# Impact of green Total Quality Management on achieving dimensions of sustainable development

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## *Abstract*

*This study aims to determine the relationship between green TQM and achieving the dimensions of sustainable development.*

*Despite the efforts made over the past years to clarify the general framework for achieving total quality, document its principles, and establish the principles, foundations, and standards for achieving total quality management, efforts made to support the general framework for total quality lack a link to achieve dimensions of sustainable development (Environmental dimension - Economic dimension - Social dimension). Relationship between total quality management and achieving dimensions of sustainable development can be identified by shedding light on concept of green total quality management . Its relationship to dimensions of sustainable development.*

*As the risks associated with the environment increase, and calls increase at the local and global levels to activate dimensions of sustainable development, a new concept is required that covers aspects of total quality management .It links them to dimensions of sustainable performance, which is concept of green total quality management.*

*Researcher relied on both deductive and inductive approaches*

*in the study. Researcher also used questionnaire lists for a sample of 450 individuals. Researcher then used the SPSS program to analyze results.*

*Study concluded that there is a direct relationship between green comprehensive quality management and achieving the dimensions of sustainable development.*

***Keywords**: green total quality management - dimensions of sustainable development - International Environmental Quality Standard ISO.*

## 1- Previous studies:

### 1-1 Previous studies about green total quality management:

Previous studies on green TQM have linked several variables, such as: achieving organizational excellence, achieving competitiveness, monitoring the implementation of environmental obligations and requirements, social responsibility, environmental responsibility, lack of information and lack of expertise and competencies, partnerships and strategic alliances, quality culture, and customer satisfaction, retention, and loyalty. The diversity of variables associated with green TQM demonstrates its importance. Previous studies related to green TQM presented as follows:

Many researchers have been interested in Total Quality Management (TQM) from several perspectives. Goetsch, D. L., & Davis, S. B. (2016) presented a view of quality management to achieve organizational excellence that included: Total Quality - Philosophy and Concepts - TQM Approach to Quality Management: Achieving Organizational Excellence - Quality and Global Competitiveness - Strategic Management: Planning and Implementation to Achieve Competitive Advantage - Quality Management, Ethics and Corporate Social Responsibility - Partnerships and Strategic Alliances - Quality Culture - Customer Satisfaction, Retention and Loyalty.

Ralea, C., Dobrin, O. C., Barbu, C., & Tanase, C. (2019, November) argue that digital technology has changed the world, and organizations need to adapt to market demands in order to survive and expand. Quality has become a key factor in decision-making, enabling appropriate evaluation, competitive advantage, and the ability to understand the

meaning of success in the context of the digital age.

Wahyuningsih, R. (2021). The Quality Project was established by all stakeholders to enhance national capacity to improve the quality of healthcare.

Al-Yamani.( 2021) attempted to clarify the impact of integration between the two approaches of target costing and total quality management on achieving the goal of the environmental dimension of sustainable development in drinking water and wastewater companies, by identifying the real needs and requirements of customers to reduce the cost to reach a target cost figure that enables determining a price and quality that meet customer expectations and represents a real value for him that ensures achieving the goal of environmental dimension of sustainable development.

Kharaz.( 2024) aimed to provide a general framework for the concept of total quality management in higher education institutions, as well as the justifications and reasons that call for total quality management, which is considered an integrated management approach imposed by changes and which has a set of successful principles. In the end, indicators for measuring total quality management in educational institutions can be used.

Al-Abdali. (2024) believes that the application of total quality affects raising the efficiency of performance, developing and modernizing the activity of workers, and its compatibility with the changes of the era and the need of workers to apply it, through improving work systems on an ongoing basis, and the administrative leaders in the institution being convinced of importance of applying TQM.

Al-Karshimi.( 2024) aimed to measure impact of applying TQM in achieving sustainable development in international

organizations operating in Yemen. The study concluded that there is a statistically significant impact of applying Total Quality Management in achieving sustainable development. The results indicated that there is an impact of the dimensions (commitment and support of senior management - making decisions based on facts - focusing on the customer - collective participation) in achieving sustainable development.

Al-Siyabi.( 2024) aimed to: Identify the role of the Lean methodology in improving the performance of a total quality system - Analyze how the methodology is used to overcome institutional risks and challenges - Examine the effectiveness of the methodology in enhancing the quality of operations in a total quality system - Identify factors that may be obstacles to achieving the objectives of a total quality system - The importance of improving quality and efficiency in institutional operations - Use the Lean methodology in management. The study showed that the Lean methodology is a very important tool in managing a total quality system, and by using the Lean methodology, the results showed significant improvements in the quality of products and services.

Al-Hamada. (2024) sees a problem in integrating comprehensive quality management systems with environmental, health, and occupational safety management systems. Integration between these systems requires a deep understanding of the requirements of each individual system, as well as the ability to ensure compatibility and harmony between them in an effective manner.

**1-2 Previous studies related to sustainable development:**

Strezov, V., Evans, A., & Evans, T. J. (2017) selected nine different indices to measure sustainable development, including: (Change in Wealth Index (CWI)- Ecological Footprint (EF) - Environmental Performance Index (EPI) - Environmental Sustainability Index (ESI) - Real Savings

Index (GSI) - Global Well-being Index (GWI) - Happy Planet Index (HPI) - Human Development Index (HDI)- Sustainable Society Index (SSI)) . The indices analyzed for ability to measure ( Economic – Environmental – Social) dimensions of sustainable development. Only two indices (SSI and GSI) were found to cover all three dimensions of sustainable development, while the rest measured either the social and economic dimensions, the social and environmental dimensions, or the economic and environmental dimensions alone.

Mohamed.(2020) also aimed to determine the relationship between the application of International Financial Reporting Standards (FIRS for SMEs) for Egyptian small and medium enterprises and the quality of financial and accounting reports and information .

Krstinić Nižić, M., & Šverko Grdić, Z. (2024) aimed to unify the diverse aspects of development. The United Nations 2030 Agenda for sustainable development identified three dimensions of sustainable development (Economic growth - Social inclusion - Environmental protection). Goals of 2030 agenda cover a wide range of different development issues. Which sustainability principles applied at (international – national – regional - local levels).

**2- Research problem:**

There has been a growing global focus on achieving sustainable development dimensions. Numerous metrics have emerged to measure sustainable development. However, there is no consensus on sustainable development metrics, and no specific specifications for total quality management that cover all metrics and dimensions of sustainable development.

Many Arab countries in general, and Iraq in particular, lack

awareness of the concept of green total quality management and its importance, despite the partial activation of environmental management systems, and attempts to apply its international specifications, including (ISO: 14006:2020), which represents part of green total quality management, and its relationship to achieving sustainable development in its various dimensions with the aim of providing a healthy green environment and sustainable development for future generations. In light of the above, the study problem can be formulated through the following main question: What is the relationship between the application of green total quality management, and achieving both the environmental dimension, the economic dimension, and the social dimension of sustainable development?

The following questions branch out from the main question:

- Do organizations fully understand the concept of green TQM and its relationship to achieving sustainable development dimensions: (Environmental –Economic - Social)?
- Does the ISO 14006:2020 standard meet the requirements for a full understanding of the concept of green TQM and its impact on achieving sustainable development in its various dimensions?

**3- Research objective:**

Determine relationship between green TQM and achieving dimensions of sustainable development.

**4- Imposing search:**

There is a statistically significant relationship between green total quality management and achieving the dimensions of sustainable development.

**5- Importance research:**

Focusing on green (TQM) helps achieve dimensions of sustainable development( Economic – Environmental - Social

dimensions). Study raises several scientific issues related to TQM and dimensions of sustainable development. Study contributes to developing a scientific concept of green total quality management (TQM). The study calls for activating the concept of TQM to meet the requirements of implementing the dimensions of sustainable development.

## 6- Research Methodology:

To achieve the study's objectives of identifying relationship between green total quality management and achieving dimensions of sustainable development, the researcher relied on: Inductive method - Deductive approach.

## 7- Scope of search:

Research focuses on identifying the relationship between green total quality management and achieving the dimensions of sustainable development. By presenting the concept of green total quality management through presenting: global models of total quality management - dimensions of sustainable development - presenting some quality specifications related to the environment. In order to present general framework of green TQM and relationship to achieving dimensions of sustainable development.

## 8- Search variables:

The independent variable is green total quality management. This identified by presenting theoretical framework of total quality management and green comprehensive quality management. The dependent variable is the achievement of sustainable development dimensions, which can be clarified by presenting the most important dimensions agreed upon by research studies on the dimensions of sustainable development.

## 9- Research plan:

### 9-1 Global models of total quality management:

Quality experts, international institutions and organizations have presented a set of global models in the field of comprehensive quality, which can be explained as follows:

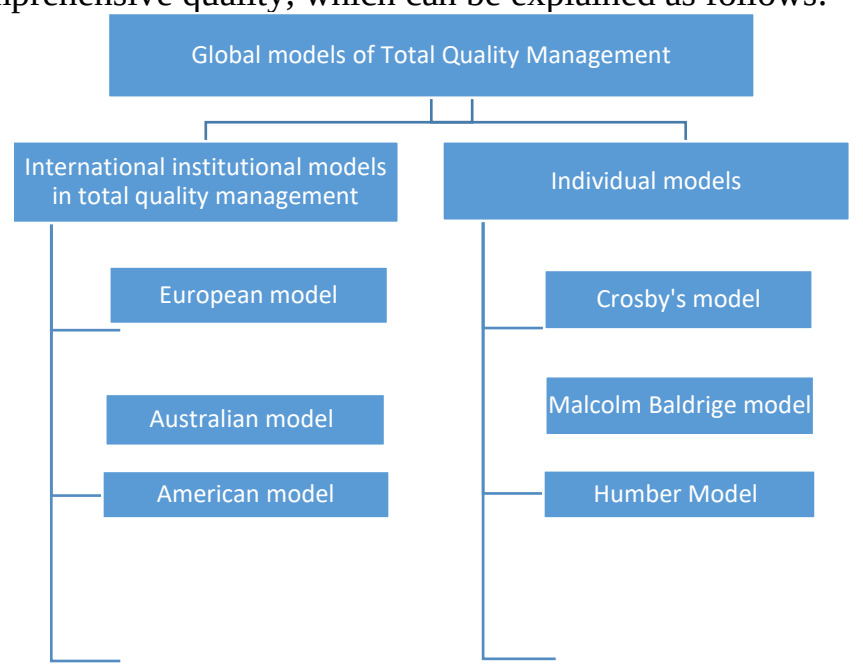


**Figure (1) Global models of Total Quality Management**
**Source: Prepared by the researcher**

The foundations and principles on which the previous models were based can be explained, and how they can be developed to be compatible with the concept of green total quality management, as follows:

- **Crosby's Model**: It consists of four pillars to support the quality process in service organizations, including (participatory management - specialized quality management, quality councils - user participation - differentiation). It is noted that Crosby focused on methods of developing quality and reducing its costs, and reducing manufacturing defects to a zero waste rate (no

defect), which means that the organization must anticipate the percentage of employee errors, avoid falling into them, and perform the work correctly the first time. Suarez, J. G. (1992) Crosby relied on fourteen steps for continuous quality improvement, including (management conviction of quality - forming development teams that include representatives from all departments - challenging problems related to quality - evaluating the cost of quality - increasing awareness of quality and the participation of all employees - taking action for all previously identified problems - identifying a team to implement the zero defect program - training supervisors to perform their role in the quality improvement program - increasing employees' interest in achieving zero defects - encouraging employees to achieve development goals - encouraging employees to inform management of obstacles to achieving development goals - encouraging and appreciating participation - holding quality meetings periodically - continuous focus on quality).

- **Malcolm Baldrige Model**: This model is used as a self-assessment tool, but if the organization feels that its performance is contrary to the efficiency level set by the model, external factors must be introduced to obtain the quality award. The Malcolm Baldrige Model helps identify the organization's strengths and weaknesses based on measuring the organization's performance from one year to the next, while comparing organization's performance with performance of other organizations. Owen, J. (2002).
- **Humber Model:** It is based on six basic elements that are implemented in six successive steps or stages (leadership

commitment and support - planning and preparation - education and training - team formation - quality design - continuous improvement). The model is based on eight principles (quality goal is to achieve beneficiary satisfaction - the availability of conviction, enthusiasm, seriousness, commitment and support from management to achieve quality - quality design includes the needs and desires of beneficiaries - the organizational structure includes (quality advisory council - quality executive council - general quality coordinator - teams for training and supervision) - providing a good system for communication and information gathering - forming teams to work on quality improvement - preparing all employees in the organization to understand the total quality management program - continuous quality improvement.

- **The European Model**: It is based on nine criteria, five of which are called "enablers" and cover what the organization can do: leadership, people, policies and plans, partnerships, capabilities and resources, and processes. In addition, four others are called "results", which clarify the organization's achievements: people results, customer results, community results and key performance results. The European excellence model issued the European Foundation for Quality Management is considered the most recent comprehensive quality model currently in use and is based on the organization's application of nine elements: leadership and the pursuit of goals, strategic policies, human resources, participation and resources, processes, customer results, human resources results, community results, and key performance results.
- **The Australian Model**: Focuses primarily on self-

assessment, although its scope is broad, and is based on the interconnectedness of the TQM efforts undertaken by each administrative level within the organizational structure by focusing on each of: leadership - policies and planning - information and analysis - people - customer focus - process and product quality - institutional performance. The Australian Quality Model represents a set of governmental and internal systems, and each sector has its own TQM mechanisms.

- **The American Model**: Known as the American Award Model, it was approved by the US Congress in 1987 to improve quality at the national level to encourage and motivate all American companies and organizations, including service organizations . The award model is based on four basic dimensions: (The engine: meaning the driving element on which the success or failure of the system depends - The system includes: ensuring the quality of goods and services, the degree of utilization of human resources, strategic planning for quality, information systems - Objectives: represents the extent of the organization's concern for its customers and the degree of their satisfaction - The degree of progress: is concerned with measuring the degree of progress in achieving quality results for the service or product).

Above models are considered the most famous and widely used models of Total Quality Management, although there are other models such as the Scottish Quality Model, which is a system with many advantages, the most prominent of which is that it is a comprehensive quality management system for all components and elements of the educational system, specifically technical and vocational education, in addition to

its wide spread at the global level. The Scottish quality standards include: strategic management - quality management - marketing and customer care - human resource development - program design and implementation - equal opportunities - health and safety - communication and management - guidance services - evaluation and certification (Al-Samhouri, et al.: 2024).

**9-2 International Environmental Quality Standard ISO: 14006:2020:**

The past decades have witnessed great attention to environmental standards as one of the most important requirements for improving the quality of life. Therefore, organizations tend to study and integrate environmental standards with: (Functional – Economic- aesthetic) standards in product design (goods and services). Emergence concept of sustainable development contributed to the development of the ISO:14000 standard after the United Nations Conference on Environment and Development in 1992, and after the recommendations of the Advisory Group on the Environment in 1993, specifically in 1996, and was amended in 2004. Environmental standards were also reinforced by the Earth Summit document issued in 2002, which called for greater environmental commitment and rationalization of resource consumption. The concepts of economic, social, and environmental sustainability and their dimensions also contributed to the emergence of environmental management or the environmental management system, thus defining the approaches to environmental product design.

Organizations that are not environmentally friendly are viewed with extreme sensitivity today. Therefore, most organizations have adopted what is known as green management or sustainable management. In addition to social responsibility, an organization must gain a positive outlook.

For an organization to be environmentally responsible, it must implement environmental management system specifications. The relevant standard is ISO:14000. ISO:14000 is an environmental system that forms a key part of any organization's strategy.

The standard deals with environmental design, i.e., designing products with environmental impacts in mind throughout their life cycle. Protection from environmental risks poses a challenge for organizations in how to transform risks into opportunities to improve environmental performance and enhance environmental reputation, achieving environmental ethical commitment and social responsibility. ISO:14006:2020 is a proposed part of the ISO:14000 family of standards, aiming to reduce harmful environmental impacts and develop projects to be environmentally friendly .

The ISO:14006:2020 specification includes eleven items, eight of which are main items, which can be explained as follows (Nouri and Ba'ilish: 2024:8):

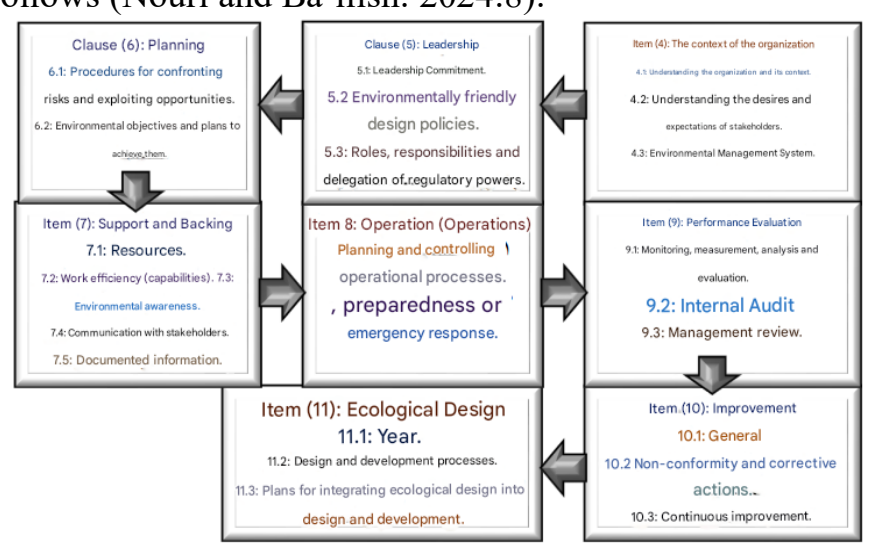

**Figure (2) Main items of the guidance specification (ISO:14006:2020)**
**Source: Nouri and Ba'ilish: 2024: 8**

## 9-3 Dimensions of sustainable development:

Dimensions of sustainable development vary according to degree of importance. The researcher can focus on three main dimensions of sustainable development as follows:

- **Social dimension of sustainable development:**

Social dimension of sustainable development refers to the role of social responsibility of organizations in covering their responsibilities that address the voluntary or optional relationships of the organization with stakeholders, which led to the emergence of sustainability for the social dimension and the impact of the work of these organizations on the communities in which they operate (Mahdi, 2023: 27).

Achieving sustainable development is linked to achieving the social dimension, which is linked to the institution's ability to achieve its goals in a good manner, at the right time, and at the lowest costs, and to adapt to the environment in which it operates by using its available resources with efficient and effective behavior. Sustainable development in achieving the social dimension can be defined as the institution's ability to achieve its plans, taking into account the social and environmental fields (Nabti, 2023: 7).

Social dimension refers to organization's ability to improve( social welfare- health – safety) of the local community, and reduce risks that threaten people in general. The social dimension reflects how and to what extent the organization has translated social goals into practical practice, including working conditions, health and safety (Rustam, 2024: 11).

Social dimension expresses the activities with social content that the organization undertakes to meet the needs of

community members inside and outside the organization. The social dimension is divided into two parts: internal and external. The internal dimension is related to shareholders and employees, while the external dimension is related to customers, the local community, and the government (Shams, 2024: 15).

Sustainable social dimension is linked to caring for citizens with limited and lower incomes, bearing the burdens of family life, supporting special groups, and promoting the culture of financial management and savings among all segments of society (Abdul-Wanis, 2024: 18).

Social dimension refers to the organization's ability to achieve positive impact and social change, which represents the promotion of awareness, education and awareness about important social issues through lectures, forums and workshops to improve knowledge and change behaviour, and encourage effective citizen participation in a way that contributes to building a democratic society (Ibn Haidara, et al., 2025: 15).

- **Economic dimension of sustainable development:**

Economic dimension of sustainable development is one of the pillars of sustainable development. Economic dimension of sustainable development is measured through: productivity, cost reduction, revenues, profits, cash flows, and business growth. The economic dimension of sustainable development is defined as improving financial and marketing performance and increasing a company's competitiveness compared to the industry average (Abdul Mahdi, 2022: 13).

Economic dimension of sustainable development is considered the most interpreted dimension of economic intelligence compared to the other dimensions (social and

environmental) (Balbal and Dabbah, 2022: 1).

Economic dimension of sustainable development focuses on the sustainability of economic construction through: effective management of capital - efficient use of resources - securing the basic needs and requirements of the individual - improving the standard of living by maximizing returns (Abdul Mahdi, 2022: 14).

Economic dimension of sustainable development includes many areas, including: the institution's contribution to improving the living conditions of community members - contributing to driving the wheel of development to reduce unemployment - the ability to generate new ideas and contributions that add to the services it provides - motivating employees to think outside the box - the ability to use technology (Gaballah, 2023: 28).

Economic dimension of sustainable development means the ability to achieve the financial goals of shareholders through satisfactory rates for their investments (Mahdi, 2023: 27).

Economic dimension represents the surplus that the organization achieves as a result of maximizing its results while reducing the level of use of its resources. It includes financial costs and benefits, reflects the long-term profitability and financial sustainability of the organization, and expresses the amount of improvement achieved in the financial and marketing aspects (Rustam, 2024: 11).

Economic dimension of an organization can be measured through its operational and financial results. From an operational perspective, the economic dimension relates to an organization's ability to reduce costs associated with (Resource acquisition- Energy consumption - Waste treatment – Disposal - Fines related to environmental incidents). From a financial perspective, the economic dimension relates to an organization's ability to: maximize profits - grow sales - return

on investment - return on assets (Shams, 2024: 15).

- **Environmental dimension of sustainable development:**

Some believe that the measurement models currently used in the financial accounting system are somewhat inappropriate for measuring the sustainable environmental dimension, and that there should be more focus on the measurement methods used in international references in a way that is compatible with the local environment (Boussabain, 2020: 1).

Measuring and evaluating environmental dimension of sustainable development is linked to environmental indicators, which are: (Compliance with environmental legislation and laws - Innovating technology that reduces pollution - Rationalizing the consumption of resources and energy - Improving environmental performance - Reducing pollution - Integrating the environmental dimension into activities that pose a threat to the environment). (Eid and Rasheda, 2021: 1).

Environmental dimension takes into account objectives and indicators related to environmental health and ecosystems. Environmental dimension index focuses on several objectives: (reducing environmental pressures on human health - increasing the vitality of ecosystems - sound management of natural resources). The environmental dimension represents an organization's commitment to preserving its natural environment and maintaining the quality of water, air, and soil. Environmental performance also refers to the impact of business activities and products on the natural environment, such as (resource consumption - waste generation - carbon emissions). (Al-Sabah, 2022: 74).

Environmental dimension of sustainable development

includes many areas that the institution must pay attention to, such as (Preserving environmental resources - Rationalizing energy consumption as an environmental resource - Adhering to environmental laws - Using environmentally friendly machines to reduce the size of harmful effects on the environment - Recycling production waste - Developing products to become environmentally friendly - Reducing damage to natural resources - Using raw materials that do not pollute environment - Reducing the amount of waste in production processes) (Gaballah, 2023: 26).

Environmental dimension related process organizing and participating in conferences and workshops that discuss environmental issues to exchange opinions and experiences, and reduce environmental risks related to the health and safety of workers (Abdul-Wanis, 2024: 18).

## 9-4 TQM and Green TQM:

Researcher believes that both Total Quality Management and Green Total Quality Management can be explained as follows:

| | TQM | Green TQM |
|---|---|---|
| **Concept** | **Concept of TQM expresses a set of principles, methods and skills that organization follows for continuous improvement. (Al-Karshimi, 2024: 1-55).** | **Concept of green TQM expresses a set of principles, methods and skills that an organization follows to achieve continuous improvement, focusing on all green factors: behavioral, organizational, environmental, social and economic.** |
| **Goal** | **TQM aims to continuously improve performance in (operations - jobs - services - individuals) by using financial and human resources through (commitment - discipline - continuity) (Al-Karshimi, 2024: 1-55).** | **Green TQM aims to meet current and future needs and customer expectations and achieve customer satisfaction by focusing on and adhering to green principles and standards.** |

| | TQM | Green TQM |
|---|---|---|
| **Importance** | **Total Quality Management derives its importance from its being a comprehensive and holistic approach to performance improvement. Total Quality Management is a classic framework that applies specific methods to aid decision-making. An organization's commitment to a quality system means it has the capacity and flexibility to embrace the concept of quality. One of the most important benefits of Total Quality Management (Jumblatt, 2024: 9)** | **Green Total Quality Management derives its importance from its being a comprehensive and holistic approach to developing green performance across all of an organization's inputs and outputs, through a commitment to green inputs and outputs.** |
| **Environmental standards and specifications** | **Environmental issues have become a corporate priority in recent years. Environmental ministries are urging organizations to consider adopting the ISO 14000 environmental management standard. Identifying variables that can predict organizations' motivations for adopting ISO 14000: cost savings, increased senior management interest, improved employee well-being, compliance with environmental regulations, meeting customer expectations, addressing trade barriers, following key environmental practices, and gaining competitive advantages (Quazi, 2001:1).** | **Green Total Quality Management requires a restructuring of existing environmental specifications and standards, taking into account a comprehensive view of all green inputs to the organization as well as all green outputs of the organization to include all human, behavioral, and material resources.** |
| **Total Quality Audits** | **Environmental auditing contributes to the implementation of the ISO standard specifications related to the environmental management system (ISO14001) by adhering to a set of binding procedures for** | **Green TQM auditing requires a focus on all processes within an organization's lifecycle, while also observing green commitments, standards, and** |

| | TQM | Green TQM |
|---|---|---|
| | **the organization to implement and comply with the environmental management system in accordance with the international ISO specifications. During the stages of implementing the environmental management system (ISO14001), the organization adheres to environmental auditing procedures. Environmental auditing helps achieve the desired objectives. (Zarouk, 2024: 1).** | **requirements at all stages of the lifecycle. This means not focusing solely on environmental aspects in the audit process. Additionally, current and future audit strategies must be consistent with green principles and standards.** |

Source: Prepared by the reaceracher

## 9-5 Comprehensive framework for green total quality management and achieving the dimensions of sustainable development:

Researcher believes that the comprehensive framework for green TQM and achieving the dimensions of sustainable development can be presented as follows:

**The comprehensive framework for green total quality management and achieving the dimensions of sustainable development**

| Dimensions of sustainable development | Various indicators to measure sustainable development | Quality specifications ( ISO) |
|---|---|---|
| Economic dimension | Change in Wealth Index (CWI) | ISO:14001:2015 |
| Environmental dimension | Ecological Footprint (EF) | ISO:14006:2020 |

| | | |
|---|---|---|
| Environmental dimension | Environmental Performance Index (EPI) | ISO:14052:2017 |
| Social dimension | Sustainable Society Index (SSI) | ISO:14002:2019 |
| Social dimension | Human Development Index (HDI) | ISO:14007:2019 |
| Environmental dimension | Environmental Sustainability Index (ESI) | ISO :14053:2021 |
| Economic dimension | Real Savings Index (GSI) | ISO:14004:2016 |
| Social dimension | Global Well-being Index (GWI) | ISO:14008:2019 |
| Social dimension | Happy Planet Index (HPI) | ISO:14005:2019 |
| | | ISO:14009:2020 |

**Figure (3)**: **Comprehensive framework for green total quality management and achieving the dimensions of sustainable development**
**Source: Prepared by researcher**

## 10- Field Research:

### 10-1 Field research objective:

Field research aims to determine the relationship between green total quality management and achieving the dimensions of sustainable development.t.

### 10-2 Field research mission:

There is a relationship between the green TQM variable and the variable of achieving the dimensions of sustainable development.

### 10-3 Research Sample:

Sample of 450 individuals divided into three groups included employees of environmental companies, Basrah university faculty members, and employees of quality companies. A questionnaire was used as a research tool.

**Table No. 1: Statistical analysis of the response rate for the questionnaires**

| Research sample | Distributed questionnaire lists | Retrieved lists | | Invalid lists | | Valid lists | | |
|---|---|---|---|---|---|---|---|---|
| | | Number of lists | List ratio | Number of lists | List ratio | Number of lists | List ratio | ratio |
| Employees of environmental companies | 150 | 138 | 92 % | 7 | 5.7% | 131 | 94.93 % | 32.43 % |
| Faculty members in accounting departments | 150 | 140 | 93 % | 11 | 4.29 % | 134 | 95.71 % | 33.17 % |
| Quality office workers | 150 | 142 | 95 % | 5 | 2.11 % | 139 | 97.89 % | 34.41 % |
| Total | 450 | 420 | 93 % | 22 | 3.65 % | 404 | 96.19 % | 100% |

Table shows good percentages that indicate the reliability of the results obtained.

### 10-4 Data Collection

The data collection process relied on the following steps:

- Identifying the most important points related to green Total Quality Management.
- Identifying the key factors influencing the

achievement of the dimensions of sustainable development.

### 10-5 Structural design of study tool:

Questionnaire was distributed to three groups including the following:

- First section: personal data about person being investigated, in order to clarify experience and qualification of person being investigated, and to determine the degree of reliance on his answer.
- Section Two: Questionnaire list includes questions that require a choice of five answers according to a five-point Likert scale that expresses a degree of agreement. opinion trend for the questionnaire lists can be explained on a five-point Likert scale as follows :

**Table No. 2: Five-point Likert scale**

| Trend of approval of questionnaire lists according to the five-point Likert scale | | |
|---|---|---|
| Approval | ( Weight of approval ) | (approval direction) |
| Very disagree | 1 | Average from 1 to 1.79: Very disagreeable |
| not agree | 2 | Average from 1.80 to 2.59: disagree |
| neutral | 3 | Average from 2.60 to 3.39: neutral |
| OK | 4 | Average from 3.40 to 4.19: Agree |
| Very ok | 5 | Average of 4.20 to 5: Very OK |

Some statistical methods included in the Statistical Package for the Social Sciences (SPSS) were used to analyze the survey data.

### 10-6 Statistical analysis of questionnaire data

Following table shows the percentages of the research sample categories in terms of: academic qualification - years of

experience:

**Table No. 3 :Frequency and relative distribution of basic data of respondents**

| According to educational qualification | | | According to years of experience | | |
|---|---|---|---|---|---|
| **Qualification** | **Repetition** | **The ratio** | **Years of Experience** | **Repetition** | **The ratio** |
| **PHD** | **53** | **13%** | **less than five years** | **76** | **18.8%** |
| **Master's** | **105** | **26.1%** | **From five years to less than ten years** | **76** | **18.8%** |
| **Professional diplomas and certificates** | **88** | **21.7%** | **From ten years to less than fifteen years** | **82** | **20.3%** |
| **Bachelor's** | **158** | **39.1%** | **Fifteen years and over** | **170** | **42%** |
| **Total** | **404** | **100%** | **Total** | **404** | **100%** |

It is noted that research sample is diverse and distinct, as it combines the professional practices, academic qualifications and experiences of the respondents.

### 10-7 Statistical analysis of data and testing hypothesis of study

#### 1- Statistical analysis of data and testing hypothesis of study

Statistical measures can be used to clarify the results of describing the statements related to the study variables as follows:

**Table No. 4: Describing opinions on the phrases that define green TQM**

| Elements (phrases) that | Descriptive statistics measures |
|---|---|

| define green TQM | Arithmetic mean | standard deviation | relative weight% | approval order |
|---|---|---|---|---|
| 1- Using and activating the concept of green employee participation helps in managing green comprehensive quality. | 4.2** | 0.759 | 84% | 1 |
| 2- Presence of a specialized green quality management department within the organization helps in managing green comprehensive quality. | 4.13** | 0.764 | 82.6% | 4 |
| 3- Presence of green quality councils within the organization helps in managing green total quality.the disclosure of environmental pollution. | 4.03** | 0.766 | 80.6% | 9 |
| 4- Management's conviction to achieve green excellence helps in green TQM. | 4.13** | 0.821 | 82.6% | 6 |
| 5- Formation and training of green development teams from all departments and administrations in the organization helps in managing green | 4.13** | 0.726 | 82.6% | 3 |

| | | | | |
|---|---|---|---|---|
| **comprehensive quality.** | | | | |
| **6- Increasing awareness of green quality among all employees of the organization helps in managing green total quality.** | **4.04**$^{**}$ | **0.794** | **80.8%** | **8** |
| **7- Commitment to environmental standards and environmental quality specifications helps in green comprehensive quality management.** | **4.12**$^{**}$ | **0.796** | **82.4%** | **7** |
| **8- There is a need to activate the green comprehensive quality framework by integrating the concepts of comprehensive quality management and environmental specifications and standards and linking them to the dimensions of sustainable development.** | **4.13**$^{**}$ | **0.765** | **82.6%** | **5** |
| **9- All laws and standards for establishing organizations must be reviewed in light of the requirements of green total quality management.** | **4.17**$^{**}$ | **0.839** | **83.4%** | **2** |

**It is clear to researcher from the previous table:**

- Arithmetic mean values of the responses of all sample members to all items (greater than 3) indicate that the opinions of the sample members tend toward approval of the green TQM variable; this is confirmed by the relative weights of all items, which exceed 60%, representing a "neutral" option. All arithmetic means for all statements were statistically significant at a significance level of (0.05). The indicators show the presence of statistically significant differences in the opinions of the respondents between the observed values and the value (3), which represents a "neutral" option.
- Descriptive statistics for the variable of achieving the dimensions of sustainable development.

descriptive statistics of the dependent variable are shown in the following table:

**Table No. 4: Describing opinions on statements that reflect the variable of achieving the dimensions of sustainable development**

| Paragraphs that define the variable of achieving the dimensions of sustainable development | Descriptive statistics measures | | | |
|---|---|---|---|---|
| | Arithmetic mean | standard deviation | relative weight% | approval order |
| 1- Commitment to the Green Total Quality Framework helps achieve the social dimension of sustainable development by (increasing organization's ability to improve social welfare- | 4.55** | 0.582 | 91% | 1 |

| | | | | | |
|---|---|---|---|---|---|
| | **community health - safety, -reduce risks) that threaten people in general.** | | | | |
| **2-** | **Commitment to the Green Total Quality Framework helps achieve the economic dimension of sustainable development by achieving sustainable economic construction based on:( Effective management of capital - Efficient use of resources - Securing the basic needs and requirements of the individual - Improving standard of living by maximizing returns) .** | **4.48**$^{**}$ | **0.655** | **89.6%** | **4** |
| **3-** | **Commitment to the Green Total Quality Framework helps achieve the environmental dimension of sustainable development through: reducing environmental pressures on human health - increasing the vitality of the ecosystem and the sound** | **4.42**$^{**}$ | **0.673** | **88.4%** | **5** |

| | | | | | |
|---|---|---|---|---|---|
| | **management of natural resources.** | | | | |
| **4-** | **dimensions of sustainable development in light of green comprehensive quality management represent the organization's commitment to preserving and protecting its natural environment with its multidimensional characteristics, such as: preserving the quality of water, air, and soil - the impact of (commercial activities - products on natural environment- resource consumption-waste generation- emissions).** | **4.48**$^{**}$ | **0.633** | **89.6%** | **3** |
| **5-** | **Commitment to the Green Comprehensive Quality Framework helps in committing to indicators for measuring sustainable development such as( Change in** | **4.32**$^{**}$ | **0.757** | **86.4%** | **6** |

| | | | | | |
|---|---|---|---|---|---|
| | **Wealth Index (CWI) - Ecological Footprint (EF)- Environmental Performance Index (EPI) - Environmental Sustainability Index (ESI) - Real Savings Index (GSI) - Global Well-being Index (GWI) - Happy Planet Index (HPI) - Human Development Index (HDI) - Sustainable Society Index (SSI)) .** | | | | |
| **6-** | **Increasing awareness of the green TQM framework helps provide a healthy green environment and achieve sustainable development dimensions for future generations.** | **4.48**$^{**}$ | **0.609** | **89.6%** | **2** |

****There is statistical significance at a significance level of 0.05.**

Previous table shows that the arithmetic means of the responses of all sample members to all items are (greater than 3). Opinions of sample members tend toward agreement regarding achieving dimensions of sustainable development. Relative weights of all sample members exceed 60%, representing a "neutral" choice. All arithmetic means for all statements were statistically significant at the 0.05 level. This means that there are statistically significant differences in the opinions of sample members between observed values and

value (3), which represents a "neutral" choice.

Sample members also agreed on importance of green total quality management and its role in achieving the dimensions of sustainable development, indicating the validity of the study hypothesis. Researcher also used variance indicators to clarify the extent of agreement and disagreement in the opinions of the sample groups regarding the statements related to the study hypothesis using the Kruskal-Wallis test, a non-parametric test applied to variables whose data do not follow a normal distribution. It measures variance between several independent samples to confirm the validity of the research hypothesis, as follows:

**Table No. 5: Analysis of variance of the opinions of the sample groups**

| Elements (dimensions) associated with study hypothesis | Sample category | Views | Rank average | arrangement | Morale test Kruskal-Wallis |
|---|---|---|---|---|---|
| Elements that define green TQM indicators | Workers in environmental companies | 141 | 34.98 | 2 | 0.509 |
| | University faculty members | 129 | 38.55 | 1 | |
| | Quality companies employees | 134 | 31.63 | 3 | |
| | Total | 404 | | | |
| Elements that determine the variable of achieving the dimensions of sustainable development | Workers in environmental companies | 141 | 35.06 | 2 | 0.99 |
| | University faculty members | 128 | 35.07 | 1 | |
| | Quality companies employees | 133 | 34.87 | 3 | |
| | Total | 404 | | | |

* Statistically significant at a significance level of 0.05

Previous table shows that the average values of ranks and rankings indicate that category that most closely matches research hypothesis data is the category of university faculty employees, as their average ranks reached (38.55, 35.07) for first and second variables of study hypothesis, respectively. Significance level values of Kruskal-Wallis test for data related to study hypothesis variables reached (0.509) (0.99), respectively, which is a value greater than 5%. This confirms absence of differences between categories representing research sample items. There is agreement on role and importance of green total quality management and achieving the dimensions of sustainable development. Validity of the study hypothesis can also be tested through correlation and regression analysis, as follows:

a) Using correlation analysis for research hypothesis variables**:**

Relationship between green TQM and achieving dimensions of sustainable development can be clarified by clarifying results of correlation between research variables as follows :

**Table No.6 : Clarifying results of correlation**

| **dependent variable and independent variable** | **Correlation analysis data** | **(Y): Achieving dimensions of sustainable development** |
|---|---|---|
| **(X): Green Total Quality Management (TQM) Variable Measurement Indicators** | **Correlation coefficient (R)** | **0.621** |
| | **Moral level** | **0.000**** |

** correlation coefficient is significant at a significance level of 0.01.

positive correlation coefficient sign indicates a positive correlation. The value of the correlation coefficient indicates the strength of the correlation:

- Sign and value of the correlation coefficient (0.621) indicate the existence of a direct relationship between green comprehensive quality management and achieving the dimensions of sustainable development. This means that the more company is committed applying green comprehensive quality management, the more the dimensions of environmental sustainable development are achieved.
- Value of the correlation coefficient (0.00) which is less than the significance level (0.01) confirms the acceptance of the hypothesis of the existence of a statistically significant correlation between green comprehensive quality management and achieving the dimensions of sustainable development.

a) Following table shows the results of a simple regression analysis of study hypothesis variables:

**Table No. 7 : Simple regression analysis**

| Statement | Regression coefficient (B) | t-test values | Moral level | Statistical significance |
|---|---|---|---|---|
| constant amount (BO) | 2.458 | 7.890 | 0.000 | Statistically significant |
| (X) Green Total Quality Management Indicators | 0.484 | 6.485 | 0.000 | Statistically significant |
| value of the coefficient of determination [R]^2 = 0.386 | | | | |
| ANOVA significance level = 0.000 | | | | |
| F test value = 42.052 | | | | |

**Based on the indicators of the previous table, the following can be explained:**

- Positive sign of regression coefficient indicates that there is a direct effect of green comprehensive quality management and achieving the dimensions of sustainable

development. The value of the regression coefficient indicates that whenever the independent variable increases by one unit, this leads to an increase in the dependent variable (by 0.484) units.

- Significance of t-test for independent variable (0.00), which is less than the significance level (0.05), confirms the acceptance of the hypothesis of the existence of a relationship between green comprehensive quality management and achieving the dimensions of sustainable development.
- Coefficient of determination (R2) of 0.386 indicates extent to which independent variable explains the dependent variable, as it explains it by 38.6%, and the remaining percentage is due to other variables and reasons.

Results of the statistical analysis confirm the validity of the study's hypothesis and the existence of a relationship between green total quality management and achieving the dimensions of sustainable development.

## 2- Search Results:

- Previous studies have focused on the general concept of Total Quality Management (TQM), shedding light on some environmental aspects and its quality specifications. With the increasing global trend toward commitment to the dimensions of sustainable development, there is a need to reformulate the concepts and principles of TQM through the concept of Green TQM.
- Researcher agrees with the factors included in the Crosby Model for achieving lasting organizational success, taking into account the factors of Green TQM, which achieves sustainability across all organizations and their employees, ensuring the safety and health of workers,

products, and the surrounding environmental impacts to achieve sustainable development.

- Factors required to win the Malcolm Baldrige Award include: the categories specified by the award (industry, services, small businesses), issuing the award in accordance with the provisions of (methodology, dissemination, results), and preventive methods. Other criteria do not include environmental standards in their various dimensions, which aim to achieve sustainable development goals. This is particularly true in the criteria established for the Malcolm Baldrige Award, which include: leadership, strategic planning, focusing on the customer, market, and partners, managing measurement, analysis, and knowledge, focusing on employees and resources, managing operations, and organizational performance results. This confirms the model's lack of green TQM standards to achieve the dimensions of sustainable development.
- Humber Model did not include any reference to achieving the environmental dimension or the concept of green TQM, which is considered an obstacle to achieving sustainable development in its various dimensions.
- European Model of Excellence referred to sustainable improvement and promoting the principles of creativity, innovation, corporate governance, organizational efficiency, risk management, and service promotion. However, it did not specifically focus on sustainable development in its various dimensions, nor did it include specific mechanisms that clarify the importance and necessity of achieving green TQM. This requires focusing on organizations' ability to develop green strategies that

ensure future results consistent with achieving sustainable development in its various dimensions, and developing a guide for green TQM that organizations can implement.

- Despite the contributions made by the American model to achieving TQM, it did not address the dimensions of green TQM to achieve sustainable development goals in their various dimensions.
- ISO:14006:2020 standard has made tangible contributions to the movement toward avoiding environmental risks throughout product life cycle, which a significant part of concept green TQM. However, the vision of green TQM must be expanded to include the dimensions of sustainable development, particularly the environmental, social, and economic dimensions. This requires changing the overall vision of the standard and defining its implementation mechanisms.
- Social dimension of sustainable development is linked to society and social relations between individuals and groups. This dimension is considered an essential part of the concept of sustainability, and its importance is demonstrated by its achievement of social justice. Sustainable development is achieved by achieving balance and justice among members of society, which contributes to reducing poverty and social injustice and achieving community development.
- Environmental dimension of sustainable development focuses on protecting the environment and preserving natural resources through: adopting practices and behaviors aimed at environmental sustainability; maintaining the balance of ecosystems; protecting natural resources; reducing emissions and pollution; mitigating the effects of climate change; supporting environmental sustainability; and investing in renewable energy, green

technology, and innovation in the field of environmental protection.

- Total Quality Management (TQM) has paid significant attention to environmental aspects, which rely on green organizational behavior, primarily based on employee policies and behaviors inside and outside the organization. Concept of (TQM) relies primarily on comprehensiveness and integration of work and procedures at all stages. Green behavior contributes to achieving TQM objectives in all environmental aspects, which helps achieve sustainable development in its various dimensions.

### 3- Research Recommendations:

- Need to integrate sustainable development standards and dimensions with the specifications of green total quality management.
- Necessity of activating Green Total Quality Framework, which combines specifications of Green Total Quality Management with necessary standards and tools to achieve dimensions of sustainable development.
- Raising awareness about the concept and importance of green total quality management and adhering to the principles, standards, and laws governing it.
- Need to develop a unified guide for green total quality management that includes all financial and non-financial information related to green total quality management and the dimensions of sustainable development, especially with regard to environmental pollution, climate change, biology, and ecosystems. All companies must disclose this guide mandatorily to ensure adherence to environmental protection standards. It also provides a useful tool for comparing the environmental performance of all

companies in light of the concept of green total quality management.

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