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Mawj Abbas Jasim Alhchaimi
ThiQar Technical College, Department of Accounting Techniques, Southern Technical University, Iraq, Mawj.alhchaimi@stu.edu.iq

Ali Mahdi Hameed
Al-Furat Al-Awsat Technical University, Al-Dewaniyah Technical Institute, dw.ali6@atu.edu.iq

Fatimah Flayyih Oudah
Al-Furat Al-Awsat Technical University, Al-Dewaniyah Technical Institute, Fatimah.oudah.idi@atu.edu

Adnan Kadhum Matrood
Al-Furat Al-Awsat Technical University, Al-Dewaniyah Technical Institute, dw.adn@atu.edu.iq

RESEARCH ARTICLE

The Role of Modern Costing Techniques (Green Target Costing, Total Quality Management) in Reducing Production Costs and Achieving Sustainable Development Goals: "An Exploratory Study in the Iraqi Stock Market"

Mawj Abbas Jasim Alhchaimi [a,*], **Ali Mahdi Hameed** [b], **Fatimah Flayyih Oudah** [b], **Adnan Kadhum Matrood** [b]

[a] ThiQar Technical College, Department of Accounting Techniques, Southern Technical University, Iraq
[b] Al-Furat Al-Awsat Technical University, Al-Dewaniyah Technical Institute

ABSTRACT

Costing techniques, such as Green Target Costing and Total Quality Management, play a crucial role in achieving sustainable development goals. These techniques assist organizations in achieving integration between economy, environment, and society, leading to sustainable development. Green Target Costing helps identify and reduce environmental costs, encouraging companies to use resources efficiently, and contributing to sustainable development goals. Additionally, Total Quality Management improves quality, reduces costs, and promotes a quality culture within the organization, ultimately contributing to sustainable development through enhanced institutional performance. The use of these costing techniques, Green Target Costing and Total Quality Management, enables organizations to achieve sustainable development by enhancing institutional performance, and integrating economic, environmental, and social aspects. The study's key conclusions are that Green Target Costing and Total Quality Management techniques aid in promoting sustainability, reducing environmental impact, and achieving sustainable development goals. Furthermore, these techniques improve performance, achieve strategic objectives, and contribute to sustainable development. The study recommends inter-organizational cooperation to share experiences and knowledge about Green Target Costing, Total Quality Management, and sustainable development. Regular and continuous evaluation of an organization's performance regarding Green Target Costing, Total Quality Management, and sustainable development is also recommended.

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* Corresponding author.
E-mail addresses: Mawj.alhchaimi@stu.edu.iq (M. A. J. Alhchaimi), dw.ali6@atu.edu.iq (A. M. Hameed), Fatimah.oudah.idi@atu.edu (F. F. Oudah), dw.adn@atu.edu.iq (A. K. Matrood).

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1. Introduction

The modern business environment, characterized by rapid developments in technology, the economy, and the environment, the emergence of globalization, and the development of modern communication methods, has made it imperative for stakeholders to reduce the depletion of resources, with the recent growing global interest in sustainable development. The interest in sustainable development issues stems from the fear of the risks of deteriorating the natural environment at the local and international levels. Governments and organizations in various countries have begun to make companies bear the environmental and social costs by issuing laws that aim to maintain a safe environment. Then the problems of rationalizing costs began, which represented a new challenge for companies, which is expressed in achieving high rates of profit on the one hand, and on the other hand, the responsibility of companies for environmental and social behavior. As companies strive to ensure their survival in the market, they focus on consumers to meet their requirements and needs for high-quality products at reduced costs. Additionally, public awareness of environmental requirements has increased through the use of eco-friendly products to preserve the environment from various forms of pollution. Consequently, it has become imperative for companies listed on the Iraq Stock Exchange to comply with the directives of advanced countries towards incorporating sustainable development considerations. This necessitates adherence to comprehensive quality standards and international specifications, ensuring product quality, environmental safety, and conformity with global sustainability standards. Therefore, a significant challenge has emerged for accountants in rationalizing these costs and, consequently, adopting modern methods capable of achieving this goal.

2. Research methodology

The primary research problem lies in the increasing costs of products due to the rising costs of production inputs, including raw materials and labor, in addition to the increasing costs of sustainable development, encompassing environmental and social costs. This problem can be formulated as the following question: -

3. Research problem

- Can modern cost accounting techniques for production (Green Target Costing and Total Quality Management) help reduce product costs and improve quality, thereby contributing to the achievement of sustainable development goals?

Research Objectives: This study aims to achieve the following objectives:

- To investigate the nature of the relationship between the use of modern cost accounting techniques to reduce product costs and rationalize sustainable development costs.
- To examine the feasibility of applying modern cost accounting techniques to rationalize product costs and sustainable development costs in the sampled companies.

4. Significance of the study

The significance of this study lies in the urgent need to implement the requirements of sustainable development programs, which have become a strategic goal for both business companies and the local economy. Additionally, it is essential to adopt modern methods to reduce production costs by using modern technologies and rationalizing sustainable development costs. The Iraqi environment is in dire need of sustainable development.

The study's significance also lies in investigating the possibility of applying modern production technologies in an environment like Iraq, which is classified as a developing country. Furthermore, the study aims to explore the relationship between modern cost accounting techniques and sustainable development.

5. Research hypotheses

The study is based on two primary hypotheses, which are derived from the nature of the problem and the questions it raises. Therefore, the research hypotheses can be formulated as follows:

- Does the use of modern cost accounting techniques, specifically Green Target Costing, lead to a reduction in product costs and the achievement of sustainable development goals?
- Does the use of modern cost accounting techniques, specifically Total Quality Management, lead to a reduction in product costs and the achievement of sustainable development goals.

6. Concept of modern production technologies

Management references indicate that the concept of modern production technologies is multifaceted due to the diverse intellectual backgrounds of researchers in this field. (Mokhtar, 2017), defined modern production technologies refer to "the machines, equipment, methods, and procedures that facilitate the conversion of inputs into outputs while ensuring environmental conservation and minimizing resource waste, thereby achieving strategic objectives and sustainable development."

Furthermore, (Hanash, 2021), define modern production technologies as "the methods, processes, and equipment used to produce high-quality goods while reducing resource waste, achieving a balance between work, pressures, and international, regional, and national environmental regulations."

In light of this, companies must currently implement environmental protection activities to comply with environmental regulations and customer environmental awareness, ensuring sustainable development and resource conservation. This enables companies to create new market opportunities and enhance their sustainable competitive advantage."

7. First: green target costing technology

- **Concept of Traditional Target Costing:**

Traditional target costing is defined as a process that ensures products are manufactured according to specified specifications, functions, and prices, and can be produced at a cost

that achieves the expected level of profitability, while fully meeting customer needs and desires (Wael, 2014).

The primary objective of determining target costing is to enable management to actively plan, manage, and reduce costs. This involves planning and managing costs from the initial stages of product development and design to the later stages of product development and production.

In general, the target costing system aims to: (Ahmed, 2020),

1. Reduce costs to ensure desired profitability.
2. Fulfill the requirements for quality, timeliness, and cost.
3. Encourage staff members to meet profit goals by fostering cross-functional cooperation and innovative problem-solving.

- **Principles of Traditional Target Costing:**

The conceptual framework for target costing, according to Horngren et al. (2015), is founded on six essential principles that offer a thorough approach to cost management that differs from conventional techniques:

Market-Driven Costing: While maintaining a satisfactory degree of quality, market prices are used to ascertain the permitted or target cost that consumers are willing to pay.

Customer Focus: Prioritizing customer needs in terms of timely delivery, price, and quality is crucial for determining the target cost. Additionally, product development must be informed by active listening to customer feedback.

Design Focus: In order to meet the target cost, cost control is ensured during the product design stage, with an emphasis on the first design steps. Low prices and prompt delivery of new products are made possible by this strategy. At the start of the production process, the necessary expenses are established.

Cross-Functional Teams: Accountants, technicians, engineers, sales and marketing researchers, production schedulers, and cost managers are just a few of the departments that must work together to implement target costing.

Value Chain Participation: The target costing process involves all value chain participants, including distributors, suppliers, customers, and service providers. A group of related tasks that improve the product and get rid of non-value-added tasks are part of this process.

Life-Cycle Cost Orientation: It is crucial to identify all costs related to a product's life cycle in order to minimize the overall cost of both customers and products over the course of their lives. This entails taking into account every stage of the life cycle, including design, production, post-sales, and research and development. A product's purchase price, operating costs, maintenance costs, and distribution costs are all included in its life-cycle cost.

- **Supporting Techniques for Implementing Target Costing:**

Some particular strategies or tactics aid in reaching the desired reduction in order to accomplish target costing Mohammad, omar, and omar (2018).

1. Disassembly analysis, or reverse engineering: This is a crucial instrument for cutting expenses and reaching the desired cost. In order to comprehend the design, materials, and manufacturing processes of rival products, it entails disassembling them.
2. The concept of "continuous improvement," or "kaizen costs," refers to the process of making minor, gradual improvements to the production process at the lowest feasible cost. Reduced waste, less resource waste, and increased productivity are the goals of kaizen costs.

3. Value engineering, also known as value analysis, is a methodical procedure that compares and examines the different tiers of product types, features, and functions as well as the expenses related to them. Value engineering seeks to find ways to cut unnecessary expenses and boost overall efficiency while achieving the necessary functional and quality standards at a desired cost level.

8. Green target costing technology

The application of cost information and cost management has become increasingly important in accounting literature. Japanese companies, led by Toyota Motor Corporation, pioneered the concept of target costing. This technique was initially developed to enable Japanese industrial organizations to compete effectively in the global market.

The green target costing technology has since been adopted by numerous American and European companies (Aurelian, 2015). The origins of target costing can be traced back to Ford in the United States and Volkswagen Beetle in Germany.

The origins of target costing can be traced back to the pioneering efforts of Ford in the United States and Volkswagen in Germany, particularly with the iconic Volkswagen Beetle model, The Japanese use of target costing was a key factor in the advancement of Japanese industries. Most Japanese organizations employ target costing due to its benefits in producing high-efficiency and effective products while minimizing production costs.

Today, a significant percentage of manufacturing companies, particularly in the automotive, electronics, and home appliances industries, utilize this approach. Although the Japanese used target costing as a strategic tool for cost management, non-Japanese managers lacked sufficient knowledge to demonstrate its importance, especially in the computer industry, which was outside their scope.

However, target costing is a comprehensive approach to cost and profit management. 80% of major assembly industries already follow this approach, which is relatively simple to understand and implement, yet has a significant impact on the profitability of organizations and companies (Purba et al., 2017).

Horvath and Berlin (2012) offer a comprehensive framework for integrating environmental costs into traditional target costing. They propose a six-step approach to green target costing:

1. Identification and evaluation of required green specifications and functions.
2. Assessment of the target selling price and green price premium.
3. Adjustment of the green profit margin and calculation of allowed costs.
4. Allocation of costs to green cost drivers.
5. Implementation of green cost management measures.
6. Implementation of green Kaizen costing.

9. Second: total quality management (TQM)

in the Global Competitive Environment In the current global competitive landscape, organizations recognize the importance of producing high-quality products. The majority of companies have adopted TQM programs to ensure their products meet stringent quality standards and their industrial processes are highly efficient.

Most companies have developed TQM programs to meet customer needs by providing products on time, reducing defective products that require rework, and encouraging

employees to continuously improve industrial processes. In essence, TQM programs embody continuous quality improvement.

A study conducted by an electronics manufacturing plant in Washington state revealed that the implementation of a TQM program yielded a 66% reduction in rework costs for select electronic product lines, a 60% reduction in scrap costs, and a 90% reduction in the product life cycle (Taylor, 2016). This underscores the effectiveness of TQM programs in enhancing product quality, reducing costs, and bolstering customer satisfaction.

Al-Janabi confirmed that significantly reducing the levels of rework costs for defective products and scrap costs will lead to a decrease in the costs associated with these costs in the company's accounting system. In all cases, total quality management leads to a reduction in product costs, resulting in customer satisfaction and ultimately gaining a competitive advantage that enables the company to achieve higher sales and profits while preserving resources (Wael, 2014).

Moreover, Sarour (2023) believes that in the modern manufacturing environment, achieving quality is no longer costly, but rather the lack of it is. Therefore, quality has become essential and must be present in any company seeking to achieve growth, balance, and stability in the market. As a result, Total Quality Management (TQM) technology has become one of the strategic priorities for achieving the company's competitive advantages.

TQM technology is defined as "a continuous improvement process that seeks to increase customer satisfaction by identifying and solving problems that limit current performance. Total Quality Management (TQM) is defined as a holistic approach that ensures the quality of an organization at all levels, from customer requirements to design, production, and post-production stages. This approach relies on the integration of all activities and the participation of all employees, led by top management, to achieve continuous improvement. The core idea behind Total Quality Management (TQM) is for businesses to keep a laser-like focus on quality while coordinating their efforts with the needs and preferences of their customers. Employee empowerment, stakeholder collaboration, and a continuous improvement culture are how this is accomplished. Organizations can guarantee customer satisfaction, obtain a competitive edge, boost sales, cut expenses, and eventually increase returns by attaining total quality.

9.1. The objectives of Total Quality Management (TQM)

A customer-centric approach, continuous improvement, supplier and partner collaboration, continuous training and development, and adaptability to external changes are just a few of the fundamental principles that must be followed in order to implement Total Quality Management (TQM), a concept that seeks to improve every facet of an organization and its services or products. Numerous advantages, such as improved product quality, higher customer satisfaction, and more efficient use of resources, can result from the application of TQM principles in businesses, according to empirical data. Furthermore, it has been acknowledged that Total Quality Management (TQM) is essential to achieving sustainable development goals in the fields of industry, the economy, and the environment (Rahman and Abbas, 2018).

In the end, TQM aims to develop an excellence culture in businesses where all parties work together to accomplish customer satisfaction, ongoing improvement, and long-term success.

9.2. The dimensions of total quality management (TQM)

TQM seeks to accomplish a number of goals, including:

1. Improving the quality of products and services to ensure that they are high-quality and problem-free in order to win over customers.
2. Encouraging staff motivation to raise output and performance.
3. Augmenting the organization's capacity to develop its entire workforce.
4. Cultivating a supportive work environment that encourages employee participation in organizational development."
5. Moreover, TQM enables organizations to exert stringent control over all production processes and facilitates the development of effective tools for process measurement.
6. Furthermore, TQM fosters exceptional flexibility, allowing companies to rapidly adapt to shifting financial market conditions and enhancing their responsiveness to changes in the work environment.
7. This, in turn, leads to effective time management, cost savings, and the production of products that cater to the diverse preferences of customers.
8. TQM enhances profitability, boosts productivity, and minimizes customer complaints regarding the services provided.
9. Furthermore, it cultivates a collaborative culture among employees, promotes competitiveness within the organization, and drives continuous improvement of the services offered.
10. Ultimately, its primary goal is to improve the quality of services provided, thereby elevating the organization's management level (Shehata and Fathi, 2020).

10. The concept of sustainable development

Sustainable development is a holistic concept that encompasses the continuity of economic, social, institutional, and environmental aspects of society. It enables communities, individuals, and institutions to meet their present needs while preserving biodiversity, maintaining ecosystems, and ensuring the long-term sustainability of positive relationships between human and biological systems.

This approach prevents the infringement of future generations' rights to a dignified life. Moreover, sustainable development necessitates addressing environmental degradation while balancing economic development needs with social equality and justice (Purba et al., 2017).

Notably, despite the all-encompassing nature of sustainable development, which spans economic, social, institutional, environmental, and other dimensions, the emphasis on the environmental aspect in the philosophy and content of sustainable development stems from the fact that the proliferation of diverse economic projects imposes a strain on the environment, whether through the depletion of non-renewable natural resources or the waste and pollution generated by these projects.

Consequently, sustainable development prioritizes environmental safety, affording equal and parallel consideration to environmental conditions alongside economic and social conditions. Environmental protection and the judicious use of natural resources become an integral component of the sustainable development process (Pillai, 2018).

11. The dimensions and components of sustainable development

The concept of sustainable development gained official recognition at the 1992 Earth Summit in Rio de Janeiro. During this conference, world leaders acknowledged the significance of sustainable development, taking into account that a substantial portion of the global population still lives in poverty, and that there exists a considerable disparity in

resource utilization patterns between affluent and impoverished nations, Additionally, the global environmental system is under severe strain. These factors collectively underscored the imperative to reorient economic activity towards addressing the pressing developmental needs of impoverished populations and mitigating adverse environmental impacts.

In response, both developing and industrialized nations proposed initiatives. Developing countries advocated for the formulation of a new growth pact aimed at tackling poverty and issues affecting less affluent nations. Meanwhile, industrialized countries acknowledged the need for concerted efforts to enhance efficient and sufficient energy and materials, as well as to transform economic activity to alleviate environmental pressures (Al-Swid and Al-Zoubi, 2023).

12. Four key dimensions of sustainable development can be identified

The Environmental Dimension:

Sustainable development seeks to accomplish various environmental objectives, including:

- The judicious utilization of non-renewable resources, entailing the preservation of natural assets to ensure that future generations inherit a comparable environment, given the absence of substitutes for these non-renewable resources (United Nations, 2017).

- Acknowledging the environment's limited capacity to absorb oil waste.
- The need to precisely determine the optimal quantity of each non-renewable resource to be utilized, based on its genuine economic value, and establishing a suitable price reflective of that value.
- The ultimate objective of sustainable development is to achieve a harmonious balance between economic growth and environmental stewardship, while taking into account the rights of future generations to access natural resources, especially non-renewable ones.

13. The economic dimension

Sustainable development aims, in the case of rich countries, to make continuous reductions in levels of energy and natural resource consumption, which are many times higher in rich countries compared to poor ones. For example, energy consumption resulting from oil, gas, and coal in the United States is 33 times higher than in India."

The sustainable development process incorporates human development, focusing on enhancing healthcare and education standards, as well as promoting participation. Sustainable development definitions underscore the importance of participatory development, enabling individuals to contribute to decision-making processes that impact their lives.

Human beings are the central focus of sustainable development definitions. Another vital element emphasized in these definitions is justice, fairness, and equality. According to definitions of sustainable development, two forms of fairness are especially pertinent: intergenerational fairness, which calls for taking future generations' interests into account.

14. The social dimension

Human development is incorporated into the sustainable development process, which emphasizes raising the bar for healthcare and education while encouraging involvement.

Definitions of sustainable development emphasize the value of participatory development, which allows people to have a say in decisions that affect their daily lives.

Definitions of sustainable development place a strong emphasis on people. These definitions also place a strong emphasis on justice, equity, and equality. According to definitions of sustainable development, intergenerational fairness—which requires taking future generations' interests into account—is one of two forms of fairness that are especially pertinent.

Fairness for those who are still living and do not have equal access to social services and natural resources is the second kind. Reducing the extreme disparity between the North and the South is the goal of sustainable development. Sustainable development also aims, in its social dimension, to provide loans to informal economic sectors, improve educational opportunities, and enhance healthcare for women.

15. The technological dimension

Sustainable development strives to bring about a profound and rapid transformation in the technological foundations of industrial societies, transitioning towards cleaner, more efficient, and environmentally benign technologies. Furthermore, it aims to facilitate technological transformation in developing countries undergoing industrialization, thereby avoiding the repetition of development mistakes and environmental pollution perpetrated by industrialized nations. The technological advancements pursued by sustainable development serve as a crucial mechanism for reconciling development objectives with environmental constraints, ensuring that development is achieved in harmony with, rather than at the expense of the environment.

16. Components and patterns of sustainability

Several sustainability patterns exist, comprising the components of sustainable development. These can be succinctly summarized as follows:"

17. Institutional sustainability

Institutional sustainability pertains to government institutions and their capacity to possess effective organizational structures that enable them to fulfill their roles in serving their respective communities. This, in turn, facilitates their contribution to achieving sustainable development, in conjunction with the roles of non-governmental organizations and civil society institutions.

The extent to which these institutions contribute to community development is also significant. Furthermore, the level of private sector engagement, represented by companies operating across various sectors, in serving the surrounding community and advancing development objectives within those communities, is also noteworthy."

18. Economic sustainability

Development is deemed economically sustainable when it incorporates policies that guarantee the long-term viability of economic activities within a community, ensuring they fulfill their intended purposes while maintaining ecological integrity. For example, agricultural and rural development are considered sustainable when they strike a balance

between ecological soundness, economic viability, social equity, and cultural appropriateness. Furthermore, they should be guided by a humane and comprehensive scientific approach. By definition, sustainable agricultural and rural development encompasses a broad range of sectors, extending beyond agriculture to include water, energy, health, and biodiversity.

19. Environmental sustainability

Environmental sustainability denotes the capacity of the environment to persist in its natural state, without compromising its integrity. The primary objective of environmental sustainability is to minimize environmental degradation to the greatest extent possible.

Achieving sustainability necessitates natural regeneration, implying that the environment must be able to replenish and restore ecological balance. This can be accomplished by incorporating environmental considerations into development planning, thereby preventing harm to natural capital and ensuring its preservation for future generations.

20. Human sustainability

The interconnection between human development and sustainable development has become increasingly apparent. This relationship is underscored by the pressing need to establish a balance between population growth and available resources.

It represents a connection between the present and the future, with the ultimate goal of ensuring a superior quality of life and standard of living for future generations. Achieving this requires a deliberate and sustained effort to integrate environmental concerns with development.

Indeed, sustainable development is inextricably linked with human development, and the two are mutually reinforcing.

21. Total quality management and sustainable development

The role of Total Quality Management (TQM) in comprehensive sustainable development entails a commitment to continuous improvement across all facets of organizational operations. This is made possible by a citizen-centric strategy, process optimization, teamwork, social responsibility, and the delivery of training based on advanced management and technology concepts.

Critical elements also include strategic measurement, evaluation, control of implementation plans, and effective leadership. Furthermore, progress toward long-term strategic objectives depends heavily on the acknowledgment, reinforcement, and sustainability of accomplishments.

By measuring results effectively and efficiently, the ultimate goal is to achieve total customer, employee, and community satisfaction, which will promote a culture of sustainability and excellence.

The objectives of Total Quality Management (TQM) are broad and include improving the general performance of the public and private sectors, increasing customer satisfaction, increasing process efficiency, and guaranteeing sustainability through innovation and continuous improvement.

TQM is more important than ever in the modern world since it is essential to maximizing customer satisfaction, productivity, and performance while emphasizing efficiency that is

based on the prudent use of resources. In order to produce high-quality outputs supported by production efficiency in both inputs and outputs, this calls for the strategic allocation of financial and natural resources as well as efficient time management (Al-Majali, 2020).

Innovation, research, and ongoing development are given top priority when Total Quality Management (TQM) is incorporated into comprehensive sustainable development. Additionally, it emphasizes the importance of enhancing customer satisfaction and overall performance in both the private and public sectors through collaborative efforts, social responsibility, and strategic partnerships.

Furthermore, it is crucial to foster successful partnerships, leverage research and strategic studies (ranging from simple to advanced) to drive exploration and innovation, and rectify deviations and errors. By learning from these deviations and errors, we can explore, innovate, and increase efficiency, ultimately achieving higher levels of efficiency through process analysis and identifying areas of strength and opportunity. Furthermore, social justice must be realized, recognizing employees as the most valuable assets, whose worth increases with their growing experience and maturity (Abdullah and Mohamed, 2022).

It is universally acknowledged today that Total Quality Management (TQM) plays a pivotal role in comprehensive sustainable development, primarily through its customer-centric approach. Quality is defined by customer requirements and their sustained satisfaction, which, in turn, facilitates the attainment of comprehensive sustainable development through collaborative efforts and mutual encouragement.

This is achieved through the integration of collective work among various departments, teams, and sectors, fostering a culture of institutional integration.

Leadership assumes a pivotal role, as competent and effective leadership makes a significant contribution to the attainment of comprehensive sustainable development objectives through ongoing training and development, characterized by innovation. Training and development are deemed an indispensable and integral component of total quality, ultimately facilitating the realization of comprehensive sustainable development.

Measurement, evaluation, and strategic control assume a vital role by leveraging data and information to analyze performance, identify areas for improvement, and drive continuous enhancement. Fortunately, we possess a state-of-the-art information center, embodied by the General Authority for Statistics, which significantly contributes to elevating the quality of cutting-edge research and strategic studies.

21.1. Exploratory study

This study explores the importance of adopting Green Target Costing and Total Quality Management techniques in industrial companies listed on the Iraqi Stock Exchange. The research aims to investigate how these techniques can improve corporate performance, reduce production costs, maintain product quality, and minimize waste, ultimately supporting the achievement of sustainable development goals.

21.2. Study sample

The study sample comprised employees from industrial companies listed on the Iraq Stock Exchange, aiming to determine the level of awareness among different administrative levels about modern costing techniques and their contribution to achieving sustainable development requirements.

The study targeted (25) productive industrial companies listed on the Iraq Stock Exchange, and to ensure objective responses, (14) companies were randomly selected. A total of (129) questionnaires were distributed directly to employees with various

Table 1. Personal characteristics of the study sample.

Gender	Frequency	Percentage%
Male	68	60%
Female	45	40%
Total	113	100%

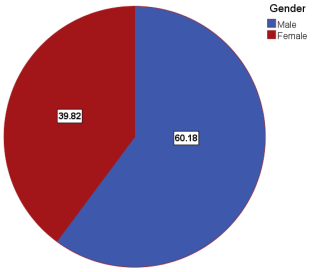
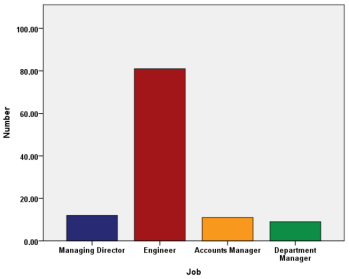


Table 2. Job title of the study sample.

Job Title	Number	Percentage
Managing Director	12	10.6%
Engineer	81	71.7%
Accounts Manager	11	9.7%
Department Manager	9	8%
Total	113	%100



specializations. The response rate was (118) questionnaires, representing (91%) of the distributed questionnaires. (6) questionnaires were excluded due to unsuitability for analysis, leaving (113) questionnaires for study and analysis, which represents (87.5%) of the returned questionnaires.

22. Characteristics and features of the research sample

The following table shows the frequencies and percentages of the study sample.

According to the data in Table 1, most of the study sample members are males, at a rate of (60%), while the percentage of females is (40%) of the target sample.

23. Job title of the study sample

The following table shows the frequencies and percentages of the study sample members according to the job title:

24. Job titles of the study sample

As shown in Table 2, the study sample consists of authorized managers, executive engineers, department managers, and accountants. The objective is to assess the extent to which these professionals utilize modern costing techniques to achieve sustainable development goals.

The findings reveal that engineers comprise the majority (71.7%), followed by authorized managers (10.6%), account managers (9.7%), and department managers (8%). This indicates that the selected sample has the necessary expertise and knowledge to apply costing techniques that support the achievement of sustainable development goals.

24.1. Experience of the targeted study sample

The distribution of sample members by experience is displayed in Table 3.

Table 3. Distribution of participants by years of professional.

Experience	Number	Percentage
Less than 10 years	15	13
More than 10 and less than 20 years	53	47
More than 20 years	45	40
Total	113	100%

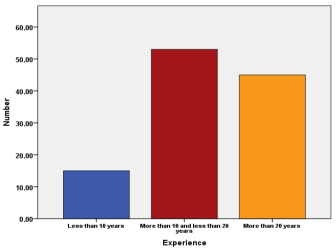


Table 4. Five-point likert scale.

Response	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Degree	5	4	3	2	1

The sample members have a great deal of experience and knowledge, which allows them to give trustworthy and well-informed answers, according to an analysis of Table 3. According to the data, fifteen sample members have less than ten years of experience, fifty-three have between ten and twenty years, and forty-five have more than twenty years. According to this experience profile, the chosen sample is qualified to offer professional and unbiased answers to the research questions.

Responses to the questionnaire paragraphs from the study sample were measured using a five-level Likert scale. The following table shows the sample's degree of agreement with the questionnaire paragraphs, which was assessed using this scale.

Through the utilization of the SPSS statistical program, the arithmetic means and standard deviations of the study sample's responses were determined. The following criteria were developed to assess the degree of agreement:

- Very high agreement (strongly agree): arithmetic mean range of (4.21–5).
- High agreement (agree): arithmetic mean range of (3.41–4.20).

These criteria were applied to assess the level of agreement for individual items and the total score of all items on the axis."

24.2. Hypothesis testing

The research is grounded in two fundamental hypotheses that address the nature of the problem presented and the underlying research questions. Consequently, the research hypotheses can be formulated as follows:

24.3. The first hypothesis

Does the adoption of modern costing technology, specifically Green Target Costing, contribute to the reduction of product costs and the achievement of sustainable development goals?

An analysis of the data presented in Table 5 reveals that the arithmetic mean of the respondents who positively responded to the questionnaire is (0.680) with a standard deviation of (**4.36**). This suggests that the companies in the study sample have embraced the concept of target costing technology as a means of achieving various objectives, including the reduction of costs associated with goods and services, as well as the attainment of sustainable development goals, which is the primary focus of this study, there exists a positive correlation between Green Target Costing and Sustainable Development.

Table 5. The arithmetic means and standard deviations of the answers of the study sample members working in companies listed on the Iraq stock exchange, regarding the use of the green target costing technique.

Phrase	Agreement Degree					Mean	SD	level of agreement
	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %			
Green target costs contribute to enhancing customer satisfaction through environmentally friendly and sustainable products.	50	48	13	1	1	4.28	0.773	Strongly agree
	44.2%	42.5%	11.5%	0.9%	0.9%			
Environmental impacts contribute to enhancing officials' awareness of the importance of sustainable development and its application.	49	55	7	0	2	4.32	0.747	Strongly agree
	43.4%	48.7%	6.2%	0.0%	1.8%			
Environmental costs contribute to clarifying the social benefit resulting from the company's activity.	51	49	12	1	0	4.33	0.700	Strongly agree
	45.1%	43.4%	10.6%	0.9%	0.0%			
Green target costs contribute to improving environmental performance through optimal use of resources and reducing waste.	54	51	4	4	0	4.37	0.722	Strongly agree
	47.8%	45.1%	3.5%	3.5%	0.0%			
Measuring green target costs supports the evaluation of the company's performance and increases the transparency of sustainability reports.	53	49	9	2	0	4.35	0.706	Strongly agree
	46.9%	43.4%	8.0%	1.8%	0.0%			
Commitment to measuring environmental costs improves health, stability and reduces employee turnover.	52	52	5	2	2	4.33	0.796	Strongly agree
	46.0%	46.0%	4.4%	1.8%	1.8%			
The measuring green target costs enhances sustainable development by raising the company's awareness of the extent of resource depletion.	49	50	9	3	2	4.25	0.851	Strongly agree
	43.4%	44.2%	8.0%	2.7%	1.8%			
Failure to measure environmental impacts leads to the failure to achieve sustainable development.	54	52	7	0	0	4.42	0.608	Strongly agree
	47.8%	46.0%	6.2%	0.0%	0.0%			
Measuring target costs contributes to the company's commitment to environmental standards and achieving sustainability.	56	55	2	0	0	4.48	0.536	Strongly agree
	49.6%	48.7%	1.8%	0.0%	0.0%			
The accounting system provides the ability to measure target costs and environmental impacts to support sustainable development goals.	49	49	12	3	0	4.27	0.759	Strongly agree
	43.4%	43.4%	10.6%	2.7%	0.0%			

(Continued)

Table 5. Continued

Phrase	Agreement Degree					Mean	SD	level of agreement
	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %			
Measuring target costs helps improve the environment, identify cost reduction opportunities, and rationalize long-term investment decisions.	53	58	2	0	0	4.45	0.534	Strongly agree
	46.9%	51.3%	1.8%	0.0%	0.0%			
Applying target cost measurement helps attract investments to achieve sustainable company benefits.	54	55	4	0	0	4.44	0.566	Strongly agree
	47.8%	48.7%	3.5%	0.0%	0.0%			
Applying target cost measurement enhances commitment to environmental accounting standards and their sustainability.	51	53	8	1	0	4.36	0.655	Strongly agree
	45.1%	46.9%	7.1%	0.9%	0.0%			
Applying green target cost measurement contributes to rationalizing administrative decisions related to production technology.	52	55	6	0	0	4.41	0.592	Strongly agree
	46.0%	48.7%	5.3%	0.0%	0.0%			
Measuring target costs helps in making long-term investment decisions.	54	55	4	0	0	4.44	0.566	Strongly agree
	47.8%	48.7%	3.5%	0.0%	0.0%			
Measuring the targeted environmental costs affects wage and profit decisions.	51	53	5	4	0	4.34	0.727	Strongly agree
	45.1%	46.9%	4.4%	3.5%	0.0%			
Measuring the environmental costs affects the cost of products and services provided to the community.	52	49	9	3	0	4.33	0.737	Strongly agree
	46.0%	43.4%	8.0%	2.7%	0.0%			
The company's management seeks the help of academic competencies in scientific institutions in order to obtain the correct scientific training in the field of green productivity.	50	53	7	2	1	4.32	0.747	Strongly agree
	44.2%	46.9%	6.2%	1.8%	0.9%			
Awareness programs related to green productivity should aim to understand the factors that cause environmental impacts.	52	53	5	3	0	4.36	0.695	Strongly agree
	46.0%	46.9%	4.4%	2.7%	0.0%			
The company's management seeks to introduce developments and improvements to the raw material entering the production process with the aim of improving quality and productivity and reducing the en1vironmental impact.	54	51	7	1	0	4.40	0.648	Strongly agree
	47.8%	45.1%	6.2%	0.9%	0.0%			
Total arithmetic mean and standard deviation						4.36	0.680	Strongly agree

Green target costing is a calculated strategy to reduce environmental expenses and maximize the use of resources. Several advantages can be achieved in the framework of sustainable development by putting this strategy into practice, including:

1. Mitigation of environmental pollution and enhancement of environmental quality.
2. Improved efficiency in the utilization of natural resources.
3. Reduction of waste generation and enhancement of recycling practices.
4. Enhanced occupational health and safety.
5. Augmentation of corporate reputation and increased stakeholder trust.

Consequently, Green Target Costing contributes significantly to the attainment of sustainable development objectives by:

1. Fostering human and environmental well-being.
2. Promoting environmental, social, and economic sustainability.
3. Supporting economically and socially sustainable development.

24.4. The second hypothesis

Does the adoption of modern costing technology, specifically Total Quality Management, contribute to the reduction of product costs and the achievement of sustainable development goals?

An analysis of the data presented in Table 6 reveals that the arithmetic mean of the respondents who positively responded to the questionnaire is (**4.33**) with a standard deviation of (**0.720**). This suggests that the companies in the study sample have embraced the concept of Total Quality Management (TQM) as a means of achieving various objectives, including the reduction of costs associated with goods and services, as well as the attainment of sustainable development goals, which is the primary focus of this study, there is a positive relationship between Total Quality Management (TQM) and Sustainable Development.

TQM is a management philosophy that focuses on continuously improving the quality of products and services. It contributes to achieving sustainable development by:

1. Improving the efficient use of natural resources.
2. Reducing environmental pollution and improving environmental quality.
3. Improving workers' health and safety.
4. Promoting client happiness and trust.
5. Supporting economically and socially sustainable development.

Therefore, TQM plays a crucial role in achieving sustainable development goals by:

1. Improving human and environmental health and well-being.
2. Promoting environmental, social, and economic sustainability.
3. Supporting economically and socially sustainable development.

This positive relationship demonstrates that TQM is an integral part of sustainable development, contributing to the achievement of its goals through the improvement of product and service quality and the reduction of environmental impact.

A positive correlation exists between Green Target Costing, Total Quality Management, and Sustainable Development.

In summary, a positive relationship exists between Green Target Costing, Total Quality Management, and Sustainable Development, as these elements contribute to achieving

Table 6. The arithmetic means and standard deviations of the answers of the study sample members working in companies listed on the Iraq stock exchange, regarding the use of total quality management technology.

Phrase	Agreement Degree					Mean	SD	level of agreement
	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %			
Commitment of industrial companies to support and implement Total Quality Management.	53	53	7	0	0	4.41	0.607	Strongly agree
	46.9%	46.9%	6.2%	0.0%	0.0%			
Continuous interest in improvements in administrative procedures.	52	54	6	1	0	4.39	0.633	Strongly
	46.0%	47.8%	5.3%	0.9%	0.0%			
Working to provide distinguished and high-quality services.	48	52	9	3	1	4.27	0.791	Strongly agree
	42.5%	46.0%	8.0%	2.7%	0.9%			
Interest in providing a continuous incentive system in line with the principles of Total Quality.	50	49	9	4	1	4.27	0.824	Strongly agree
	44.2%	43.4%	8.0%	3.5%	0.9%			
Interest in eliminating the problems facing the work.	49	49	8	3	4	4.20	0.946	Strongly agree
	43.4%	43.4%	7.1%	2.7%	3.5%			
Providing the necessary resources that contribute to continuous development to keep pace with the change in the global industrial environment.	49	52	10	2	0	4.29	0.776	Strongly agree
	43.4%	46.0%	8.8%	1.8%	0.0%			
Continuous performance evaluation to identify strengths and weaknesses and levels of success in achieving the set goals.	49	48	9	5	2	4.21	0.901	Strongly agree
	43.4%	42.5%	8.0%	4.4%	1.8%			
Keeping pace with the provision of modern technologies that help improve the quality of the product and service.	50	48	12	3	0	4.28	0.761	Strongly agree
	44.2%	42.5%	10.6%	2.7%	0.0%			
Ensuring that employees working in the institution are trained to adopt quality as a system of work and determine the path.	52	50	8	3	0	4.34	0.727	Strongly agree
	46.0%	44.2%	7.1%	2.7%	0.0%			
The company seeks to bear responsibility towards society by improving quality.	51	53	8	1	0	4.36	0.655	Strongly agree
	45.1%	46.9%	7.1%	0.9%	0.0%			
The company seeks continuous improvement in its plans, production programs and practices.	54	50	8	1	0	4.39	0.661	
	47.8%	44.2%	7.1%	0.9%	0.0%			
The company seeks to update its database continuously.	53	55	5	0	0	4.42	0.579	
	46.9%	48.7%	4.4%	0.0%	0.0%			
Analyses the company's external environment in order to invest in available opportunities.	49	51	9	3	1	4.27	0.793	
	43.4%	45.1%	8.0%	2.7%	0.9%			

(Continued)

Table 6. Continued

Phrase	Agreement Degree					Mean	SD	level of agreement
	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %			
The company encourages innovative methods of working to develop Total Quality.	52	51	7	3	0	4.35	0.717	
	46.0%	45.1%	6.2%	2.7%	0.0%			
Working to spread the culture of Total Quality among all company employees.	53	50	8	2	0	4.36	0.695	
	46.9%	44.2%	7.1%	1.8%	0.0%			
Follow up on recent studies related to developments in Total Quality.	50	54	8	1	0	4.35	0.654	
	44.2%	47.8%	7.1%	0.9%	0.0%			
Hold awareness workshops for the local community to preserve the environment.	49	54	9	1	0	4.34	0.663	
	43.4%	47.8%	8.0%	0.9%	0.0%			
Cooperate with civil society institutions to achieve environmental sustainability.	54	53	6	0	0	4.42	0.595	
	47.8%	46.9%	5.3%	0.0%	0.0%			
Total arithmetic mean and standard deviation						4.33	0.720	Strongly agree

environmental, social, and economic sustainability and improving corporate environmental, social, and economic performance.

These three interconnected elements synergistically contribute to the attainment of environmental, social, and economic sustainability objectives.

Green Target Costing serves to minimize environmental costs and optimize resource utilization, while Total Quality Management enhances product and service quality, thereby reducing environmental impact.

Sustainable Development represents the ultimate objective that organizations strive to achieve through the integration of Green Target Costing and Total Quality Management. The successful implementation of these elements facilitates the realization of environmental, social, and economic sustainability.

The interrelationship between these concepts can be illustrated as follows:

- Green Target Costing → Environmental cost reduction and resource efficiency optimization.
- Total Quality Management → Enhanced product and service quality, with minimized environmental impact.
- Sustainable Development → The ultimate goal is achieved through the synergistic integration of Green Target Costing and Total Quality Management.

25. Conclusions

- Improving Efficiency: Target Costing and Total Quality Management techniques help enhance efficiency and reduce waste, ultimately contributing to achieving sustainable development goals.

- Cost Reduction: Target Costing helps minimize costs and improve profitability, thereby contributing to achieving sustainable development goals.
- Quality Enhancement: Total Quality Management helps improve quality and reduce defects, ultimately contributing to achieving sustainable development goals.
- Enhancing Sustainability: Target Costing and Total Quality Management techniques help promote sustainability and reduce environmental impact, thereby contributing to achieving sustainable development goals.
- Performance Improvement: Target Costing and Total Quality Management techniques help enhance performance and achieve strategic objectives, ultimately contributing to achieving sustainable development goals.
- Innovation Enhancement: Target Costing and Total Quality Management techniques help foster innovation and improve processes, thereby contributing to achieving sustainable development goals.
- Customer Relationship Improvement: Total Quality Management helps improve customer relationships and enhance customer satisfaction, ultimately contributing to achieving sustainable development goals.

26. Recommendations

26.1. Target Costing

- Implementing Target Costing: To accomplish cost, quality, and environmental integration, it is advised that organizations implement Target Costing successfully.
- Establishing Strategic Goals: The organization must establish specific strategic goals and use target costing to figure out how to reach them.
- Creating Cost Systems: In order to accurately identify, analyze, and improve costs, the organization must create cost systems.

26.2. Total quality management

- Adopting Total Quality Management: To accomplish integration between quality, the environment, and society, it is advised that organizations successfully implement Total Quality Management.
- Establishing Quality Standards: The organization must establish clear quality standards and decide how to use Total Quality Management to meet them.
- Creating Quality Systems: In order for the organization to recognize, evaluate, and enhance quality standards, quality systems must be created.

26.3. Sustainable development

- Establishing Sustainable Development Goals: The organization must establish specific sustainable development goals and decide how to reach them using target costing and total quality management.
- Creating Sustainable Development Strategies: In order for the organization to accomplish integration between the economy, environment, and society, sustainable development strategies must be developed.
- Assessing Sustainable Development Performance: The organization's sustainable development performance must be assessed in order to identify areas for improvement.

26.4. General recommendations

- Inter-Organizational Cooperation: It is recommended to cooperate between organizations to share experiences and knowledge about Target Costing, Total Quality Management, and Sustainable Development.
- To increase knowledge and abilities, it is advised to offer training and instruction in target costing, total quality management, and sustainable development.
- Periodic Evaluation: It is recommended to conduct periodic evaluations of the organization's performance in relation to Target Costing, Total Quality Management, and Sustainable Development.

Ethical approval

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

Author contribution

Mawj & Ali designed the research framework and conducted data collection. Fatimah performed statistical analysis and wrote the initial draft. Adnan reviewed and edited the manuscript. All authors read and approved the final version.

Data availability

The data that support the findings of this study are available on request from the corresponding author.

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