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The role of the fractional manufacturing system in achieving of manufacturing system efficiency

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***Abstract* :** The current research aims to highlight the fact that the continuous change in the industrial and production environment requires companies to have the ability to adapt quickly and effectively to respond to these changes and to obtain a competitive advantage in the local market. Therefore, the fractional manufacturing system is one of the systems used to respond quickly to the changing market requirements and can be implemented successfully by integrating technology, personnel, and modern techniques into production processes. Hence, the research problem arises with the critical research question: What is the role of the fractional manufacturing system in achieving the efficiency of the manufacturing system? The research was taken from the General Company for Electrical and Electronic Industries as a community. A descriptive analysis of the research variables was conducted to identify the arithmetic mean, standard deviations, relative importance, correlation coefficient, influence, and (Cronbach's Alpha) coefficient, It was distributed (250) questionnaires were distributed to the staff, and (231) questionnaires were retrieved from them by (15) A questionnaire was damaged, and (216) a questionnaire valid for analysis. The research reached the most important conclusion that the fractional manufacturing system is the outcome of the production processes for organizations to obtain the highest level of efficiency, which in turn helps in the optimal exploitation of resources and achieving a competitive advantage.

Keywords: Fractional manufacturing system, efficiency

INTRODUCTION: The current challenge in the current industry is to develop production control systems that can support productivity, flexibility, responsiveness, modularity and the possibility of expansion. Real-time decision making more effectively and efficiently In reality, to be more responsive and effective in a more dynamic and turbulent environment, production must be controlled more closely to the real progression of tasks. Because it is necessary to collect more information in real time and it seems that the production concept is able to generate a lot of information during the production cycle and provides an appropriate solution in addition to the total or partial manufacturing methods used in production decision-making. In general, the research was divided into four agency axes: the first axis includes the research methodology, the second axis includes the theoretical aspect and the concepts of the research variables, which are the independent variable, the segmented manufacturing system, and the variable dependent on the efficiency of the manufacturing system, and the third axis was devoted to the practical side, and the fourth axis dealt with conclusions and recommendations.

First: Research problem

Focusing on various areas of manufacturing, increasing production and productivity, reducing waste and efficient use of production capacity, and securing the needs and desires of customers requires the establishment fractional manufacturing systems that serve as a bridge to bridge the gap between manufacturing in Iraq and developed countries in light of the development in information technology, which requires the development of manufacturing systems Through which it is possible to meet the needs of customers and develop capabilities that can contribute to building competitive capabilities in a way that qualifies Iraqi industrial organizations to keep pace with global markets, and the research problem emerges from the following main question:

"The role of the application of the fractional manufacturing system in achieving the efficiency of the manufacturing system?"

Second: Research Importance

1- The Fractional manufacturing system, with the help of Iraqi industrial organizations, can contribute to enhancing flexibility and achieving competitive capabilities in light of market fluctuations.

2-The Fractional manufacturing system helps achieve a wide variety of products, high flexibility, and quick response to changes in the markets.

Third: Research objectives

The research objectives are as follows:-

1-Identify the reality of the fractional manufacturing system and the level of efficiency of the manufacturing system in the researched company.

2-Identifying the nature of the relationship between the fractional manufacturing system and the level of efficiency of the manufacturing system.

Fourth: Research Hypotheses

A- The first hypothesis is that there is a significant correlation between the fractional manufacturing system as a whole and each of its dimensions (flexibility, scalability, modularity, effective cost, adaptation) and the efficiency of the manufacturing system.

B- The second hypothesis is that there is a significant effect relationship of the fractional manufacturing system as a whole and each of its dimensions (flexibility, scalability, modularity, effective cost, adaptation) on the efficiency of the manufacturing system.

Fifth: Hypothetical scheme of the research

The research scheme can be illustrated to explain the two research variables through the sub-dimensions of the independent variable and the main dependent variable, as shown below:

1- The independent variable: the fractional manufacturing system and its dimensions (flexibility, scalability, modularity, effective cost, adaptation) based on the scale (Mezher,2020)

2- The dependent variable: which includes the efficiency of the manufacturing system based on a scale (Al-Skafi and Al-Hashemi,2015)

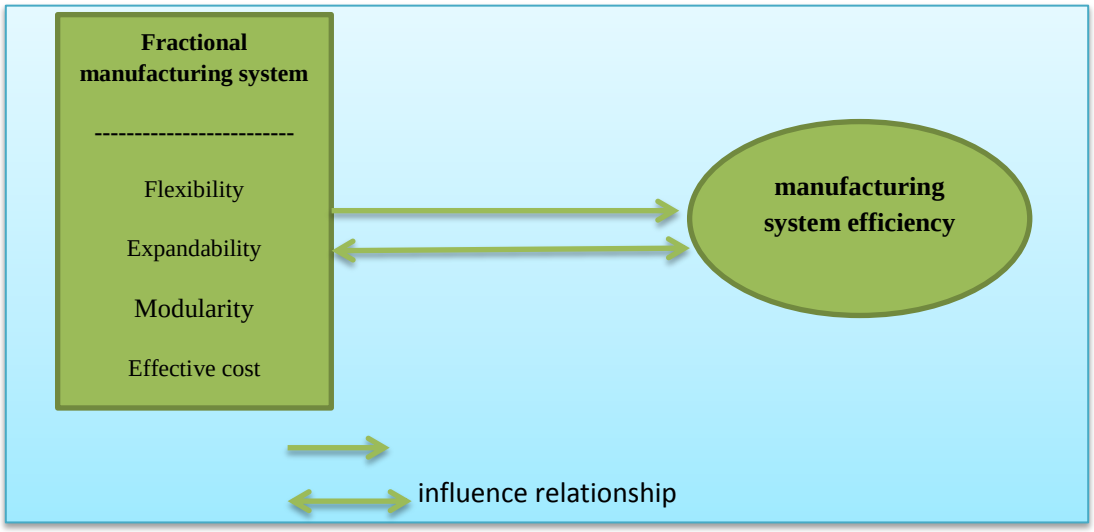

Figure (1) The hypothetical scheme of the study

Sixth: Community and the research sample

Study population The General Company for Electrical and Electronic Industries As for the sample, (250) questionnaires were distributed to its employees, and (231) questionnaires were retrieved from them, and (216) questionnaires valid for analysis.

Seventh: Justification for the research

In general, the importance of the activity is evident through its contribution to the progress of the industry and the trend towards fractional manufacturing, which has an impact on the management of production companies. Due to the suitability of the variables and dimensions of research in the researched company, it has been chosen as a field for research for the following reasons:

1-The suitability of the research problem, its importance and objectives with the reality of the nature of the researched company and its field of specialization.

2- Appropriate field application for the research in the researched company, as well as providing full support and cooperation with the researchers in order to obtain the necessary data necessary for the research.

3- The need to develop production processes in companies operating in the industrial sector in order to advance the industrial reality in Iraq and the private sector, which contributes to supporting the general economy of the country.

Eighth :previous studies

A- Studies related to the fractional manufacturing system

Study Mezher, (2020) "The impact of the fractional manufacturing system on product quality through the mediating role of production technology" The study aims to determine the requirements for the application of the segmented manufacturing system in the responding organization and to describe and diagnose the level of production technology in the researched organization, the General Company for Electrical and Electronic Industries together and the sample was distributed (200) As for the study measures, Shapiro-Wilk scale, Kolmogrov-Smirnov scale, and the most important results, there is a strong relationship between fractional manufacturing system and the quality of the products through production technology, where the fractional manufacturing system is increased by one amount, which leads to an increase in the quality of the products by an amount, and there is also a correlation between the internal variables The correlation between the fractional manufacturing system and production technology reached (0.714), while the correlation between the fractional manufacturing system and product quality reached (0.732). questionnaires were conducted on the company's board members, factory managers, their assistants, production line managers, and engineers.

B- Studies related to manufacturing system efficiency

Study Al-Skafi and Al-Hashemi, (2015) "Occupational Safety Management Practice and its Role in Improving Production Efficiency" The study aims to diagnose the correlation between occupational safety management practices and production efficiency and to demonstrate the impact of occupational safety management practices on production efficiency and the study population Najaf Oil Refinery. Productivity The available energy and the most important results It is clear that productivity efficiency is one of the important matters that called the attention of the countries of the world as it is an indicator of profit and performance efficiency in institutions It is also a means to achieve economic and social goals, and there is an inverse relationship between the number of work accidents and work productivity expressed in the refinery's productivity, which means that an increase in work accidents leads to a decrease in labor productivity. to lower production efficiency in the refinery.

The second topic / theoretical framework

First: concept of the Fractional manufacturing system

Fractional Manufacturing System (FrMS) is a new and advanced system for the concept of manufacturing that was introduced by (Warnecke) in 1993 and it is an independent system that refers to multiple cooperating units or factors that are mainly divided into Fractional entities, each of which has a specific function aimed at providing Serving, producing a product, or providing an activity to other units (Baykasoglu, 2001:75) The process of dynamic restructuring in the Fractional manufacturing system refers to the reorganization of the logical connections of the Fractional units or entities regardless of their hierarchical location, in other words, the change of these entities or the factors associated with them, which have an effect on changing the internal or external environment. The limits of reconfiguration (for example, reorganization, generation, and transfer), which are considered as one of the important factors in the fragmented entities that contribute to the generation of new entities and the disposal of the old fragmented entities that exist from them (Ryu & Jung, 2014:55)

Fractional Manufacturing System is a flexible system and consists of the distinctive elements of the factory (machines, infrastructures, manufacturing cells, tools, processes, etc.) that exchange information, knowledge, materials, human and virtual resources, Providers (Attar &Kulkarni, 2014: 1814) Fractional Manufacturing System is a social-technical system consisting of technology, human resources, and interrelated business processes through production processes, technological functions, and human communications to achieve a common goal in a specific context (market, competition, customers, society, and any other activity in which the organization operates) (Peralta & Soltero, 2020:48-49).

Some researchers emphasize that the Fractional Manufacturing System can be viewed as an open system consisting of units that enjoy independence in work in addition to being an integral part of a system in itself. The conceptual idea of the modular method is used to treat the lack of flexibility in the system, taking into account internal and external factors. To reduce the complexity of the organizational structure by increasing its scalability and optimization (Lafou et al., 2016: 100).which was defined by (Ramin, 2018:12) Among the similar factors through which the goal of the productive and functional factory can be achieved in terms of efficiency, effectiveness, cooperation, coordination and negotiation with others.

From the point of view of the researchers, it is a system consisting of a group of similar factors through which the goal of the productive and functional factory can be achieved in terms of efficiency, effectiveness, cooperation, coordination and negotiation with others.

Second: the importance of the Fractional manufacturing system

The current manufacturing companies are facing an unprecedented process of change in the business environment. Important changes such as market globalization, shorter product cycles, broad product sales, product customization, changes in demand patterns, major rapid technological developments, and the amount of information and knowledge to be processed with the presence of traditional organizational structures. This requires flexibility and high interaction

with environment through the ability to adapt, which will be of importance to project-based organizations in achieving their strategy and objectives under harsh working conditions (Kramarenko, 2010:13), and the Fractional manufacturing system is a large and complex system consisting of Many issues such as personnel, equipment, continuous operations, batches, large data, flow of information and decision-making processes, as the organization needs to complete its industrial activities such as this system for the production of small and complex parts and is able to ensure that the ceiling of the cost of the product is not raised, especially automation operations, as it always has the need for development and introduction New computer applications because manufacturing systems are characterized by a deep organizational hierarchy and high customization, which in turn affects the integration of a number of general models to describe the proposed manufacturing systems. It is linked to material processing. (Botef, 2011:65) believes that the importance of this system is concentrated in the following:

1-Identify the basic organizational entities and activities that consume the organization's resources.

2-Looking beyond advanced manufacturing systems to alternative delivery methods with a high degree of flexibility such as make-to-buy options or external solutions.

3-Create flexible and configurable modules for processes and work practices.

4-Adopting an approach based on operations and building systems around its various levels to maintain its efficiency and dynamism.

5-Adopting heterogeneous systems as alternatives to the hierarchical structure of the organization.

6-Integrating staff and technology into purposeful and highly responsive units.

Third: Objectives of the Fractional manufacturing system

Intelligent and distributed manufacturing systems that manage a large volume of information and processes, which were occupied by Fractional manufacturing systems, which are characterized by their ability to address the required complexity through distributed manufacturing systems in an inspired manner through independent, self-organizing units and integrated with each other. It is able to manage the complexity from the beginning and provides Opportunity for inclusion, integration and sustainability in manufacturing activities For this reason, the goal of using fractional manufacturing as a framework for planning, designing, modeling, simulating, optimizing, evaluating and managing manufacturing processes is to create a modular manufacturing system similar to the natural element through which the similarity of the self-structure will allow, to adjust the detailing of functions, properties or principles that form This will lead to a stable and developed state on the system and thus the ability to support the pressure it faces in the course of work, and transform interaction with the environment in a neutral manner, which means that the results are balanced in economic and social dimensions and the industrial environment, and increases the efficiency of the results and contributes to the diversity and sustainability required for the manufacturing system that guarantees Technical and economic feasibility of operations (Peralta et al., 2017: 7).

The goal of modular manufacturing (Peralta et al., 2015:928) is to develop a framework for planning, designing, modeling, simulating, optimizing, managing, and evaluating processes as compared to forms of organization of modular natural entities that modify their functions, features, or principles according to the context and nature of environmental stress. Before designing a modular manufacturing system, it is necessary to know the basics of modular entities and examine the modular model, the philosophical model, and theoretical principles of natural objects to determine the measurement for this purpose. Among the objectives of the modular manufacturing system are(Peralta & Soltero, 2020: 52):-

1- Achieving objectivity in formulating measurable engineering.

2-Provide a set of features and performance evaluation criteria to enable real-time monitoring.

3-Intervention and resolving potential conflicts and contradictions between the fragmented units.

4-Independent units or entities have their goals, but these goals are almost overlapping and similar to the general goals of the system as a whole.

Fourth: Dimensions of the Fractional manufacturing system

A Fractional Manufacturing System is a system that can produce a variety of parts or products in any order and at a continuously changing time. Flexibility is reflected in manufacturing systems in general with different types such as machine flexibility, sequence flexibility, routing flexibility, (Mittal et al., 2018:3). It is a part manufacturing system, due to its inherent flexibility, this system will take care of the size of the part that operates in different operating conditions to give the required results, and efforts usually seek to achieve the best quality at a lower cost with a shorter response time (Girneata, 2012:244) and most researchers agreed on the dimensions of part manufacturing (Huang et al., 2018: 1138) (Peralta et al., 2017: 3) (Mezher, 2020: 346):

1-**Flexibility:** Flexibility is an umbrella term for managerial processes and strategies that impose new demands on employment. Examples include non-stereotypical staffing arrangements, increased requirements for self-organization, and unlimited work at the same time. Flexibility can be a positive resource for workers, providing more autonomy of working time and opportunities for control over tasks.(Hoge ,2019:9), Indicates (Siagian et al., 2021: 4) that

flexibility is the ability of the organization to adapt supply chain practices after environmental changes to improve performance, and the flexibility of the organization is determined by the ability of The supplier expects a sudden change to support manufacturing in order to meet customer demands. Although process flexibility is a useful tool for dealing with uncertainty about demand, it has the potential to increase production costs due to the acquisition of high-tech machinery, training of personnel, and redesign of the layout of the organization. Process flexibility complicates production and inventory policies as manufacturing two or more products in organizations turns finding optimal production decisions into a multidimensional decision problem(Cimen et al.,2016:316).

2-**Scalability:** It means the possibility of increasing or decreasing the production capacity to adapt to changes in demand (Peralta & Soltero, 2020:51). t is the scalability of systems development especially in manufacturing systems, which can be considered as an advantage in the system. It may provide a significant increase in the possibility of solving a number of problems in the design and operation of manufacturing systems to enable new insights, whether in terms of quantity or quality. In other words, the scalability of retail manufacturing systems may provide an increase in improvement. Manufacturing systems design and process enabling new manufacturing development, As well as systems models for sustainability and community well-being as well as the functional aspects of scalability, which can be seen as primarily technical issues with consideration of broader social concerns (Woun et al., 2017:112). The advantage of scalability can be considered as a tool to increase sustainable value and thus the specific objectives along the three main lines of research and development and application can be defined (Putnik et al., 2013:751):-

1-Scalability means new capabilities, new energy and a new resource for actual manufacturing systems.

2-Scalability means new potential vision, new capability and new energy.

3-The scalability of manufacturing is very important because it provides the transfer of knowledge and ideas from engineering and management fields in particular to manufacturing and computing science.

3-**Modularity**: It is a method or method through which the system is divided into tangible entities of small units that can be created independently and used in different systems to operate multiple functions. (Peralta&Soltero,2020:51) However, standard or modular formation was discussed as a means to create standard parts that are produced in improved processes, meaning that the essence of modular formation is not a standard division, but rather a standard way of thinking about the productivity process. production in these three areas through (Lennartsson et al., 2010:455-456):-

1-Determines the modularity of the product so that the materials, components and other resources required for production are known and can be controlled any the degree of independence of the components and their standardization (standardization).

2- Process modularity refers to the management of production and the establishment and control of production methods, i.e. how the product is made, with the aim of reaching a high degree of manufacturing, which requires a higher degree of planning and preparation, compared to production.

3- Supply chain modularity refers to who does which who defines the involved participants so that responsibilities and delivery requirements are known and can be controlled and monitored.

4-**Effective cost**: The effective cost system can produce low-cost information, so it will increase the decision-making performance in organizations and add value to the organization. It is the philosophy of cost optimization, which is of great importance in achieving the goals set by the organizer. (Chen, 2020:268) Cost contributes to the continuous improvement of the workflow. It is expressed as a group of technologies that aim to create higher value at lower costs. Therefore, organizations in the production process collect and analyze cost data to reduce costs. To achieve this end, it is necessary to reduce the use of resources and increase the efficiency of existing resources. Production aims to increase the financial performance and operational efficiency of the organization and to identify the actual deviations of the planned costs and their causes and the necessary infrastructure for decision-making processes to improve the cost (Yucenursen, 2011:147). In light of the constantly changing market conditions, effective cost is one of the main factors in ensuring the survival and competitiveness of industrial organizations. When adding to that the ever-increasing demand for product diversity and variable productivity volumes, production cost becomes more important in a complex field that has a very significant impact on the performance of the manufacturing organization. The most difficult batch-related tasks and decisions involve dividing the total production quantity into batches in order to improve certain parameters and allocating available production resources to batches over a period of time so as to ensure on-time delivery at the lowest possible production costs (Daneshjo, 2013:37).

5-Adaptation: Despite the many efforts to solve the problem of relations between the organization and the environment, the first idea of the ability to adapt began in the eighties because of the competitiveness in the global market. The system pushes for a new balance, as the ability to adapt means scanning the environment, interpreting it, giving an answer, and realizing flexibility as the ability to absorb information from the environment, and the ability to adapt needs to manage the boundaries of the organization's environment, as production processes focused on the ability to manufacture into three categories: product mix, production technology, and size. Measuring mixability

through the number of products in a variety of them and the possibility of production technology when machines and equipment are used to manufacture different commodities (Chaudhary et al., 2020:2). A particular type of production management may increase flexibility due to increased learning, which facilitates adaptation to the environment. Similarly, The positive relationship with the effects of suppliers and external contractors associated with human talent and related to the size of employability, for example, the use of temporary workers and Gore related to performance (Stefanovic, 2010:2).

Fractional manufacturing systems are seen as a cost-effective response to market changes, which try to combine high productivity of custom production with flexibility of Fractional manufacturing systems, and are able to respond to changes quickly and efficiently. In response to market demands and system capacity for new products (Goncalves et al., 2018:36-37).

Fifth: Concept of manufacturing system efficiency

The efficiency of the manufacturing system is a process or a complete system with a specific base or goal within the global production goals required in the context of the production management system, which implicitly express product quality and contain variables that can be measured and processed (Tursunov, 2019:75). Manufacturing efficiency has two components: the technical or material component, which refers to the ability to use production inputs effectively through production outputs, and allows the use of inputs or the use of the least possible amount of inputs allowed by the production of outputs. The price component refers to the ability to combine inputs and outputs optimally. And the ratios in light of the prevailing prices (Reiff et al., 2002:45).

The efficiency of the manufacturing system is the subject of comparison between the actual and the standard productivity. It is a relationship between the actual performance and the desired or planned performance. As a result, it is the ratio of what has been performed and what must be performed. It shows the degree of idealism in the use of resources in the production process, or in other words, it is the best use of the elements of production in order to achieve the greatest amount. It is possible to produce with an appropriate degree of quality and quality at the lowest cost, and it is seen that the efficiency with which the inputs are converted into outputs. Efficiency can be measured through the ratio of outputs to inputs known as system productivity(Adam&Ebert,2007:22).

Presented (Reiff et al., 2002:46) element of manufacturing efficiency a formal definition of a technically efficient product that is technically effective if the increase in any output requires a decrease in at least another output or an increase in at least one input, and if the reduction of any input requires an increase in at least one other input or a decrease in at least one output, and so a technically inefficient producer can produce the same output with less than at least one input or the same inputs can be used to produce more than at least one output, It was defined (Zinovchuk & Kopytova, 2018:121) It is expressed in the final results of the economic activities of the organization's management system that are verified by its production processes and have a major role in achieving leadership for the organization.

From the point of view of the researchers, the optimal use of resources to achieve the objectives of the organization, as appropriate conditions must be set to maintain a balance between all work aspects within the organization to achieve efficiency.

Sixth: importance of the manufacturing system efficiency

The importance of the efficiency of the manufacturing system depends on the rules used and good management. There is a common belief that quality management affects manufacturing efficiency. Therefore, total quality management leads to organizational improvement, information flow, and communication between employees. It is an important tool for improving efficiency. It is an effective tool that begins the moment the vision is formulated. And the broadening of the strategy horizon, which is supposed to lead to the success of the organization and provide effective leadership along with the appropriate total quality management that was achieved from the first time, supporting all the complexities that occur in production management, as well as contributing to reducing expenditures and maintaining the level of achieved spending. (Kolinski et al., 2014: 1-2) and (Grigoreva et al., 2019: 1090) consider that the importance of assessing the efficiency of the manufacturing system lies in the important role that productive activity plays in the markets and what industrial projects occupy in the country, so it must Knowing the importance of the efficiency of the manufacturing system through the following points:-

1-It helps in detecting problems quickly at their inception and taking quick remedial steps to correct or modify the deviations that occur, and thus directs the work towards its correct path.

2-The speed of detecting deviations that hinder the continuation of work or its increase and its transfer to other production sites, especially if there is interdependence between production units.

3-It helps to avoid mistakes in developing the future plan for the production units, to reduce losses and to achieve the objectives of the production unit, because the future plan is part of the organization's strategic plan.

4-The efficiency of the manufacturing system helps in knowing the utilization of available material and human resources to achieve the planned objectives.

Considers (Grigoreva et al., 2019:1090) that the importance of evaluating the efficiency of the manufacturing system lies in the important role that productive activity plays in the markets and what industrial projects occupy in the country. Therefore, the importance of the efficiency of the manufacturing system must be known through the following points:-

1- It helps in detecting problems quickly at their inception and taking quick remedial steps to correct or modify the deviations that occur, thus directing the work towards its right track.

2- Quick detection of deviations that hinder the continuation or increase of work and its transfer to other production sites, especially if there is interdependence between production units.

3- It helps to avoid mistakes in developing the future plan for the production units, to reduce losses, and to achieve the objectives of the production unit, because the future plan is part of the organization's strategic plan.

4- The efficiency of the manufacturing system helps in knowing the utilization of available material and human resources to achieve the planned goals.

Seventh: objectives of the manufacturing system efficiency

Efficiency aims at the operational level, analysis of the performance of individual workstations and the issue of resource balancing as well as the details of evaluating the operational efficiency and economic efficiency of the production process so the distinction between production efficiency in these two aspects is necessary because of the possibility of obtaining a complex analysis of the production process taking into account the economic and operational aspects, it can be Analyze the relationships between the indicators in terms of economic and operational terms and use feedback within their respective areas of analysis as well as between economic and operational analysis (Kolinski et al., 2014:5) In general, this efficiency of the manufacturing system aims to compare the planning of production capacity with implementation, consistency and sufficiency over time, and in light of the high competitiveness observed in the market specifically with the intent (Paulino et al., 2017:1):-

1-Drawing production process maps.

2-Develop Gantt schedule and comply with global usage factors.

3-Verify the deviations that occur.

Manufacturing efficiency in production aims to reduce the total consumption of raw materials in the manufacturing industry, reduce waste generated by manufacturing companies, and enhance the homogenization of industrial waste generated. Recycling, which in turn reduces the consumption of primary raw materials, and thus these standards reflect the contributions of various manufacturing efficiency strategies to specific goals(Zinovchuk&Kopytova,2018:120).

In general, achieving manufacturing system efficiency goals requires a structured approach that includes the best use of existing strategies to address all aspects of each standard implemented to prevent waste in the first place. It does not recommend implementing a single strategy to achieve manufacturing system efficiency goals. On the contrary, manufacturing organizations should incorporate multiple strategies to cover all Standards Unit managers in organizations must achieve manufacturing system efficiency goals by implementing practical strategies at the process level Integrated strategies must be deployed in the workshop to motivate organizations to formalize and pursue material efficiency and waste management plans Most of these actions are not primarily driven by technology rather than In the short term, manufacturing system efficiency improvements may focus on operational improvements, management commitments, and shifting life cycle thinking (Shahbazi, 2015:48)

The third topic: the practical side

First: coding and describing variables

The primary tool in the current study was a questionnaire in order to collect data and information about the Union Industries Company Limited, and accordingly the study sample consisted of the total employees of the concerned company and by (250) questionnaires distributed to the staff, and (231) questionnaires were retrieved from them, by (15) damaged questionnaires , and (216) questionnaire valid for analysis, and as a result, a set of illustrative symbols were used to represent the study's variables and dimensions, and this is what was presented in Table (1).

Table (1) coding of the study variables

code	paragraphs	dimensions	variants
Flex	5	**Flexibility**	**Fractional Manufacturing System**)FrMS(
Modu	5	**Scalability**	
Scal	5	**Modularity**	
Cost	5	**Effective cost**	
Adap	5	**Adaptation**	
MSE	11	**one-dimensional**	**manufacturing system efficiency**

Second: The normal distribution test for the study

Since the moral value of the two tests is higher than (0.05) and the results of Table 2 show that the normal distribution test is accepted for the withdrawn data test, it can be concluded that the studied data are subject to the conditions of normal distribution and that the findings of the study can be applied to the general population

Table (2) normal distribution test

Sig.	Z	variants
0.126	1.858	**Flexibility**
0.168	2.468	**Scalability**
0.129	1.901	**Modularity**
0.182	2.680	**Effective cost**
0.191	2.803	**Adaptation**
0.113	1.665	**Fractional Manufacturing System**
0.117	1.719	**manufacturing system efficiency**

Third: Testing stability and credibility of measurement tool

It is noted from results of Table (3) the stability of the measurement tool, and this means that the questionnaire tool according to academic and administrative research is compatible with the employees of the studied company, and this is due to the stability of the fractional manufacturing system by (0.997) and the efficiency of the manufacturing system by (0.913).

Table (3) Cronbach's alpha

Cronbach's Alpha		variants
0.997	0.895	**Flexibility**
	0.897	**Scalability**
	0.893	**Modularity**
	0.901	**Effective cost**
	0.890	**Adaptation**
0.913		**manufacturing system efficiency**

Fourth: - Descriptive statistics of data

It "is noted from the results of table (4) the interest of the workers in the General Company for Electrical and Electronic Industries to improve the retail manufacturing system, and this achieved an arithmetic mean of (4.05) and a standard deviation equal to (0.47), indicating the company's interest in improving its interests by using retail manufacturing to expand and improve its internal flexibility. This variable through five dimensions came at the forefront of the flexibility dimension with an arithmetic mean of (4.07) and a standard deviation of (0.48), It is also noted that the company has little interest in the scalability dimension, which achieved an arithmetic mean of (4.02) and a standard deviation" of (0.51).

The "results of Table (4) also indicate the interest of employees in the General Company for Electrical and Electronic Industries in improving the efficiency of the manufacturing system, and this is between an arithmetic mean (4.08) and a standard deviation equal to (0.52), indicating the company's interest in improving its interests in improving the efficiency of the manufacturing system by investing in the innovations and ideas of employees By developing new ideas and methods to increase their productivity, this variable was measured through eleven items, led by the seventh paragraph, with an arithmetic mean of (4.16) and a standard deviation of (0.70).) and a standard deviation" of (0.55).

Table (4) Descriptive analysis

NO.	S.D	Mean	NO.	S.D	Mean	NO.	S.D	Mean
Flex1	4.09	0.63	Scal5	4.02	0.67	MSE1	4.02	0.66
Flex2	3.99	0.66	**Scal**	**4.05**	**0.47**	MSE2	4.07	0.78
Flex3	4.21	0.71	Cost1	4.09	0.65	MSE3	4.16	0.70
Flex4	4.00	0.64	Cost2	4.17	0.68	MSE4	4.06	0.71
Flex5	4.04	0.66	Cost3	3.93	0.61	MSE5	4.09	0.67
Flex	**4.07**	**0.48**	Cost4	4.08	0.72	MSE6	4.09	0.68
Modu1	4.15	0.67	Cost5	4.06	0.72	MSE7	4.01	0.55
Modu2	3.86	0.67	**Cost**	**4.07**	**0.54**	MSE8	4.05	0.63
Modu3	3.93	0.63	Adap1	4.18	0.75	MSE9	4.16	0.73
Modu4	4.09	0.73	Adap2	3.99	0.69	MSE10	4.13	0.66
Modu5	4.08	0.66	Adap3	4.09	0.73	MSE11	4.06	0.68

Modu	**4.02**	**0.51**	Adap4	3.88	0.55	**MSE**	**4.08**	**0.52**
Scal1	3.97	0.67	Adap5	3.95	0.62			
Scal2	4.05	0.66	**Adap**	**4.02**	**0.54**			
Scal3	4.08	0.59	**FrMS**	**4.05**	**0.47**			
Scal4	4.16	0.66						

Fifth: Hypothesis testing

H_1: There is a statistically significant correlation between the retail manufacturing system and the efficiency of the manufacturing system.

It is noted from the results of Table (5) that there is a strong correlation between the fractional manufacturing system and the efficiency of the manufacturing system, the amount of which is (0.913).

Table 5 Correlation Matrix

	Flex	**Modu**	**Scal**	**Cost**	**Adap**	**FrMS**	**MSE**
Flex	1						
Modu	.854**	1					
Scal	.850**	.835**	1				
Cost	.800**	.839**	.805**	1			
Adap	.802**	.793**	.797**	.841**	1		
FrMS	.927**	.933**	.922**	.929**	.918**	1	
MSE	.827**	.816**	.841**	.864**	.875**	**.913****	1

H_2: There is a statistically significant effect of the retail manufacturing system on the efficiency of the manufacturing system.

To test this hypothesis, a structural model was built that shows the nature and type of relationship between the retail manufacturing system and the efficiency of the manufacturing system. Figure (2) adopts the structural structure of the overall effect of the retail manufacturing system on the efficiency of the manufacturing system. electrical and electronic due to the importance of the modular manufacturing system whenever the efficiency of the manufacturing system improves, in other words, increasing the modular manufacturing system by one unit leads to an improvement in the efficiency of the manufacturing system by one standard weight of (0.967) with a critical value of (31.194) and a standard error of (0.013), which means The General Company for Electrical and Electronic Industries is aware of the importance of improving the retail manufacturing system in order to ensure gaining the satisfaction and confidence of its customers.

The results of Table (6) also show that the fractional manufacturing system contributes to explaining the amount of (0.834) of the variation in the efficiency of the manufacturing system, while the remaining value is due to factors not included in the study.

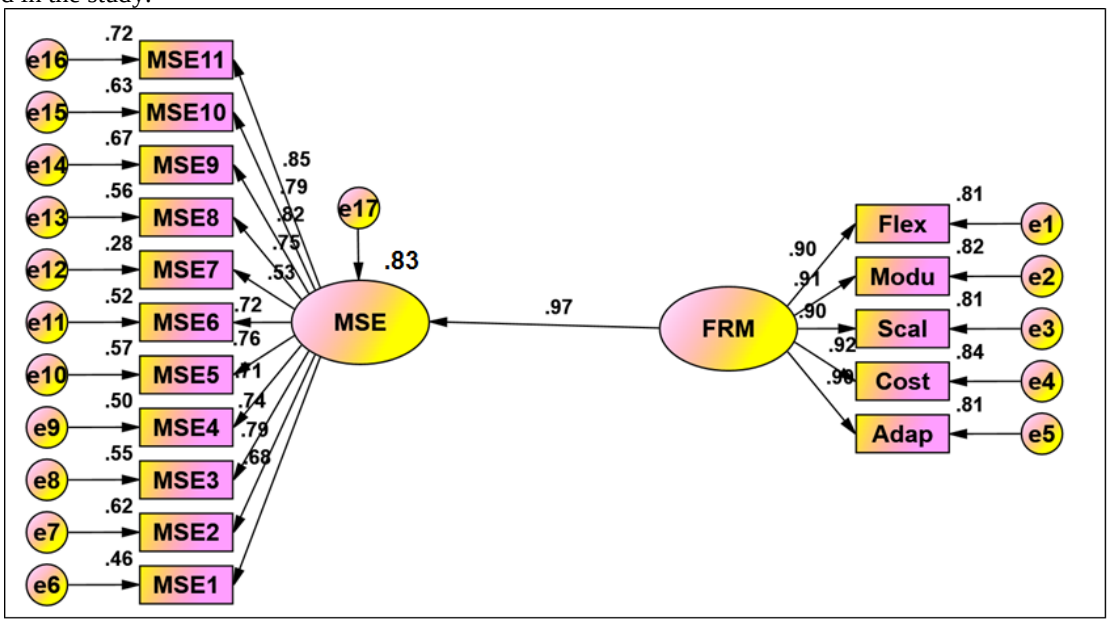

Figure (2) The structural model of fractional manufacturing system in manufacturing system efficiency

Table (6) final results of the impact of the segmented manufacturing system on the of the manufacturing system efficiency

Path			Estimate	S.E.	C.R.	R^2	P
Fractional Manufacturing System	--->	**manufacturing system efficien**	0.967	0.031	31.194	0.834	0.001

The fourth topic: conclusions and recommendations

First:Conclusions

1-The research indicates that the Fractional manufacturing system is the outcome of the production processes for organizations to obtain the highest level of efficiency, which in turn helps in the optimal utilization of resources and the achievement of a competitive advantage.

2- The Iraqi industrial companies' adoption of the Fractional manufacturing system enables them to regain their ability to compete through its techniques that eliminate or reduce sources of waste and increase activities that add value to the product.

3-The application of the Fractional manufacturing system helps to perform the tasks of the production process efficiently through the coordination and cooperation of entities to produce the company's products.

4-The company suffers from the problem of high production costs due to the company's use of traditional methods that did not give importance to non-material considerations when carrying out the manufacturing process, such as market study, meeting customers' desires, response time, and production speed.

5- The research reached through the results that showed that the majority of the company's members have a clear perception of the possibility of applying the fractional manufacturing system at the company level.

Second :Recommendations

1- The need for the management of the company under discussion to adopt the application of the Fractional manufacturing system and to clarify its objectives and advantages in a preferential manner achieved from the application of the system according to a future strategy, which is therefore due to reducing the costs incurred by the company as well as developing the skills of workers, which is reflected in improving the quality of the products provided.

2- Adopting modern manufacturing systems and methods instead of the traditional systems, as they do not meet the needs of those units in competition, and applying the Fractional manufacturing system that increases the consolidation of the company's strengths.

3-Working on conducting market studies and opening multiple marketing outlets to market the company's products, as well as signing memorandums of understanding with the various ministries regarding supplying them with the company's products and according to the specifications required by those authorities, such as processing instead of directing these ministries to the foreign product.

4- Adopting Fractional manufacturing systems and methods instead of the traditional systems, as they do not meet the needs of those units in competition. Among these systems is the Fractional manufacturing system.

5-Through the analysis, it was found that there is a weak relationship between the scalability and the efficiency of the production system, so the company must create an organizational unit for studying the market and work on preparing the necessary supplies on an ongoing basis and coordinating the work of the unit with the rest of the units by the management of the organization in order to achieve its goals of survival, growth, continuity and adaptation With the conditions in the work environment.

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