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The Extent Of Readiness Of Organizations To Establish A Mechatronics System An Exploratory Study Of The Opinions Of A Sample Of Workers In The General Company For North Electricity Distribution

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ABSTRACT

The mechatronics system is considered one of the most important systems developed globally due to its effective importance in implementing various works such as producing goods, services, industrial products, and communication systems. It is concerned with designing products and integrating industrial, electrical, mechanical, and computer processes into a modern production system. Therefore, the effective performance and organization's effective achievement of its goals and the emphasis on the quality of performance, as the system is one of the keys to success and how to provide advanced technological products, as the design of the mechatronics system is characterized by efficiency and competitiveness in an industrial environment that is increasingly developing day after day, which is not easily achieved.

Keywords: Mechatronic System.

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Introduction

The progress in information technology has contributed to relying on the automation approach in the design and manufacturing processes of goods and services. Manufacturing operations today are conducted by relying on computerized and intelligent programs without the intervention of the human element. However, the intensity of competition in today's world has pushed organizations to work on improving operations and increasing productivity while reducing waste by improving maintenance activities. Production processes as a result of applying new methods in the current manufacturing environments and the challenges that accompany them, as facing these challenges are critical to reducing costs, focusing on quality, and flexibility in manufacturing, And reduce delivery times to customers, and preserving the environment from pollution by relying on modern manufacturing systems, including the mechatronics system, as this system is one of the most important systems developed in the modern era. It is a mixture of production processes and modern electronic systems concerned with product design and development. Through this system, the principles of electrical, mechanical, and computer engineering are integrated when implementing manufacturing processes as it is based on mechanical, electrical, and Industrialization together, as the mechatronics system and smart robots are no longer a functional area within the electronic departments of organizations. Still, rather it has become an integral part of the production and manufacturing function of any organization as it is the active element in the manufacturing process due to the advanced globalization in the productive, manufacturing, and commercial fields and its ability to generate competitive economic opportunities (John Wang, 2017,5).

This work divides into four sections, the first section is previous studies and research methodology, the second presents the theoretical side of the research variables, the third presents the practical side to prove the validity of the research hypotheses, and the fourth side is devoted to presenting the conclusions and suggestions.

The First Topic

previous studies and research methodology

The first section: previous studies

First: Previous studies of the mechatronics system:

1. Integration of Mechanical and Electronic Systems in Mechanical Engineering / Venkata, Subbarao & Lakshmi, Venkatesh (2011).

The systematic study of the university explains the system subordinate to the system in industrial organizations; It also shows the ability of the mechatronics system to integrate with mechanical and electronic systems and thermostats in the traditional (mechanical) and electronic design.

2. Mechatronics Around the world – At a Glance/ Rachita Sharma & Bhaskar Dhiman (2021).

Linking the various engineering fields to manufacturing products capable of meeting the advanced needs generated by the changing environment according to the mechatronics system and highlighting the importance of the mechatronics system in manufacturing and its various characteristics such as saving time, increasing productivity, and cost-effectiveness.

3. Designe of Mechatronic System Using CAX Enviroment/ Andrzej Lukaszewicz & Mykhaylo Melnyk (2021).

The study aims to develop a new method in the design of the mechatronics system that contributes to treating the existing problems in the current manufacturing methods and also works on proving the new method's effectiveness through the analysis, design, and implementation of manufacturing processes using the mechatronics system.

The second section: Research Methodology:

First: the research problem: The mechatronics system is one of the effective systems that push companies to use smart manufacturing methods to achieve economic benefit, as it represents an effective value chain from suppliers to final products, including specialized infrastructure through its activation and development. To reach success and prosperity and maintain competitive advantage.

The problem of the study: Through the review of the two modest researchers on the topics of the

mechatronics system, it became clear that they did not receive sufficient attention at the level of the concerned field to ensure that it achieves the best possible productivity and reduces it. Unjustified expenses and costs to the lowest possible level, especially since most of these dimensions and components are approved in the researched field but not under their academic title due to the limited knowledge of management leaders in the concepts of (mechatronic systems), as many variables should be managed Companies understand and interact with them to enhance their uniqueness and success in carrying out their tasks and then achieving their goals by establishing automated control systems that contribute to the ideal implementation of production processes and access to excellence and brilliance.

Based on the previous, to determine the role of the possibility of applying the mechatronics system at the level of our companies, this research attempt came to address the problem of testing the possibility of adopting and applying the mechatronics system in the Nineveh Distribution Electricity Department.

Second: The importance of the research: The current research comes from the importance of the variable that was studied according to what some writers mentioned to give an expressive overview of it, as the mechatronic system is one. One of the important production systems in the business world due to its ability to give organizations the ability to meet the ever-increasing demands of customers and provide developed products that give them a distinct competitive precedent compared to their counterparts in the global market of fierce competitive nature, where workers in the system should be able to design and manufacture advanced products from Through their experience and skill that qualifies them to deal with mechanical devices, sensors, actuators, analog and digital circuits based on microprocessors such as controllers, logic gates, robots, and others. As for the second variable (the organizational structure), its importance emerges as one of the important issues that have a significant and direct impact on organizations at all their administrative and technical levels if their importance, objectives, dimensions, and funds are highlighted. Identifies. It plays an important role in the overall functioning of the organization.

Third: Research Objectives: The current research suggests that the field in question depends on a programmed production system that perfectly organizes the production process, each according to its priorities, to save time, effort, cost and achieve competitiveness. Precedent over similar competitors, as well as:

1. Contribute to providing a theoretical and philosophical framework that fully expresses the dimensions of the study, which are the dimensions of the mechatronics system.
2. Determine the most harmonious and influential components for establishing the mechatronics system in the company under study.
3. Strive to develop the actual reality of the company under study and keep abreast of its developments.
4. Attempting to diagnose the actual reality of the dimensions and components of the mechatronics system in the company under study using the checklist.
5. Identify the nature of the relationship and influence between the dimensions of the mechatronics system, and determine the degree of integration between them in the company under study.
6. Determining the variation in the dimensions of the mechatronics system in terms of importance and influence in the company under study.

Fourth: Study hypotheses: To analyze the field reality and determine the most important results that it seeks to reach, the researchers formulated several hypotheses, perhaps:

The first main hypothesis: There is a significant correlation between the dimensions of the mechatronics system, and the following sub-hypothesis emerges from it:

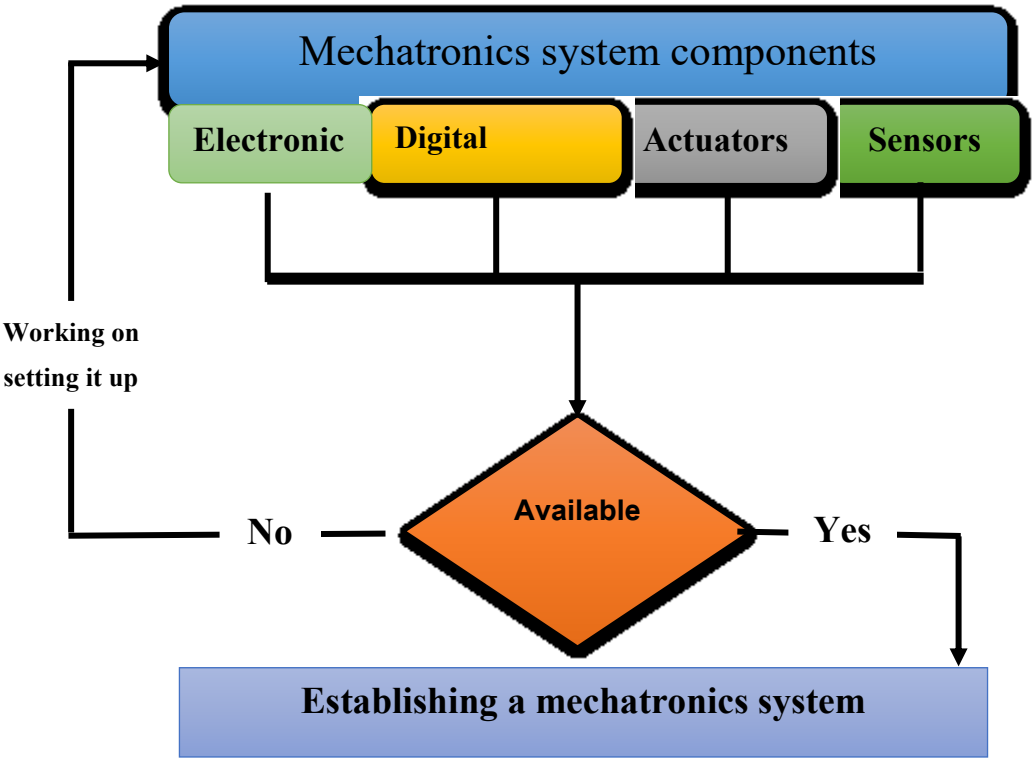
- There is a great correlation between the dimensions and components of the mechatronics system.

The second main hypothesis: There is a significant effect on the organizational structure

of the company under study in the mechatronics system, and the following sub-hypothesis emerges from it:

• There is a significant influence of the organizational structure in every component of the mechatronics system.

Fifth: The hypothetical research scheme: The systematic treatment of the study problem requires the design of a hypothetical scheme, as shown in the following figure, which indicates a correlation and influence relationship between the dimensions of the mechatronics system.



Sixth: Statistical analysis and processing tools: The researcher relied on several appropriate statistical tools for data analysis, processing, and testing of its hypotheses based on the (SPSS V.26) program, including :

- Frequencies, percentages, arithmetic averages, and standard deviations to describe and diagnose the study variables.
- Simple correlation coefficient: It determines the nature of the relationship between two variables.
- Spearman correlation coefficient: to determine the nature of the relationship between several independent variables simultaneously with the dimensions of a dependent variable.
- Simple regression coefficient: It is used to determine the effect of one independent variable on a dependent variable.
- Cronbach's alpha coefficient: To verify the measurement's validity and the study dimensions' stability.

The second topic
The theoretical side

First Section: Mechatronics System

First: The Concept: Many authors assert that the mechatronics system is an integrated technology that includes many disciplines and advanced engineering techniques, including industrial engineering, precision mechanical engineering, electrical engineering, control algorithms, product design systems, manufacturing processes, and other engineering applications.

As emphasized (Hewitt & king, 1996, 10) that the mechatronics system is the technology that brings many inventions and recent developments to achieve better task performance, higher product quality, lower manufacturing cost, lower energy consumption, higher energy consumption, higher manufacturing accuracy,

and efficient energy conversion. Electrical into mechanical energy and vice versa.

As pointed out (Alciatore & Histand, 2005,7), the mechatronics system includes analysis, design, synthesis, and selection of systems that combine electronic and mechanical components with modern control tools and microprocessors. As defined by W. Bolton, 2015, 3), a mechatronics system is a synergistic design philosophy that describes the integration of technical areas that include sensors, measurement systems, driving, coding, and microprocessors, as well as analysis of the behavior of intelligent computer control systems for the design and manufacture of products and processes.

While (Hehenberger & Bradley, 2016, 17) explained that mechatronics is a multidisciplinary field that refers to the skill sets needed in the contemporary and advanced automated manufacturing industry as a result of the intersection of mechanics, electronics, and computing, where mechatronics specialists create simpler and smarter systems that are more fundamental to growth Expectations in automation and modern manufacturing. And (Sharma And Dhiman,2021,2) explained that another concept is a system through which distinctive products are produced in an ideal manner by achieving integration between the various manufacturing and engineering disciplines because the system is an application of different technical fields to discover reliable solutions in product design and manufacture with the latest methods and lowest costs.

Second: The Objectives of The Mechatronics System :

(Apuu, 2010, 9) explained that the most important goals of the mechatronics system are to make improvements in flexible manufacturing engineering systems (FMS) that include computer-controlled machines, robots, automatic material transfer, and overall supervisory control, which makes mechatronics systems from It is very easy to design processes and products, and apply them in terms of cost to manufacturing processes and thus achieve the goals that this system seeks to achieve, including:

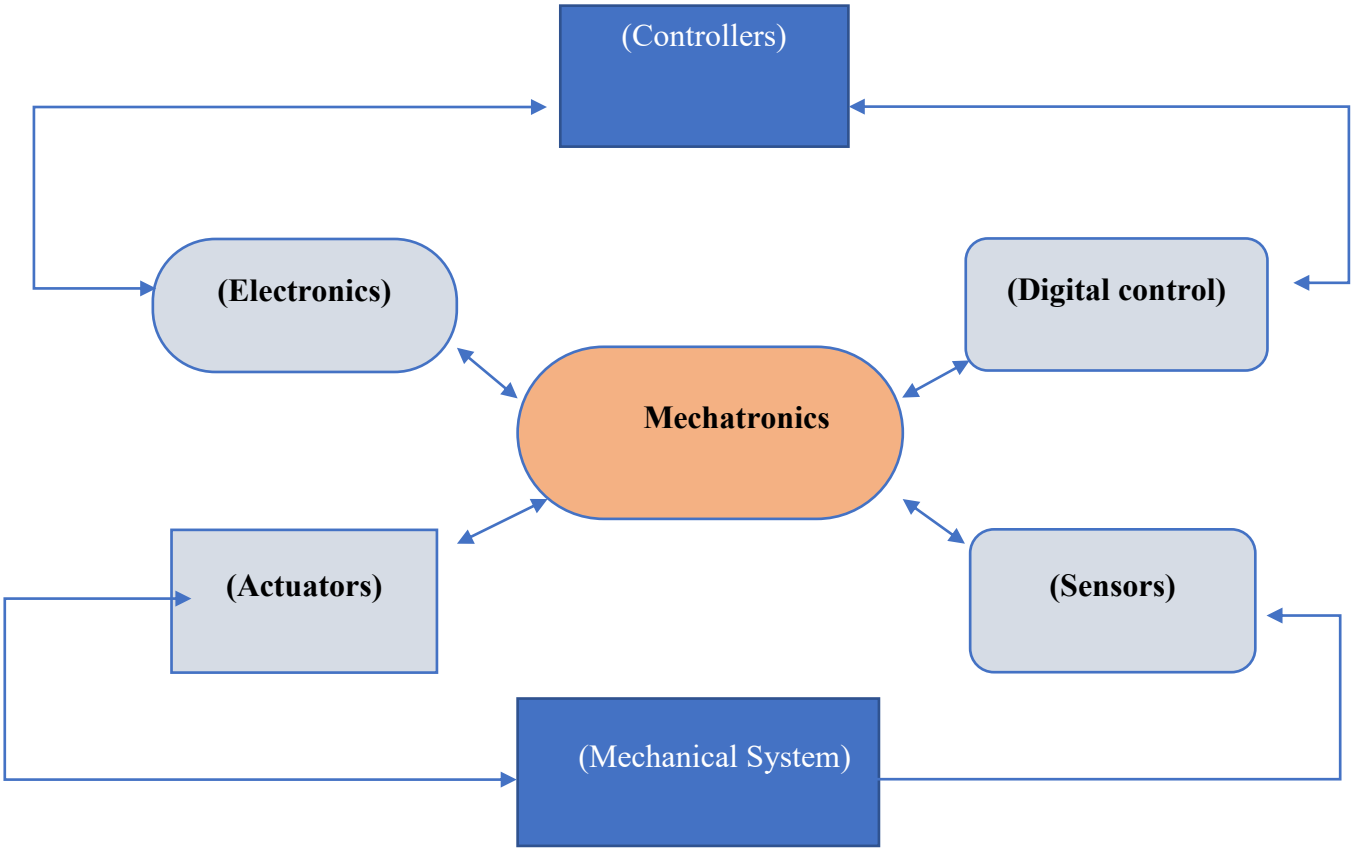
1. Improve products and processes.
2. Effectively developing production mechanisms.
3. New smart product design (reprogrammable).
4. Inventing new technologies in line with modern concepts of manufacturing.
5. Better design quality in the early stages through rapid (virtual) prototyping and improved design efficiency (reuse of design models, reduce the number of calibration parameters, and thus reduce calibration effort to create a direct variable using a fixed set of building elements up to 80%).
6. An advanced level of flexibility continuously improves the system due to the adoption of intelligent model-based system design.

In the same context (LAKSHMI, 2011, 495) indicated that the mechatronics system is concerned with generating movements in machines in a controlled manner, where controlling the movements is necessary, through the objectives of this system lie in:

1. Applying classical control techniques to mechanical plants requires machines that enable them to operate independently and to a certain degree of complexity and in critical situations or to a higher level of independence.
2. Facilitate and organize necessary interactions with the human operator or user where such human-machine interactions require an appropriate approach in an emergency situation.
3. Applying classic control techniques to mechanical factories, we need machines that can work efficiently and effectively in critical situations, changing environmental conditions, and at a higher level of independence and reliability.

Third: Mechatronics System Elements: The mechatronics system is characterized by a special character that can be demonstrated through the four elements that this system possesses and that these elements are the main building for it, and each element is complementary to the other, and the mechatronics system cannot complete any process that it performs without these elements, and given the great importance of time and the urgent need for Exploiting every second in it, we find that the arts of the industry have changed

from their traditional forms represented by the abstract sciences of mechanics, control systems, their operations and industrial applications to other forms represented by self-moving electromechanical systems, most of their operations are controlled by computers. To obtain distinctive quality products, designers resort to the introduction of computer systems even in the simplest production processes and in all heavy and light industries, including various engineering industries, which makes the computer an indispensable thing as a link between various sciences and production in all fields, which is expressed by the four elements set out in the form:



Source: The figure shows the system which components of the mechatronics the researcher prepared.

Based on the previous, it is possible to identify the most important elements that this system possesses through the consensus of the majority of writers and researchers, and they are : (Bolton, 2019, 4) ، (Sabri cetinkunt, 2015, 329 ، ( )Wilamowski, 2011, 29) , (Alciatore& Histand, 2011, 375)

First: Sensors: Sensors or (industrial sensors) are one of the most important elements of the mechatronics system and the most influential in it, and they are of several types. The demand for them is great through the websites of suppliers of companies that manufacture products with the mechatronics system. (Bolton, 2015, 29) . Indicated that the sensor is The element that produces a signal related to the quantity that can be measured in the process of producing a product through the mechatronics system, such as measuring the temperature of electrical resistance, as the term transducer is often used instead of the term sensor. Some systems use the sensor and transducer measurement system together in the Mechatronics manufacturing process. As explained (Obaia, 2017, 2), sensors are control elements used in machines, production processes, and equipment during implementation, as many commercially available types exist. Their use is more effective in the mechatronics system because sensors work to convert signals into digital form to be displayed on Computers or any other display devices.

It also has effective properties that can bring great economic benefits to production and companies. Therefore, (Wilson, 2008, 3)

identified the most important characteristics of industrial sensors, including:

1. Transferability: This characteristic shows the functional relationship between the physical and electrical inputs and outputs extracted from the machines. This relationship is usually represented as a graph showing the relationship between the input signal and the output. The details of this relationship may constitute a complete description of the basic characteristics of expensive individually calibrated sensors. This process may take the form of a calibration curve adopted in manufacturing mechatronic products.

2. High sensitivity to the environment: Sensitivity is defined in terms of the relationship between the physical signal of the input and the electrical signal of the output, and in this way, it can be expressed as derived from the transmission function concerning the physical signal, and industrial sensors can automatically sense the manufacturing environment and detect faults in a way. Fast and there are types of smart sensors that can predict holidays before they occur, which saves companies expensive costs in terms of cost and time.

3. Dynamic range or extension: It is the range of the input physical signals that can be converted into electrical signals by the sensor, and it is called the dynamic range or the extension, and signals outside this range can cause unacceptably large inaccuracies and thus can lead to stops In a system, this range or dynamic range is usually defined by the sensor vendor as the range to which other performance characteristics of the sensors are expected to apply.

4. Uncertainty: Uncertainty is generally defined as the largest expected error between the actual and ideal outputs between typical units. For example, the accuracy of the thermometer may be guaranteed within 5%, and if it exceeds that, the sensor will give an alert signal to solve the problem; it adopts sensors to determine their accuracy, and one sensor may have better accuracy than another if it has 1% uncertainty compared to another with 3% uncertainty.

5. Accuracy: It is defined as the extent to which industrial sensors can perform the functions correctly required of them throughout their work period, and the accuracy of the sensors is represented in design, conformity to performance, and increased production, whereby machines can work quickly and accurately and in hundreds of times less than the time needed by humans, and therefore Reaching the best performance of the machines and saving costs and thus achieving the specified production targets.

Second: Actuators: The actuators have wide applications that can be used in industry and other manufacturing technologies. These linear actuators are specially designed and manufactured to increase efficiency and reduce the cost of production processes. (Sabri cetinkunt, 2005, 1) Explained that the actuators are indispensable components of the mechatronics control systems and have a prominent role in the power flow devices between the electrical, mechanical, and manufacturing fields. According to the manufacturing techniques of the mechatronics system. (Bishop, 2006,7) also confirmed that the actuators (actuators) are the basis of power for the mechatronics system, which deals with control commands (mostly in the form of an electric signal) and produces a change in the production system by generating power, movement, control of heat and flow of materials, and other productive activities. And (Bishop 2006, 9-13;) explained that the (actuators) of the mechatronics system have several types :

1. Electric motors: It contributes to activating the work of the mechatronics system in a way that makes it an effective system in the implementation of manufacturing operations by allowing the choice of the type of actuators for most of the procedures for controlling the on and off operations of electrical products. Several examples of this type of actuator include switches and transistors. These actuators operate or turn off the electrical equipment manufactured ready, as shown in figure (1).

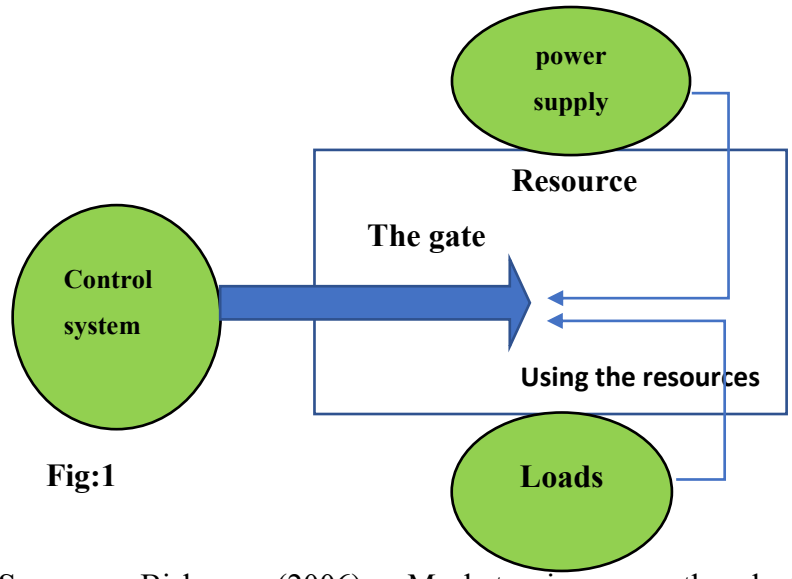


Fig:1

Source: Bishop, (2006), Mechatronic an Introduction, 1th.ed, Published in CRC Press, Taylor & Francis Group, LLC, University of Texas at Austin U.S.A., P10 .

2. Electromechanical actuators: Described as the most common type of motor and the principal means of converting electrical energy into mechanical energy in industry, they can be broadly categorized as AC motors, which are used in many industrial applications with horsepower used in rolling mills and super horsepower motors used in Massive manufacturing operations, although they are expensive, they play an important role in heavy industries, but they need a source of power and constant current, and their maintenance requires great capabilities and costs.

3. Electromagnetic actuators: It was invented by the English scientist Michael Faraday in 1821, and it is one of the widely used devices in our modern age. It runs machines in factories and electric trains, and it also operates sewing machines and electric washing machines, refrigerator pumps, and others. There are many types, large and small, to suit every use. The solenoid is the most common electromagnetic motor, which consists of a soft iron core surrounded by a wire coil. When the coil is energized, a magnetic field is created that provides force to push or pull the iron core in different directions, which is the essence of the work of these motors. Another important type, the electromagnet, is widely used in industries that require large forces.

4. Intelligent Material Engines: Madge smart engines are sensitive and can evolve and adapt to constantly evolving use. These engines have several characteristics that enable them to carry out their tasks perfectly, such as using vibration reduction, noise cancellation, and computer processors to carry out operations and process information. Among the characteristics of smart materials engines are also the ability to change their appearance, shape, viscosity, and color. The change is also either from the outside or the inside, like changing its temperature or behavior in the magnetic or electrical industries, where the smart material adapts according to its surroundings and adapts and corrects what should be corrected or changed to another form to perform its tasks better. The smart material engines led manufacturers to identify weak points in the coated layer of an aircraft, or imminent cracks in a dam or a huge wall, and to reduce or reduce vibrations in machines, as they are used in every field and modern scientific or industrial field of smart cognitive mechatronics systems.

Third: Digital Control: As the global market demands superior quality goods and lower costs, the automation of the factory floor has changed from discrete machines with simple hardware-based controls to an integrated manufacturing unit with sophisticated interconnected data and control systems, the transformation of many organizations has been gradual starting with the

introduction of controllers Programmable logic and personal computers to digital machines and operations. Accordingly, (Wilamowski & Irwin, 2011, 14) explained that digital control is important for the analysis, design, and implementation of control systems for the mechatronics system by making manufacturing processes low-cost and high-speed due to accurate sensors, which aims to eliminate delays and losses in industrial processes in all its stages. While (Sabir, 2015, 45) emphasized that the control system was designed to make the mechatronics system do what it wanted to do or implement. Therefore, the control system designer needs to know the required behavior or the expected performance of the system so that it can make control decisions either through the control circuit Analog or computer-digital, called an analog control unit.

Forth: Electronics: During the past years, electronic technologies have gained increasing importance, especially in industry, as these technologies provide improved and more efficient manufacturing methods and have the possibility of precise control and regulation for each production process. Therefore, (Appuu, 2010, 57) indicated that the electronics adopted in manufacturing processes. Modern technologies work to perpetuate the manufacturing process in a way that guarantees it a distinguished level of quality through its reliance on modern manufacturing systems, including the mechatronics system. (Sabri, 2015, 245) explained that electronics and digital analogs are an integral part of the equipment used in production according to the mechatronics system, which consists of electronics, linear circuits, semiconductors, and electronic communication devices, which are essential elements in the manufacture of products.

The Third Topic
The Practical Side

The study includes the following topics:

First: Description and diagnosis of the research community and its sample: The research community and its sample can be described as follows:

a. Description of the research community: The company under research was chosen as a field for conducting the research for the following reasons:

1. The extensive experience possessed by the company under discussion, as it is one of the leading companies in Nineveh Governorate.

2. The company's demolition covers Nineveh Governorate and the nearby governorates. Table (1) gives a simplified definition of the company in question

Table (1) A simplified definition of the company in question

The company
The Directorate of Electricity Distribution of Nineveh Governorate / the General Company for the Distribution of North Electricity was established on 1/9/1966. It was linked to the Baghdad Electricity Authority and the National Electricity Authority. The General Company for North Electricity Distribution / Nineveh is one of the Iraqi Ministry of Electricity and Energy's largest companies. It enjoys legal personality and financial and administrative independence to achieve its objectives under the internal system and is governed by the Public Companies Law No. (22) of (1997). The company has an honorable history in the energy field and distinguished quality. With this good reputation, it occupied a prominent position among the companies because of its vital impact on the conduct of all aspects of life, as the production of electricity, its transmission, and then its distribution is one of the most important challenges for Iraqi industries in terms of its dependence on local machinery and equipment. Available in very large quantities and completely, and the possibility of its development and increase of its production capacity and its reliance on its distinguished technical cadre that it prepared in operation, maintenance, and rehabilitation work, as the company contributed to the establishment of a lofty edifice for the industry in Iraq and provided conclusive evidence of the possibility of industrial development for this dear country in the most difficult circumstances.

Source: brochure of the company under investigation.

B. Description of the research sample: An intentional sample was selected, represented by the individuals surveyed who have experience and know-how and are aware of the company's activity and tasks to ensure the benefit of accurate and useful information provided by them, as well as the possibility of obtaining ideas and suggestions that enhance the importance of the research, and in line with that, the researchers began distributing (211) forms, as this form included the general manager of the company, members of the board of directors, directors of departments, divisions, main formations and supervisors of production lines. (209) valid forms were obtained for analysis, meaning that the response rate reached (94.12%). Table (2) shows the description of the surveyed individuals.

Table (2)
Description of the researched individuals in the company under investigation

Academic achievement									
PhD		**Master's**		**Diploma**		**College Graduate**		**prep**	
%	the number	**%**	the number	**%**	the number	**%**	the number	**%**	the number
118	25	18.95	40	7.10	15	62.0	131	-	-

Years of service in the company (year)													
more- 31		**30 - 26**		**25 - 21**		**20 - 16**		**15 - 11**		**10 - 6**		**5 - 1**	
%	the number	%	the number	%	the number	%	the number	%	the number	%	the number	%	the number
4.73	10	7.10	15	26.45	56	33.17	70	14.21	30	14.2	30	-	-

age (year)							
more - 50		**49 - 40**		**39 - 30**		**29 - 20**	
%	the number	**%**	the number	**%**	the number	**%**	the number
42.65	90	47.39	100	9.95	21	-	-

Source: Table prepared by researchers based on the results of the questionnaire.

Table (2) shows that the respondents have good qualifications that enable them to understand the components of the questionnaire and deal with it properly, as the percentage of those who hold a preparatory certificate reached (0.0%). It is also clear from the table (2) that the service period of the individuals surveyed in the company under study who have a service of no more than twenty years amounted to (26.45%), which are years during which managers obtain knowledge and experience in their field of work, which helps them take appropriate decisions to complete their work. Table (2) indicates that (47.39%) of the respondents are over 40 years old and over, and this indicates that they can understand the questionnaire more accurately and answer it correctly.

Second: Description and Diagnosis of Research Variables: The content of this aspect includes a description of the nature of the research variables according to what the respondents realize in the company under research, through the researcher's use of the (SPSS 26) program to infer the arithmetic means, standard deviations, repetitions, their percentages, and the response ratio to the scale area And as follows:

Table (3)
Summary of frequency distributions, means, standard deviations, response ratio, and coefficient of variation for the components of the mechatronics system in the company under study

Variation % coefficient	response rate %	standard deviation	Arithmetic mean	response scale					variable symbol		
				Strongly disagree	Dis agree	neutral	I agree	I agree Severely			
				%	%	%	%	%			
67.31	55.16	1.28	2.75	6.44	27.51	15.55	39.88	10.67	X 1	Sensors	Mechatronics system components
38.88	52.66	1.01	2.63	24.84	8.68	28.35	7.30	30.80	X 2	Actuators	
39	46.93	0.91	2.34	18.10	3.86	28.35	7.58	42.09	X 3	Digital control	
34.24	60.93	1.02	3.04	39.17	5.60	11.52	39.17	5.60	X 4	Electronics	
44.85	53.92	1.05	2.69	22.13	11.41	20.94	23.48	22.29	-	General Average	
-	-	-	-	33.54		20.94	45.77		-	the total	

The table was prepared by researchers based on N=209. .the outputs of the (SPSS 26) program

It is inferred from table (3) data that there is an agreement between the respondents' opinions regarding the components of the mechatronics system. The overall consistency of the answers of the respondents in the agreement reached (strongly agree, agree) (45.77%), and this indicates that there is an acceptable degree of consistency of importance for the answers of the respondents to Paragraphs of the mechatronics system, that is, the opinions of the respondents tend towards the positive pole based on the (Likert) quintuple scale, and this arithmetic mean (2.69). The standard deviation (1.05) was reinforced, while the degree of general inconsistency of the respondents' answers in the paragraphs on the components of the mechatronics system was (33.54). Therefore, % (I do not agree, I strongly disagree) is a small percentage. As for the percentage of (neutral) answers, it constituted (20.94%) of the total respondents, and the value of the coefficient of difference was (44.85%), and this means that the respondents agreed to a clear degree about These variables according to their point of view.

In comparison, the response rate to the scale space was (53.92%), and this indicates that the level of awareness of the respondents that indicates the importance of the components of the mechatronics system for the company is under development. Urging also indicates that the respondents' answers to the components variables and their clauses were unanimously positive. The component (X1), which represents the sensor component, had the largest and most positive contribution to enriching the components of the mechatronics system, as it obtained the highest agreement (50.55%), arithmetic mean (2.75), and standard deviation (1.28), which indicates homogeneity between the answers of the respondents, and depending on On the values of the arithmetic means, the response ratio and the coefficient of variation, the importance of adopting the components of the mechatronics system in the company can be determined, as shown in table (4).

Table (4)

The relative importance of establishing the components of the mechatronics system from the individuals surveyed in the company under study

Variation coefficient %	response rate %	Arithmetic mean	Activity icon	Activities	T
67.31	**55.16**	**2.75**	**X1**	**Sensors**	
38.88	**52.66**	**2.63**	**X2**	**Actuators**	
39	**46.93**	**2.34**	**X3**	**Digital control**	
34.24	**53.92**	**3.04**	**X4**	**Electronics**	

The table was prepared by researchers based on the results of the electronic calculator.

The data in table (4) indicate that the managers of the company under consideration are paying increasing attention to adopting the application of the (sensors) component in the first place, then the (engines) component in the second place, then the (digital control) component in the third, then the (electronics) component in the third place. Fourth and last, in line with the foregoing, the first hypothesis is accepted at the research level.

Third: Determining the extent of the response of the company under research to establish the components of the mechatronics system: To identify the response of the company under research to the application of the components of the mechatronics system, the T-Test was used as shown in table (5)

Table (5)
results of the statistical laboratory (T) for the respondents' answers to the research variables

V . N	Variable	MEN	ST.D	T	* response rate
Sensors	VAR 1	3.7799	0.9554	57.194	6 / 6 = 100 %
	VAR 2	2.2967	0.9796	33.893	
	VAR 3	2.2010	0.9795	32.485	
	VAR 4	3.5694	1.0077	51.204	
	VAR 5	3.4641	0.9951	50.325	
	VAR 6	2.8947	1.2397	33.756	
Actuators	VAR 7	2.6316	1.0755	35.371	6 / 6= 100 %
	VAR 8	3.3493	1.0504	46.096	
	VAR 9	2.3923	0.8373	41.306	
	VAR 10	2.9856	1.2537	34.427	
	VAR 11	2.2919	0.9932	33.359	
	VAR 12	2.1531	0.9069	34.320	
Digital control	VAR 13	2.5407	1.0093	36.390	6 / 6 = 100 %
	VAR14	2.0000	0.7595	38.067	
	VAR 15	2.0191	0.7656	38.127	
	VAR16	2.0239	0.9169	31.910	
	VAR17	2.6986	0.9806	39.784	
	VAR18	2.7321	1.0400	37.976	
Electronics	VAR 19	2.9665	1.0348	41.441	6 / 6 = 100 %
	VAR 20	3.4498	1.0463	47.664	
	VAR 21	3.6938	0.9913	53.868	
	VAR 22	2.2392	1.0378	31.192	
	VAR 23	2.6172	1.1506	32.884	
	VAR 24	3.2536	1.0776	43.647	

.Source prepared by researchers N = 209 1.990 =Tabular (T) value

(*)Response ratio = number of variables for each dimension / sum of variables for one dimension

The results of the table can be described as follows:

a. The results of the statistical test (T) for the variables (X1 - X6): Table (5) showed the results of the statistical laboratory (T) for the respondents' answers that all the sub-variables achieved agreement within the dimension (sensors), as the value of (T) calculated for these variables was greater than Its tabular value of (1.990) at a significant level of (0.05), and the compatibility of the company in question with this component reached (100%). It is responsible for securing and processing the various types of information required by the manufacturing

process to ensure that it is implemented correctly and in the fastest time.

B. The results of the statistical test (T) for the variables (X7 - X12): Table (5) showed the results of the statistical laboratory (T) for the respondents' answers that all the sub-variables achieved agreement within the component (holon product), as the value of (T) calculated for these variables was greater of its tabular value of (1.990) at a significant level of (0.05), and the compatibility of the company under discussion with this component reached (100%), which showed that while companies are seeking to implement the mechatronics system, they should make more efforts To develop work and carry out comprehensive restructuring operations and activate control programs for devices and equipment in a way that enables them to manufacture products of outstanding quality comparable to competing products, by focusing on one of the dimensions of the mechatronics system, which is the engines.

C. The results of the statistical test (T) for the variables (X13 - X18): Table (5) showed the results of the statistical laboratory (T) for the respondents' answers that all the sub-variables achieved agreement within the dimension (numerical control), as the value of (T) calculated for these variables was greater From its tabular value of (1.990) at a significant level (0.05), and the compatibility of the company under discussion with this component reached (100%), and this result confirms the support of the senior management to provide the physical and software parts involved in the manufacturing process, as this dimension provides all the requirements Manufacturing process and other supporting functions.

d. The results of the statistical test (T) for the variables (X19 - X24): Table (5) showed the results of the statistical laboratory (T) for the respondents' answers that all the sub-variables achieved agreement within the (electronics) dimension, as the value of (T) calculated for these variables was greater than Its tabular value is (1.990) at the level of significance (0.05), and the percentage of compatibility of the company under discussion with this component is (100%), and this result is explained that to achieve a quick and immediate response to the needs of customers, companies should adopt multiple methods in the implementation of their operations Manufacturing, including the adoption of advanced electronics so as not to cause any confusion or problems as a result of the different sequence of production stages, and this is the essence of the work of after electronics.

Conclusions and suggestions

The study concluded a set of conclusions related to the study variables as follows:

1. The individuals surveyed in the company under study have an appropriate level of experience, in addition to the fact that most of them hold a good scientific qualification, and this indicates that they have gained maturity and sufficient understanding of the company's work, which contributed to their understanding of the questionnaire items correctly and accurately.
2. The management of the company under study depends on changing the methods used in production due to the emergence of new energy sources. However, the limited sources of funding prevent this from being properly achieved.
4. A significant impact of the dimensions of the mechatronics system combined with the organizational structure in the company under study was achieved, which indicates the presence of an impact of the organizational structure in a way: It contributes to the successful establishment of the mechatronics system in the company under study in the future.
5. The management of the company under study works to provide its employees and engineers with the necessary expertise and skills to qualify them and give them the necessary knowledge to ensure the implementation of work and tasks without errors or few problems and thus to keep pace with it. With developments in the surrounding environment

The study concluded with a set of proposals related to the study variables as follows:

1. Increasing the interest of the management of the company under study in the contents of administrative thought in modern fields, especially the mechatronics system, and deepening it among the managers and employees of the company under study, as this contributes to enhancing its ability to survive and grow in the business world.

2- Increasing the interest of the management of the company under study in the dimensions of the mechatronics system, such as sensors, actuators, digital control, and electronics, in an attempt to produce products and services that meet the needs of its customers in terms of quality and appropriate cost, as well as the economic benefits that the company derives from the application of the mechatronic system with its four components.

4. Managers and officials in senior management should work to raise the morale of individuals and workers and enhance their belonging to the company in which they work by giving them more powers to make decisions, as well as working to provide sufficient information about the application of modern systems in the company so that individuals can deal with them and make decisions about it.

5. The company under study should coordinate with the general electricity distribution companies, such as the General Company for Baghdad Electricity Distribution, the General Company for Central Electricity Distribution, and the General Company for the Distribution of South Electricity. To hold continuous training courses for managers and workers to develop their skills and abilities in the fields of work, including the dimensions of the mechatronics system and its impact on the possibility of initiating its application.

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