



THE POSSIBILITY OF INTEGRATION BETWEEN THE BOTH LEAN  
MANUFACTURING SYSTEM (JUST-IN-TIME System) AND MASS  
CUSTOMIZATION SYSTEM IN IRAQI ORGANIZATIONS THE STATE  
COMPANY FOR THE MANUFACTURING OF PHARMACEUTICALS AND  
MEDICAL APPLIANCES (NINEVEH) AS A MODEL

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**Abstract**

The two researchers seek to demonstrate the possibility of integration between the Lean Manufacturing System (Just-in-Time “JIT”) and the Mass Customization System in the organization in question through an exploratory study in that organization and on the diversity of their administrative levels, and given the lack of interest of many governmental organizations in the topics of the Lean Manufacturing System (Just-in-Time “JIT”) and Mass Customization System. Also, due to the importance of the two topics from the researchers' point of view, in addition to the studies that dealt with the study variables and the relationship between them in the Iraqi environment, which led to a comprehensive approach to this topic in an attempt to find a way to integrate the successful application between the Lean Manufacturing System (Just-in-Time “JIT”) and Mass Customization System.

In order to achieve the goal of the research and answer the questions of the research problem, this research was applied to the sample consisting of (27) people from different departments in the organization in the field of research, and the electronic questionnaire was relied on due to the Corona pandemic and the difficulty of social communication as a main tool for data and information collection, and it was treated using a group of statistical

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tools suitable for the nature of the research, such as: the mean, standard deviation, coefficient of variation, and T-Test. in addition to the correlation and effect coefficients, which were implemented using (**IBM SPSS Statistics**), the leading statistical software, **version 27**, on the computer.

**The research has reached many results, including:**

- There is a significant correlation between both Lean Manufacturing System (Just-in-Time “JIT”) and Mass Customization System in the organization under study.
- There is a significant effect between both Lean Manufacturing System (Just-in-Time “JIT”) and Mass Customization System.

Relying on the results of the research, a number of conclusions were shown, and according to which, the researcher presented a set of suggestions that, in turn, are consistent with those conclusions, including the need to adopt these two topics; i.e., Lean Manufacturing System (Just-in-Time “JIT”) and Mass Customization System, as a prevailing culture in the manufacturing process being a profitable source in many cases, on the one hand, and the adoption of a more important culture represented in meeting various demands of customers on the other hand.

*Keywords:* Lean Manufacturing System (Just-in-Time “JIT”), Mass Customization System.

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## **Introduction**

With the great development taking place in the industrial environment and production systems, it has become necessary to develop administrative and production systems in order to respond to the requirements of the modern stage. One of the things that supported its development is the use of automation in industry, computers and modern digital manufacturing methods, and one of the most prominent modern systems that have emerged is the (Just-in-Time “JIT”) system, which has contributed significantly to reducing costs, raising performance levels and expanding production processes Especially since keeping pace with that development requires the presence of a large stock of raw materials and final products, which constitutes a burden on organizations when there are no demands on them. In line with the continuous developments and changes in the tastes of customers, the 90s of the last centuries witnessed the emergence of systems based on the demands and trends of customers. The philosophy of linking the customer’s opinion with the engineer’s has emerged. In many cases, the customer is one of the influential in interfering in the design of products, and thus, ensuring the highest sales while achieving the highest levels of customer satisfaction.

To achieve this, our research is represented through four topics, the first of which is the research methodology, then the theoretical framework of the research, followed by the practical framework of the research, and finally, conclusions and recommendations.

## **The First Topic**

### **Research Methodology**

#### **First: Research Problem**

The study of the Lean Manufacturing System (Just-in-Time “JIT”) is a topic of great importance, as a result of the increasing interest it has received from many researchers and industrial organizations, in addition to its great role in improving productivity levels and reducing costs remarkably, especially when integrated with Mass Customization System, which requires speed in processing, speed of delivery, and continuous communication with markets and customers on the one hand, and suppliers

and designers on the other. The contents of the research problem could be identified by raising the following questions:

1. What is the level of awareness of the research organization of the advantages of (Just-in-Time “JIT”) System?
2. What is the organization's perception of Customization System and the potential benefits of its application?
3. To what extent could the adoption of (Just-in-Time “JIT”) system be considered an effective contribution to the implementation of the Mass Customization System?
4. What is the nature of the relationship and influence between (Just-in-Time “JIT”) system and Mass Customization System?
5. What are the obstacles that prevent the application of both of these systems together?

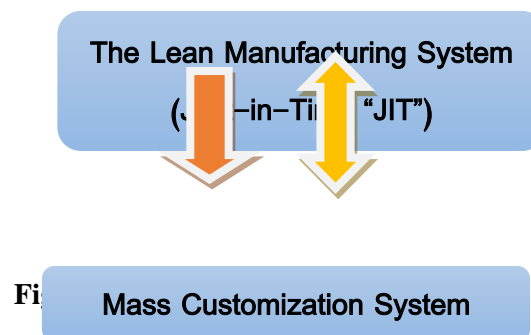
## Second: Research Importance

The elements of the importance of research emerge through the number of contents related to the subject of the research itself, its field of application and its increasingly important effects at the present time, especially for contemporary organizations, as awareness of the importance of adopting the Lean Manufacturing System (Just-in-Time “JIT”), as well as the development of global awareness of the importance of activating the Mass Customization System. Therefore, these topics have become one of the most important topics at the global level, and the research acquires one of its important aspects from the organization under research, or the sector in which the research was applied. The importance of the research can be summarized as follows:

1. It deals with two important topics for organizations in general, and organizations under research in particular, at the theoretical and applied levels, because these two levels contribute to the continued growth and survival of these organizations.
2. Attempting to show the importance of Lean Manufacturing System (Just-in-Time “JIT”) and Mass Customization System as one of the requirements of commitment towards customers in a way that enhances the mental value of business on the one hand, and enhances its competitive position on the other.

## Third: Hypothetical Research Model

The research model was designed after defining the research problem, its importance and objectives, and by reviewing the strategies related to the topic, in order to address the research problem in order to achieve its objectives, and then, the default model of the research was designed, as shown in Figure (1).



## Fourth: Research Hypotheses

In line with the objectives of the research, and to test the hypothetical research model, a set of main and secondary hypotheses were relied upon, we will present them as follows:

1. The first main hypothesis: There is a significant correlation between the Lean Manufacturing System (Just-In-Time “JIT”) System and Mass Customization System.
2. The second main hypothesis: There is a significant effect relationship between the Lean Manufacturing System (Just-In-Time “JIT”) System and Mass Customization System.

### **Fifth: Research Objectives**

The research aims to diagnose the relationship between the Lean Manufacturing System (“JUST-IN-TIME “JIT”) System and Mass Customization System, thus, the research objectives can be identified as follows:

1. Defining the management of the organization in question with the concept of Lean Manufacturing System (Just-In-Time “JIT”) System and Mass Customization System and the need to apply them to achieve excellence and distinction in the business environment.
2. His contribution is modest in defining the two research variables (Lean Manufacturing System (Just-In-Time “JIT”) System and Mass Customization System, in light of the presentation of the theoretical framework for each of them, in a way that reflects the urgent need for business organizations to think of mechanisms for improving production processes.
3. To reveal the level of interest of the researched organization in the Lean Manufacturing System (Just-In-Time “JIT”) System, as well as revealing its ability to adopt this technology and the extent of the organizations’ interest in adopting and implementing Mass Customization System.
4. Diagnosing the level of application of the Lean Manufacturing System (Just-In-Time “JIT”) System and Mass Customization System and determining the extent to which the organization under research is close to their application.
5. Identifying the nature of the correlation and impact relationships between the application of the Lean Manufacturing System (Just-In-Time “JIT”) System and Mass Customization System.

### **Sixth: Research Methodology**

The Descriptive-Analytical Approach was utilized in processing data and information.

### **Seventh: Research Limits**

1. **Spatial Limits:** The research was limited to **The State Company for The Manufacturing of Pharmaceuticals and Medical Appliances (Nineveh)**, which is a public sector company. This organization was selected as one of the organizations related to and convenient with the current research topic.
2. **Time Limits:** The duration of the research was determined by the period of writing the theoretical framework of the research, and distributing the questionnaire on personnel under research, and receiving it from them, as well as the period for completing the field study, which started from **April, 1<sup>st</sup>, 2021** until **October, 1<sup>st</sup>, 2021**.

### **Eighth: Methods of Calculating Data and Information**

The following methods were used to collect data for the research:

1. The use of some foreign sources, as well as foreign periodicals, letters and university theses that are related to the research topic from the Internet, in order to cover the theoretical part of the research and to support the field study.
2. Questionnaire form: to obtain the data of the individuals of the research sample, as well as to determine the role of the Lean Manufacturing System (Just-in-Time “JIT”) and Mass Customization System. Where many sources were relied upon in preparing the questionnaire variables, as the expressions for the variables of Lean Manufacturing System (Just-in-Time “JIT”) were prepared depending on the references: (Jarirah, 2013), (Al Yaqoub, 2013), (Al-Masry, 2016), (Safia, 2020). Also, while preparing terminologies regarding Mass Customization System, references of (Forza & Salvador, 2006), (Al Taweel and Kiki, 2009), and (Jassim, 2014) were used. The five-point Likert scale was adopted, as the range of answers to the questionnaire’s paragraphs ranged from (1-5) degrees, and the degree (5.4) represented the level of agreement or the high degree. As for the scores (2,1) they indicate the level of disagreement or the low degree. While the degree (3) represents the neutral or average answer that covers the research variables, which are (40) paragraphs in total.
3. Statistical Methods: The outputs of the statistical program (IBM SPSS Statistics) version 22 were utilized.

## **The Second Topic**

### **The Theoretical Framework of the Research**

#### **First: Lean Manufacturing System (Just-in-Time “JIT”) System**

##### **A- Emergence of Lean Manufacturing System (Just-in-Time “JIT”) System**

Lean Manufacturing System (Just-in-Time “JIT”) is one of the important topics in industrial engineering and modern production systems. This system originated in Toyota Motor Corporation, and researchers believe that the beginning of this system was with the visit of the corporation's director (Taizo Ishida) to one of the Central Markets of the United States, and then applied this system in the company because of his admiration for the mechanism of the system and its high flexibility, in addition to reducing waiting-time for customers. In light of the complete competition of companies and the great development that occurred recently in terms of uniqueness and renewal of the desires of customers, which led to the necessity of forming educated organizations that are able to reduce costs continuously and keep pace with those changes, (Safi, 2020: 13). Lean Manufacturing System is a philosophy that includes the concepts of operations' function to achieve competitive advantage and precedence for the organization, (Al-Bardini, 2014: 23).

Lean Manufacturing System (Just-in-Time “JIT”) System could be defined as a production methodology that aims at improving production processes in general by eliminating waste, improving quality levels, reducing overall costs, and increasing the flexibility of manufacturing processes, (Abdulla & Matsui, 2007:4). While (Al-Yacoub, 2009: 17) sees it as a system, through which, limited quantities of final products are produced at a specific time at the required price and quality, with zero-storage or exceptionally low level of storage.

##### **B- Objectives of Applying Lean Manufacturing System (Just-in-Time “JIT”) System**

According to Tcheng, Lean Manufacturing System (Just-in-Time “JIT”) achieves major goals that can be listed as follows; (Al-Najjar and Mohsen, 2012: 479) and (Phogat, 2013:98):

1. Increase the organization's ability to compete with others as well as staying in the field of competition for as long as possible.
2. Develop manufacturing processes and reduce waiting-times.
3. Increase production efficiency and reduce costs and time and effort wasting.

4. Disposal of the inventory-under-operation within the production lines by delivering the supplier small batches to the production departments.

5. Getting rid of bad suppliers.

#### **C- Benefits from implementing Lean Manufacturing System (Just-in-Time “JIT”)**

1. Implementation of the Lean Manufacturing System (Just-in-Time “JIT”) brings many benefits, including; (Madanhire, etal, 2013: 334):

2. Better quality products.

3. Distribute quality-control responsibility to everyone, not just to the quality controller.

4. Significantly reduce the total waste and scrap, in addition to reducing work-time, preparation and production.

5. The production flow is smoother and less sloppy.

6. Zero-inventory equals zero-errors, and increase production efficiency.

In a group of studies that included (1035) American industrial companies, it was found that (84%) of the companies have achieved multiple benefits, including: (reducing inventory by 78%, reducing preparation time by 83%, reducing handling time by 90%, improving market-response by 90% %, increasing inventory turnover and reducing working-space), (Garra, 2013: 90), and (Abdulla & Matsui, 2007: 4).

Lean Manufacturing System (Just-in-Time “JIT”) can be compared with other production systems, as illustrated in Table (1).

**Table (1) Comparison of Lean Manufacturing System (Just-in-Time “JIT”) with Conventional Systems**

<b>Lean Manufacturing System (Just-in-Time “JIT”) System</b>	<b>Conventional Production System</b>
1. Flexible production system based on production requests.	Flexible production system based on production flow.
2. Inventory gradually reduced to zero.	Requires large inventory.
3. Depends on manufacturing cells.	Depends on the flow of processes between production stages.
4. No specialization, and all-around-knowledge of all work processes.	Specialization is in one job only.
5. Comprehensive quality and performance control.	Medium quality control.
6. Simple and low-cost system.	A complex and expensive Costing System.
7. Rely on financial and non-financial metrics.	Rely on financial metrics only.

**Source: (Jarirah, Talal Suleiman: 2013), Lean Manufacturing System (Just-in-Time “JIT”) and the requirements of its application in industrial joint stock companies in Jordan, Field Study, Humanities Studies, Volume (4), Edition (1), pp: 91.**

#### **Second: Mass Customization System**

##### **A- Mass Customization System Origin and Concept**

The modern history of Mass Customization System began in 1970, when Alvin Toffler wrote in the field with his book Future Shock.

Also, in 1987, Stan Davis wrote about the Mass Customization System in his published book: Future Perfect.

While the shift from Mass Production to Mass Customization System was in the work of Joseph Pine in 1993, (Freihat & almahirah, 2014: 56). Mass Customization System is defined as: The ability to produce products or services in large quantities, despite their different specifications according to the needs of customers or types of customers, (Slack, et al 709: 2013). Mass Customization System, (Krajewski, et al, 2013: 117) sees it as: A strategy that uses highly differentiated processes to generate a wide range of customized products at reasonably low costs. Whereas (Stevenson, 2015:151) defines Mass Customization System as: A strategy for the production of standardized goods or services, which includes a certain degree of customization in the final product or service. One of the most important methods of this strategy is delayed differentiation or preference (**Postponement**), as well as normative design. As for (Freihat & almahirah, 2014: 56), he sees Mass Customization System as a strategy that creates value through a form of interaction between companies and customers in the manufacturing and assembly stage at the level of operations to produce customized products that are similar in their production cost and price to those of mass-produced products.

Table (2) shows a comparison between Mass Production and Mass Customization System, as follows:

**Table (2), Comparison between Mass Production and Mass Customization System**

<b>Dimensions</b>	<b>Mass Production</b>	<b>Mass Customization System</b>
<b>Focus</b>	Efficiency for stability and control.	Distribution and customization for flexibility and rapid response.
<b>Objectives</b>	Development, production, marketing and processing of goods and services for a small price that is almost universal.	Affordable, diverse and personalized, everyone can find exactly what they want, develop, produce, market and supply goods and services.
<b>Main Advantages</b>	-Steady demand. -Large homogeneous markets. -Low-price, stable quality, standardized goods and services. -Long product development cycle. -Long product life cycle.	-Unexpected demand. -Inconsistent ports. -Low-prices, high quality, customized goods and services. -Short product development cycle. -Short product life cycle.
<b>The Product</b>	Standard products manufactured according to specifications.	Standard units assembled according to users' needs.
<b>The Structure</b>	Bureaucracy and Hierarchy.	Organic, flexible and relatively less hierarchical.

**Source: Skačkauskienė, Ilona, & Davidavičius, Sigitas, 2015, The Features of the Concept of Mass Customization, Journal Business Theory and Practice, V. 16, No. 2, Vilnius Gediminas Technical University, P. 134.**

Finally, (Al-Jubouri, 2010: 329) defines it in two directions. First: Theoretical Definition: It means giving the product or service an individual (personal) advantage, and it expresses the company's ability to provide the customer with anything he wants comfortably, at any time, place and way he wants it.

Second: Procedural Definition: it is the use of flexible processes and a flexible organizational structure to produce various and perhaps individual products and services at low costs and within the framework of standardized production.

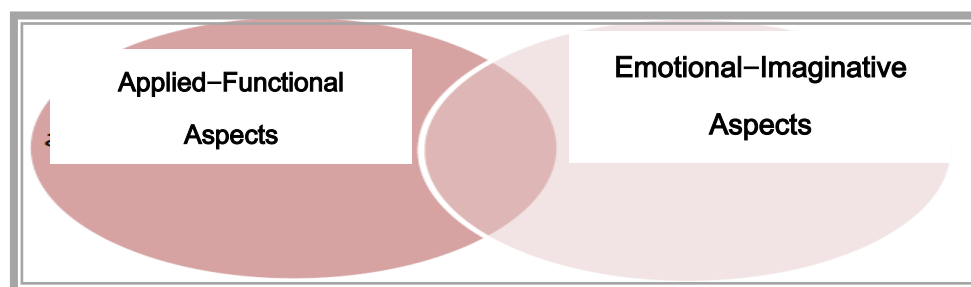
## **B- Aspects and Conditions of Mass Customization System**

Figure (2) shows the aspects of the Mass Customization System, as two aspects of the Mass Customization System must be distinguished. The first aspect is the concept of imagination, which is the ability to provide anything that is required (requirement) for the customer, and profitability, at any time and any place, and in any way the customer wants.

The second aspect is the applied and practical concept, which is the ability to use flexible processes and organizational structures to produce a range of products and services designed according to the specifications required by customers, at the lowest possible cost.

As for the conditions of Mass Customization System, the most important of them are; (Freihat & Almahirah, 2014:56-58):

1. There is a demand for diversity and customization with appropriate market conditions.
2. The value chain must be ready.
3. Technology must be available.
4. Products are applicable for customization.
5. The obligation to share knowledge.



**Figure (2):** Main Aspects of Mass Customization System

Source: Bianchi, Francesca 2012, Mass Customization in footwear sector: guidelines to configure the Business Model after the introduction of a product configurator, Master Thesis, POLO TERRITORIALE DI COMO University, Italy, P: 6.

### **C- Prerequisites of Mass Customization**

The shift from Mass Production to Mass Customization System may appear to many companies questionable, so the decision to make such a change must be preceded by an analysis of potential advantages and disadvantages, as well as, an analysis of the prerequisites needed for the successful implementation of Mass Customization System. The basic requirements can be divided into external, internal factors, as follows:

**1- External Factors:** These factors are independent of the manufacturer in the short term. In the long run, the manufacturer can influence these factors, for example, through marketing activities. These factors, if met, may justify the shift from mass production to Mass Customization System; It includes:

**a. Marketplace Factors:** Harmony of the market, size of the market, disruption factor, product life cycle, competition.

**b. Human Factors:** Customers' willingness to purchase customized products, (accepting a longer delivery period, sometimes a higher price).

**c. Logistics:** Provides fast and cost-effective ways to deliver products from factories to customers.

**2- Internal Factors:** Depend on the manufacturer, and include:

**a. IT systems:** In order to design, produce and deliver highly customized products with mass production efficiency, all processes along the value chain must be supported by an efficient IT architecture.

**b. Infrastructure:** This category includes factories' location, (they must be relatively close to markets, in order to reduce delivery time, some experts even suggest the idea of mini-factories



describing them as "promising"), and production lines; (The most important advantages that are required are flexibility and efficiency in the production of unique products on a large-scale), (Freihat & almahirah, 2014:56-58).

#### D- The Competitive Advantages of Mass Customization Strategy

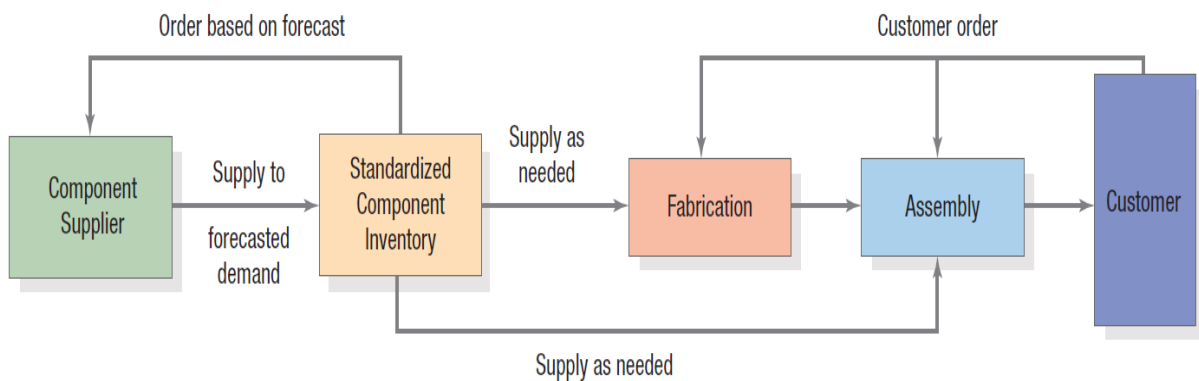
**1. Customer Relationship Management:** Mass Customization System requires detailed input from customers so that the ideal product or service can be produced.

**2. Clearance of finished goods inventory.**

**3. Increase the perceived value of services or products:** The mass customization system often has a higher value in the mind of the customer than the actual cost of production, as this perception allows companies to charge prices that provide a good margin.

#### 4. Assemble-to-Order Strategy

This strategy includes two phases in providing the service or product. Initially, components are produced or purchased and kept in stock. This stage is important because it enables the company to produce or purchase these items in large quantities to keep costs down. In the second stage, the company assembles these components according to a specific customer request. In Mass Customization System, this stage must be flexible to deal with a large number of potential groups and be able to produce customer's order quickly and accurately. Figure 3 illustrates Assemble-To-Order strategy.



**Figure (3): Assemble-to-Order Strategy**

**Source: Krajewski, Lee J., Ritzman, Larry P., & Malhotra, ManojK, 2013, Operations Management Processes and Supply Chains, Global Edition, Pearson Education Limited, P: 388.**

#### 5- Modular Design:

The modular design enables producers to quickly assemble products with models to achieve a custom configuration for an individual customer, avoiding the long wait for the customer that occurs if individual parts must be assembled. Dell Computers has successfully used this concept to become a dominant force in the personal computer industry by allowing consumers to configure units to their own specifications.

#### 6- Postponement

Postponement: Delaying any modifications or customizing the product for as long as possible in the production process. Postponement is a method of postponing a production process or not completing a product or service by postponing delivery until the customer's preferences or specifications are identified. In case of goods, semi-finished units may be kept in stock until customers' orders are

received, and custom features are integrated at any time according to customers' requests. For example, furniture makers can produce dining room sets, but colors, graphics and shapes are not applicable to them, allowing customers to choose colors, graphics and shapes. Once the selection is made, the colors and designs can be made in a relatively short time, thus, eliminating long waits for customers, giving the seller a competitive advantage. (Al-Jubouri, 333, 2010), (Krajewski, et al, 2013:387-388), (Stevenson, 2015:151-152) and (Heizer, et al, 2017: 285).

#### **E- The Advantages and Strengths of Mass Customization System**

**1-** Management in many companies uses Mass Customization System to successfully create greater value for their customers and a competitive advantage for their companies.

**2-** To minimize 'company sacrifices'. The modern consumer is more demanding than ever and due to the ease of access to the global market, the dynamics of the industry are constantly changing.

**3-** Mass Customization System technologies allow companies to create a cost-effective value chain, with increased flexibility in meeting the needs of customers from heterogeneous market demands. Companies that listen to consumers pay more attention to service delivery, rather than just acquiring new customers. They focus on building lasting relationships with existing clients.

**4-** Customers can be seen as partners in the Mass Customization System, where companies allow consumer input to influence the value creation process to a predetermined degree, (Stojanova, et al, 2013:230).

(Bianchi, 2012:7) indicates that **the most important advantages of Mass Customization System are:**

**1-** Increased profits, as the customer can be willing to pay more for some exclusive and personal.

**2-** There is no need to forecast demand.

**3-** Increase customer loyalty as he may be satisfied with receiving exactly what he wants.

**4-** Value chain integration.

**5-** Increased customer participation in the purchasing process.

**6-** Reducing overproduction, because the company only realized what the customer wanted.

### **Third: Practical Framework**

#### **Description and Analysis of Study Variables**

##### **A- Description and Analysis of Main Study Variable, which is (Lean Manufacturing System) in the corporation under study**

This presentation and analysis of the research variables aims to build a general perception of the nature of the variables from the respondents' point of view, leading to preliminary indicators that help simulate the theoretical part of the research, and then push it towards testing and conclusion. Table (4) represents the results of the arithmetic mean, standard deviation, coefficient of variation and T-Test, in addition to the level of significance regarding the main study variable (Lean Manufacturing System). Where a total arithmetic-mean of (3.82) has appeared, which is greater than the hypothetical mean. This indicates that there is good interest in providing and applying Lean Manufacturing System, with a general standard deviation of (1.027), which is a high one, that reflects a dispersion in the answers of the respondents with a general coefficient of difference of (0.27), and this was reinforced by the value of T-Test of (15.7) at the level of significance of (0.00), keeping in mind that the lower the coefficient of variation on one hand and the higher the value of T-Test on the other, the more this indicates commitment of the organization to apply Lean Manufacturing System, and at a level of significance of (0.00), which is less than (0.05), which indicates the moral existence of that variable or that paragraph, as follows:

**Table (4)** Arithmetic-mean, Standard Deviations, Variation-Coefficient, and T-Test for the main study requirement (Lean Manufacturing System)

Paragraphs		Arithmetic-mean	Standard Deviations	Variation-Coefficient	T-Test
1	Implementation of the Lean Manufacturing System (Just-in-Time "JIT") Relies on an Unlimited Number of Suppliers	4.00	.784	0.20	26.50
2	The system helps in providing products according to the customer's desires	4.26	.764	0.18	28.96
3	To implement the Lean Manufacturing System (Just-in-Time "JIT") it is necessary to rearrange and restructure the processes	4.07	.874	0.22	24.23
4	Lean Manufacturing System (Just-in-Time "JIT") greatly simplifies production systems and eliminates unnecessary activities	4.07	.997	0.25	21.23
5	Lean Manufacturing System (Just-in-Time "JIT") reduces overall costs	3.89	1.086	0.27	18.61
6	Lean Manufacturing System (Just-in-Time "JIT") requires the selection of a small number of raw materials	3.96	.940	0.24	21.91
7	The organization does not have sufficient information on the implementation of the Lean Manufacturing System (Just-in-Time "JIT")	3.63	.967	0.27	19.51
8	The organization works to implement continuous improvement of processes, workers and machines	3.93	1.035	0.26	19.71
9	The organization has continuous improvement programs at the technical, administrative and operational levels	3.85	1.047	0.27	18.74
10	The organization has evaluation programs for the work as a whole in order to reach zero defects	3.63	1.115	0.31	16.92
11	The company is working on training employees to add skills specific to the application of the Lean Manufacturing System (Just-in-Time "JIT").	3.15	1.262	0.40	12.96
12	The company seeks to amend	3.44	1.219	0.35	14.68

	administrative decisions in a manner appropriate to the application of the system				
13	The company is building a communication network with the suppliers in order to keep in constant contact with them	3.74	1.259	0.37	15.44
14	The organization prepares a schedule to assess the quality of the raw materials processed to ensure the quality of the final products	3.78	1.050	0.28	18.70
15	The organization builds a master scheduling system for production that corresponds to the processing operations	3.59	1.185	0.33	15.75
16	The implementation of the Lean Manufacturing System (Just-in-Time "JIT") requires a slight adjustment in the arrangement of production lines	3.81	.962	0.25	20.60
17	The application of the system aims to reduce the storage of raw materials and finished products	4.00	.961	0.24	21.63
18	The organization seeks to establish long-term relationships with suppliers	4.07	1.035	0.25	20.45
19	It is possible for the suppliers to participate in knowing the details of the production process to increase the awareness of the suppliers of how to prepare the raw materials	3.59	1.047	0.29	17.82
20	The application of the system reduces the preparation and preparation times for raw materials and equipment	3.89	.974	0.25	20.75
<b>Lean Manufacturing System Total Paragraphs</b>		<b>3.82</b>	<b>1.027</b>	<b>0.27</b>	<b>15.7</b>

0.05  $P \leq *$ 

Level of significance 0.00

N =27

### **B-Description and Analysis of Main Study Variable, which is (Mass Customization System) in the corporation under study**

This presentation and analysis of the research variables aims at building a general perception of the nature of the variables from the respondents' point of view, leading to preliminary indicators that help simulate the theoretical aspect, and then, developing it towards testing and conclusion. Table (5) presents the results of the arithmetic mean, standard deviation, variation-coefficient, T-Test and level of significance of the dependent variable of the study (Mass Customization System). It showed a total arithmetic mean of (3.61), which is greater than the hypothetical mean, and this indicates that there is

good interest in adopting Mass Customization System, with a general standard deviation of (1.15), which is a high one, and that reflects a large dispersion in the respondents' answers and also shows that there is a lack of credibility in the respondents' answers with a general coefficient of difference of (0.33), and this was reinforced by the T-Test value of (17.26) at a level of significance of (0.00), knowing that the lower the coefficient of variation on one hand and the higher the T-Test value on the other, the more this indicates the organization's commitment in applying Mass Customization System more and at a level of significance of (0.00), which is less than (0.01), and this indicates the moral existence of that variable or that paragraph, as follows:

**Table (5)** Arithmetic-mean, Standard Deviations, Variation-Coefficient, and T-Test for the main study requirement (Mass Customization System)

Paragraphs		Arithmetic-mean	Standard Deviations	Variation-Coefficient	T-Test
21	The organization meets the needs of customers by allowing them to express their opinions	3.56	1.19	.33	15.56
22	The organization identifies products that meet the needs of customers accurately	3.78	1.12	.30	17.51
23	Customers get frustrated when they are forced to choose certain types of products	4.00	1.11	.28	18.74
24	The organization exchanges opinions and ideas with customers in the initial product design stage	3.48	1.25	.36	14.45
25	Through dialogue with customers, the organization takes their opinions and changes product designs accordingly	3.41	1.15	.34	15.37
26	The organization has standard designs that it uses for all products	3.52	.935	.27	19.55
27	The organization has special designs for customers with high purchasing power	3.67	1.18	.32	16.19
28	Customers' opinions on packaging are taken into account	3.41	1.15	.34	15.37
29	The organization deals transparently with customers and suppliers in order to provide the best products	3.81	1.04	.27	19.08
30	The organization has an information base that includes all customer preferences	3.41	1.15	.34	15.37
31	The organization follows up the customers after using the	3.19	1.42	.46	11.70

	products to find out the errors and to modify the products in the next times				
32	The organization uses social media to reach customers and take their opinions	3.59	1.40	.39	13.39
33	The organization is rearranging the production lines to offer products that match the largest possible number of customers	3.59	1.19	.33	15.75
34	The organization deals with industrial customers and offers them products of their own	3.44	1.28	.37	13.97
35	The organization sees customers as one of its most important priorities and is keen to satisfy them	3.85	1.03	.27	19.49
36	The organization is trying to introduce the latest technologies into production processes in order to provide the best products	3.85	.907	.24	22.06
37	The organization allows customers to postpone their purchase without incurring the costs of preparing the order and purchasing costs	3.52	.893	.25	20.47
38	The organization has the ability to respond quickly to customer requirements at the lowest cost and conform to specifications	3.52	1.31	.37	20.47
39	The organization seeks to acquire modern technologies such as computer design and manufacturing	3.74	1.26	.37	13.94
40	The organization takes into consideration the products prevalent in the market and develops its products in the light of those products to achieve greater desire among customers	3.93	1.14	.29	15.44
<b>Mass Customization System Total Paragraphs</b>		<b>3.61</b>	<b>1.15</b>	<b>.33</b>	<b>17.26</b>

### 3. Correlation and influence relationships between the study variables

It requires analyzing the research model and testing its main hypotheses as they appear in the research methodology, the content of this relationship, and that is to verify the validity of the first hypothesis

which states that there is a significant correlation between Lean Manufacturing System and Mass Customization System.

**a. Correlation between Lean Manufacturing System and Mass Customization System**

Table (6) indicates that there is a significant correlation relationship between Lean Manufacturing System and Mass Customization System, as the value of the correlation coefficient was (83.6%) at a significant level of (0.05). Lean Manufacturing System, through which the successful application of Mass Customization System is reached. Thus, the researched organization has contributed to achieving an important part of the philosophy of adopting systems that contribute significantly to reducing the costs of production processes and satisfying customer demand and satisfaction at the same time.

**Table (6)** *The results of a relationship between Lean Manufacturing System and Mass Customization System at the total level of the organization under research*

Independent Aspect Approved Aspect	Mass Customization System
Lean Manufacturing System	*83.6

$P \leq 0.05$

N= 27

**B. The relationship of influence between the Lean Manufacturing System and the Mass Customization System at the overall level of the research organization**

**1. The influence relationships between Lean Manufacturing System and Mass Customization System at the level of the organization under research:**

Table (7) indicates that there is a significant effect of the Lean Manufacturing System on Mass Customization System in the organization under study, as the calculated (F) value reached (55,569) and its significance was (0.000) at the level of significance (0.05), and two degrees of freedom of (1.26) and with a coefficient of Determine ( $R^2$ ) of (0.698), and this indicates that (69.9%) of the effects are explained by the model from the differences or effects present in the response variable, and the rest belong to other variables that were not covered by the research model.

By following up on the (B) coefficients and their (t) test, it was found that the calculated (t) value amounted to (7.454) and its significance was (0.000) at two degrees of freedom of (1.26) and at a level of significance of (0.05).

**Table (7)** *The results of the effect between Lean Manufacturing System and Mass Customization System at the level of the researched organization.*

Independent Aspect Approved Aspect	Lean Manufacturing System		Standard-Mean STD.	T	Sig.t
	B0	B1			
Mass Customization System	1.022	0.836	0.137	7.454	0.000

**Model Summary**

Significant F	df2	df1	F	R <sup>2</sup>
0.000	26	1	55.569	0.698

P ≤\* 0.05

N= 27

#### Fourth: Conclusions and Recommendations

##### Conclusions

Based on the research results, a set of conclusions were reached as follows:

1. The organization under study applies the research variables, both Lean Manufacturing System and Mass Customization System, but the application was in a varying percentage oscillating towards the higher application of Lean Manufacturing System.
2. The variation of the sub-dimensions appears in the application of Lean Manufacturing System, due to a number of sub-dimensions, including the failure of the researched organization to build a communication network with the suppliers, as well as the weakness of the training process for the working personnel to add skills specific to the application of Lean Manufacturing System (Just-in-Time "JIT").
3. In light of the Corona pandemic, the surveyed results indicate that the organization in question does not use social media to reach customers and take their opinions.
4. The management of the organization in question does not follow up on customers after using the products to find out errors and modify the products in the coming times as an indication of the lack of after-sales services.

##### Recommendations

The research presents a number of recommendations in an attempt to enhance field work within the organization in question to enhance work in the dimensions of the study, as follows:

1. The organization in question should work on the participation of individuals working within the organization in workshops, seminars and lectures on enhancing the production process in general and Lean Manufacturing System in accordance with the principles of Mass Customization System in particular.
2. The organization's management should work on developing the communication process, enhancing electronic communication processes, and promoting the optimal use of social media in light of the Corona pandemic.
3. The organization in question should work on surveying the opinions of users of its products, identifying errors or problems they face and addressing them, in order to avoid mistakes and enhance their market reputation, because the Iraqi marketing environment is characterized by being an open environment for similar and alternative products.
4. The organization in question should build permanent and direct contacts with the suppliers by using modern programs, including ERP programs and systems, which guarantee a timely partnership with the suppliers to avoid delays in processing.
5. The necessity of adopting the two subjects of Lean Manufacturing System (Just-in-Time "JIT") and Mass Customization System, although the results of the study indicate their application, but it



must be strengthened and adopted as a culture prevailing in the manufacturing process as it is a profitable source in many establishments and organizations.

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