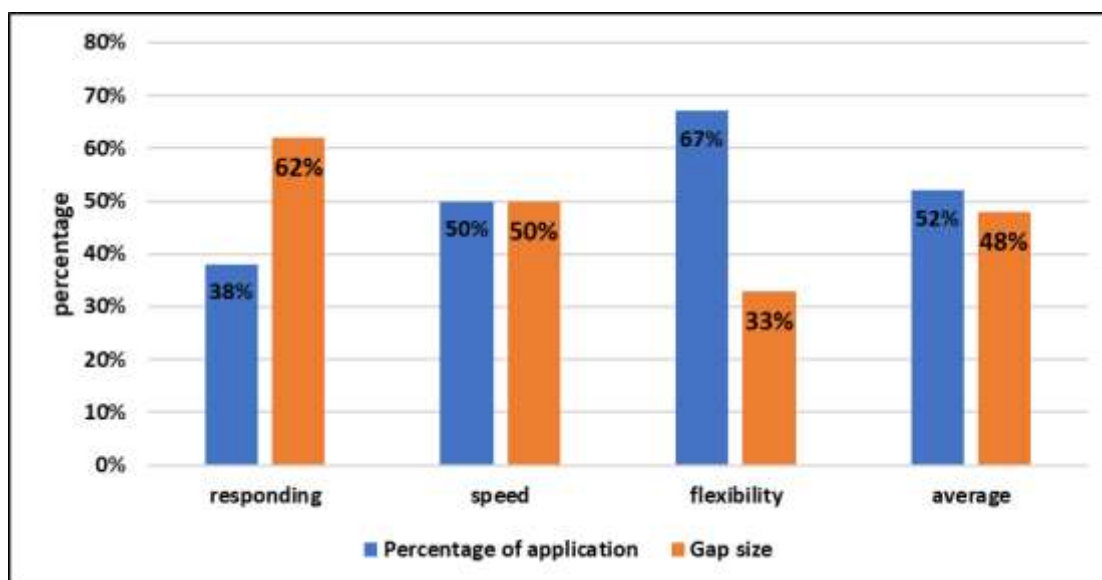


Figure (1) The average gap size and the percentage rate for applying the dimensions of the accelerated supply chain

Source: Prepared by the researcher based on (Microsoft Excel 2016)

The dimensions of the accelerated supply chain measure the extent to which the organization has succeeded in achieving its goals, and in order to measure the extent of the application of the accelerated supply chain in the Baghdad Company for Soft Drinks, it is necessary to use the dimensions (flexibility, speed, response) and using a checklist by asking questions and knowing the extent of their application within the company's corridors Flexibility appeared in the application rate of 67%, which is a good indication that the company owns a wide variety of soft drinks and even mineral water to meet the demands of a wide segment of society, in addition to the company's ability to meet market demand through delivery within the specified times, while speed appeared

in the percentage of application 50% which is of medium significance because the company suffers from some limitations in the production speed as a result of some sudden stops due to malfunctions or the appearance of defective products or because of defects in raw materials and other reasons, while the percentage of application after response was 38%, which is a low significant percentage. Because the company suffers from failures in this aspect as a result of the company not owning a research and development department, in addition to the fact that the production efficiency of some of its lines began to decline due to their obsolescence. As it becomes clear that the total application percentage (52%), which is an average percentage, because the company

suffers from some obstacles and failures, but this does not mean that the company is unable to implement the accelerated supply chain, as the company possesses the qualifications for application, but at different levels, and here it is resorted to using the Pareto scheme for the purpose of Determine which dimension has the effect of the few affecting the other dimensions.

a. Pareto chart

Pareto chart can be defined as a type of graph that includes columns and a line

graph, where the individual values are represented in descending order by columns and the cumulative total is represented by the line. Through Table (5) it is possible to determine which of the dimensions has the greatest effect, as the dimensions were arranged in descending order based on the amount of the gap size, and then extracting the percentage of the size of the gap and the cumulative percentage.

Table (5) the size of the gap, the ratio of the size of the gap and the cumulative ratio of the dimensions of the accelerated supply chain

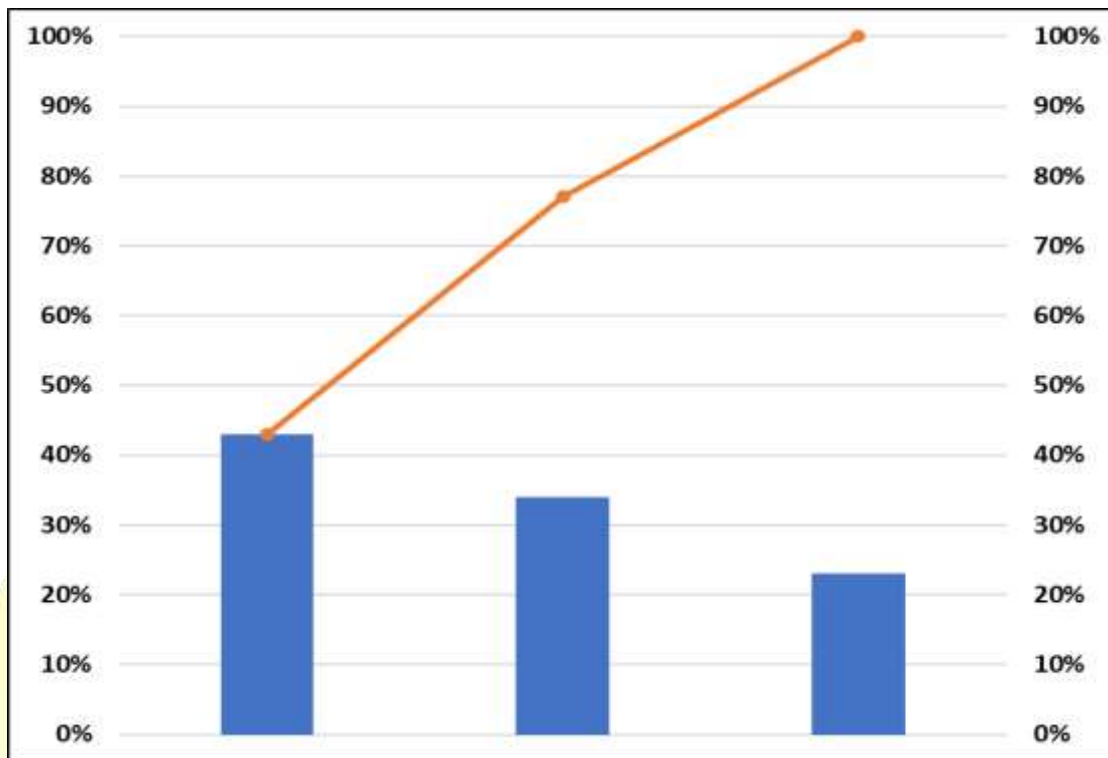
| Cumulative percentage | Gap Size Ratio | Gap size | Dimensions of the accelerated supply chain | No |
|-----------------------|----------------|----------|--|----|
| %43 | %43 | 0.62 | response | 1 |
| %77 | %34 | 0.5 | the speed | 2 |
| %100 | %23 | 0.33 | Flexibility | 3 |
| | %100 | 1.45 | total | |

Source: Prepared by the researcher.

Figure (2) shows the representation of the Pareto diagram for the dimensions of the accelerating supply chain. It becomes clear to us that after the response has the greatest impact on the rise in the size of the gap among the rest of the dimensions, so the company must reduce the size of the gap after the response by addressing the failures in this aspect and then solving the rest Failures related to other dimensions.

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Figure (2) Pareto chart to determine the ratio of the size of the gap and the cumulative ratio of the dimensions of the accelerated supply chain



Source: Prepared by the researcher based on (Microsoft Excel 2016)

2. Lean Manufacturing System

We find that the company is able to apply it through the results shown by the checklist and the availability of the dimensions of this variable in the researched company. Table (6) shows the final results of the checklist for the dimensions of the Lean Manufacturing System, as well as the percentage of application and the size of the gap between these dimensions in the Baghdad Company for Soft Drinks.

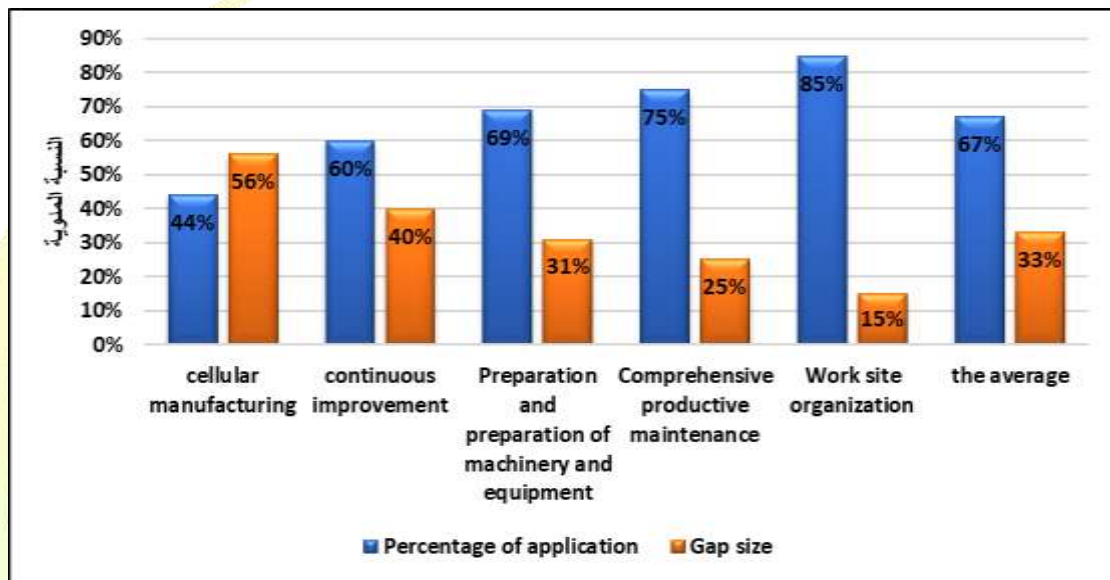
Table (6) Final results of the Lean Manufacturing System Dimensions Checklist

| Gap size | Percentage of application % | Weighted arithmetic mean (application rate) | Dimensions of Lean Manufacturing System | No |
|----------|-----------------------------|---|--|----|
| %15 | %85 | 3.4 | Work site organization | 1 |
| %25 | %75 | 3 | Comprehensive productive maintenance | 2 |
| %40 | %60 | 2.4 | continuous improvement | 3 |
| %31 | %69 | 2.75 | Preparation and preparation of machinery and equipment | 4 |
| %56 | %44 | 1.75 | cellular manufacturing | 5 |
| %33 | %67 | 2.66 | Total Lean Manufacturing System Dimensions Application Rate | |

Source: Prepared by the researcher

Based on the results of Table (6), the rate of application of the dimensions of the Lean Manufacturing System in the company under study was (2.66), with an application rate of (67%) and a gap size of (33%), which is the amount of departure from the ideal situation, and Figure (3) shows the average size of the gap and the average percentage Percentage of applying the dimensions of the Lean Manufacturing System.

Figure (3) The average gap size and the percentage rate for applying the dimensions of the Lean Manufacturing System



Source: Prepared by the researcher with the adoption of (Microsoft Excel 2016)

The dimensions of the Lean Manufacturing System measure the extent to which the organization succeeds in eliminating all types of waste, and in order to measure the extent of the application of the Lean Manufacturing System in the Baghdad Company for Soft Drinks, the dimensions must be used (worksite organization, comprehensive productive maintenance, preparation and preparation of machines and equipment, continuous improvement, Cellular manufacturing) and using a checklist by asking questions and knowing the extent of their application

within the corridors of the company, where the organization of the work site appeared with an application rate of 85%, which is a highly significant percentage since the company is working on organizing, arranging and cleaning the work site in the best way, while the comprehensive productive maintenance appeared in an application percentage 75%, which is highly significant because the company sets a comprehensive annual maintenance plan for equipment and machinery, and with regard to continuous improvement, it appeared with an application rate of 60%,

which is a moderately significant percentage for the presence of some activities that do not add value. It has a good indication that the company is working on the proper preparation and preparation of machines and equipment, while the percentage of application of cellular manufacturing was 44%, which is a low significant percentage because the company does not work on applying some of the characteristics of manufacturing cellular.

It is clear that the overall application rate (67%), which is a good percentage, as the

company has the qualifications for application, but at different levels, and here the use of the Pareto scheme is resorted to for the purpose of determining which dimension has the effect of the few affecting the other dimensions.

a. Pareto chart

Through Table (7) it is possible to determine which of the dimensions has the greatest effect, as the dimensions were arranged in descending order based on the amount of the gap size, and then extracting the percentage of the size of the gap and the cumulative percentage.

Table (7) the size of the gap, the ratio of the size of the gap and the cumulative ratio of the dimensions of the Lean manufacturing system

| Cumulative percentage | Gap Size Ratio | Gap size | Dimensions of Lean Manufacturing System | No |
|-----------------------|----------------|----------|--|----|
| %33 | %33 | 0.56 | cellular manufacturing | 1 |
| %57 | %24 | 0.4 | continuous improvement | 2 |
| %76 | %19 | 0.31 | Preparation and preparation of machinery and equipment | 3 |
| %91 | %15 | 0.25 | Comprehensive productive maintenance | 4 |
| %100 | %9 | 0.15 | Work site organization | 5 |
| | %100 | 1.67 | total | |

Source: Prepared by the researcher

Figure (4) shows a representation of the Pareto diagram for the dimensions of the Lean manufacturing system. It becomes clear to us that the cellular manufacturing dimension has the greatest impact on the height of the gap size among the rest of the dimensions, so the company must reduce the size of the gap after cellular manufacturing by addressing the failures in this aspect and then Solve the remaining failures related to the other dimensions.

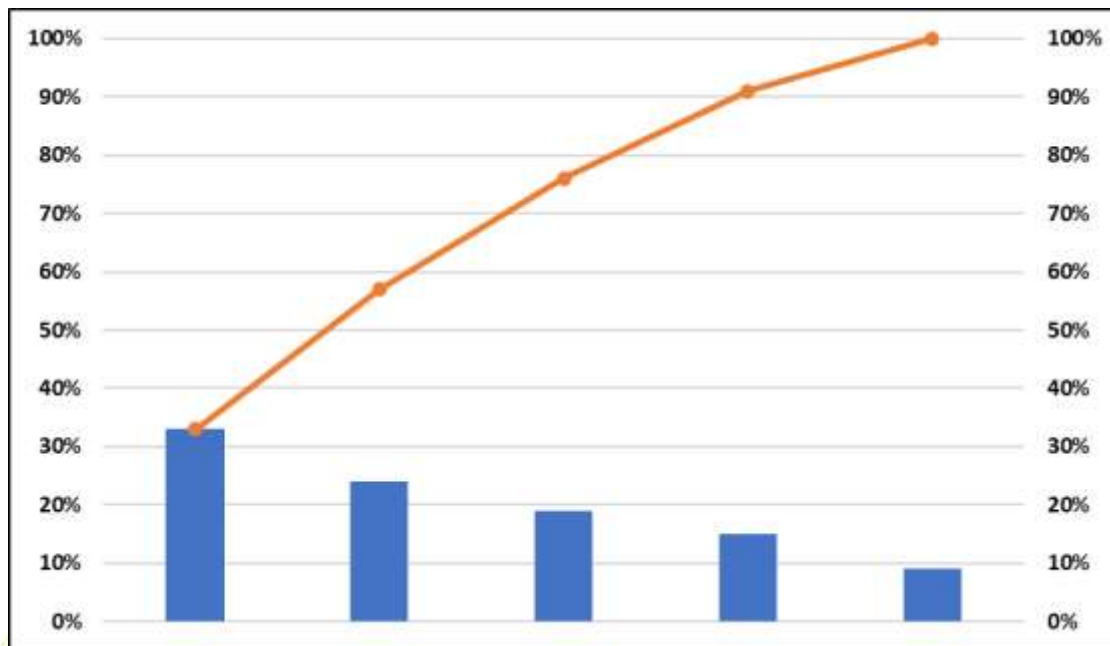


Figure (4) Pareto chart to determine the ratio of the size of the gap and the cumulative ratio of the dimensions of the Lean manufacturing system

Source: Prepared by the researcher based on (Microsoft Excel 2016)

By using the checklist we note the following :

The level of application of the dimensions of the accelerated supply chain and the lean manufacturing system was measured by using the checklist to identify the extent to which these variables can be applied.

FOURTH TOPIC: CONCLUSIONS AND RECOMMENDATIONS

First: Conclusions

1. The company’s performance on the level of continuous improvement is weak, as few teams are formed from different departments for the sake of continuous improvement, and this is attributed to work pressures, as well as the absence of a direct

line of communication between customers and the company to receive complaints and suggestions.

2. Some of the company's cadres in the production departments do not have sufficient experience in the field of preparation and preparation of machines and equipment.

3. The application of cellular manufacturing is not clear in the company, because its production lines are designed on the basis of sequential stages, and each stage is a machine to perform a specific task simultaneously, so that stopping any stage leads to stopping the entire production line and thus increasing waiting times. In addition, training and

rehabilitation courses are rather few, and this reduces the multiplicity of skills of its workers to deal with various production processes.

4. By analyzing the results using the Bayto diagram, it became clear that the response dimension has the greatest impact on the remaining dimensions of the accelerating supply chain in the high size of the application gap.

5. By analyzing the Pareto diagram for the dimensions of the Lean manufacturing system, it is clear that the cellular manufacturing dimension has the greatest impact on the height of the gap size among the rest of the dimensions.

6. Through the results of the checklist, the company in question possesses the qualifications that enable it to implement the accelerated supply chain and the lean manufacturing system.

Second: Recommendations

Based on the findings of the study, we suggest a set of recommendations, the most important of which are:

1. The company must make a depreciation account for machinery and equipment when estimating the planned production capacity.
2. The company should establish a special department for research and development

and assign individuals with sufficient experience in this field because of its importance in the field of environmental analysis, as well as developing the skills of its workforce.

3. The company shall train the personnel of the maintenance department to conduct comprehensive productive maintenance, as well as take the opinions and suggestions submitted by them in order to raise their morale and enhance their loyalty to the company.

4. The necessity of opening a direct line of communication with customers to receive complaints and suggestions.

5. The company should set up training courses to rehabilitate its production cadres and to increase their expertise and multiplicity of skills to deal with various production processes.

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