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THE IMPACT OF IMPLEMENTING A SUSTAINABLE QUALITY MANAGEMENT SYSTEM IN ENHANCING OPERATIONS PERFORMANCE: ANALYTICAL STUDY IN THE ETIHAD FOOD INDUSTRIES COMPANY- ETIHAD SUGAR FACTORY

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Abstract
The current study aims to demonstrate the impact of applying the sustainable quality management system in enhancing Operations performance, as an administrative approach that provides the possibility of improving best practices and expanding them in the future, based on the fact that quality creates value for customers and society by supporting the sustainability triad (economic, social, environmental) through continuous improvement in Operations performance and innovation. The issue of the investigation is described in the volume of the effect of applying a sustainable quality management system to improve Operations effectiveness. The significance of the study is in providing light on the sustainable method of quality management that can be used to help organizations improve their Operations performance and have significant results while also maintaining a sustainable nature that contributes to the prosperity of societies and increases the competitiveness of organizations. To accomplish the goals of the study, a questionnaire with 40 items was employed. The purpose of the investigation was to formulate two basic hypotheses. To assess the legitimacy and fidelity of the results, a variety of statistical methods were employed using statistical programs (SPSS.ver.24) and (AMOS.ver.24). The findings of the study showed a significant association and influence between the sustainable quality management system and Operations performance.

Keywords: Quality Management System, Operations Performance, Social Quality, Operation Creativity, Environmental Concern.

Introduction

In the midst of the challenges facing the industrial sector represented by global competition and technological acceleration, The necessity of implementing contemporary systems and methods to address these issues and facilitate the satisfaction of customers in a way that ensures the quality of the product and its sustainability, as well as the cost and efficiency of the process,

were all considered when the design was created. Sustainable quality management is a comprehensive approach that attempts to lead excellence and sustainability in the organization's operations and products by taking a customer's perspective, the active participation and empowerment of employees, and the continuous improvement of the quality of its Operations performance by integrating sustainability principles into operations and procedures to achieve a positive impact on the environment, in addition to adopting practices that contribute to community development and achieving sustainable results that enhance the value and efficiency of organizations. Thus, it aims to achieve a balance between economic, social and environmental performance, and enhance competitiveness and sustainability in the long term. The investigation sought to clarify the definition of sustainable quality management as it relates to quality management and quality improvement, it took into consideration the economic, social and environmental aspects of sustainability, which is intended to maintain a balance between the needs of the customer and the environment while also achieving efficiency, using modern technology to enhance efficiency and improve quality. All of this was combined with a comprehensive approach that required all levels of the organization to participate in order to achieve the goals. The researchers utilized the questionnaire method primarily for the purpose of collecting information and data regarding the practical application of the questionnaire. The study sample consisted of (100) participants selected from various departments of the Union Sugar Factory.

The Study Hypothesis

According to the purpose of the study, the following hypotheses were proposed:

- A significant association exists between the independent variable (quality management system that is sustainable) and the dependent variable (Operations performance).
- A significant association between the independent variable (quality management system that is sustainable) and the dependent variable (Operations performance) exists.

Sample and Community of the Study

The Union Sugar Factory was chosen as the site for the practical study due to its significant contribution to providing the local community with its products, in addition to being a viable option. The study sample represented the factory's workforce in its various departments. (100) questionnaires were distributed, their questions were answered, and many elements of the study were clarified. A total of (100) questionnaires were received, meaning a response rate of (100%).

Statistical Methods Used

More advanced statistical methods were: Arithmetic mean, Standard deviation, coefficient of variation, relative significance, corroborative factor analysis, correlation analysis, regression analysis. T-test, F-test, and Cronbach's Alpha Coefficient.

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LITERATURE REVIEW

First: Sustainable Quality Management (SQM)

1. Sustainable Quality Management Concept

The doctrine of sustainable quality management is still considered the central principle of business and a method for improving performance by combining different processes and activities(Al-Barqaawi, 2023:80).(Habib and Al-Fakiki, 2021: 175) see that quality means meeting or exceeding customer requirements and it includes product quality, social responsibility quality, price quality and delivery date.

(Al-Lami & Al-Moussawi, 2023: 119) This term suggests that the concept of sustainability is consistent with the needs of the current generation while not negatively impacting the resources necessary for the future generation. It attempts to maintain or support the process on a long-term basis while attempting to prevent the depletion of natural resources or materials in the long term. Both quality and sustainability are derived from strategic actions, there are similarities in the actions including a long-term perspective, continual improvement, employee empowerment, a functional approach that is cross-based, standards development that is system-based, and a focus on eliminating waste and pursuing the ISO 9000 and 14000 standards. processes that focus on quality have an additional benefit that is the improvement of environmental performance, as a result of the process's reduced waste, rework, and increased efficiency (Chaudhuri & Jayaram, 2018: 2-7).

(Wong & Wong, 2014: 52) indicate that it represents interactions between the organization, its customers and suppliers, and then obtaining the greatest benefits of sustainability by expanding the focus to the maximum extent possible from the source of raw materials towards the downstream towards customers and then back again with the recycling of products and waste.

(Abdul Hadi, 2020: 29) sees it as an administrative system that relies on teamwork and team spirit with the aim of achieving a set of work-related goals and focuses on removing all obstacles and solving all problems facing the workflow with the aim of raising the level of quality of various products with the aim of satisfying the largest possible number of customers at different levels, desires and expectations for various products and preserving the environment on an ongoing basis.

(Fok, et al., 2021:47) defined it as an integrative approach to follow up on customer satisfaction by integrating the organization’s strategies with sustainability practices that can ensure the organization’s good economic, social, and environmental performance.

(Al-Ani & Al-Moussawi, 2022: 55) see it as an appropriate technology that combines customer expectations and environmental strategies to develop sustainable products and services that maintain their sustainability and continuity while reducing effort and cost in all product or service design processes and activities to achieve strategic goals and obtain a competitive advantage and reputation for the organization.

(Al-Barqaawi, 2023: 83) confirms that it is an approach to managing compliance with quality standards according to the sustainability triad (economic, social, and environmental) in the long term with the aim of improving and maintaining the overall performance of the organization. It is a means of preserving business and its competitive advantage by integrating quality requirements with sustainability dimensions.

Based on the above, it is a set of interactive activities between the organization, suppliers and customers in order to obtain highly efficient outputs according to the sustainability triad (economic, social and environmental) by providing strong and sustainable competitive performance.

2. importance of sustainable quality management

(Shahzad, et al., 2019: 7) considers that the importance of sustainable quality management results from its focus on three important aspects, which are: (Al-Barqaawi, 2023:84)

- Environmental sustainability (EV) is concerned with dealing with waste in a responsible manner, reducing toxins, decreasing the probability of hazardous accidents, and producing environmentally friendly products.
- Economic sustainability (ECO) is concerned with the cost of energy, the revenue generated from advertising, the utilization of waste to generate revenue, and energy efficiency.
- Social sustainability (SOC) is concerned with maintaining communication with the external community and preventing the organization from engaging in any activities that negatively affect society while on the job.

3. Benefits of Sustainable Quality Management

(Batista & Farncisco, 2018:2) see that the benefits of sustainable quality management are embodied in a way that indicates the interconnected relationships between economic, social and environmental dimensions through the following:

a. Provides the opportunity to enhance the transparency of organizations, their value, reputation and legitimacy.
b. Comparisons can be made with other companies.
c. A significant resource that helps with the evolution and development of the Operations system.

4. Principles of Sustainable Quality Management

(Al-Barqaawi, 2023:93) indicated that it is represented in:

- Commitment of senior management.
- Adoption of quality systems and standards.
- Designing the product according to quality determinants.
- Auditing and quality control.
- Empowering workers.
- Continuous improvement.

5. Dimensions of the sustainable quality management

(Salman, 2022: 226) mentioned the dimensions of sustainable quality management as:

- **Quality Costs (QC)**: reflect the degree to which the product's requirements are achieved or not, as specified by the customer. These requirements include the design of the product, the instructions for operation, the regulations of the government, the timely delivery of the product, the marketing of the product, and the service provided (Mitra, 2021: 23).

- **Social Quality (SQ)**: It's the degree to which people participate in the social, economic and cultural endeavors of their communities while also enhancing their personal happiness and potential. This corroborates four experimental conditions that determine the degree and quality of social participation: (Holman & Walker, 2018: 247)

a. The leadership of social and economic security over time and other resources.
b. The degree to which social cohesion is maintained and the extent to which norms and values are embraced and shared.
c. The degree to which individuals participate in and are socialized into various organizations and relationships.
d. Social empowerment is the degree to which social structures, relationships and organizations facilitate participation and the development of capabilities.

- **Environmental Concern (EC)**: The environmental management system represents a set of systems specific to environmental management that aim to care for the environment and its surroundings from the negative effects of production systems on it (Darwish & Yahya, 2000: 225).

The environmental impact can be measured mainly in three aspects, which are: (Peng, et al., 2018: 4).

a. Resource consumption: Resources differ in different manufacturing industries regarding their consumption of basic resources, specifically energy and material consumption is associated with the consumption of primary resources, such as energy is consumed by the main equipment and its associated subsystems, and includes the consumption of raw materials and secondary materials.
b. Waste management: Waste includes materials that are no longer reusable and wasted material that results from unplanned defects and additional structures that produce these components. These entities either create waste material or increase the consumption of material.
c. Pollution control: It encompasses a variety of pollution types, including liquid gas, solid, sound and harmful chemicals.

Second: Operations Performance(OP)

1. Concept of Operations Performance

Performance is the final result of all activities aimed at achieving the organization's goals by investing its available resources according to standards and considerations related to those goals (Al-Jubouri & Al-Jubouri, 2013: 85) defined Operations performance as a set of activities and operations adopted by the organization at all administrative and organizational levels, relying on the expertise, skills, knowledge and creativity of its employees through the best use of available resources, providing products of distinguished quality that meet the needs and desires of customers and ensure the acquisition of various competitive advantages.

While (Tortorella & Fettermam, 2018: 270) indicated that it represents the achieved result of the organization's activities through harmonization between the business environment and the organization's resources.

(Subali, et al., 2020: 4377) considers it an attempt to combine the best of practices and decisions that are intended to assess strategies in competition in order to draw in customers, it also aims to provide reliability, process flexibility, cost reduction, product or process innovation, and

product quality. (Kazem, 2022: 55) indicates that it is the method chosen by the organization to accomplish its operations to achieve the best possible results by using available resources efficiently and effectively and providing products and services that meet the needs and desires of customers to gain their loyalty, increase market share, and achieve competitive advantages. Based on the above, it is a set of activities that enable the organization to accomplish its work using available resources and achieve the best results by providing high-quality goods and services that meet the needs, desires and aspirations of customers.

2. Importance of performing operations

The importance of Operations performance is highlighted by its direct link to competitive advantage, which is generated from the value that the organization creates for customers through manufacturing, assembly, and packaging, or by offering products at lower prices than competitors to obtain equivalent advantages or offer advantages at higher prices (Kenyon, et al., 2016: 27).

(Liu, et al., 2020: 17-19) and (Kazem, 2022: 56) pointed out the importance of performing operations through the following:

- Good process performance in industrial organizations reduces costs to a minimum.
- Improves the effective use of raw materials, which leads to increased revenues and profits.
- Improves both product performance and quality and meets customer needs through efficient use of resources.
- Process performance adapts to demand and achieves production efficiency.
- Through it, revenues and profits are increased due to its association with the financial performance of organizations.
- Process performance achieves customer satisfaction by meeting their needs on time and with appropriate quality.
- Helps gain competitive advantage and retain employees.

3. Dimensions of Operations Performance

(Russell & Millar, 2014: 73) see that the dimensions of process performance are embodied in the following:

- **Process cost:** Focusing on the cost dimension and neglecting other dimensions (quality, flexibility, delivery, and creativity) will constitute a dark spot in the life of the organization and thus may negatively affect its performance in a way that leads to the cessation of operations and the withdrawal of the organization from the competition circle due to its reliance on one dimension of these dimensions (Al-Zaidi, 2009: 38). (Mohsen & Al-Najjar, 2012: 56) indicated that organizations are able to reduce the cost of the product by tracking all sources of loss and reducing expenses in general and achieving maximum value.
- **Process quality**: The quality of a product or service is the capacity to do things right without making mistakes, and to please customers by providing goods and services that are free of errors (Slack, et al., 2013: 46). Improving the quality of the process in the organization leads to eliminating defects, a high level of performance, a low rate of complaints, and improved personal and distinguished treatment of each customer (Espino- Rodriguez, 2016: 6).

- **Process flexibility**: It is the ability of operations to change from one product to another or from one customer to another at a lower cost and represents a competitive advantage through the following: (Al-Ali, 2000: 44)

a. Meeting the urgent changes in the market.

b. Meeting the different needs of the customer because marketing always aims to satisfy the requests submitted by customers.

(Kazem,2022: 73) indicated that it is the effort made by industrial organizations to respond or adapt to changes that occur in the process, product, or service quickly and effectively.

- **Delivery:** Organizations seek to reduce the time taken to receive customer orders for their products and deliver them to them in a final manner. Focusing on priority delivery achieves many advantages, including: (Meredith & Shafer, 2007: 64)

- High quality.
- Reducing risks.
- C. Reducing costs.
- Improving communications.
- Increasing efficiency.

- **Process innovation**: It is represented in providing goods or services to customers, and it is a challenge facing organizations today in their business environment, and at the same time it is a competitive advantage for organizations, and in order for the organization to continue to innovate and provide new products on an ongoing basis, its strategy should focus on: (Al-Zaidi, 2009: 38)

- Research and development.
- High quality of the product.
- Possessing the ability to modify or develop production equipment.
-

RESULTS AND DISCUSION

Research sample:

The questionnaire was distributed to a sample of (100) valid forms for analysis. After collecting the information, it was transferred to a statistical program (SPSS 24) for analysis and a statistical program (AMOS 24) for the purpose of extracting information from it. The researchers employed descriptive and analytical statistics. Descriptive statistics included the frequency of each occurrence, their percentage of the total, the mean, standard deviation, and variation coefficient, while analytical statistics included correlation coefficients, regression, and confirmatory factor analysis for the purpose of revealing the relationships and effects between the variables used.

Questionnaire stability and reliability

In order to determine and demonstrate the stability and reliability of the questionnaire results so that if the experiment is repeated under similar conditions, we get the same results. In this case, the criteria for the stability and reliability of the questionnaire must be calculated, as one of the most important and common criteria is the Cronbach's alpha coefficient. This coefficient is a statistical measure that determines the consistency of the questions within the questionnaire. The Cronbach's alpha coefficient is an important method through which the quality of

questionnaires is ensured and thus research results are highly reliable. The researchers found the results of the Cronbach's alpha coefficient and placed them in the following table:

Table No(1) Cronbach's alpha coefficients

Items	No. of Items	Cronbach's Alpha
QC	5	.80
SQ	5	.88
EC	5	.80
SQM	15	.91
PC	5	.80
PQ	5	.87
PF	5	.82
D	5	.82
OC	5	.85
OP	25	.94
All Items	40	.96

The results of the table show that they are close to one, which indicates the stability and reliability of the questionnaire. The values of Cronbach's alpha coefficient are good values and give a high degree of stability. Therefore, we conclude that the questions formulated by the researchers here are consistent with each other and are capable of measuring what they were built for.

Frequencies and their percentages for the questionnaire:

Extracting frequencies and their percentages for questionnaire items is one of the important steps in data analysis because it provides benefits that help the researchers understand and interpret the questionnaire results more deeply. Frequencies enable us to identify and know the most frequently repeated answers, and thus help in identifying the prevailing trends in the opinions or behaviors of participants. And show the level of general satisfaction. In addition, they help in providing a strong database to support making strategic decisions, such as amending policies or improving services based on participants' responses, and thus planning for advanced stages of identifying areas that need specific treatments. The following table includes the frequencies and their percentages for the (SQM) axis items that were extracted from the questionnaire results:

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Table No. (2) Frequencies and percentages of the SQM axis items

Item		strongly disagree	disagree	Neutral	Agree	strongly agree	item	strongly disagree	Disagree	neutral	agree	strongly agree
QC1	Frequency	0	0	0	82	18	EC1	0	0	0	64	36
	Percent	0	0	0	82.0	18.0		0	0	0	64.0	36.0
QC2	Frequency	0	9	0	37	54	EC2	0	0	10	54	36
	Percent	0	9.0	0	37.0	54.0		0	0	10.0	54.0	36.0
QC3	Frequency	0	0	0	47	53	EC3	0	0	18	47	35
	Percent	0	0	0	47.0	53.0		0	0	18.0	47.0	35.0
QC4	Frequency	0	0	0	26	74	EC4	0	0	9	45	46
	Percent	0	0	0	26.0	74.0		0	0	9.0	45.0	46.0
QC5	Frequency	0	0	0	45	55	EC5	0	0	0	37	63
	Percent	0	0	0	45.0	55.0		0	0	0	37.0	63.0
QC	Frequency	0	9	0	237	254	EC	0	0	37	247	216
	Percent	0	1.8	0	47.4	50.8		0	0	7.4	49.4	43.2
SQ1	Frequency	0	0	0	54	46						
	Percent	0	0	0	54.0	46.0						
SQ2	Frequency	0	0	18	63	19						
	Percent	0	0	18.0	63.0	19.0						
SQ3	Frequency	0	0	0	45	55						
	Percent	0	0	0	45.0	55.0						
SQ4	Frequency	0	0	0	44	56						
	Percent	0	0	0	44.0	56.0						
SQ5	Frequency	0	0	0	54	46						
	Percent	0	0	0	54.0	46.0						
SQ	Frequency	0	0	18	260	222						
	Percent	0	0	3.6	52	44.4						

The results in the table show that the participants in the questionnaire tended in their answers to strongly agree and agree with most of the paragraphs of the axes and dimensions of the questionnaire. Finally, the researchers drew the following graphs for the percentages of answers to the scale for the dimensions of the (SQM) axis in order to give a clearer picture of the answers:

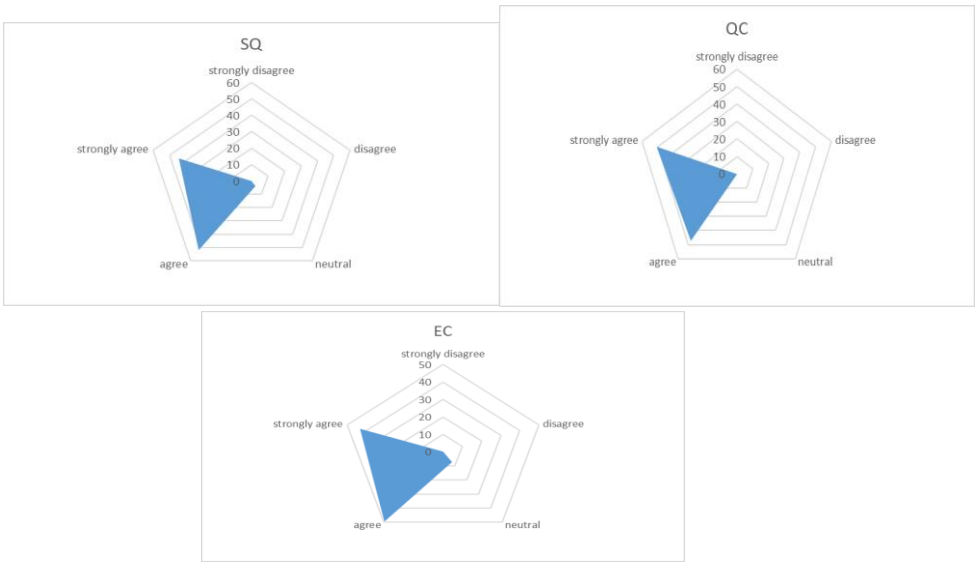

Figure (1) shows the percentages of responses for each scale for the dimension items.

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The following table includes the frequencies and their percentages for the OP axis items that were extracted from the questionnaire results:

Table No. (3) Frequencies and percentages of OP axis items

item		strongly disagree	disagree	neutral	agree	Strongly Agree	item	strongly disagree	disagree	neutral	agree	Strongly agree
PC1	Frequency	0	0	0	78	22	D1	0	0	1	63	36
	Percent	0	0	0	78.0	22.0		0	0	1.0	63.0	36.0
PC2	Frequency	0	9	0	37	54	D2	0	0	9	55	36
	Percent	0	9.0	0	37.0	54.0		0	0	9.0	55.0	36.0
PC3	Frequency	0	0	0	45	55	D3	0	0	17	48	35
	Percent	0	0	0	45.0	55.0		0	0	17.0	48.0	35.0
PC4	Frequency	0	0	0	30	70	D4	0	0	9	46	45
	Percent	0	0	0	30.0	70.0		0	0	9.0	46.0	45.0
PC5	Frequency	0	0	0	47	53	D5	0	0	8	47	45
	Percent	0	0	0	47.0	53.0		0	0	8.0	47.0	45.0
PC	Frequency	0	9	0	237	254	D	0	0	44	259	197
	Percent	0	1.8	0	47.4	50.8		0	0	8.8	51.8	39.4
PQ1	Frequency	0	0	2	55	43	OC1	0	0	2	38	60
	Percent	0	0	2.0	55.0	43.0		0	0	2.0	38.0	60.0
PQ2	Frequency	0	0	17	60	23	OC2	0	0	1	62	37
	Percent	0	0	17.0	60.0	23.0		0	0	1.0	62.0	37.0
PQ3	Frequency	0	0	0	45	55	OC3	0	0	9	55	36
	Percent	0	0	0	45.0	55.0		0	0	9.0	55.0	36.0
PQ4	Frequency	0	0	0	46	54	OC4	0	0	18	47	35
	Percent	0	0	0	46.0	54.0		0	0	18.0	47.0	35.0
PQ5	Frequency	0	0	0	56	44	OC5	0	0	2	38	60
	Percent	0	0	0	56.0	44.0		0	0	2.0	38.0	60.0
PQ	Frequency	0	0	19	262	219	OC	0	0	32	240	228
	Percent	0	0	3.8	52.4	43.8		0	0	6.4	48	45.6
PF1	Frequency	0	0	1	64	35						
	Percent	0	0	1.0	64.0	35.0						
PF2	Frequency	0	0	9	56	35						
	Percent	0	0	9.0	56.0	35.0						
PF3	Frequency	0	0	18	47	35						
	Percent	0	0	18.0	47.0	35.0						
PF4	Frequency	0	0	9	45	46						
	Percent	0	0	9.0	45.0	46.0						
PF5	Frequency	0	0	2	38	60						
	Percent	0	0	2.0	38.0	60.0						
PF	Frequency	0	0	39	250	211						
	Percent	0	0	7.8	50	42.2						

The results in the table also show that the participants in the questionnaire tended in their answers to strongly agree and agree with the paragraphs of the axes and dimensions of the questionnaire. The following graphs were drawn for the percentages of answers to the scale for the dimensions of the (OP) axis:

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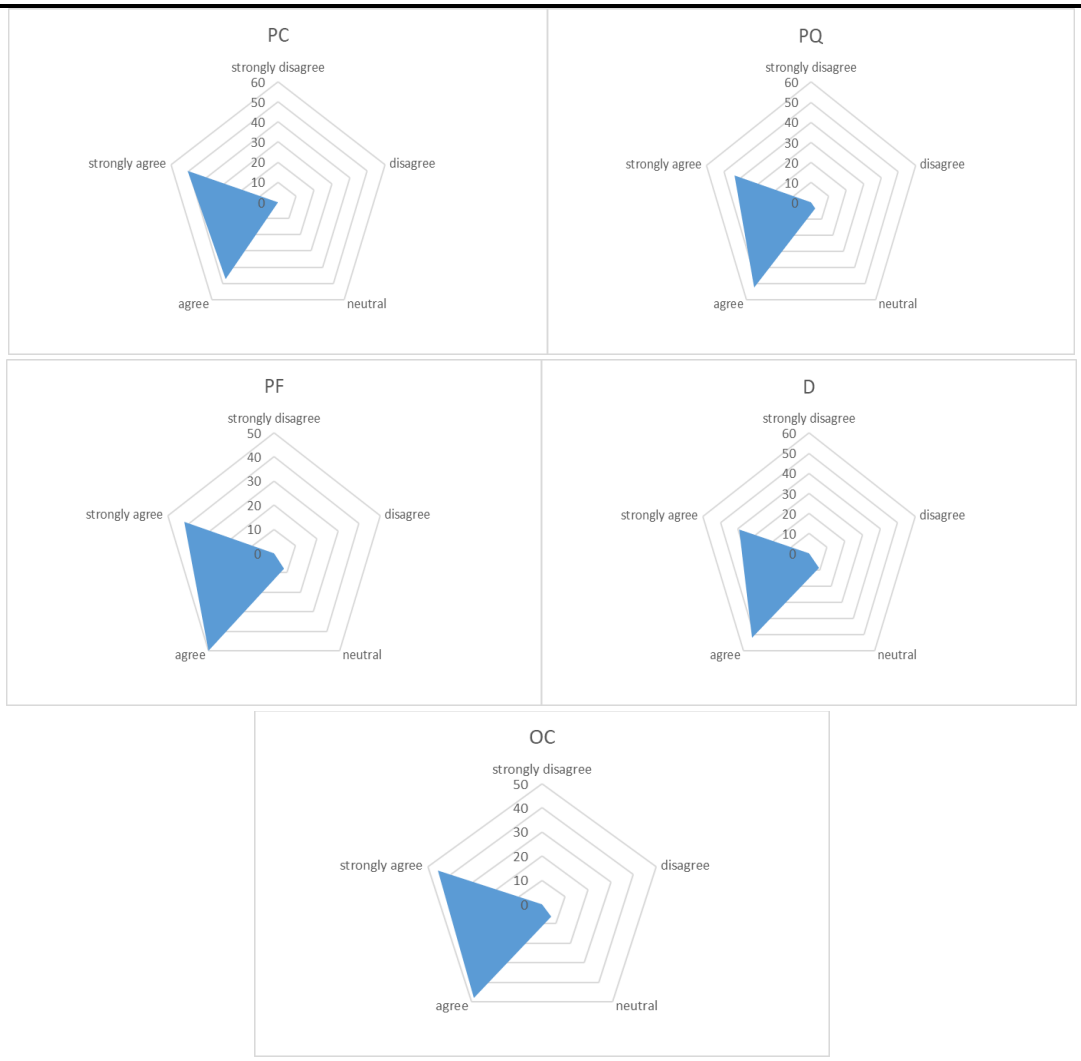

Figure (2) shows the percentages of responses for each scale for the axis items.

General statistics for questionnaire items:

Descriptive statistics, represented by the average, standard deviation, and variance, is considered to be an important tool in the analysis of Questionnaire data, this tool helps the researchers to have a comprehensive understanding of the nature of the distribution and the common pattern in the responses. The average number of patients in the hospital is approximately 3,000, which is the central value of the data. the value of the answers that are most similar, which enables the general trend of the answers to be known and the degree to which they deviate from this general trend to be determined. Regarding the standard deviation, it's purpose is to show the degree to which the participants' answers are spread out, if the value is small, this means that the answers are almost average, and if the value is large, this means that there are different opinions about the specific passage. The coefficient of variation is a figure that is used to describe the variation of data relative to the average, and is obtained by dividing the standard deviation by the average. This measure facilitates a comparison of datasets with different scales. Ultimately, descriptive statistics provide a detailed description of the data gathered via the questionnaire, which facilitates better decisions. The following table includes general information about the (SQM) and (OP) axes:

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Table No. (4) General statistics for the paragraphs of the two axes (SQM) and (OP)

item	Mean	Std. Deviation	Coefficient of variation	item	Mean	Std. Deviation	Coefficient of variation	item	Mean	Std. Deviation	Coefficient of variation
QC1	4.18	0.386	9	SQ1	4.46	0.501	11	EC 1	4.36	0.482	11
QC2	4.36	0.882	20	SQ2	4.01	0.611	15	EC 2	4.26	0.630	15
QC3	4.53	0.502	11	SQ3	4.55	0.500	11	EC 3	4.17	0.711	17
QC4	4.74	0.441	9	SQ4	4.56	0.499	11	EC 4	4.37	0.646	15
QC5	4.55	0.500	11	SQ5	4.46	0.501	11	EC 5	4.63	0.485	10
QC	4.47	0.377	8	SQ	4.41	0.432	10	EC	4.36	0.448	10
item	Mean	Std. Deviation	Coefficient of variation	item	Mean	Std. Deviation	Coefficient of variation	item	Mean	Std. Deviation	Coefficient of variation
PC1	4.22	0.416	10	PQ1	4.41	0.534	12	PF1	4.34	0.497	11
PC2	4.36	0.882	20	PQ2	4.06	0.633	16	PF2	4.26	0.613	14
PC3	4.55	0.500	11	PQ3	4.55	0.500	11	PF3	4.17	0.711	17
PC4	4.70	0.461	10	PQ4	4.54	0.501	11	PF4	4.37	0.646	15
PC5	4.53	0.502	11	PQ5	4.44	0.499	11	PF5	4.58	0.535	12
PC	4.47	0.382	9	PQ	4.40	0.436	10	PF	4.34	0.464	11
D1	4.35	0.500	11	OC1	4.58	0.535	12				
D2	4.27	0.617	14	OC2	4.36	0.503	12				
D3	4.18	0.702	17	OC3	4.27	0.617	14				
D4	4.36	0.644	15	OC4	4.17	0.711	17				
D5	4.37	0.630	14	OC5	4.58	0.535	12				
D	4.31	0.477	11	OC	4.39	0.464	11				

We notice from the table results that the answers tend to strongly agree and agree. As for the standard deviation values, the low values of the standard deviations and coefficients of variation indicate the homogeneity of the sample answers.

Confirmatory factor analysis of questionnaire axes:

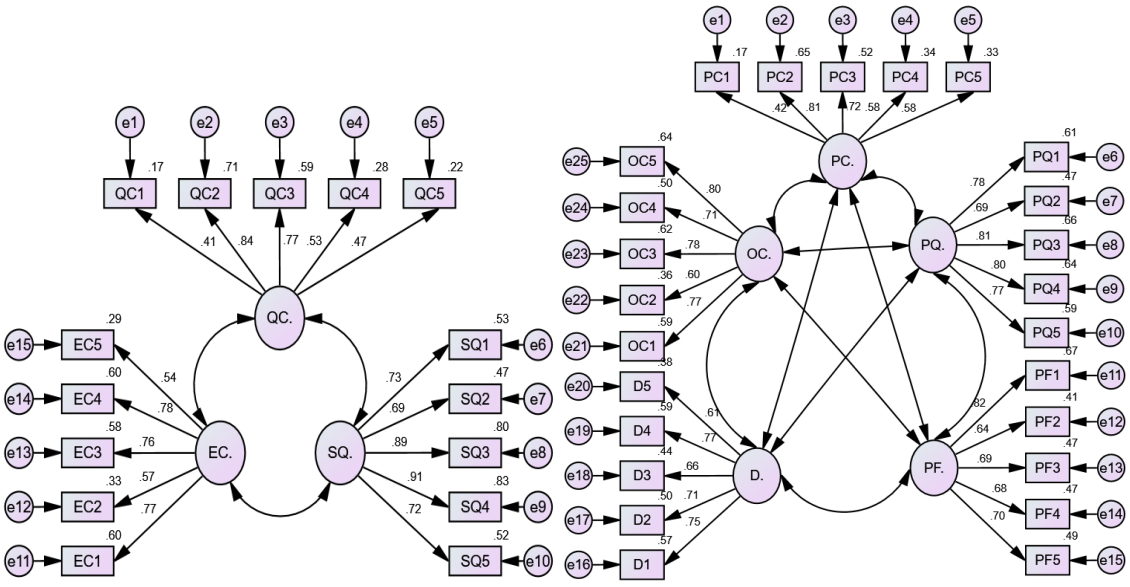
Confirmatory factor analysis (CFA) is a statistical procedure that is primarily employed to authenticate the structure or factor structure of data and assess its consistency with the hypothesized model by the researchers. Additionally, confirmatory factor analysis is a powerful method that facilitates the assessment of the items used to measure variables in relation to the theoretical characteristics of the variables we want to measure. As a result, it helps to improve the accuracy and reliability of the questionnaire's results by checking the consistency of the questions and the theoretical framework for the factor structure, it increases the structural validity and reliability of the questionnaire, and decreases the likelihood of obtaining inaccurate results. The researchers developed a scheme for structural modeling that included weights for regression. Additionally, the criteria for accuracy of the proposed model by the researchers was identified. Among the metrics employed by the researchers are the ratio of the chi-square value to the number of degrees of freedom, the CFI (comparative fit index), the TLI (Tucker-Lewis

index), and the RMSEA (root mean square error of approximation). The outcomes are listed in the following table:

Table No. (5) The process of evaluation and decision-making regarding acceptance or rejection of proposals.

Parameter	SQM			OP		
	Parameter Value	Comparison	Decision	Parameter Value	Comparison	Decision
X^2(df) (sig.)	471.751 (87) (0.000)	Less than 0.05sig.	Accepted	2138.644 (265) (0.000)	Sig. Less than 0.05	Accepted
CFI	0.95	More than 0.50	Accepted	0.92	More than 0.50	Accepted
TLI	0.96	More than 0.50	Accepted	0.90	More than 0.50	Accepted
RMSEA	0.00	Less than 0.05	Accepted	0.00	Less than 0.08	Accepted

The values of the criteria indicate the quality of the model assumed by the researchers, and thus the suitability of the model to the data, as their values were high and indicate the model's ability to explain the relationships between variables. The structural diagram of the two axes that were built using the AMOS program is shown in the following figure:



SQM OP

Figure (3) shows the structural plan of the two axes.

The standard regression weights fixed on the straight lines from dimension to paragraph show that the paragraphs interpreted the dimensions to which they belong. The following table includes the standard regression weights for the two axes.

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Table No. (6) Standardized Regression Weights for each paragraph

	Estimate		Estimate		Estimate
QC1 <--- QC.	.407	SQ1 <--- SQ.	.728	EC1 <--- EC.	.774
QC2 <--- QC.	.845	SQ2 <--- SQ.	.686	EC2 <--- EC.	.573
QC3 <--- QC.	.769	SQ3 <--- SQ.	.894	EC3 <--- EC.	.762
QC4 <--- QC.	.533	SQ4 <--- SQ.	.910	EC4 <--- EC.	.775
QC5 <--- QC.	.469	SQ5 <--- SQ.	.722	EC5 <--- EC.	.539
PC1 <--- PC.	.418	PQ1 <--- PQ.	.778	PF1 <--- PF.	.817
PC2 <--- PC.	.808	PQ2 <--- PQ.	.689	PF2 <--- PF.	.640
PC3 <--- PC.	.719	PQ3 <--- PQ.	.813	PF3 <--- PF.	.687
PC4 <--- PC.	.580	PQ4 <--- PQ.	.798	PF4 <--- PF.	.682
PC5 <--- PC.	.576	PQ5 <--- PQ.	.766	PF5 <--- PF.	.699
D1 <--- D.	.753	OC1 <--- OC.	.765		
D2 <--- D.	.707	OC2 <--- OC.	.601		
D3 <--- D.	.662	OC3 <--- OC.	.785		
D4 <--- D.	.771	OC4 <--- OC.	.710		
D5 <--- D.	.615	OC5 <--- OC.	.797		

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Correlation test:

The null hypothesis proposed by the researchers and intended to be examined is (there is no significant association between (SQM) and the (OP) axis at a level of significance of (5%)). To demonstrate it, the researchers found the association values and their p value, these results are then listed in a table:

Table No. (7) Correlation between the two axes

Correlations					
		QC	SQ	EC	SQM
PC	Pearson Correlation	.702**	.650**	.736**	.777**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	100	100	100	100
PQ	Pearson Correlation	.615**	.665**	.795**	.775**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	100	100	100	100
PF	Pearson Correlation	.595**	.670**	.739**	.748**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	100	100	100	100
D	Pearson Correlation	.789**	.563**	.727**	.768**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	100	100	100	100
OC	Pearson Correlation	.781**	.414**	.695**	.695**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	100	100	100	100
OP	Pearson Correlation	.798**	.674**	.844**	.860**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	100	100	100	100
**. Correlation is significant at the 0.01 level (2-tailed).					

From the data in the table above, we can deduce that the association between (SQM) and (OP) was (0.860) and had a significant p value. the value is considered to be zero, and this value is less than the (5%) level of significance. As a result, the null hypothesis is denied and the alternative hypothesis is embraced. We discover that there is a direct and significant association between (SQM) and (OP) beneath the (5%) level of significance. The association between (QC) and (OP) was significant (0.798) and its p value was the value is considered to be zero, and this value is less than the (5%) level of significance. As a result, the null hypothesis is denied and the alternative hypothesis is embraced. We deduce that there is a direct and significant association between (QC) and (OP) below the (5%) level of significance. The association value between (SQ) and (OP) was (0.674) and had a significant p value. the value is considered to be zero, and this value is less than the (5%) level of significance. As a result, the null hypothesis is denied and the alternative hypothesis is embraced. We discover that there is a direct and significant association between (SQ) and (OP) beneath the (5%) level of significance. The

association between (EC) and (OP) was (0.844) and its significance was (0.000). The value is identical to zero. This value is less than the (5%) probability level. As a result, the null hypothesis is denied and the alternative hypothesis is embraced. We discover that there is a direct and significant association between (EC) and (OP) beneath the (5%) level of significance. The following figure illustrates the connections between the variables involved in the study:

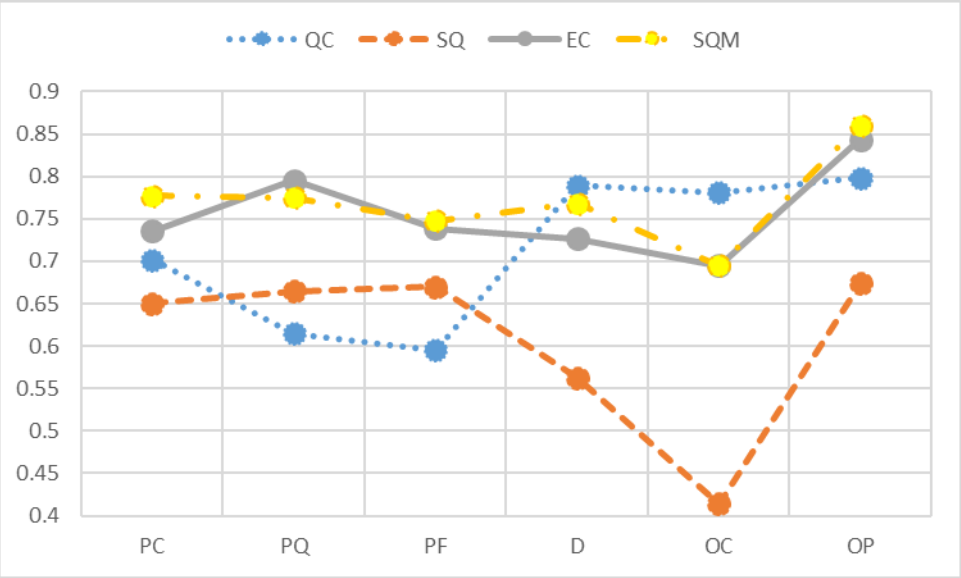

Figure (4) shows the Correlations between the (SQM) axis and its dimensions and between (OP).

Effect of (SQM) and its dimensions in (OP):

The researchers put forward the following null hypothesis to show the effect of (SQM) on (OP):

H0: There is no significant effect of the (SQM) axis and its dimensions on the (OP) axis.

In contrast to the alternative hypothesis:

H1: There is a significant effect of the (SQM) axis and its dimensions on the (OP) axis.

In order to test this hypothesis, it was necessary to analyze the data and find the results of the effect. These results are included in the following table:

Table No. (8) Impact analysis results

Dependent Variable	Predictors	R Square	F test	Sig. of F test	Standardized Regression coefficient	t test	Sig. of t test
OP	QC	.637	172.246	.000[b]	.798	13.124	.000
	SQ	.454	81.576	.000[b]	.674	9.032	.000
	EC	.712	242.162	.000[b]	.844	15.562	.000
	SQM	.739	277.314	.000[b]	.860	16.653	.000

From the table, it is evident that the degree of association for the (QC) impact model in (OP) was (63%), which means that the model explained (63%) of the total and the remainder was explained by other variables not involved in the research. The F-test value was (172.246) with a significant p value. the value of zero, which is less than the (5%) probability of a significant result, therefore, the model employed is a significant model. Regarding the regression coefficient's value, it was (0.798) with a t-test that was significant at the (5%) level. This implies

that the number (0.798) implies that each additional dollar spent on (QC) leads to a improvement in the performance of operations by (79.8%). The coefficient of determination for the (SQ) impact model in (OP) was (45%), which means that the model explained (45%) of the total variance, and the remainder was explained by other variables not involved in the research, The F-test value was (81.576) with a significant p-value of (0.000). the value of zero, which is less than the (5%) probability of a significant result, therefore, the model employed is a significant model. The regression coefficient value was (0.674) with a t-test that was significant at the (5%) level, this means that there is a significant indirect effect between them. This implies that the number (0.674) implies that each increase in social quality (SQ) leads to a improvement in performance via (67.4%). The degree of determination associated with the (EC) effect model in (OP) was (71%), which means that the model accounted for (71%), and the remainder was attributed to other factors not included in the study. The F-test value was (242.162) with a significant p value. the value of zero, which is less than the (5%) probability of a significant result, therefore, the model employed is a significant model. The p value of the regression parameter was equal to (0.844) with a t-test that was significant at the (5%) level. This implies that there is a significant indirect effect between them. Other words, the number (0.844) implies that, each additional degree of environmental concern (EC), leads to a improvement in the performance of operations by (84.4%). The coefficient of determination for the (SQM) impact model in (OP) was (73%). This implies that the model accounted for (73%) of the total variance, and the remainder was explained by other factors not considered in the study. The p value of the F-test was (277.314) and was significant. equal to zero, which is less significant than (5%). As a result, the model employed is of great importance. The value of the regression coefficient was significant ($p<0.05$) with a t-test that was equal to (16.653), which is a significant value that is below the (5%) level. This implies that there is a significant indirect effect between them. Other words, the number (0.860) implies that every unit of improvement in sustainable quality management (SQM) leads to a increase in performance via (86%).

Conclusions:

Upon examining the topics presented in the literature, assessing the data, and analyzing the outcomes, the following conclusions were drawn: The values of Cronbach's alpha coefficient give a high degree of stability, and we conclude that the questions formulated by the researchers are consistent with each other and are able to measure what they were built for. The participants in the questionnaire tend in their answers to strongly agree and agree with most of the paragraphs of the axes and dimensions of the questionnaire. The values of the criteria for confirmatory factor analysis indicate the quality of the model proposed by the researchers, as indicated by the values of the criteria, the model is appropriate and the data is well explained by the model. The standard regression weights demonstrate that the sections of the text explained the magnitude to which they belong. The direct and significant association between (SQM) and (OP) with a level of significance of (5%). The direct and significant association between (QC) and (OP) with a level of significance of (5%). The direct and significant association between (SQ) and (OP) with a level of significance of (5%). A direct and significant association between (EC) and (OP) exists at a level of significance of (5%). A notable direct

effect exists; thus, That each unit increase in quality costs (QC) leads to an improvement in operations performance by (79.8%). That each unit increase in social quality (SQ) leads to an improvement in operations performance by (67.4%). That each unit increase in environmental concern (EC) leads to an improvement in operations performance by (84.4%). That each unit increase in sustainable quality management (SQM) leads to an improvement in operations performance by (86%). The researcher suggests the need to focus on applying the principles of sustainable quality management in the operations of industrial organizations in general and the factory under study in particular, and to emphasize the dissemination of these principles with the aim of continuing and keeping pace with market developments and facing the challenges of competition. The researcher also suggests conducting future studies on the impact of lean management on sustainable quality.

References

1. Abdel Hadi, Mohamed Gamal Mohamed, (2020), The role of sustainable quality in improving the effectiveness of the administrative decision in the National Authority for Drinking Water and Sanitation, Scientific Journal of Economics and Trade.
2. Al-Ali, Abdul Sattar Muhammad, (2000), Production and Operations Management, Wael Publishing and Distribution House, Amman, Jordan.
3. Al-Ani, Samir Shaker Mahmoud and Al-Moussawi, Abbas Nawar Kaheet, (2022), Compatibility between green target costing and deploying the sustainable quality function to build a sustainable competitive advantage, Al-Kut Journal of Administrative and Economic Sciences, Volume 14, Issue 45.
4. Al-Barqaawi, Osama Ahmed Hajeel, (2023), The combined impact of continuous improvement and training in sustainable quality management, Master's thesis, College of Administration and Economics, Al-Qadisiyah University.
5. Al-Jubouri, Maysar and Al-Jubouri, Muhammad, (2013), Clarity of Operations performance standards and its role in improving organizational decisions: A survey study of the opinions of a sample of managers of Badoush Cement Factory in Mosul City, College of Administration and Economics, University of Mosul.
6. Al-Lami, Nagham Fouad Abbas and Al-Moussawi, Abbas Nawar Kaheet, (2023), Integration of sustainable quality at the source and the green supply chain to manage costs and enhance competitive advantages, Al-Kut Journal of Administrative and Economic Sciences, Volume 15, Issue 47.
7. Al-Zaidi, Hala Muthanna Muhammad, (2009), The impact of technological change on Operations performance, higher diploma research, Administrative Technical College - Baghdad.
8. Batista, A. A. D. S., & Francisco, A. C. D. (2018). Organizational sustainability practices: A study of the firms listed by the corporate sustainability index. Sustainability, 10(1), 226.
9. Chaudhuri, A., & Jayaran, J., (2018), A socio-technical view of performance impact of integrated quality and sustainability strategies, International Journal of Production Research, Vol. 57, No. 5.
10. Darwish, Mohammed and Yahya, Ibrahim, (2000), Total Quality Management, Dar Al-Handasah Printing Press, Egypt.

11. Espino-Rodríguez, T. F., (2016), How hotels compete on the basis of competitive priorities and their relationship with infrastructural and structural decisions. Service Business, Vol.10, No.4.
12. Fok, L. ; Morgan, Y. C., & Zee, S. (2021). A Multi-Industry Study of Sustainability, Total Quality Management, Organizational Culture, and Performance. International Journal of Operations and Quantitative Management, 27(1), 45-60.
13. Habib, Athmar Zahir, and Al-Fakiki, Ali Farhan Abdullah, (2021), The Role of Total Quality Management in Achieving Competitive Advantage, Special Issue of the College of Administration and Economics Conference, University of Kufa.
14. Holman, D., & Walker, A., (2018), Social Quality and Health: examining individual and neighborhood contextual effects using a multilevel modeling approach. Social indicators research, 138, 245-270.
15. Kazem, Saja Nazim Jawad, (2022), The Role of Green Manufacturing in Enhancing Operations Performance: An Analytical Study of the Opinions of a Sample of Workers in the Production Department of the General Company for Rubber and Tire Industries in Najaf Governorate, Master's Thesis, College of Administration and Economics, University of Karbala.
16. Kenyon, G. N. ; Meixell, M. J., & Westfall, P. H., (2016), Production Outsourcing and Operations Performance: An Empirical Study Using Secondary Data, International Journal of Production Economics.
17. Liu, H., & Wu, S., & Zhong, C., & Liu, Y., (2020), The sustainable effect of Operations performance on financial benefits: evidence from Hines quality awards winners. Sustainability, Vol.12, No.5.
18. Meredith, J,R & Shafer, Scott M., (2007), Operation Management for MBAS" 3rd ed , John Wiley & sons, Inc, New York .
19. Mitra, Amitava, (2021), Fundamentals of quality control and improvement, 4th Edition John Wiley & Sons, Hoboken, New Jersey.
20. Mohsen, Abdul Karim and Al-Najjar, Sabah Majeed, (2012), Production and Operations Management, 4th Edition, Al-Dhakira for Publishing and Distribution, Baghdad, Iraq.
21. Peng, T., Kellens, K., Tang, R., Chen, C., & Chen, G., (2018), Sustainability of additive manufacturing: An overview on its energy demand and environmental impact. Additive Manufacturing, 21, 694-704.
22. Salman, Nidal Ali Salman, (2022), The impact of business model elements on sustainable quality through testing the mediating role of Six Sigma: An analytical study in Ishtar Light Industries Company in Baghdad Governorate, PhD thesis, College of Administration and Economics, University of Mosul.
23. Slack, Nigel & Jones, Alistair Brandon and Johnston, (2013), Operations Congress Management, Seventh Edition, Italy, Library.
24. Subali, Stefanus ; Budy, Widjaja ; Djumilah Hadiwidjojo & Solimun, Sumiat, (2020), The Influence of Information Technology on the Operations Performance of Medium Scale Business Entities in East Java, International Journal of Scientific & Technology Research, Vol.9.
25. Tortorella, Guilherme & Fettermann, Diego, (2018), Relationship between Operations Performance and Help Chain Critical Success Factors, Journal of Management & Industrial Engineering.

26. Wong, W. P., & Wong, K. Y., (2014), Synergizing an ecosphere of lean for Sustainable Operations, Journal of Cleaner Production, 85, 51–66.

Appendix (1) Questionnaire form

First: Sustainable Quality Management (SQM)

1. Quality Costs (QC)

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	The budget is well prepared and consistent with the quality costs.					
2	There is sufficient investment in improving quality processes such as training and equipment.					
3	Rework or production costs are low in the factory.					
4	Failure costs (waste and waste) are under control and monitored periodically.					
5	The factory performs preventive maintenance on the machines to ensure that its production does not stop.					

2. Social Quality (SQ)

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	The factory management encourages collaborative working methods and creates a diverse and inclusive work environment.					
2	Employees are satisfied with the work environment and social climate in the factory.					
3	The factory contributes to the development of the local community through social initiatives.					
4	The factory takes the environment into consideration and works to reduce the negative impact on society.					
5	The factory management is keen to build a corporate culture based on encouraging individual and collective responsibility towards quality and sustainability.					

3. Environmental Concern (EC)

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	Effective strategies are implemented to reduce waste and minimize its negative impacts through sustainable options.					
2	The factory cooperates with the local community in environmental conservation initiatives.					
3	Periodic assessment of the negative impact of plant operations is conducted.					
4	The factory seeks to develop new innovations that reduce its environmental impact.					
5	The factory is working to promote the use of local raw materials to reduce the carbon footprint.					

Second: Operations Performance (OP)

1. Operation Cost (PC)

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	Management works to improve Operations efficiency to reduce expenses.					
2	The management is working to improve the management of expenses in the factory.					
3	The cost of producing one ton of sugar compared to the quality is acceptable.					
4	Management seeks ways to improve overhead costs without compromising quality.					
5	Management works on production efficiently without significant cost wastage.					

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2. Operation Quality (PQ)

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	The factory seeks to develop new products that focus on sustainability.					
2	Strict quality control standards are applied throughout production.					
3	Production operations are running smoothly and regularly.					
4	The technology used needs to be updated to improve the quality.					
5	The inventory management system is efficient and ensures the availability of required raw materials.					

3. Operation Flexibility (PF)

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	Factory operations are able to adapt to changing demand.					
2	Immediate changes can be implemented based on customer feedback or production issues.					
3	There are flexible procedures that allow for easy change of production line.					
4	Management periodically evaluates operations to ensure they meet changing market requirements.					
5	Technologies and tools are available to enhance Operations flexibility.					

Delivery (D) .4

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	Employees understand the importance of delivery in enhancing customer satisfaction and the factory's reputation.					
2	The product is delivered to customers on time.					
3	The administration seeks to facilitate delivery procedures in the process of returning or exchanging products if necessary.					
4	Clear information is available about delivery dates and shipping stages.					
5	Customers are satisfied with the level of service provided during the delivery process.					

5. Operation Creativity (OC)

NO	Paragraphs	completely agree	Agreed	agreed to some extent	do not agree	do not agree completely
1	The factory management encourages new ideas and innovations among the workers and works to motivate them.					
2	Factory management takes calculated risks when it comes to trying out new ideas.					
3	The factory employs modern technology to enhance efficiency and improve quality.					
4	Encouraging innovation in developing products and services in new and sustainable ways.					
5	New products are developed based on innovation and continuous improvement in processes.					