T.C.
ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

CONCEPTS AND OBSTACLES OF TOTAL QUALITY MANAGEMENT IMPLEMENTATION IN IRAQ'S CHEMICAL SECTOR

MASTER's THESIS

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Engineering Management Master in English Program

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T.C.
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LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ MÜDÜRLÜĞÜ

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Enstitümüz, Engineering Management Department İngilizce Tezli Yüksek Lisans Programı (211281013) numaralı öğrencisi Husamuldeen Qays Jameel ALSAMRAI'nin "Concepts and Obstacles of Total Quality Management Implementation in Iraq's Chemical Sector" adlı tez çalışması Enstitümüz Yönetim Kurulunun 22/06/2023 tarihinde oluşturulan jüri tarafından *Oy Birliği* ile Yüksek Lisans tezi olarak *Kabul* edilmiştir.

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DECLARATION

I, Husamuldeen Qays Jameel ALSamrai, hereby declare that the thesis titled "Concepts and Obstacles of Total Quality Management Implementation in Iraq's Chemical Sector" is an original piece of writing that I have created for the purpose of receiving the master's degree in the field of engineering management at the Faculty of Engineering Management. I further declare that this study, or any portion of it, has not been published and presented for an additional degree or study paper in any other university or institution (22/06/2023).

Husamuldeen Qays Jameel ALSAMRAI

DEDICATION

I would like to dedicate the findings of my research to any and all organizations and businesses operating within the chemical industries that are interested in enhancing their executive and management work through the implementation of the most recent technologies available in the world for the objective of applying and completing their projects and achieving the level of economic value that they are looking for.

My research would not have been successful without the support of my supervisors, Prof. Dr. Gozde Ulutagay, and I would like to use this opportunity to thank for her invaluable guidance and advise as well as convey my gratitude to her.

Last but not least, I would like to give thanks and gratitude to God for benefiting me during the course of my scholastic pursuits.

PREFACE

Foremost thanks to Allah, the most beneficent and merciful, who helped me to complete this study and to submit it in such a way.

I would like to express my thanks, appreciation, and gratitude to my supervisor, Prof. Dr. Gozde Ulutagay for her concern, guidance, and advice.

June 2023 Husamuldeen Qays Jameel ALSAMRAI

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ABBREVIATIONS

FSP	: Firms' Supply Performance
ISO	: International Organization for Standardization
NPD	: New Product Development
OEMs	: Original Equipment Manufacturers
QFD	: Quality Function Deployment
ROI	: Return on Investment
SCM	: Supply Chain Management
SE	: Simultaneous Engineering
SPC	: Statistical Process Control
VA	: Value Analysis
WCED	: World Commission on Environment and Development

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CONCEPTS AND OBSTACLES OF TOTAL QUALITY MANAGEMENT IMPLEMENTATION IN IRAQ'S CHEMICAL SECTOR

ABSTRACT

The principal objective of this study is to evaluate the current state of the Iraqi chemical industry (ICI) and to quantify the extent to which the total quality management philosophy has been adopted by the country's chemical industries, with a focus on the pharmaceutical, food, and detergent sectors. Second, the research aims to pinpoint the difficulties inherent in implementing the comprehensive quality management tenet in Iraq's chemicals industry.

The study's population comprised a subset of Iraqi chemical factories engaged in the manufacturing of chemicals. The research sample comprised of (145) specialists from the medicines, food, and chemical detergents industries. For the purpose of investigating the issue of characteristics, a structured questionnaire was employed to gatherd information compared to the representative organizations.

After data gathering and evaluating, it was discovered that industrial facilities had a significant interest in implementing the TQM philosophy's variables to varying degrees and at a variety of various levels. This was found to be the case following the discovery that there was a large interest. The constant development was the application that reached the highest capacity.

The next phase of application consisted of utilizing statistical approaches and receiving feedback. The participation of workers and the development of their skills was the degree of application that was the least advanced.

According on the results of the research, various suggestions were made. One suggestion is that businesses who have not yet implemented total quality management should do so immediately. In order to fully implement the combined TQM dimensions, it is also recommended that suppliers be included in the process from the start. Third, because they aid in spotting and dissecting quality issues, statistical methods and quality-control instruments should be given greater love and care.

Keywords: *Chemicals Industry, Quality Management, Implementing Management, Production Industry.*

IRAK KİMYA SEKTÖRÜNDE TOPLAM KALİTE YÖNETİMİNİN UYGULANMASINA İLİŞKİN KAVRAMLAR VE ENGELLER

ÖZET

Bu araştırmanın birincil amacı, Irak kimya endüstrisinin (ICI) mevcut durumunu değerlendirmek ve toplam kalite yönetimi felsefesinin ilaç, gıda, ve deterjan sektörleridir. İkincisi, araştırma, Irak'ın kimya endüstrisinde kapsamlı kalite yönetimi ilkesinin uygulanmasının doğasında var olan zorlukları saptamayı amaçlıyor.

Çalışmanın popülasyonu, Irak'ta kimyasal madde üretimi yapan kimya fabrikalarının bir alt kümesinden oluşuyordu. Araştırma örneklemini ilaç, gıda ve kimyasal deterjan endüstrilerinden (145) uzman oluşturmuştur. Özellikler sorununu araştırmak amacıyla, örnek kuruluşlardan bilgi toplamak için yapılandırılmış bir anket kullanıldı.

Veri toplama ve analizden sonra, endüstriyel tesislerin TKY felsefesinin değişkenlerini değişen derecelerde ve çeşitli seviyelerde uygulamaya önemli bir ilgi duyduğu keşfedildi. Büyük bir ilgi olduğu keşfedildikten sonra durumun böyle olduğu ortaya çıktı. Sürekli gelişim, en yüksek kapasiteye ulaşan uygulamaydı.

Uygulamanın bir sonraki aşaması, istatistiksel yaklaşımların kullanılması ve geri bildirim alınmasından oluşuyordu. İşçilerin katılımı ve becerilerinin geliştirilmesi en az ileri düzeyde olan uygulama derecesiydi.

Araştırma sonuçlarına göre çeşitli önerilerde bulunulmuştur. Bir öneri, henüz toplam kalite yönetimini uygulamaya koymamış işletmelerin bunu hemen yapması gerektiğidir. Birleştirilmiş TKY boyutlarını tam olarak uygulamak için, tedarikçilerin de baştan itibaren sürece dahil edilmesi önerilir. Üçüncüsü, kalite sorunlarını belirlemeye ve incelemeye yardımcı olduklarından, istatistiksel yöntemlere ve kalite kontrol araçlarına daha fazla sevgi ve özen gösterilmelidir.

Anahtar Sözcükler: *Kimya Endüstrisi, Kalite Yönetimi, Uygulama Yönetimi, Üretim Endüstrisi.*

1. GENERAL STRUCTURE OF THE RESEARCH

1.1 Introduction

To meet the formidable challenges of the twenty-first century, and the rapid changes that have ensued, business organizations have adopted a clear vision that allows them to see into the future, and that has compelled them to abandon the administrative practices they had relied on in the past in favour of more innovative strategic approaches. It's thanks to this that they've been able to stay up with the constant changes and fierce global rivalry (Wilden et al., 2019).

Due to the ever-changing nature of the business world, successful companies must adopt a variety of tactics to ensure their continued existence and expansion. In light of the fact that the whole quality strategy has shown to be a useful tool for companies as they adapt to the ever-shifting demands of the global market, it has become increasingly prioritized by businesses worldwide (Wilden et al., 2019).

Currently, a number of industrial companies and service managers are searching for the most efficient approaches to enhance the managment advantages of their respective positions services. Many questions what effective leaders must do to strengthen their organizations and guide them to global management greatness. Such inquiries consider the ambitions of the great plurality of modern corporate organizations and underline the significance of identifying the most suitable strategies to attain this stage (Pambreni et al., 2003).

The goal of “TQM” is a management concept with the stated intention of fostering an organizational culture and common intellectual framework that facilitates responsiveness to customers' ever-changing needs in an ever-changing market. Therefore, it is crucial for companies committed to excellence to understand the managerial leadership of the operational viewpoint of “TQM” to be able to take benefit of the benefits and features offered by this approach (Basu, 2014).

1.2 Aims of Study

This research's principal objective is to examine and evaluate the current state of quality in the Iraqi chemical industry with respect to such factors as customer-driven quality; executive management's dedication to and support of quality; institutional culture; provider participation; participative management and advancement; and continuous enhancement.

There is also the following main aim that has been established in addition to the primary one:

1. Evaluate the current state of quality in three chemical industries in Iraq.
2. Describe the TQM principle advantages.
3. Examine the obstacles facing the implementation of TQM in the Iraqi chemical industry and provide solutions.
4. Clarify the justification for implementing TQM in the Iraqi chemical industry.

1.3 Study Topics

1. What is the current status of the Iraqi chemical industry TQM implementation?
2. What concerns and obstacles exist in the implementation of TQM in the Iraqi chemical industry?

1.4 Study Parameters

In this study, two variables were utilized for the “total quality management “framework:

1. Independent parameters (variables of organization data characteristics):
2. Industry classification, firm ownership, present market reach, company ownership structure, operating parameters, company size, number of locations, capital, amount of products, employee count, and company ownership structure.
3. The dependent parameters (parameters of TQM ideology):

The responsibility and encouragement of higher management, the level of service of the client, employment involvement and advancement, continually improvement, provider involvement, managerial culture, the utilization of statistical monitoring and responses, and the most significant barriers and difficulties that face the application of quality in the company's operation.

1.5 Study Methodology

This study relied heavily on the use of the questionnaire template provided in Appendix A.

Using an internal consistency test, the researcher analyzed the reliability instrument, where Cronbach's alpha, a measure of reliability, was computed, and experts in the field provided their approval.

The primary goals of the questionnaires were to:

1. To investigate the implementation of the stated important quality elements in order to comprehend the present quality challenges.
2. The second objective is to learn how Iraq's chemical sector workers feel about quality and "ISO" standards by polling them on the topic of a possible quality management overhaul.

1.6 Previously Research

Over the past several years, a great number of studies have been conducted that investigate the level of quality that a variety of businesses and organizations provide their customers with. In addition, there has been an explosion of research on the connection between comprehensive quality management and a wide range of problems. Research was conducted in the manufacturing sector of Thailand to investigate the impact that Total Quality Management (TQM) has on "supply chain management" (SCM) and "firms' supply performance" (FSP). The researchers constructed measurement instruments for "SCM," "TQM," and "FSP" based on a comprehensive literature review, validation by experts, pilot testing, and a range of statistical approaches. This enabled them to meet the objectives of this investigation. The proposed model was investigated with the help of path analysis.

According to the findings of the study, the group of "SCM," "TQM," and "FSP" metrics was reliable and accurate for the automotive industry in Thailand. According to Talib and Rahman (2010), "TQM" had significant direct good impacts on both "SCM" and "FSP," in addition to having significant indirect positive effects on "FSP" via "SCM."

In other research, the effects of applying "TQM" in a variety of businesses and industries across a number of countries were investigated. An investigation was carried out in Italy with the purpose of determining the elements that determined the degree to which "TQM" principles were known and understood by health care specialists from the point of view of their workforce. Utilizing total quality test measures as well as a novel and efficient instrument, the researcher in this study carried out a survey of the health care infrastructure in "Trieste" in order to design the participants and carry out the study. The purpose of this survey was to carry out a routine evaluation of the penetration and externalization of "TQM" concepts within the health care infrastructure.

Researchers found that by using a straightforward tool to track TQM's progress, they were able to spot several problem spots that needed fixing. Studies have also been conducted to ascertain how far the TQM philosophy has spread across different industrial sectors and at what levels, taking into account the resources and resources at their disposal. This has been shown to be the case (Militaru et al., 2013).

Several research projects looked at how TQM relates to companies' competition policies in an effort to determine how implementing a comprehensive quality strategy would boost pharmaceutical companies' ability to compete. The primary result of this research was the identification of a statistically significant correlation between implementing a whole quality plan and enhanced profitability; the quality culture was the most influential component of the entire quality strategy on business success. The study's author stated that quality is critical to an organization's survival since it is a strategic problem for achieving competitiveness.

The survey revealed that Iraqi industrial groups embraced the majority of TQM aspects to varying degrees. The study demonstrated a statistically significant distinction between TQM characteristics and the competitive policies implemented by Iraqi industrial companies.

Other research has concentrated on the correlation between "Total Quality Management" and advancement effectiveness. One research demonstrated the significance of knowledge management and analyzed the connection between understanding management, Total Quality Management, and advancement effectiveness.

In order to gather the necessary empirical data, the researcher Nguyen and Chau (2017) distributed questionnaires to (223) managers working for a total of (1,139) Taiwanese high-tech enterprises. In this study, a structural equation modelling approach was taken to investigate how knowledge management, total quality management, and innovative performance are all connected to one another. In conclusion, it was discovered that knowledge management had a favourable association within each "TQM" and advancement performance and that the "TQM" concept served as a mediator in the relationship between knowledge management and innovation performance.

One study focused on the connection between total quality management and the productivity of organizations. The research was carried out on business organizations with the purpose of determining whether or not there was a connection between integrating information management and "TQM", as well as highlighting the function that integration plays in enhancing and increasing the performance of businesses. According to the findings of the study, there is an integration between information management and "TQM", as well as a strong relationship between the two, and the integration has a significant effect on the effectiveness of the companies that were chosen as case study for the reseach (Zeng et al., 2015).

The connections between "TQM" and various other areas have been the subject of numerous different research efforts. Because of the dearth of information concerning the connection between quality management and New Product Development (NPD), one study looked into the effect that quality management has on "NPD" velocity.

The research demonstrated a favourable correlation between "TQM", "Value Analysis (VA)", and "Quality Function Deployment (QFD)", all of which are quality management philosophies and methods and the rate of "NPD". Companies that have already adopted "TQM" and additional quality resources will have a stronger foundation upon which to build when introducing novel "NPD" strategies like Simultaneous Engineering (SE) and design for production and assembly. Those

Original Equipment Manufacturers (OEMs) that are considering transitioning to ODMs or OBMs (Original Design Manufacturers or Original Brand Manufacturers) will find this very heartening. TQM is commonly used by OEMs, but "NPD" receives comparatively less attention (Yin et al., 2019).

Globalization is a process whereby forces of global capitalism seek to integrate economies all over the world. Another study looked at how governments' roles have shifted in this fast-evolving context. While the need for quality services and quality assurance is rising globally, governments around the world are being tested by the opposing and contradicting impacts of globalization and multinational industrialization, pursuing ultimate profitability. This research thus generates an impossibility theorem, presenting new difficulties and possibilities for governing bodies. Quality assurance and total quality management (TQM) in the age of globalization were discussed, as well as alternative theories of government and proposals for what the government should do to foster their implementation (Permana et al., 2021).

This research was unique in that it focused on the potential for TQM applications in Iraqi Chemical Industry and addressed the most pressing problems that would need to be solved.

2. THEORETICAL FOUNDATIONS OF THE RESEARCH

2.1 Quality as a Description

The quality principle is an age-old concept that, such as other management principles, has evolved. Numerous multinational firms have adopted it to enhance the quality of their products, as well as to provide aid in overcoming extreme problems and achieving customer fulfilment (Prajogo and Sohal, 2006).

Due to the significance of this principle and the global growth of its use, the concern of researchers and academics has enhanced, resulting in several achievements that have aided in its adoption and implementation. This notion has been defined numerous times, with each definition emphasizing a distinct subject (Mukhopadhyay, 2020). Such definitions also change depending on the user and the intended application.

At table 2.1, various discrpted of quality from the standpoint of researchers and organizations whose work focuses on quality research are presented.

Table 2.1: Several Descriptions of Quality

Quality Organizations	Quality Description	Scientists
Guran concepts	Quality is suitability for use, the fundamental criterion for determining whether a product is suitable for use regardless of its status or condition.	Juran and Cryna,1993
Crosby concepts	Quality is conformance to requirements; hence, a product is of high quality provided more of its specifications meet client criteria.	Ross, 2000
Deming concepts	Quality is a movement that satisfies current and future consumer requirements.	Evans and Dean, 2003
American Society for QC concepts	Quality is a collection of products and services that may fulfil particular requirements.	Goetsch and Davis, 2010
ISO concepts	Conforming the product's attributes to customer specifications is quality.	Alwan, 2005

There are many distinct points of view when it comes to determining quality. For example, the customer or client describes quality as "all advantages and qualities of

the product or operation that help to satisfy consumer expectations, including affordability, safety, accessibility, dependability, consistency, and usability" (Hassan and Jaaron, 2021).

This definition disregards the dynamic nature of the circumstance and restricts quality to the product itself. Additionally, quality can be described from the producer's perspective: quality of conformity, which implies ensuring that a product or solution is manufactured in accordance with its design (Ezuruike and Prieto, 2014).

In fact, the above-mentioned quality definitions demonstrate that quality is a multifaceted notion that conveys a particular viewpoint for a certain product in a given era and varies from stage to stage in order to enhance the organization's mission to satisfy the desires of clients (Mukhopadhyay, 2020).

Therefore, the most recent definition of quality is "a constantly changing procedure that includes perpetual attention to every service and product, staff and operations, and ecological factors (internal and external) with the goal of achieving the expectations of customers and fulfilling their requirements in order to achieve their complete fulfillment and fulfillment" (Harrington et al., 2012).

2.2 Quality Characteristics

We observe from quality descriptions that quality comprises various characteristics (Edwards and Sohal, 2003). These measurements vary based on the sort of goods or services being offered. Following is an overview of these aspects:

1- Performance refers to the essential working characteristics of a product, like the visual clarity or the speed at which a machine operates, etc. Because this quality varies from one thing to another and from one person to another, determining what constitutes an acceptable level of a new product is dependent on the perspectives and preferences of individuals.

2- Features: supplemental, or "additional," features added to a product's primary characteristics in order to raise Its appearance in the consumer's perception; examples of features are a multimedia CD player, leather upholstery, and a remote control. Features can also be referred to as "additional" features. People have a tendency to transform less important quantifiable characteristics

into more essential ones, despite the fact that it might be challenging to determine which measurable characteristics are the most relevant.

3- Consistency: conformity to established norms or market requirements. This factor became more significant after the establishment of regulatory bodies like the World Trade Organization and the International Organization for Standardization. In accordance with this dimension, which takes into account objective metrics unaffected by consumer preferences, restrictions are imposed on the requirements of various products, and the government and the authorized agencies monitor them.

4- Styling: This metric refers to the product's ability to appeal to the buyer's sense of style, including their preferred product shape, colour palette, and accoutrements. That includes the physical characteristics of the product as well as its auditory, olfactory, and gustatory qualities. Architectural features such as the outside finish of a building provide a good illustration. The extent to which this alters is determined by the nature of environmental change. As with many things, this differs depending on who you ask.

5- Validity: the likelihood that a product will perform properly within a projected time range, as opposed to the possibility that a product would fail to function properly during a given time period. This measurement is only relevant for long-lasting products because it is not applicable to perishable goods having a limited shelf life.

6- Durability: Optimal operation life, i.e., the amount of use a product can withstand before requiring repair with reasonable care and the duration of time during which a product can be utilized before requiring repair, after which it is more cost-effective to purchase a replacement product.

7- Workability: Chemical firms are exempt from this measure's repair and maintenance requirements because their operations do not necessitate it. Nonetheless, additional services, such as printing the appropriate warehousing situations on the product's packaging and providing instructions on how to use it, may be supplied; this is the most essential factor that ensures the quality assurance and ISO practices.

8- Safety: It is the confidence that a client will not be injured or harmed by a product as a result of the product's physiological and chemical characteristics and its final packing.

9- Conceptions: These are people's opinions; the product's reality is based on its brand name, advertising, and similar factors; hence, it's important to utilize cutting-edge advertising techniques and start a stellar campaign to promote the product since this shapes consumers' mental pictures of it.

10- Reputations: These allude to the consumer's evaluation of the product's quality based on the manufacturer's reputation in the market, which is based on experience and prior knowledge.

11- Responsiveness: When the vendor responds to the customer: treating the client with respect and respect.

In spite of the fact that quality can be measured in several aspects, these dimensions are inextricably intertwined. On the contrary, every dimension is a translation of numerous others. For instance, the product's effectiveness can be gauged across multiple dimensions, including its reliability, conformance, features, and attractiveness. Companies often choose to focus on a few key quality indicators in order to stand out from the competition, despite the fact that it is prohibitively expensive to measure every possible indicator across all relevant dimensions (Hassan and Jaaron, 2021).

2.3 Descriptions and Concepts of TQM

Recent developments in quality economic internationalization, the proliferation of information systems, information infrastructure, the Internet, worldwide standards (such as ISO), global trade agreements (such as GATT), etc., can be traced back to the emergence of global difficulties. Economic organizations/enterprises and service providers have been subjected to these, raising their level of awareness of the difficulties they face. In order to meet these problems, these businesses must implement scientific approaches, including the ability to invest in tools that boost productivity and adaptability in the face of change (Hassan and Jaaron, 2021).

The three words that make up the acronym TQM are all important and should be taken into account while attempting to define the concept.

Total - "Everyone in the company, regardless of their position, is responsible for ensuring quality is achieved. It acknowledges the need to establish procedures across the company, all of which contribute to the consistent meeting of all agreed-upon client needs. Gain the lowest possible operating expenses and the highest possible rate of return by doing this " (Sowerbutts, 2004).

Quality - "Any company's first priority should be meeting the demands of its customers by providing them with the goods or services they've ordered on time and within budget. Customer loyalty will rise, new consumers will be easier to attract, and market position will increase as a result " (Saremi et al., 2009).

Management - "The upper management directs the effort to provide consumers with quality by communicating the company's mission and core values to all employees, putting in place the essential organizational structures, and fostering an environment of continuous improvement". What we have here is the organizational equivalent of a unified, principle-based plan to raise standards across the board.The goal of Total Quality Management (TQM) is to meet or exceed customer expectations through the consistent enhancement of all aspects of a company's operations, including the quality of its goods, processes, and services (Khan, 2016).

TQM, or Total Quality Management, is a management philosophy centred on enhancing customer value via the systematic development and steady enhancement of an organization's processes and systems. It offers an innovative perspective on effective management and supervision. It reframes quality as the degree to which clients are happy with a product or service. Decisions in TQM are based on data rather than opinion. Among all the quality and excellence prizes, the most prestigious one is the Malcolm Baldrige National Quality Award, which is won by organizations that have implemented Total Quality Management (Shao et al., 2017) .

TQM, or Total Quality Management, is a philosophy that emphasizes the management of soft factors like employee morale in addition to the more tangible parts of running a successful organization (Gözükara et al., 2019).

According to TQM, a company's procedures are what makes it tick, and thus it's up to management to ensure that every worker has the knowledge and expertise they need to accomplish their job effectively (Maharjana et al., 2014).

To further clarify, Total Quality Management (TQM) is a system of planning and controlling all aspects of an organization (everything from advertising and finance to design and engineering and manufacturing and even customer satisfaction) to ensure that final goods and services consistently meet or exceed both customer needs and company goals (Hassan and Jaaron, 2021).

Hence, Total Quality Management (TQM) is a management concept and approach that makes every employee accountable for the product's quality. When applied to an organization, TQM treats each job as its own process, which is then managed in a customer/supplier framework. At each stage, the goal is to establish and fulfill customer needs to ensure the highest level of satisfaction for the end user at the lowest possible price (Ahmad and Yusof ,2010).

The tension between decreasing costs and maintaining employees' dedication to continual improvement is an issue that firms must face while implementing total quality management. Quality standards and quality awards are two ways that quality is accomplished can be evaluated (Hassan and Jaaron, 2021).

By bolstering additional quality assurance approaches to adapt to shifts in objects and activities and enhancing the efficiency of functional procedures, Total Quality Management (TQM) aims to eliminate all possible defects in the final product by tracing their origins and eliminating the underlying causes (Hamood et al., 2011). "TQM is a collection of entire system processes aimed at getting the right things done (externally) and getting everything done (internally) the first time and every time, with economic viability evaluated at each level of each process," writes Maharjana et al., 2014.

2.4 Beginnings and Advancement of TQM

Total quality management implementation entails four distinct steps (Hassan and Jaaron, 2021).

2.4.1 Verification and associated step

This part of the process is sometimes referred to as the phase of the examination. It exemplifies the first steps toward attaining the quality. It does not stop the error from

happening, but it does make an effort to recognize it, correct it, and distinguish defective products from those that are acceptable.

2.4.2 Quality control step

This era kicked off at the turn of the century when statistical techniques were first used for quality assurance. The major goal of quality control is preventing and avoiding faults in the processing of products or services; therefore, it naturally gravitated toward standardization and uniformity of production as a method to this end.

2.4.3 Quality assurance step

This phase is implemented to increase prevention efforts, and it is predicated on the zero failures principle, which emphasizes avoiding mistakes from the get-go.

2.4.4 “TQM” step

The following step is defined by client confidence in the business and its satisfaction. In this era of intense competition, the traditional function of quality assurance has shifted dramatically from control to management tool. This change necessitates the search for an understanding of overall managerial oversight based on continuous development in efficiency and analysis and resolution of problems.

2.5 Elements of Achievement in TQM

In order to successfully deploy TQM, it is necessary to identify its crucial success criteria. These factors, which can be discovered in the literature, differ amongst authors. Numerous scholars have defined crucial elements as "important areas of organizational planning and activity that must be implemented for efficient quality management in an organizational unit." There are various variables that must be emphasized by TQM implementation facilitators (Ahmad and Yusof ,2010). Total quality management methodology rests on the following elements:

2.5.1 Participation and assistance of high management

According to the research of Emerald (2005), the dedication of top management is the most significant factor for the success of an institution while implementing TQM. The magnitude of a project's success reflects on the degree of commitment from

senior management (Papadopoulos et al., 2015). Top managers have the authority to elevate TQM to the organization's highest priority. Bush and Glover (2012) define commitment as "the readiness to engage oneself; that is, one's ego, time, and effort." When implementing TQM, high management must have committed to their people and to capital investment in order to develop an institution with the culture, understanding, and equipment required to service the client.

When it comes to Total Quality Management (TQM), top executives must adopt a code of conduct that promotes the establishment of policies, a solid support system, and personal accountability (Yee et al., 2011). Every single employee, from the janitor to the CEO, should be fully invested in Total Quality Management and work tirelessly to ensure that it becomes an integral part of the company's environment (Yee et al., 2011).

Top-level management's involvement is crucial for TQM's success because it allows departments more freedom to address their own challenges, facilitates better internal communication, and keeps tabs on how well quality initiatives are progressing toward the company's long-term objectives (Townsend, 2015).

Customer happiness, quality product, continuous development, and employee satisfaction are the goals of Total Quality Management (TQM), Blanchard and Broadwell (2021) stressed that quality monotering from high management is the foundation for successful "TQM" deployment.

As per management studies, the effectiveness of any initiative that tries to change the operational strategy of an organization is closely correlated with the dedication of the high management. Without the assistance of senior management, it is exceedingly difficult to alter the behaviour of organizational stakeholders (Yee et al., 2011).

Kanji (1998) presented a similar framework named "Kanji's Business Excellence Model (KBEM)". To achieve organizational excellence, KBEM takes its cues from "Kanji's pyramid" rules of "TQM" and integrates the top leadership with the four principles (Comfort the Client, Management by Fact, People-based Management, and Continual Development) and the eight core conceptions shown in figure (2.1).

The major objective of "Kanji's Business Excellence Model" is to simultaneously measure the pleasure of consumers, employees, and shareholders inside a business in order to provide a thorough appraisal of organizational effectiveness. Specifically,

"Kanji's Business Excellence Model" may be used to evaluate the "Business Excellence Index (BEI)" to demonstrate how well different elements of the firm – leadership, continual development, and other TQM concepts – are doing geographically and most crucially, over the period.

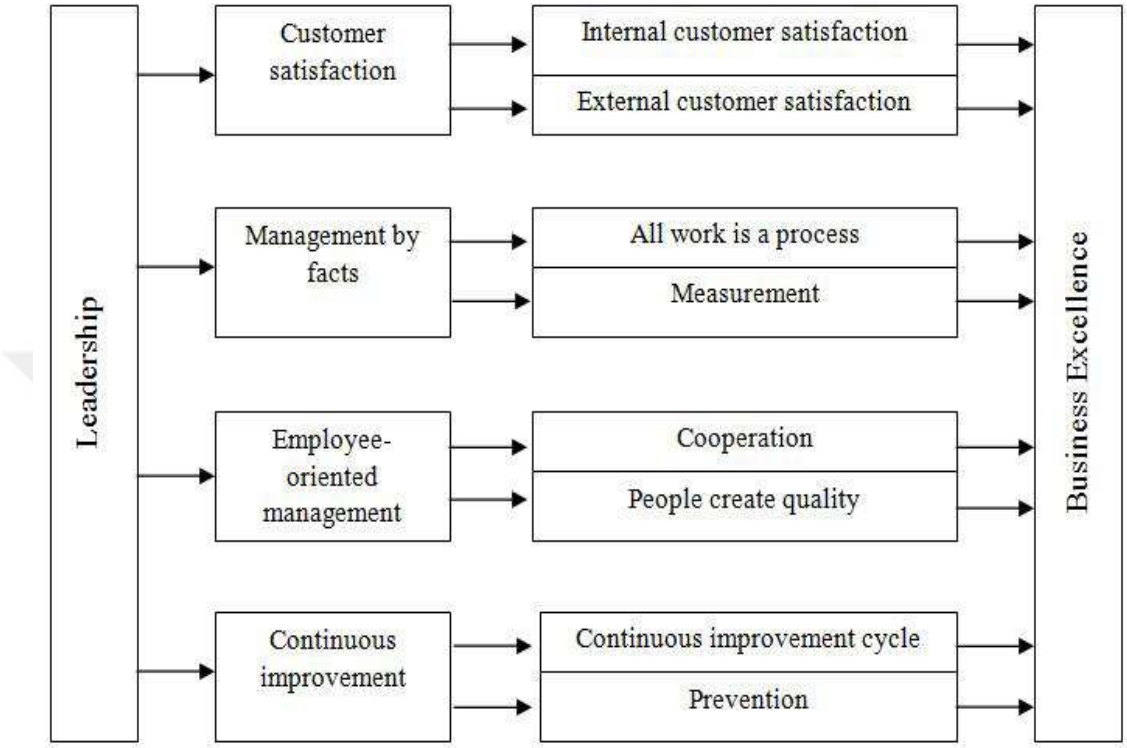

Figure 2.1: Kanji's Business Excellence Model

Source: Yusof and Aspinwall (2000)

As Yusof and Aspinwall (2000) noted, "KBEM" is not just an important contribution to the "TQM" literature but also to the field of organizational literature more broadly. To begin, it is important to note that the validity and reliability of past studies that aim to downplay the importance of leadership and top management to an organization's performance are questionable at best. However, in Kanji's view, leadership is the central factor in achieving corporate excellence. Secondly, the type of the function of high management as a basic driver of business excellence has not been clarified in prior studies, or the nature of the links between high management and other ideas of TQM has not been taken into account.

Three primary factors that assist top management were elucidated by Townsend, (2015) and are deemed crucial to the TQM discipline:

1. Participation in team meetings, openness to spending time with others, receptivity to criticism, and a desire to aid in issue-solving all demonstrate interest.
2. Supporting them by providing knowlodgment and other important materials.
3. Submiting to the company with robust planning team by facilitating the implementation of plans, the ongoing review of project plans, and the formal commissioning of project managers and their teams.

2.5.2 Engagement and development of employees

Several academics have pointed out that World economies have a history of actively promoting employee participation in a wide variety of settings. To that end, one of them is enabling workers.

As a result of the increased complexity and competition in the outside world, this trend emerged in the 1990s (Yee et al., 2011).

"the process of boosting sentiments of self -efficacy among organizational members by identifying situations that create powerlessness and removing them by both formal organizational practices and informal means of delivering efficacy information," as defined by Conger and Kanungo (1988). One of the "most crucial pillars of TQM," according to Lawler (1994), is giving workers a voice in the company's operations. "sharing with front-line employee's information about an organization's performance," as described by Bowen and Lawler (1992).

With its focus on creating a quality culture in which all members of a company share a commitment to continuous improvement, TQM was instrumental in paving the way for more employee agency and engagement refinement aimed at boosting happy customers (Yee et al., 2011).

"A management approach that emphasizes the importance of people in attaining perfection" as defined by Adeinat and Kassim (2019).

"obtaining employee participation and interest in the process of improving quality" is how Yusof and Aspinwall (2000) define employee involvement in a TQM-based business.

Increases in service output and revenue are the results of “TQM” initiatives aimed at boosting worker happiness and commitment. In order for service firms to properly respond to consumer needs, employee satisfaction and loyalty are key variables (Yee et al., 2011).

Employee happiness is correlated with company loyalty, according to the studies referenced by Silvestro, (2002). This study's findings show that, in order to foster employee loyalty, the company should prioritize their needs.

In order to institutionalize empowerment in a way that is more or less permanent, “TQM” staff members empowerment by distributing responsibility for duties that were traditionally handled by management (Yee et al., 2011).

It's common knowledge that front-line employees have a greater understanding of consumers' wants and needs than their superiors do and that when given the authority to get their tasks done, they produce better outcomes more quickly than managers can (Raimona and Mohd, 2006).

To ensure its continued success, TQM must invest in the training of its workers by offering courses that provide them regarding the knowledge and competencies necessary for TQM's application and succession. Conveying knowledge and abilities in a constructive manner while taking into account the efforts of individuals. As stated by Blanchard and Broadwell (2021), training methods should be based on solid scientific evidence if they are to effectively boost trainee performance.

2.5.3 Continuous development

The management discipline places a significant emphasis on the theme of ongoing quality improvement. As per to Podgórski et al., 2020, the “TQM” applications as the basis for ongoing quality improvement.

Many researches have submited significant progress in elucidating how “TQM” can facilitate continuous quality improvement. These studies have been carried out by numerous researchers. “TQM” emphasizes the necessity of an organization-wide dedication to the pursuit of perpetual quality improvement for every operation that is customer-focused. According to Matsuo and Murakami (2013), a firm's financial performance can be affected by improvements made to the quality of the product or service (TQM).

According to Dassisti (2010), continuous quality improvement is fundamentally a company-wide approach that consists of sequential and interrelated actions that help monitor the improvement of business processes.

Continuous quality development places an emphasis on making little, incremental improvements that, over the course of time, add up to have a large, cumulative effect and can lead to groundbreaking innovations. It is usually defiend as a bottom-up strategy, a type of "learning by doing," that enhances an organization's competitiveness by the ongoing enhancement of its goods, services, people, processes, and environment (Matsuo and Murakami, 2013). This maximization of competitiveness is accomplished through "learning by doing" (Matsuo and Murakami, 2013).

Techniques for continuous improvement are "the accepted method for minimizing waste by concentrating on modest, incremental changes," according to one definition of the term. Due to these strategies guarantee that manufacturing methods become thinner and more effective and remove waste where appreciate is added, they are often required for these industries to adopt them in their production the environment so that they can respond to the rapidly shifting needs, wants, and preferences of their customers and remain competitive. This is essential if these industrial industries are to thrive in the current market (Vinodh et al., 2021).

Modest adjustments made on a regular basis are the foundation upon which solutions for continuous improvement are constructed. These solutions help eliminate waste while also considerably reducing production costs, improving productivity, safety, and effectiveness. According to Vinodh et al. (2021), businesses need to come up with creative solutions if they want to maintain their competitiveness and adaptability while also being able to swiftly meet the needs of customers.

When addressing issues of reliability, availability, maintainability, and performance within an organization, effective integration of the improvement function with engineering and other manufacturing functions can save enormous amounts of time, money, and other valuable resources. The strategies underlying continuous improvement work to locate and implement improvements that can be made to a company's products, services, and processes on an ongoing basis.

According to Matsuo and Murakami (2013), firms are increasingly employing these strategies in an effort to enhance their internal systems and procedures.

Continuous improvement involves minimizing or doing away with activities that do not significantly add to the value of the products or services that are being produced in order to fulfill the requirements and requirements of customers.

According to Vinodh et al. (2021), the foundation of continuous improvement is the elimination of discrepancies and the prevention of errors. Each of an enterprise's operational processes, activities, and outputs must undergo continuous enhancement.

In addition to this, they shouldn't lose sight of the fact that not only the external environment, but also the wants and preconceptions of customers are always shifting. According to Battina (2016), as a consequence of this, the organization ought to upgrade and increase its processes and components in order to deal with the variations in the outside environment.

Employees are encouraged to improve regulatory systems, processes, and procedures as part of TQM, as well as to submit new ideas and initiatives for the transformation of the business. Opportunities for advancement can originated from various of different places, like as the proposals of employees, operational research and development, and new product creation. The information comes from a variety of sources, including clients, competitors, the internet, and others (Battina, 2016).

2.5.4 Customer - motivated quality

Excellence in service delivery is inextricably linked to the involvement of customers. According to the findings of a number of studies, the purpose of gathering data on the quality of service provided and the level of satisfaction experienced by customers is to provide information that can be utilized to boost customer loyalty as well as the overall financial performance of the firm.In addition, a number of studies have shown a connection between the way customers feel about the quality of a product or service and the amount of money the company makes (Vinodh et al., 2021).

In a broader sense, "a post-consumption evaluation of a particular product or service" is how customer satisfaction is typically defined. The concept of customer pleasure may be approached from two different vantage points: contentment with a given transaction and satisfaction with the overall experience. According to Matsuo and

Murakami (2013), "transaction-specific satisfaction" is defined as a "evaluation of the experience and client's responses to a specific company's encounter," while "accumulated fulfillment" is defined as "customers' overall evaluation of patronage encounter from conception to the active" (Matsuo and Murakami, 2013).

A customer's expectations are the yardstick by which the quality of a product or service is measured, both in terms of how the customer perceives it and how they evaluate it. When all the ratings for each aspect are added up, the total quality is what ultimately determines how happy the customers will be (Bendoly, 2016). According to "TQM", it is the consumer, not the company, who determines the standards that must be met by the products they purchase.

Long-term partnerships with vendors are developed without relying on price reductions from suppliers, and quality management as a whole is prioritized in order to please all consumers (including internal ones). Quality is described as meeting or exceeding customer expectations, and customer satisfaction is the fundamental purpose of any firm, whether its focus is on providing public functions, like in the public sector or creating commodities in the private sector. When a company truly believes in and is conscious of the need of high efficiency and effective service delivery, it is more likely to achieve that goal (Battina, 2016).

In order to meet the requirements of customers, it is essential to have a system to collect organized information about their wants and to accept complaints from clients in order to investigate, resolve, and avoid them in the future, as well as to consider consumer feedback when designing new products (Battina, 2016).

2.5.5 Suppliers engagement

Due to market globalization and increased rivalry, the supply chain has witnessed significant international expansion in recent decades. Consequently, a solid "SCM" is essential in order to maintain global competitiveness, as suggested by the work of various writers. The way to do that is to enhance both product performance and customer service while simultaneously decreasing costs (Raimona and Mohd, 2006).

Accordingly, supply chain management (SCM) has emerged as an important topic in a variety of contexts, including logistics, marketing, internal organization, and integrated information management. Supply chain management (SCM) relies heavily on the purchasing function. Typically, it's in charge of everything from choosing

vendors to overseeing contracts to keeping tabs on supplier performance to keeping lines of communication open. Since TQM is also competent in all these areas, integrating TQM and SCM is vital to a company's competitiveness (Matsuo and Murakami, 2013).

Given the recent difficulties encountered by the purchasing function in the course of provider choosing, the following factors probable to be essential when organizations evaluate potential or current providers (Raimona and Mohd, 2006):

- Aims: Is the provider capable of adhering to realistic cost, quality, and efficiency objectives for the product?
- Duration: Is there any chance that the supplier's product improvement timeline will coincide with the deadline?
- Ramp-Up: Is the supplier capable of rapidly expanding capacity and manufacturing to meet volume demands?
- Innovation and Engineering: Is the supplier equipped to come up with a good design, make it, and troubleshoot if issues arise in terms of engineering knowledge and manufacturing space?
- Learning: How well-trained are the supplier's key people in starting up and debugging the necessary procedures?

Anyone on the team weighs in on the decision of which supplier to work with, whether that supplier is internal (a member of the department's staff) or external (a member of the team's financial backers or contractors). There may be a recommendation from a subset of the commercialization team. Suppliers are then subjected to a thorough audit that takes into account the supplier's commodity-specific weightings for pollution, environmental conformity, quality, engineering capability, price, and geographic position (Handheld et al., 1999).

A product's price, quality, technology, and time to market are all heavily influenced by its suppliers. There are a wide variety of businesses that encourage their engineers to become familiar with their suppliers' systems, methods, and processes in order to enhance collaboration, lessen room for error, and better comprehend product capabilities. These days, many businesses are trying to get their suppliers involved in

the creation of cutting-edge products, processes, and services in order to achieve breakthrough outcomes (Vinodh et al., 2021).

2.5.6 Organizational environment

An organization's culture can be thought of as a set of guiding principles that identify the prevailing set of values within an organization and explain how they function to improve quality, foster a commitment to ongoing improvement, foster growth, and mitigate opposition to new ideas and approaches.

There are numerous academic definitions of company culture. "The principles, norms, customs, lore, and lexicon that are taken for granted within an organization; a reflection of the current ideology held by its members; a source of pride and unity for its members; a set of unspoken rules for getting along with one another; a means by which the social framework in which its members work is maintained" as defined by Jahanshad and Vedadi (2019).

Cultural norms inside an organization are "holistic, historically set, bound together by social conventions like ritual and symbolism, formed and maintained by the people who make up the organization as a whole, this collective structure is pliable but resistant to change" as described by Hofstede (1991). All businesses have their own distinct cultures and subcultures that govern how things get done and who works with whom.

Schein (1992) distinguished between artefacts, values and beliefs, and fundamental assumptions as the three tiers of heritage. Given the importance of cultural factors in determining how well an organization adapts to modifications, the underlying assumptions that make employees adopt TQM are crucial to the program's success or failure.Organizational culture and the success of total quality management (TQM) initiatives are intertwined. The degree to which TQM procedures may be applied in an organization is limited by the culture of that organization (Yeung et al., 1991).

Developing a company-wide commitment to quality is "one of the fundamental requirements for the effective adoption of TQM," as stated by Jahanshad and Vedadi (2019). " The company's people and the values they uphold are the foundation of any successful business" as stated by Scarnati & Scarnati (2002).

In order to effectively carry out a TQM program, it is necessary to foster a society that is focused on producing high-quality goods and services. This is because a workforce whose services is not quality-oriented would resist the shift to a quality-conscious society. As a result, TQM necessitates a culture that welcomes change and is committed to the ongoing enhancement of its offerings (Jahanshad and Vedadi, 2019).

Accordingly, adapting the company's culture to internal and external environmental variables is essential to establishing a culture of excellence. This aids in the realization of its goals and the implementation of its new strategy, and it also improves its problem-solving abilities.

Employees in a company with a Total Quality Management (TQM) culture are encouraged to think for themselves, come up with novel ways to boost the company's quality and output, and develop a sense of pride in their work (Hassan and Jaaron, 2021).

2.5.7 Utilizing statistical control and feedforward

One of the most useful TQM methods, statistical process control (SPC), helps keep process variances to a minimum through careful monitoring. Workers who utilize a statistical control system to monitor and adjust the quality of the company's processes should be well-versed in this tool if they are to effectively detect and resolve any quality issues that arise. The ability to evaluate quality using a number of different quality control measures is essential (Hassan and Jaaron, 2021).

Quality tools assist in identifying and persistently addressing issues with product or service quality inside a company. Therefore, it is incumbent upon the company's testing procedure in the laboratories to guarantee that samples collected at the manufacture stage, throughout the production procedure, and at the end of the manufacturing step are in accordance with the necessary standards. There are seven quality control tools that are simple to learn but incredibly effective at pinpointing and understanding quality issues (Montgomery, 2005).

Although a single tool may suffice at times, workers often find that using many tools at once is more efficient. Here are some of the instruments at your disposal:

1. Diagrams showing causes and effects: These charts help pinpoint the root causes of specific quality issues. Fishbone diagrams get their name from their resemblance to the skeleton of a fish. A cause-and-effect diagram is a graphical representation of the connections between the factors that contribute to an effect. Its purpose is to reduce expenses and increase productivity through enhancing processes and goods (Montgomery, 2005).
2. Flowchart: is a visual representation of the logic (and often the physical) steps in a process or procedure. As a visual aid, it's simple to use and understand. They are used to describe procedures in quality management during ongoing efforts to enhance performance. Flowcharts are helpful because they describe the process and display how the many steps relate to one another (Draper & Ames, 2000).
3. Checklists: are used to keep track of how often certain problems arise and how often they are fixed. A straightforward yet useful fact-gathering instrument, it allows the worker to record concrete data about the flaws they've seen. A checklist is an easy tool for groups to gather information and get started on solving problems (Jahanshad and Vedadi, 2019).
4. Control diagrams: These are graphs used to determine whether a process is working as expected relative to a measured value such as weight, width, or volume. Control charts are the most extensively used SPC tool for identifying and locating the reasons for anomalous fluctuations in monitored measures (McQuater et al., 1995).
5. Scatter diagrams: are a special type of graph that can be used to display the relationship between two variables. Useful for gauging the degree of linear link (correlation) between two variables. In addition to shedding light on the past, they can be utilized to foretell the future (Mears, 1995).
6. Pareto analysis: is a method for prioritizing quality issues based on their impact. The principle of Pareto analysis states that there are a few number of truly crucial quality issues, while the vast majority of issues are largely irrelevant. These methods make it simple to identify the root causes of failure and high costs (McQuater et al., 1995).

Histogram: a graph that displays the distribution of values for a variable as a function of frequency. It is employed whenever the information spans a continuous domain. Histograms are useful when a company needs to visualize the distribution of data by showing how many things fall into each category as a bar graph. Histograms are useful for figuring out the average, the standard deviation, and the pattern of a distribution at a glance (McQuater et al., 1995).

2.6 Quality Experts

Many modern philosophers have toiled away at the task of defining and expanding on quality. Some nations and organisations have begun to implement their brilliant ideas. The most well-known of these forefathers include “Deming”, “Feigenbaum”, “Ishikawa”, “Juran”, “Tajuchi”, “Crosby”, and others.

Total quality is not a single notion but rather a collection of interconnected principles that, when combined, provide a holistic way of conducting business in which all intellectual input is taken into account. “Deming”, “Joseph M. Juran”, and “Philip B. Crosby” were the main authors.

Many would also include Armand “Feigenbaum” and other Japanese specialists, including “Shingeo Shingo”, in addition to these three (Jahanshad and Vedadi, 2019).

2.7 Value of Quality

There are three different types of expenses involved in implementing a successful TQM program (Hassan and Jaaron, 2021) (figure 2.2).

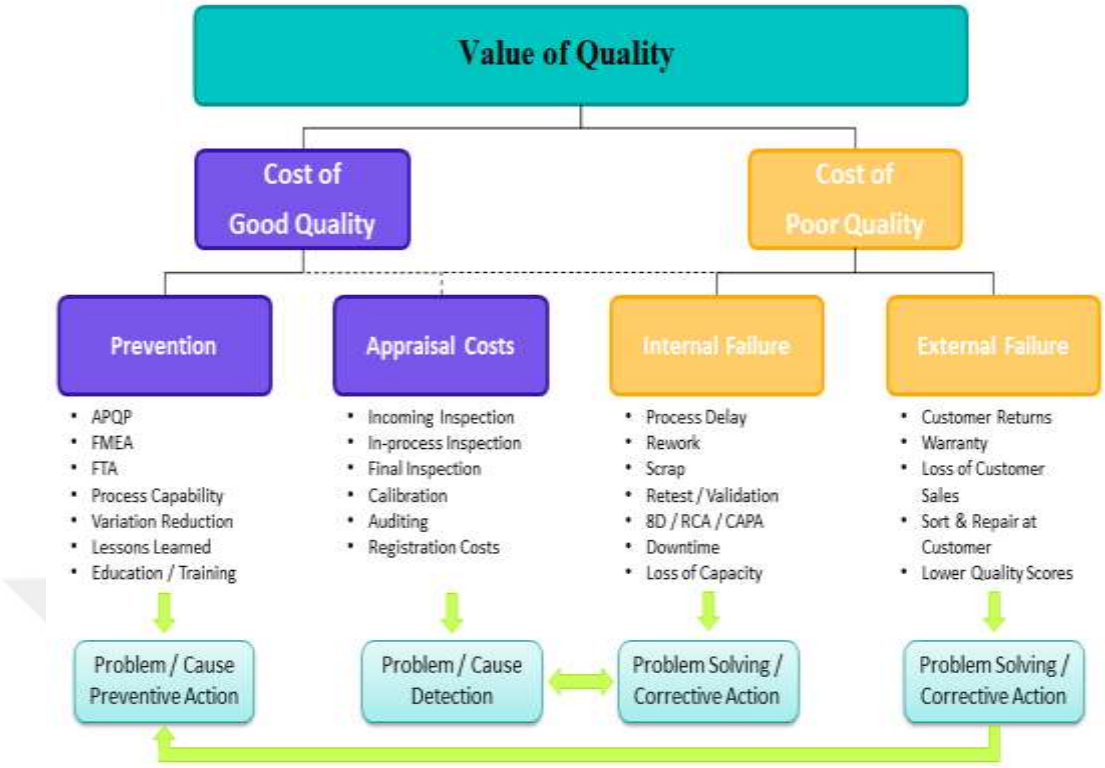

Figure 2.2: Value of Quality

Source: Hassan and Jaaron, 2021

2.8 Distinctions between Conventional Management and TQM

However, many businesses are still run the old-fashioned way, and TQM has been on the rise in recent years. Many businesses are looking to implement a management strategy that would help them stay in business, increase productivity, and remain competitive. Total quality management is a system developed after extensive study and investigation into the problems and failures of conventional management. Differences between TQM and conventional management are outlined in Table 2.2 below (Ezuruike and Prieto, 2014).

Table 2.2: Comparison of Conventional Management and "TQM"

No.	TQM Concepts	Classical Qm
1	Give your attention to the clientele	Centre your attention on the rules governing people who live alone
2	Cooperation and teamwork	Individuals who are alone themselves
3	the employment-finding goal of an organization, group, or business	Work motivated by an individual's goals

Table 2.2: (Cont.) Comparison of Conventional Management and "TQM"

No.	TQM Concepts	Classical Qm
4	The continuous growth of systemic processes	Resolving each issue individually or having no effect at all
5	Organized gathering and utilization of empirical information	Regarding feelings or views, decisions are decided
6	Seeking information from other sources	Only include references to the internal structure
7	There is no way to get around the argument	Demonstrating that the criticism is not valid
8	Employees are given the option to pick from the available options	People are currently awaiting instructions on ways to carry out a task
9	Protection	Costs associated with repairs
10	An organizational structure that is both horizontal and decentralized	Framework for the organization that is vertical and focused
11	Ensure that the consumer is happy and that all of their needs are met	Increase the return on investments and make as much as possible compared to the circumstances
12	EquiStrive for a healthy balance between your short-term and long-term goalslibrium among short-term and long-term objectives	Pay attention to the objectives in the near term
13	Democracy, participation, and the delegation of authority are the defining characteristics of leadership is characterized by democracy, involvement, and delegation of authority	Leadership can be described as the exercise of autocracy and the issuance of administrative instructions in the absence of resistance

Source: Ezuruike and Prieto, 2014

2.9 Descriptions of Quality Based on ISO Requirements

Several international service standards have emerged in recent years, with a focus on satisfying customers, remaining competitive in the face of constant change, and bolstering organizations' abilities to put modern management practices into practice. In recent years, there has been a meteoric rise in the number of standards released by standardization authorities in the business world. The rapid pace of The globalization and interconnectedness of the economy has produced by western economies over the last two decades has played a significant role in driving this trend toward uniformity (Martínez-Costa et al., 2009).

ISO (International Organization for Standardization) is one example of a body that sets standards and processes for things like quality control and assurance. ISO 9000

is a set of international standards for quality management that aim to aid businesses in satisfying their clients and other important constituencies. Employee training, company-wide policy communication, thorough documentation of processes, and using ISO 9000 principles as a foundation for continuous improvement are all part of the scope of "internalizing" ISO 9000 standards (Martínez-Costa et al., 2009).

Companies can use the ISO 9000 series as a guide when developing their own internal quality management system. Models or quality assurance standards have proliferated rapidly since the end of World War II. Thus, in 1979, the “British Standards Institute” produced the BS 5750 series to regulate the chaotic growth of various quality assurance standards; this series would subsequently serve as the framework for the development of the “ISO 9000” standards (Ezuruike and Prieto, 2014).

In fact, the first set of “ISO 9000” standards were created all the way back in 1987. Adjustments were made to the criteria in 1994. A new review was conducted in the fourth quarter of 2000, with the intention of emphasizing the series' excellence and its leaning toward integrated quality management. There are three guidelines in the ISO 9000:2000 family. The only one that can be certified is “ISO 9001:2000”. Organizations can earn their seal of approval if they can show that their practices are in line with those outlined in ISO 9001:2000 (Ezuruike and Prieto, 2014).

Multiple studies in recent years have pushed for closer alignment between ISO 9000 and TQM, also known as continuous improvement. The revised ISO 9000:2000 standard further strengthens this integration by mandating that businesses adopt a "continuous improvement" mindset instead of a "strict adherence to standards" mindset.

The audit process has evolved to reflect this reality by assessing the degree to which the organization is committed to and implementing a culture of continuous improvement (Ezuruike and Prieto, 2014). A new edition of ISO 9001, titled ISO 9001: 2008, was released in 2008. This is an exceptionally rigorous and all-encompassing benchmark. "An intriguing documentation system is included, allowing the company to keep track of its daily activities in a way that not only satisfies consumer needs but also prepares the way for the enhancement of its products and services in order to surpass those needs and those expectations. The integration of documentation with the several techniques to continuous improvement

recommended by the standard (for example, tools for assessing and improving quality in-house, as well as analyzing data and taking corrective measures) is extremely effective. Organizations who fully accept and implement this worldwide standard will find that their clients and other stakeholders are much happier as a result " (Mohammad, 2014). As may be seen in table 2.3, there are also some other distinctions between ISO and TQM.

Table 2.3: Variations between Conventional Management and Total Quality Management

No.	SO Framework	TQM Framework
1	It can be viewed as a preliminary step towards the TQM framework.	It can be regarded as a more thorough and general framework.
2	It emphasizes the technical aspect.	It emphasizes the social and human aspects.
3	It is not concerned with the client directly but indirectly through the implementation of quality requirements for the product or service offered to the client.	It emphasizes internal and external clients, handles them directly by doing field research to suit their wants and wishes, and strives to fulfil them.
4	Companies utilizing ISO are subject to frequent inspections and are required to make improvements in accordance with International Organization for Standardization requirements.	Organizations implementing TQM have their own framework, which they may adapt as they see fit.
5	It is a set of specific techniques and work practices.	Its primary subjects are constant improvement and advancement
6	The duty for quality is assumed by the department of inspection and quality verification.	Every person in the organization assumes quality accountability.
7	It is applicable to particular divisions but not necessarily to all organizational stages.	It applies to all departments, sectors, and divisions of the corporation.

Source: Hassan and Jaaron, 2021

2.10 Expected TQM Advantages

Numerous institutions that have implemented TQM have gained great achievement in the manufacturing and service sectors. This had an effect on other institutions working to implement this notion in necessary to attain growth and longevity.

Table 2.4 highlights the advantages of using TQM by manufacturing companies.

Table 2.4: Advantages of İmplementing TQM

No	Region	Advantage
1	Clients	Clients' needs must be satisfied.
2	Staff	1-Involve all employees in the enterprise's management. 2-Guarantee that each employee understands his position and requirements. 3-Include employees in the process of development and enhancement. 4-Raise and enhance the workers' understanding of the quality of the work and the regulations through their dedication to quality.
3	Facilities	Enhance the quality of operations regardless of the many sorts of employees whose environments vary.
4	Workplace Structure	1-Connect the organization's components and work in a manner conducive to discipline and dedication. 2-Contribute to the creation of a written system to assure performance in the event an employee is absent or leaves the organization. 3-Substantial reduction of administrative bureaucracy and elimination of numerous repetitive procedures, which frequently interfere with officials' dedication to their orders.
5	Quality Verification	1-Lessen the institution's resource and time wastage potentials. 2-Develop the institution's reputation in the community and the quality framework requirements for its operations.

Source: Hassan and Jaaron, 2021

2.11 Typical Concerns and Difficulties in TQM Application

During the implementation of "TQM", a number of difficulties and errors may arise within the organization. These errors may impede the successful application of the "TQM" program and the realization of its advantages. Listed below is a summary of various errors and problems: (Mohammad, 2014).

1. Replicate the challenges of competitors without examining and assessing their trials on quality and adopting only the successful approaches.
2. Promote the organization to get fast results without giving all the required elements for the TQM program's effectiveness.

3. Inconsistency between the words and deeds of leaders causes them to lose credibility in front of their workers.
4. Assuming that technology is more important than human assets, despite the fact that the success of the TQM program depends on the development of qualified people resources who can utilize to accomplish the intended goals.
5. Complying with regulations, rules, and routine operations that are incompatible with the TQM strategy because they impede employee contact with the "TQM" strategy and hinder continual development.
6. The absence of information offered to employees regarding the submission of "TQM" diminishes their motivation and excitement for their work.
7. Leadership's insufficiency to respond to the thoughts, willingness, and issues of staff, providers, and customers, which hinders the TQM effectiveness of the programme.
8. Ignoring the equilibrium between hard and simple objectives, as the use of "TQM", necessitates long dedication in addition to tight profits.

3. QUALITY MANAGEMENT CONDITION

3.1 Introduction

The chemical industries play a crucial role in any country's economy because of the weight they carry in terms of the transformations embedded within the industrial output for conversion. Furthermore, the chemical industries share similarities and complications with the rest of the manufacturing sectors, as well as the agricultural and service sectors. It is difficult to find a substance that does not enter food preparation in this important components, as it enters the production of bread, biscuits, and cheese, all of which were introduced during the introduction of these industries due to the production of production intervention requirements such as chemical fertilizers used in the production of agricultural crops. The sugar business relies on salt as a raw resource, and the chemical industry puts some of the compounds and materials it generates to use in leather production, leather tanning, clothing, and so on.

3.2 Current Quality Management Conditions in the Iraqi Chemical Industry

It is necessary to look at the chemical and pharmaceutical industries in Iraq from multiple angles and aspects, and the most prominent of these aspects is the progress, diversity and quality of these industries.

The main factor, especially in the chemical industries in Iraq, is the availability of raw and intermediate materials, and the accumulated experience in the fields of industries, chemical and pharmaceuticals made access to these industries inevitable due to the Iraqi cadres of long experience in these fields, where chemical industries began in the forties of the last century and accumulated great experiences the pharmaceutical industries started in the sixties of the last century and developed significantly, and the expertise increased in them. Most of the health sectors witnessed their diversity and efficiency with different treatments for many common diseases in Iraq.

The industrial sector in Iraq consisted of 21 registered companies and approximately 2251 projects of manufacturing, mining, and construction enterprises. The majority of these projects were small and medium-sized, with 10 to 20 employees, as of 2011. The industry employed approximately 31588 people, and their production was valued at approximately 976.9 million U.S. dollars, while their added value amounted to 367 million U.S. dollars (Mohammed and Amer, 2012). The Iraqi Federation of Industries (IFI) represents Iraq's various manufacturing industries, such as those producing food and drink, building materials, products such as pharmaceuticals, chemicals, metals, engineering, clothing, leather, paper, printing, packaging, crafts, plastics, rubber, and furniture are all examples of industries that benefit from this practice.. This study will focus on three industries: the pharmaceuticals, food, and washing industries. These industries are significant because they have direct effects on individual health and the ecosystem.

3.3 Industry's Current Problems and Obstacles

There are several investment possibilities and justifications in the industrial sectors. The most important causes are the market's capability for absorption and the abundance of human capabilities. This sector has a number of challenges, the most significant being political instability and mobility constraints (Grant et al., 1994).

In addition, challenges with financial management and deficient infrastructure are endemic to this sector, as are the complexity and high cost of international trade operations. The problem has also been compounded by the high cost of moving commodities, services, and raw materials. The subpar quality of the financing programs given by banks and credit organizations is one of the issues confronting the industrial sector (Paltrade, 2010).

Clearly, the disproportionate mechanisms of the regional marketplace damage the chemical industries. This has culminated in the removal of illegal products that are incompatible from the market. The readily accessible nature of basic materials poses a major threat to the industry. Increasing the market competitiveness of small businesses by encouraging them to combine with others or form strategic alliances can be accomplished by encouraging them to form strategic alliances or mergers. In addition, this would reduce the detrimental consequences of family company management and practices inside the industry (Grant et al., 1994).

3.4 Current State of Quality Management in Iraq's Chemical Industries

In generally, the quality of Iraq's industrial output has increased substantially during the past decade. Its proportion to the total GDP climbed from 8% in the mid-1980s to 17% in the late-1990s, then declined during the first years following 2003 and has reached 16% in recent years. The following table outlines some of the most pressing quality issues and challenges currently confronting specified chemical industry industries.

Table 3.1: Current State of Quality Management in Iraq's Chemical Industries

No.	Requirements	Pharmaceuticals Industries	Food Industries	Washing Industries
1	Direct correlation to individual health	Sure	Sure	Sure
2	Existence of sufficient laboratories	Sure	A few	A few
3	Accessibility of competent personnel	Sure	A few	Never
4	Provision of raw materials	Sure	A few	A few
5	Availability of an effective training program	Sure	A few	A few
6	Acquiring ISO Certifications	Sure	A few	A few
7	Obtaining GMP Accreditations	Sure	A few	Never
8	Obtaining HACCP Accreditations	Never	Sure	Never
9	Obtaining PS Certificates	A few	A few	A few

As little as a third of the National Master Drug List was covered by locally produced pharmaceuticals (NMDL), which means that work towards drug production must proceed (Kimadia, 2014).

The pharmaceutical sector has spent millions on Good Manufacturing Practice (GMP) compliant infrastructure. There was an investment of almost 50 million dollars between 2005-2014. Bonuses on Iraqi drugs also exceed those of global competitors, making Iraqi pharmaceuticals the most cost-effective option. Yet another obvious aspect of the competitive environment is the accessibility of medicines (Iraqi Federation of Industries, 2014).

The food industry's primary challenge is the way local markets function at the moment. Unfair competition between imported and domestically produced goods resulted from lax inspections of commercially available goods for compatibility,

validity, composition, and country of origin. Another roadblock was the Ministry of Education's most recent policies and choices. Some of the food manufacturing companies were in danger because of them. In order to protect kids' health, the ministry banned a wide variety of unhealthy foods from being sold in school cafeterias. Consequently, businesses in the food industry were thrown for a loop due to the conflicting regulations and overlapping authority of various government agencies (Iraqi Federation of Industries, 2014).

Because of its importance to people's well-being and safety, food products require extra care during the quality assurance and control processes. Quality can also be affected by other factors, such as short expiration dates. The industry's collective wisdom was crucial in solidifying a commitment to excellence.

The increasing demands of the consumer market and the cutthroat nature of the business environment have made it necessary to commit to a policy of constant quality improvement. Many organizations now boast both ISO and HACCP certifications.

As it pertained to the washing industries, it lacked proper technical understanding and experience in regard to items like laundry detergent and bath soap. The current package and its development were a tricky subject that required careful attention (Iraqi Federation of Industries, 2014).

The washing industry has a demand for quality. The fair efficiency of locally controlled licensed industries should be boosted by quality. ISO accreditation may be appropriate for two or three producers, but all must adhere to specific specified manufacturing practices to guarantee quality and uniformity (Iraqi Federation of Industries, 2014).

For the sector as a whole to thrive, investment in testing laboratories and infrastructure is crucial. There is a lot of emphasis on quality management, quality production, and quality assurance in this industry. The industry might benefit greatly from advertising initiatives and tools, as well as management and technical education (Iraqi Federation of Industries, 2014).

3.5 Proposed Structure for TQM Implementation in Iraq's Chemical Industries

TQM is not a perfect solution for all of a company's management woes, nor is it a quick and magical method that, like a quality circle or other management techniques, can transform a company's old and strong traditional culture into a free cultural identity that is able to make adjustments to the new changes by applying it in a short time period. It should also be emphasized that TQM is not a public remedy, but rather the management appearance that is most likely to lead to achievement.

TQM can be seen as the successful implementation of this new management method in many organizations, with a focus on innovation, development, and continual improvement. To what extent all participants of the organizations contribute to its activation is a key factor, and the management of the organizations plays a pivotal role in all of these activities.

Figure (3-1) presents a structure for the implementation of the steps of the TQM methodology in the Iraqi Chemical Industries: endorsement of this concept, work on its distribution, and improvement of performance and efficiency.

Figure 3.1: Implementation of the Steps of the TQM

Source: Mohammed and Amer, 2012

3.6 TQM Implementation Steps

There are four steps to achieving a successful TQM strategy in different organizations and facilities.

3.6.1 Preparatory step

It is known as the zero phase because it comes before the construction step, and it is one of the most significant steps in the application technique. This step signifies the beginning of the effective deployment of the TQM system. It is called the zero step because it precedes the construction step. In the first step of this stage, the organization's perspective, policies, and aims are re-formulated, and an outline of the organization's future operations and procedures are created. The obligation to allocate the required resources for the TQM plan marks the end of this phase. In this step, it is vital to make certain that the team possesses the necessary skills, talents, and training in order to carry out TQM application activities (Mohammed and Amer, 2012).

This step covers the following stages:

1. The determination to applemented TQM: In this stage, the directors decide whether or not they are interested in using the TQM system, which necessitates good attitudes toward this method.
2. Functional executives receive introductory TQM training, and it's ideal to train all managers at once to start organizing their ideas on implementing a system of total quality to ensure the highest possible collaboration and collaboration among them.

Manufacturing managers, quality assurance managers, laboratory chairs, administrative professionals, and research and development managers can all receive training from Iraq's chemical companies. The chamber of transactions, or some other suitable venue, might host the training sessions.

3. Strategically preparation for TQM: The strategy implementation begins by preparing for the next phase, considering and predicting future situations, and taking into account the structure of the organization's work and the tactics to be implemented to attain long-term objectives. Then, concrete plans for management's work, employees, and activities are devised.

Many steps comprise the strategy plan for complete quality management:

a. Beginning the process: In order to execute the TQM system effectively, upper management must not only foster a pleasant working climate but also foster a new work ethic in which employees are willing to operate in accordance with the system's tenets. The stage can be carried out with the help of any management. All of the following prerequisites must be met:

- Employee participation.
- Creating updated training curriculum to accommodate the current state of affairs.
- Efforts are being made to alter the dominant culture of the company.

b. Working on the organization's objective statement: It is essential to the success of strategic planning that the organization's primary goal be made clear in order to garner the necessary financial and psychological backing. Therefore, it must transmit the organization's mission and strategic goals to the various functional levels through carefully crafted and recorded policies.

It is also important for the organization to have policies that facilitate its involvement in and communication with the various divisions. Managers have an obligation to brief all staff on the new policy and reassure them that TQM is a deeply held belief, not a fleeting fad.

c. Identifying fundamental challenges: To minimize uncertainty and mayhem, it is necessary to identify the internal difficulties facing the adoption of the TQM plan and try to give solutions to eliminate the element of unexpected on the task.

d. Creating the strategy: To achieve the objectives efficiently and productively, improvement must have a detailed strategy for each dimension; nevertheless, the following characteristics must be provided at this step:

- Services that will be created in the future.
- Client prerequisites and prerequisites.
- Advancement of a quality culture.
- Establishment of long-term objectives.

- Formulation of proposals.
- Making a report from scratch. It's imperative that the report be drafted and sent to upper management for action.

e. Making judgments on how to distribute organizational resources: This may be a tough choice, and it is a position of failure for many managers where central problems do occur in some companies, particularly those in the public industry, where management requests for more information from each administrative rate and tries to blame those in the greater levels of administration or below them. This consumes time and detracts from duty. Consequently, it is vital to allocate responsibility and power to people who are nearest to the actuality of the task that requires evaluation.

f. Initial statement: It is at this point that the ideas and thoughts should be promoted, and the effectiveness of this development depends on the speaker's proficiency in promoting the concepts of TQM and the level of his belief in them. In the first statement, the message must be carefully selected and communicated to individuals precisely in order to effectively reach them while avoiding style notes from top to bottom in order to foster the spread of enthusiasm and community engagement to TQM.

3.6.2 Development step

This contains a comprehensive implementation strategy. To achieve this, the following stages are included:

1. Appointment of the participants of the quality group, including the organization's leadership and high-level officials. They should direct the TQM program within the organization, eliminate barriers across functionalities, and overcome change opposition.
2. The consultant is typically selected from among the higher-ups in the organization, and his credibility and enthusiasm for Total Quality Management (TQM) should not be discounted. He ought to have a varied set of talents and abilities and a high level of character. His background shows that he can successfully implement new ideas and facilitate cooperation between different departments and administrative divisions.

3. Learning quality group and quality consultant: the board must pay significant priority to training quality, and the advisor must obtain substantial training on topics pertaining to total quality.
4. Conducting the initial TQM board conference: The meeting involves the writing of a charter for the organization and the allocation of responsibilities to assist the implementation of the strategy, as well as the programmer for the subsequent meeting and a version of the TQM proposal.
5. Approving an application strategy and allocating the necessary resources: At this step, the plan to conduct the TQM program is authorized, and the appropriate financial means are provided.
6. Utilizing TQM methods, such as brainstorming, the Pareto diagram, and other selection-aiding tools, to identify and pick the goals and all significant activities inside the objective.
7. It is important to train executives and the highest level management to back the organization of these circles, which are considered a scaled-down version of the council quality, but within each portion or a detailed administrative status, and to coordinate between the quality council and improvement activities or workgroups to identify troubles facing the implementation process and work to overcome them (Mohammed and Amer, 2012).

3.6.3 Evaluation step

In this phase, you will provide the groundwork for the subsequent phases by giving the information required for planning, executing, and sharing your findings. It includes activities like conducting surveys, planning calendars, and conducting interviews with employees at all levels of the firm, all of which serve as inputs for the implementation of TQM and provides direct backing for the strategic goal. These steps can be taken as many times as necessary. This step consists of the following:

1. Self-assessment: This evaluation intends to examine the workers' understanding and raise their awareness of the significance of TQM.

In order to define the difference between the organization's purpose and strategic targets, on the one hand, and its existing position, on the other, it must evaluate the

organization's current state. To do this, the following factors should be examined (Chen et al., 20170:

- Contest: in which the organization must evaluate the status of competing by testing several elements, including an understanding of who the current competitors are and why the customer favours them, determining the basis that the contest is based on, determining the shape of the contest, and the purposes for changing the regulations for dealing with providers.
- Organization: it should also determine and improve the condition of the organization by studying numerous aspects, such as a future objective, the followed working process, the technical competency of employees, the best way to take benefit of the latest techniques, and the ideal method to utilize them for the organization's beneficial, external affairs and forms of cooperation required, intrinsic and outer forms of information exchange that impede the development of completing tasks, and specifying internal and external forms of communication that hinder the improvement of work completion.
- Clients: which it organization must also assess some elements related to the customer, including recognizing current clients and ensuring that their demands do not change; if a change does occur, it must be understood why and how to reap the benefits of it; the possibility of the sustained customers' allegiance to the organization and when to achieve it; and the channels that ought to be used to obtain entry to near-future clients.
- Assessing the steps of work: the organization should review all worker activities and actions in order to shorten the big operations cycle by streamlining procedures, eliminating missed working circles, and transitioning to current processing. To achieve these objectives, the organization should examine a number of factors, including the levels of finalization and the individuals responsible for their fulfilment, the time necessary to complete every step, the obstacles facing finalization of each level, how to delay or deliver the work, and the variance between current effectiveness and expected achievement.

2. Organizational evaluation: This is accomplished by conducting personal interviews with employees to identify the difference between the actual organizational environment and the desired future organization characteristics in terms of TQM.
3. Understanding customer feedback: It requires an in-depth survey of customers and the development of novel approaches to data collection, such as asking inquiries during a meeting or over the phone in a way that doesn't make the customer feel like he's being surveyed. Customer satisfaction can be gauged by asking about various facets of a business, such as its products, policies, and procedures, as well as its sales representatives and its achievement when asked to produce a particular service or component specifically, as well as the customer's general impression of the business and the rationale behind their product selection.
4. Evaluating the training course: Because the training process is so important for developing technical and managerial skills, the organization should evaluate the discipline problems and use the trainees' opinions to get to the right level of training. This means that a lot of things need to be looked at when it comes to training, such as the appropriateness of the course materials to be used, the degree of difficulty of the course materials, and the duration of the training course.
5. Evaluating the value of quality: an evaluation of the monetary expenses of quality. It is important to highlight that the majority of the TQM allocation is designated for training costs.

3.6.4 Implementation step

In this step, the team's performance and function are evaluated. TQM is a group effort to finish the task that relies on the skills and knowledge of both employees and management to ensure the highest possible quality and output, as the progress of the work is discussed at frequent meetings. The following are some of the most common tenets of TQM departments (Chen et al., 2017):

a. Regard for product or delivery quality.
b. Emphasize the significance of responses.

c. Emphasis on quality assurance.

d. Implementation of the concept of total quality cost.

e. Highlight the significance of employee engagement.

f. Utilization of scientific technique.

g. Implementation of the principle of teamwork and integration at work.

This step consists of the following stages:

1. Choice of trainers inside the organization: Trainers must be chosen based on their TQM experience, which includes receiving training on the TQM framework and attending workshops and conferences in order to implement TQM. They must also have a reputation and a significant dedication to the organization's growth and are frequently obtained from outside organizations that specialize in such teaching.

- Developing understanding and increasing awareness of the significance of TQM by concentrating on what TQM is, who benefits from it, how it is implemented, and why its implementation is essential for the organization's survival and continued existence.

- Putting out effort to learn new things and develop one's "soft skills," such as working together effectively, understanding group dynamics, communicating effectively, and resolving issues.

2. Teamwork: This stage entails the organization of working groups that will aid in the gathering of data, the generation of ideas for addressing issues, and the development of a viable quality management strategy.

3.7 Considerations should be made throughout the implementation of TQM steps

3.7.1 Experiences sharing

The accomplishment of the preceding stages, from planning to execution, supplies the organization having the core knowledge base so that the principles have been determined, obstacles to the change approach have been addressed, and positive stories have indeed been created. This phase should incorporate lessons learned from

the quality field. Consequently, there will be an interchange and diffusion of experiences.

3.7.2 Complete execution of the proposed structure

In light of the results of the monitoring and assessment process, and in order to improve the probability of success for the general implementation of TQM, it may be disseminated after the following conditions have been met (Chen et al., 2017):

1. Obtaining success with the small experimentation for the partial implementation.
2. Ensuring that there is competent staff to share their knowledge with another.
3. Working to supply all the necessary elements for the model's effectiveness.
4. Using any application-related faults to your advantage and preventing them from happening any more.
5. A wider range of organizational units should be encouraged to submit applications in a competitive setting, with the winning prize going to the division or administration described in the application and judged to have submitted the highest quality proposal.

3.7.3 Management of quality

It indicates that the board is focused on the company's quality strategy. As depicted in figure (3.2), it contains the following frameworks:

1. Guidance quality team: consists of the committee chair, the chairman of the organization, and high-ranking executives who promote the organization's core areas.
2. Team quality director: The upper management selects a commissioner for the quality to lead a small team; his responsibilities include activating the quality and guaranteeing its implementation.
3. Quality workflow facilitation team: it’s to aid in the development and enhancement teams' efforts by providing them with the appropriate training and directing them toward the best opportunities for putting the proposed solutions into action.

Figure 3.2: Quality management framework

Source: Chen et al., 2017

3.7.4 Formulation and distribution of a thorough quality guideline

It is part of the technical considerations required to support the application of TQM. It seeks to raise an understanding of the principles and procedures of TQM applicable at all administrative levels and to emphasize the benefits of reapplying total quality management. The following are included in this guide:

1. Introduction of the TQM principle and the benefits of its implementation.
2. Fundamentals and application prerequisites.
3. Important steps that must be taken to implement TQM.
4. Engineering tools for TQM implementation.
5. Documentation and guidelines are required.

3.7.5 Required modifications for TQM system deployment

Figure 5 shows that there are a few tweaks to the TQM approach that need to be made, and its worth noting that resistance to change of any kind is to be expected among an organization's staff; as such, TQM must gain the trust and support of its employees through education campaigns that outline the methodology's scope, as well as its value to the company's long-term health (Lepistö et al., 2022).

Figure 3.3: Required modifications for TQM system deployment

Source: Lepistö et al., 2022

3.7.5.1 Organization environment

The old heritage of the organization needs to be replaced with a new one that consists of a set of principles, ideas, and values that assist in comprehending the most recent events and modify inner and outer variables so that the organization can continue to function normally, the relationships between employees can grow, internal communication can be improved, and decisions can be made with greater ease and effectiveness.

3.7.5.2 Organization framework

Similar to how the company's culture has evolved over time, the organization's structure needs to shift from its traditional form to that of an integrated system, which views the company as a collection of interdependent parts working together toward a common goal and, as a result, motivates managers to view the plan holistically rather than in silos. In addition to improving horizontal and vertical workflow, this also makes it simpler to relay directives, guidelines, and other relevant information to those in charge.

3.7.5.3 Redesigning operations

Because the existing design, depending on inputting modifications solely, does not meet the TQM strategy, new procedures must be established, and they must also correspond with the standards of TQM, in order to enhance the high level of quality. Many different approaches have been employed in re-engineering projects recently. They are predicated on a complete overhaul of the company's foundational structures, systems, practices, and protocols. These strategies are geared toward eliminating mundane tasks, cutting costs, and speeding up and bettering service.

3.7.5.4 Policies and legislation

Policies are regarded as implement for carrying out the organization's job via its controls and basic norms, as well as its general performance. Consequently, the use of TQM necessitates the formulation of new guidelines to serve the organization's updated strategic vision and achieve its goals. However, policies must be adaptable so as not to constrain the freedom of those who apply them. To avoid system disruption, these measures should not approach the barrier of excessive flexibility.

3.7.5.5 Approach of management

The implementation of the TQM approach necessitates replacing the present management design in the organization with such an innovative leadership approach that has certain characteristics and a unique work approach sustained with the modern design, as the organizational leadership's obligation and achievement depend on the appropriate implementation of the TQM framework.

4. METHODOLOGY

4.1 Introduction

The study methodology has been described in this chapter to achieve the purpose of the study and explains the approaches of study used to gathering and analyzing data, where describes the three main steps of this study research framework.

Stage one is a review of relevant literature on the theoretical foundations of quality management systems in organizations. Stage two is a questionnaire survey of Iraqi Engineers working in the organization's management field. Step three includes validating the development of a management system to achieve benefits gained from implementing quality management, and there are several advantages which will be achieved through quality management in Iraq.

The research methods described above are discussed in depth in the following sections. In order to comprehend the intricacy of the research subject, the wealth of present data was crucial in this study.

Therefore, systems that could collect data on numerous elements of a problem were crucial. Possible methods include survey/questionnaire, modelling, and historical analysis.

Therefore, modelling was deemed improper because it could not answer "why" or "where" queries.

In addition, a cursory check of the sponsor's archive materials revealed that Historical Analysis might not be acceptable because the accessible materials might not be capable of focusing on current events or giving the requisite depth of information.

The community of the study consists of chemical plants throughout Iraq, with the inclusion of the pharmaceutical, food, and washing industries.

4.2 Study Design

The research design is a structured overview of how the research study is to be performed, where the overall approach is chosen to systematically and logically combine the various components of a study, effectively solving the research issue and forming a basis for data collection, calculation, and analysis.

The selected approach can be qualitative, quantitative, and mixed methods to guide research procedures that follow some philosophical theories, design techniques, and study methods (Creswell, 2018).

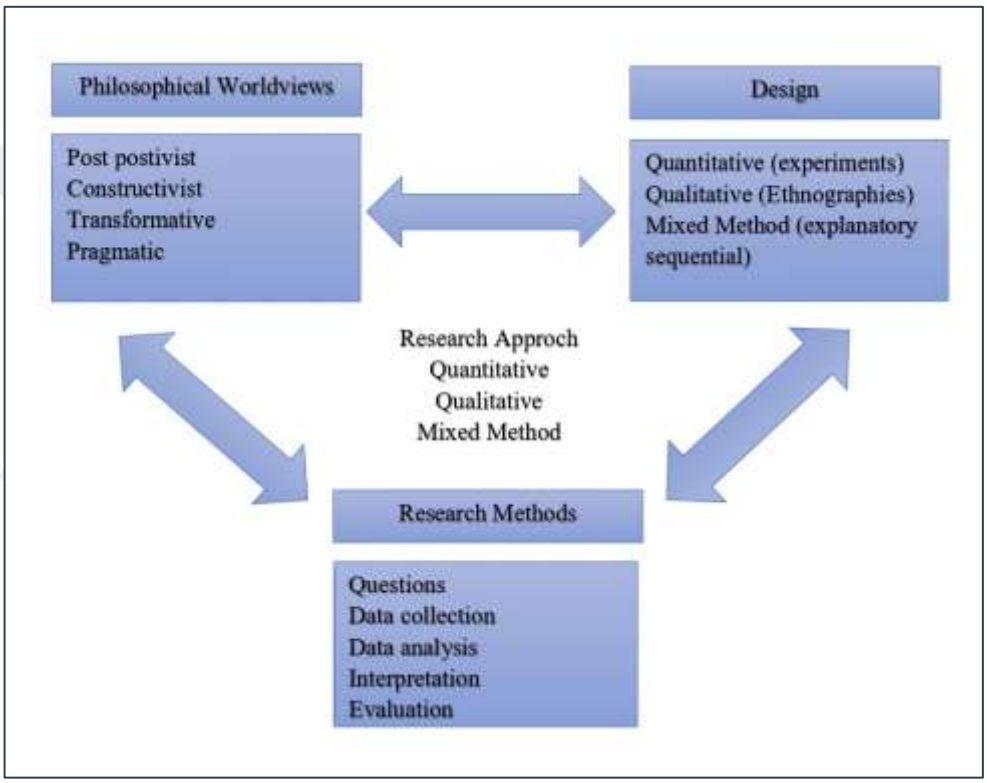

Figure 4.1: Framework for Research Design

Source: Creswell, (2018)

4.3 Hypothetical Concepts

Hypothetical concepts may be described as overall guidelines and understanding of the world or the purpose of a study carried out by the researcher (Creswell, 2018).

Usually, the author uses those principles and theoretical concepts in a research paper. However, some people might never agree that they should accept a particular assumption or agree on the role these hypotheses play in the study process (Mertens,

2019). Philosophical assumptions include ontology, epistemology, axiology, methodology, and philosophical assumptions of rhetoric (Creswell,2018).

Figure (4.2) demonstrates these philosophic assumptions according to Gunatilake (2013), focusing on particular issues like what is the method of the study? How does the investigator relate to the examined person? Which are the principles that contribute to the study? What was the study's reality? What's learning communication?

Ontology is a philosophical assumption regarding the essence of truth in which the investigators believe the multiple reality of their subjects, and this is illustrated by the use of various themes using the technique (What is the study process?) Rhetorical tale (What is the language of research?).

Epistemology is a metaphysical theory of the relation between the researcher and the known and how empirical knowledge has been gained. Axiology is an assumption philosophy on the role of ethics in science. The methodology is a logical theory of the research process and method, which is defined as inductive by the expertise of the scientists in data collection. Rhetoric is the practice of language study and the practice of convincing the public.

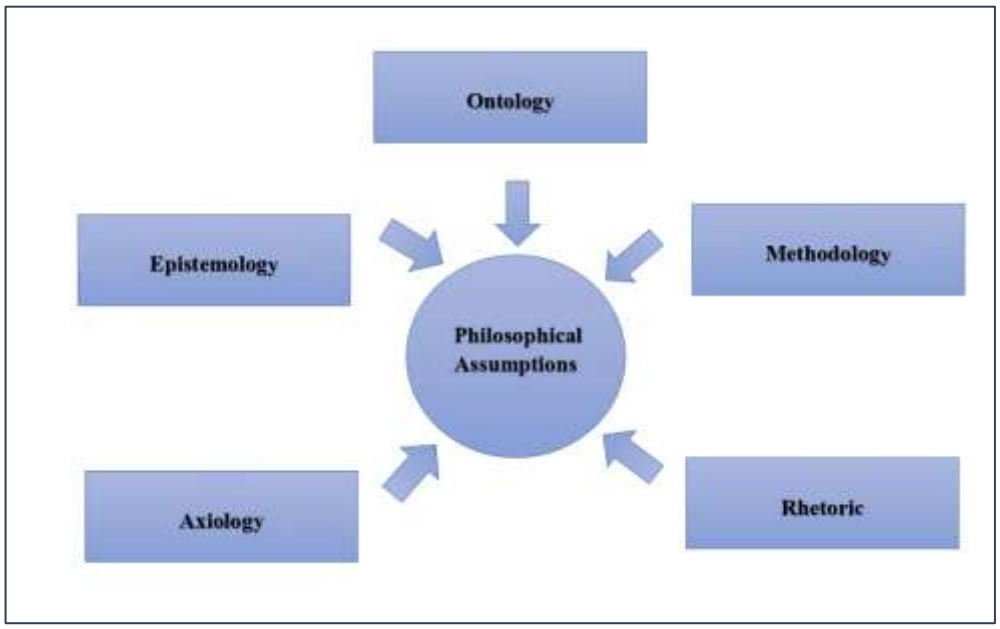

Figure 4.2: Philosophical Theories

Source: Gunatilake, (2013)

4.4 Methods of Research

The researcher's choice of survey type is impacted by three primary factors: the time necessary to complete each survey, the research method, and the sample size. Combining survey methodologies is regarded as an efficient strategy for data collecting. It is based on the concept of mixing two or more strategies for the same subject and maintaining the best characteristics of each while reducing the drawbacks. According to Eyisi (2016) this strategy has been shown to be extremely effective in increasing the credibility of research by increasing the response rate.

This research utilizes a mix of two very effective surveys: an interviewer-administered survey and a self-administered questionnaire.

The variety of this approach enables the researcher to mix several pertinent methodologies in order to address research problems and accomplish research objectives. This combination has the potential to provide a high response rate and a high level of reliability of studies. Additionally, by combining two or more methodologies, the investigator can reach a broader variety of responders who completed the questionnaire is released. However, this strategy demands researchers to invest additional time and effort in addition to possessing the necessary abilities and expertise to run the hybrid method procedure.

From the viewpoint of research goals, a research plan can be categorized as descriptive, correlational, illustrating, or exploratory. The aim of the study will decide the kind of research to be implemented from a perspective of the study goals (Neuman, 2014):

- Research is known as descriptive research when attempting to explain a situation, practice, service, or procedure in a systematic manner or when attitudes regarding certain problems are identified and how to study issues.
- Research includes a correlation between several parts of a situation if the study focuses on attempting to find or assess the nature of an interaction, interdependence, or partnership.
- Research is defined as explaining when the main goal of explaining why events happen and constructing, creating, extending, or testing the theory. It helps to explain why and how two parts of a phenomenon are related.

- Research can be explored if the purpose of a study is to either explore a field where minimal research needs to be done or to explore possibilities for specific research and to establish preliminary concepts and research issues.

The study is descriptive in concept as it aims to explain the various practices of monitoring and optimization in intelligent manufacturing management. The study is also considered an exploration of the method of inquiry, where the study takes both qualitative and quantitative methods into account, and the synthesis between the two methods to sufficient to accomplish the purpose of the study.

4.4.1 Choice of research methodology

The approaches of the analysis adopted by the study are based on the research researcher's philosophical concepts, research design, and fundamental research procedures for gathering, analyzing, and interpreting information, according to Creswell (2018).

Study approaches are defined as the kind of qualitative, quantitative, and mixed techniques that guide the research design processes (Mertens, 2019).

Quantitative research, as per Aliaga and Gunderson (2005), is effective at generating knowledge from a wide range of units in the broadest possible field, but quantitative methods can be very shallow when a topic or idea is to be studied in depth.

The qualitative method is best for a detailed investigation of a study issue. It is a system, which studies subjects in their natural environment, which attempts to explain or perceive a phenomenon with regard to the meanings that people bring to them, where data are inductively analyzed in this method based on details to general concepts, and the researcher interprets the importance of the information (Creswell, 2018).

A qualitative study can define an approach to analysis and try to understand the significance of individuals that are dedicated to social issues, where the qualitative study is intended to examine the real circumstances in their time-based and local circumstances (Flick, 2018).

On the other side, mixed methods give quantitative and qualitative benefits. Researchers regarded the selection between the quantitative and qualitative

approaches as important. Nevertheless, they are no better than the other because they both have distinct traits and have their strengths and limitations (Mertens, 2019).

4.4.2 Selecting a mixed approach

This study uses a mixed-methods approach because the study purpose to get a detailed comprehension of the significance of monitoring and optimization in intelligent manufacturing management. Regarding Creswell (2018), if a practice or theory requires to be investigated and clarified since few studies have been done, then a mixed approach is needed.

Valen and Olsson (2012) conducted a study to determine the extent of the importance of the occupational service management career for the owners of buildings in relation to their buildings in fine, functional, and up-to-date conditions by performing the questionnaire investigation and thorough interviews.

The qualitative approach was the first proposed; due to the limited literature in this field, the research analysis is exploratory and required explanatory studies to validate findings.

The quantitative approach was then used to verify and generalize results for a population and to analyze the results of the qualitative process by means of a questionnaire survey. To accomplish corroborate and generalize the qualitative technique's conclusions to a community and to further investigate their findings, the quantitative approach was then applied via a questionnaire assessment.

4.4.3 Selecting research methods

This section describes effective research approaches by choosing mixed approaches for this study analysis as an acceptable methodology. The search method is the technique for the gathering of observation research information and may be classified into four main topics: documentation, interviews, analysis, and questionnaires (Denscombe, 2010).

The selected methods used for gathering information in this research include documentation and questionnaires. The study mandated an exploratory development approach involving the collection first of qualitative information and then quantitative data.

The study began with gathering qualitative information from related literature and documentation to collect as much knowledge about sustainable building components, it was the first step of the study. The second step of the study involved the acquisition of quantitative data. The results of the documentation gathered were used for designing a questionnaire that was created and then brought up to members of the manufacturing fields and automation project specialists.

4.5 Structure of Research

The study approach implemented in this study could be shown by means of a three stages research framework, as shown in figure (4.3). Stage one consists of the literature review of theoretical foundations and study of quality management conditions in the Iraqi chemical industry, which also includes the highlight on the challenge to implement quality management concepts in Iraqi chemical.

Stage two consists of a questionnaire investigation to assess the results and review additional documents. Stage three consists of validating and analyzing the research results in depth.

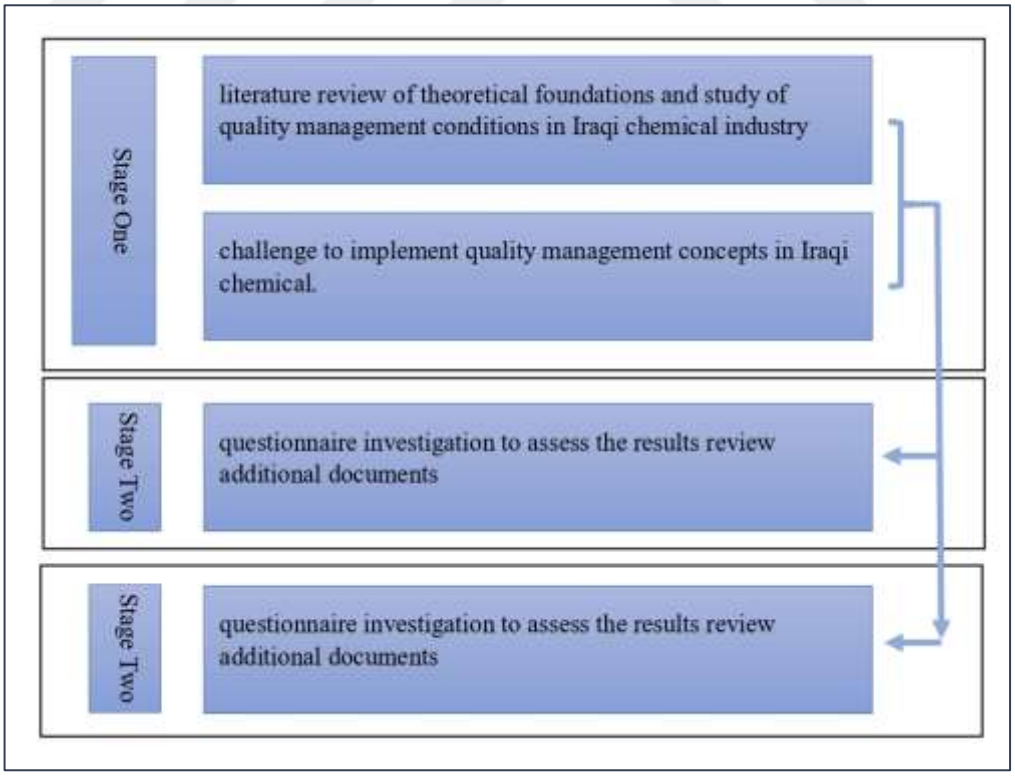

Figure 4.3: Framework of Research Stages

Source: Author

4.5.1 Theoretical structure

The literature review in the study was presented to provide a strong theoretical structure for the field of research and to promote the study's aims and purpose. When findings were made, the literature review proceeded to the latter stages of the study process.

A review of the relevant literature positions of a study defines the information gaps, provides a structure for establishing the value of the study, and thus provides an explanation for the problem statement (Creswell, 2018).

Denscombe (2014) suggests that such a method aims at arriving at a result on the proposed information of a subject depended on a detailed and impartial review of studies carried out on the topic. This method was helpful, where numerous publications on the study subject were identified, but these publications needed to recognize to define theoretical foundations and study of quality management conditions in the chemical industry and challenge to implement quality management concepts in the chemical industry.

The study included selecting the literature from several sources, including books, seminars, blogs, and databases, in addition to several journals like the Journal of Building and Environment, Journal of Construction, Engineering and Management, and Journal of Chemical Industry.

The principle of the literature gathering was a keyword study for the 'Chemical Industry'. The choice of literature has been dependent on background pertinence to the research, paper currency, and material quality.

The stages followed in this study to define the concepts to the achievement of total quality management implementation. Relevance of the analysis included results from earlier studies on the components that establish a sustainable facility; while this consistency of the contents involved concern with the rich data on research objectives available in the literature, the results and suggestions are typically set out in the abstracts.

A total of (35) concepts to achieving total quality management implementation were described. The (35) ingredients were then classified as per literature into concepts related to, Participation and assistance of high management, Engagement and Development of Employees, Continuous Development, Customer - Motivated

Quality, Suppliers Engagement, Organizational Environment, and Utilizing Statistical Control and Feedforward. Each ingredient has been refined to meet the ingredients detected in the analysis of information.

4.5.2 Questionnaire survey

The scientists have designed a questionnaire survey to offer a quantitative or mathematical explanation of population patterns, behaviours, or views by analyzing a sample of that population (Creswell, 2018).

Figure (4.4) shows the research process at this point, where this part is dedicated to designing and processing the survey questionnaire and evaluating the survey results.

The questionnaire aims to evaluate the concepts to achieving total quality management implementation and the challenges of implementing this concept in the Iraqi chemical industry.

Questionnaires are a documented set of queries designed to specifically gather details from persons and gather details utilized for information analysis. Questionnaires must be designed in a method that may be completed easily method and not need any help.

They can be difficult because respondents cannot speak in their own words, and sometimes the researcher has no chance to verify if the responses are valid. However, these are very simple to organize, and all participants have required essentially the same queries and chosen from the recorded responses, it's suitable for quantitative study (Denscombe, 2014).

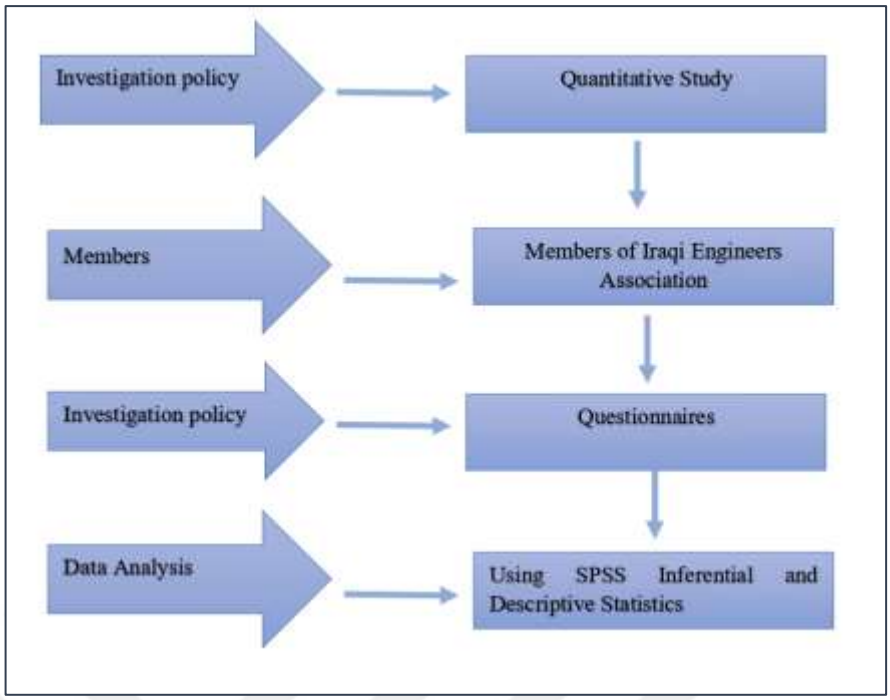

Figure 4.4: Steps of Questionnare Survey

Source: Author

4.5.2.1 Questionnaires sample

The questionnaire study includes a quantitative approach specifically to the use of the sample primarily, which selects individuals, choosing a number for several and generalizing findings that might represent a wider population.

According to Bryman (2016), the degree to which a specimen is a community depends on specimen volume, the basic design of choice processes, and the specimen structure, where the specimen volume is the number of persons from the community through which the investigator gets data, the specimen design or sampling the strategy be referred to the

basic plan choice process, where specimen structure is a list representing persons in a community. The questionnaires were targeted at (145) registered members of the Iraqi Engineers Association (IEA) they work in fields of the chemical industry. The participants were contacted by printing the questionnaire and distributing it in papers, social media numbers, and email addresses obtained from the register of the Iraqi Engineers Association (IEA), as stated above. Where participants were required to answer the questionnaires and send them back through the same receipting method, and then questionnaires (102) were returned after giving them a specific duration (21) days.

4.5.2.2 Questionnaires design

The questionnaires should be designed to gather data that could be used for evaluation, provide a list of questions, and must ask people for data on identified research matters (Denscombe, 2014). where four key criteria must be met while questionnaires are designed:

Theoretical awareness of the study was conducted and obtained by analyzing submitted literature or other qualitative study methods that may function as a pilot approach.

- The validity of the questionnaire, how the question tests what it has been designed to test, and the reliability of the questions, whether these are consistent or relevant.
- Experience in writing a questionnaire and the utilization of a wide variety of questionnaires published.
- Knowledge of the target demographic.

A sample of the questionnaire is included in Appendix A. The questionnaire includes a group of specific questions designed to gather the knowledge that will assist in achieving the aims and objectives of the study.

Specific questions are designed with answers that only permit the answers to match into categories defined by the researcher in advance.

The questionnaire also included the scales defined as measurement levels, which are a method for arranging information in the measurement of indicators into the nominal

an ordinal level, and also scales to determine the intensity, direction, amount, or power of a variable measured in quantitative data.

Scales include Likert, Thurstone, the social distance of Borgadus, semantic differential, numerical ranking, and the scale of Guttman.

They are utilized by social scholars to provide strong data quality, high precision and reliability, compare data sets, and improve data collection and analysis (Neuman, 2014).

The scale of measurements utilized for this study is nominal and ordinal (numerical and Likert) measurement scales. The nominal measurement scale is used in section 1 of the questionnaire; it's required from the respondent to select the speciality of his/her occupation and years of experience.

Section 2 (part 1 and part 2) deals with issues by using the ordinary measurement scale (Likert scale), Where they included a 5-point Likert scale, which requires respondents to indicate to what extent they agree or disagree about the effects and criticality of the listed for the concepts to achieve total quality management implementation and the challenges of implementing this concept in Iraqi chemical industry, where; No.5=Strongly Agree, No.4=Agree, No.3=Disagree, No.2=Neither agree nor disagree, and No.1= Strongly disagree. Due to its simplicity, flexibility, and reliability, the Likert scale is the most widely used form of scaling (Neuman, 2014).

4.6 Data Gathering

The response ratio for the data collection is beneficial in assessing the efficiency of the questionnaires returned in the study. Table (4.1) displays the distribution of the questionnaire for the survey method. 145 questionnaires were distributed directly, either by printed papers or by sent questionnaire link (google format) through social media numbers and email addresses, and then (102) completed questionnaires were then returned, which resulted in (71 %) of participants. Table (4.2) displays the number of responses depending on the various backgrounds.

Table 4.1: Response Rate

Questionnaire		**No.**
The questionnaires were distributed directly	25	145
The questionnaires sent by social media numbers	95	
The questionnaires were sent by email	25	
The overall number of returned completed questionnaires		102

Table 4.2: Engineering Specialization Distribution

Engineering Specialization	**Rate %**	**No.**
Chemical	59.8	61
Production	15.7	16
Mechanical	8.8	9
Electrical	9.8	10
Other	5.9	6
The total number of completed questionnaires returned	100	102

4.7 Data Analysis

The study followed initial steps to insert data gathered in the program SPSS 22, after which the data inserted were reviewed and errors verified. It was a required practice to verify the data input process was correct. SPSS 22 was used descriptively and differentially to analyze the data from the survey.

Helsel (2005) reports that descriptive statistics typically define or identify a collection of data elements and attempt to deduct information obtained by sampling by graphically presenting the information or explaining its key patterns and how it is distributed when inferential statistics are presented.

The primary purpose of a pilot study is to identify issues prior to the main study, allowing the researcher to undertake steps to improve the research methodology.

In addition, researchers conduct pilot tests to determine how long it will take participants to submit questionnaires while addressing all relevant topics without becoming dissatisfied. Patton (2002) opines that pilot experiments should be a standard component of excellent research methodology because they can save investigators both time and money by identifying logistical difficulties and other design flaws prior to the actual study and allowing for corrections and improvements prior to the execution of the main investigation.

Addressing research obstacles in advance is beneficial. Despite the benefits listed above, pilot research does not ensure the success of the major study and can even result to its termination. There may be further flaws that were not disclosed in the pilot.

The study involved the analysis of the percentile form, Cronbach's Alpha, and relative important index. The study also involved the engineering specialization of the different participants in the questionnaire survey, as shown in figure (4.5).

The results show that (59.8 %) have a chemical engineering background that, carries the highest percentage of engineers that they are working in the field of chemical manufacturing sectors; the results also show that (15.7 %) have a production engineering background, while the result shows (8.8 %) have a mechanical engineering background, the results also showed (9.8 %) have an electrical engineering background, and (5.9 %) have other engineering specialization background.

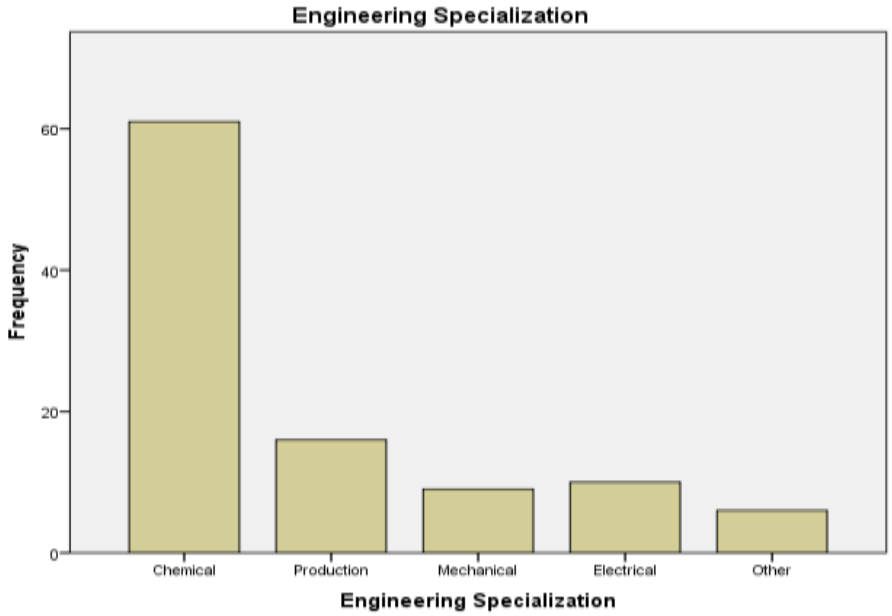

Figure 4.5: Engineering Specialization

The study shows the years of experience of the different participants as per figure (4.6), where (10.8%) from the percentage of the participants the have experience from 0-5 years of professional experience, (12.7%) from the percentage of participants from 6 -10 years of working experience, (8.8%) with 11-15 years of professional experience, (21.6%) of participants from 16 -20 years of professional experience, and (46.1%) for more 21 years of professional experience.

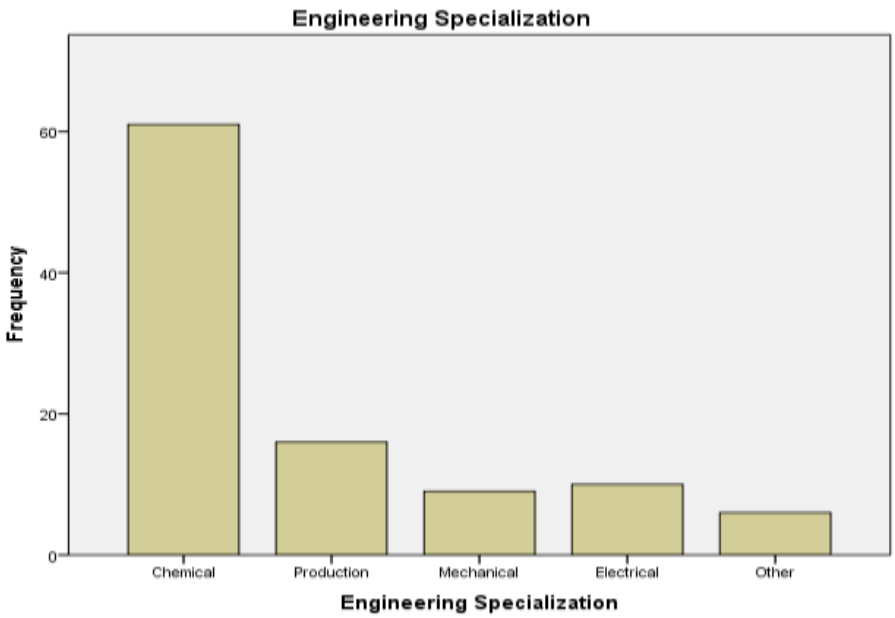

Figure 4.6: Years of Experience

Also, the analysis shows different engineering occupations as per figure (4.7), where (36.3%) they are working in the project management field of chemical manufacturing sectors; the results also show that (32.4%) they are working as product engineers, while the result shows (7.8%) as a planning engineer, the results also showed (14.7%) working supervisor engineer, and (8.8 %) working other engineering occupation.

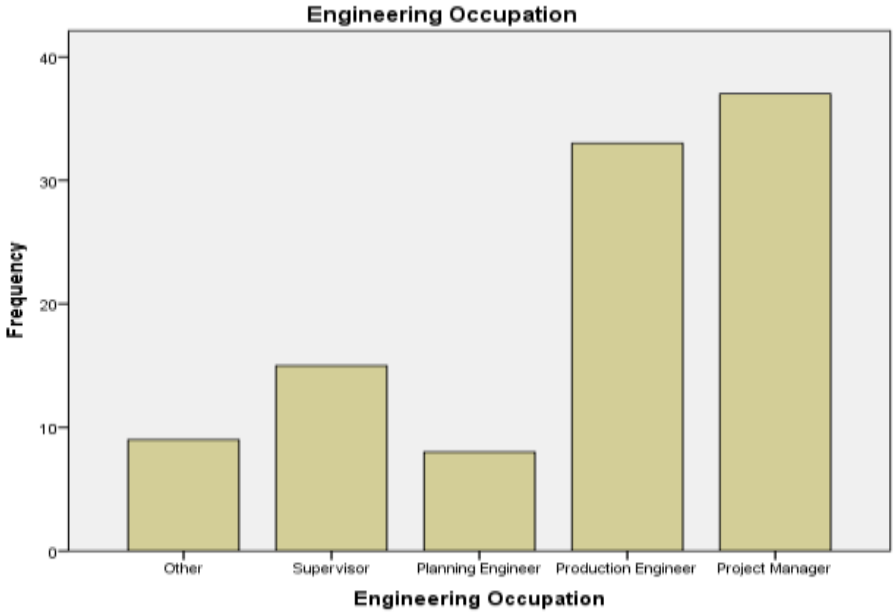

Figure 4.7: Engineering Occupation

The study also shows differences in education level among the participants as per figure (4.8), where (39.2%) of participants they have a BSC degree, (40.2%) of participants they have an MSC degree, while (18.6%) they have PhD degree, and (2%) they have other degrees of education.

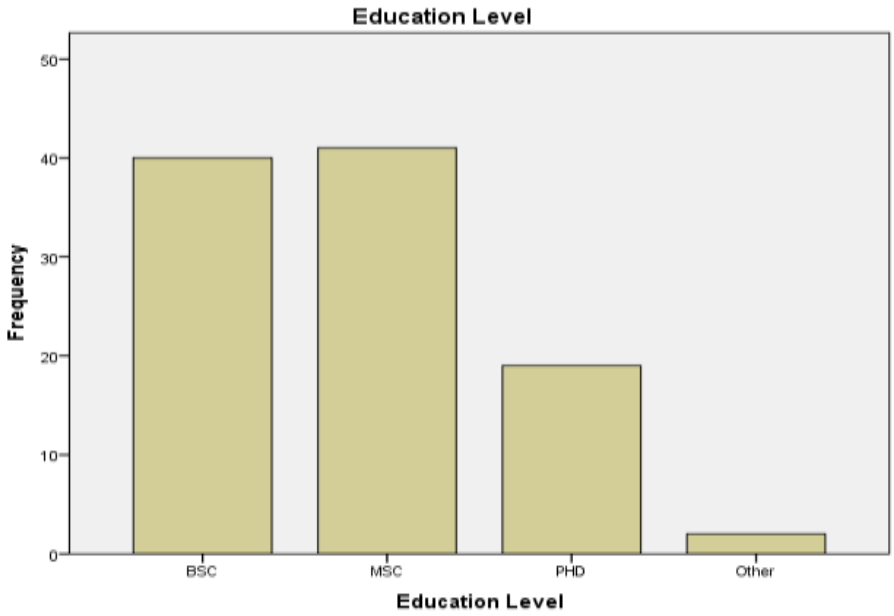

Figure 4.8: Education Level

4.7.1 Assessing the level of data reliability

The reliability assesment was conducted to establish the dependability of scales used to determine the importance of monitoring and optimization concepts in intelligent manufacturing management. The reliability test is utilized to assess the consistency of the selected level, and the "Alpha Cronbach" is the most popular reliability test, as shown in equation (4.1).

The purpose of the reliability evaluation was to indicate the dependability of the measures used to determine the significance of monitoring and optimization concepts in intelligent manufacturing management.

$$\alpha = \frac{n}{(n-1)}\left[1 - \frac{\sum_{i=1}^{n}\sigma_{yi}^{2}}{\sigma_{x}^{2}}\right] \quad \textbf{(4.1)}$$

Where:

α = alpha Cronbach

n = refers to the number of scale items

σ_{yi}^2 = refer to the variance associated with the item i

σ_x^2 = refer to the variance associated with observed total scores

Where the values of (0.70) or larger are accepted, table (4.3) indicates that all values more than (0.70) value, its acceptable for Cronbach's alpha value, meaning that the scales are reliable for this analysis.

The author utilized the internal-consistency approach by calculating the reliability coefficient (Cronbach alpha) for all subjects in the study, excluding the example questions' features. The coefficient of reliability was computed for the dimensions of the investigation.

First elements: The concepts to achievement total quality management implementation.

Second element: The obstacles to the achievement of total quality management implementation.

Table 4.3: The Cronbach's Alpha Values

Components	**No. of Items**	**Value**
The concepts to achieve total quality management implementation	35	0.884
The obstacles to the achievement of total quality management implementation	13	0.777

4.7.2 The concepts to achieve total quality management implementation

The primary purpose of this study is to examine and evaluate the current state of quality in the Iraqi chemical industry with respect to such factors as customer-driven quality; executive management's dedication to and support of quality; institutional culture; provider participation; participative management and advancement; and continuous enhancement.

This study sought to identify the concepts to achievement total quality management implementation into seven elements, each part consisting from 5 concepts, also to data assessment, re-coded were assigned for the questions from (1 to 35) of respondent's opinions on these concepts to code to (C1 to C35), as shown in table (4.4)

Table 4.4: The Concepts to Achievement Total Quality Management İmplementation

No.	Items	Code	Elements
1	Top management must be sets a clear strategic plan and clear goals for how quality is used.	C1	Participation and assistance of high management
2	Top management must be desires to construct a great reputation between some of customers for excellence and increased quality.	C2	
3	The management must be implements a system of rewards to enhance quality.	C3	
4	The management must be concerned with establishing good communication channels between the company's various departments.	C4	
5	Top management must be provides departments with the flexibility necessary to tackle their difficulties.	C5	
6	The company must be educates its employees on contemporary procedures and skills that will enhance their productivity and quality.	C6	Engagement and Development of Employees
7	The goal of the company's training courses is to improve quality.	C7	
8	All personnel at all levels of management must be participate in the company's training program.	C8	
9	The lengthy duration of various training programs will be diminishes the approval of engagement in such programs.	C9	
10	Employees are paid for acquiring new skills to encourage them to be more innovative and proactive.	C10	
11	Company must be aims to address quality issues systematically and persistently	C11	Continuous Development
12	The company must be committed to consistently developing and releasing new items.	C12	
13	The company must have a dedicated research and development division for the continuing enhancement of its products.	C13	
14	Continuous upgrading of products and services affords the business a strategic advantage over rivals.	C14	
15	Company must be engaged in supplying machinery and equipment as well as cutting-edge technology in order to improve the quality of its products.	C15	
16	Customers' requirements and wishes, as well as their level of product satisfaction, must be continuously evaluated by a business.	C16	Customer - Motivated Quality
17	When creating new products, the company must consider the perspective of its clients.	C17	
18	The company must continuously study client issues and propose suitable remedies.	C18	
19	There must be a framework within the organization that facilitates access to management officials for client complaints.	C19	
20	When implementing quality initiatives, the corporation must take into consideration client demand for its products.	C20	

Table 4.4: (Cont.) The Concepts to Achievement Total Quality Management İmplementation

No.	Items	Code	Elements
21	The company must exert significant effort to develop long-term partnerships with its customers.	C21	Suppliers Engagement
22	Depending on quality, a company must be concerned with the legislation governing purchases from lower-priced suppliers.	C22	
23	The effectiveness of providers must be reviewed based on their dedication to quality and timeliness.	C23	
24	The comments of suppliers concerning the materials and costs must be considered.	C24	
25	When designing new items for the company, suppliers' input must be considered.	C25	
26	Top management highlights that all employees are collectively responsible for quality.	C26	Organizational Environment
27	Employees' organizational attachment and loyalty must be bolstered at all times by the management through the provision of all available resources.	C27	
28	Principles and beliefs that are prevalent in a firm would promote growth and lessen reluctance to change.	C28	
29	Top management promotes discussion among employees about ideas and opinions.	C29	
30	Top management is concerned with implementing organizational cultural changes to support availability to quality.	C30	
31	The organization must use quality control programs to monitor plans along the production process.	C31	Utilizing statistical Control and Feedforward
32	To minimize variance and deviation in the manufacturing cycle, the company must employ statistical methods extensively.	C32	
33	Throughout the production cycle, quality control systems in the organization must utilize the right measuring instruments.	C33	
34	The completed product must be sampled to ensure that it conforms to the relevant criteria.	C34	
35	The company maintains (daily or electronic) records of inspection and testing findings for future utilization.	C35	

4.7.2.1 Participation and assistance of high management

Where table (4.5) describes the level of the concepts to achieve total quality management implementation that belongs to the participation and assistance of high management elements, it shows ‘The management must be concerned with establishing good communication channels between the company's various departments (C4) as the maximum value with a ranking summation of (430).

This is followed by 'Top management must be desires to construct a great reputation between some of the customers for excellence and increased quality' (C2) 2nd rank with summation of (430) but with standard deviation (0.84). 'Top management must set a clear strategic plan and clear goals for how quality is used' (C5) ranked the 3rd with a summation of (414).

Table 4.5: Participation and Assistance of High Management

No.	Concept	Mean Values		Std. D.	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	C1	4.06	0.099	1.003	1.006	414	4th
2	C2	4.22	0.083	0.840	0.705	430	2nd
3	C3	3.94	0.083	0.842	0.709	402	5th
4	C4	4.22	0.068	0.684	0.468	430	1st
5	C5	4.06	0.077	0.781	0.610	414	3rd

4.37

4.7.2.2 Engagement and development of employees

Table (4.6) describes the level of the concepts to achieve total quality management implementation that belongs to the engagement and development of employee elements. It shows 'The company must be educating its employees on contemporary procedures and skills that will enhance their productivity and quality' (C6) as the maximum value with a ranking summation of (444).

This is followed by 'Employees are paid for acquiring new skills to encourage them to be more innovative and proactive.' (C10) 2nd rank with summation of (426). 'The lengthy duration of various training programs will be diminishing the approval of engagement in such programs' (C9) ranked the 3rd with a summation of (412).

Table 4.6: Engagement and Development of Employees

No.	Concept	Mean Values		Std. D.	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	C6	4.35	0.071	0.713	0.508	444	1st
2	C7	4.00	0.085	0.856	0.733	408	4th
3	C8	3.98	0.075	0.758	0.574	406	5th
4	C9	4.04	0.086	0.867	0.751	412	3rd
5	C10	4.18	0.084	0.849	0.721	426	2nd

4.7.2.3 Continuous development

Table (4.7) shows the level of the concepts to achieve total quality management implementation that belongs to the continuous development element, where it shows 'The company must be committed to consistently developing and releasing new items' (C12) as the maximum value with a ranking summation of (408).

This is followed by 'The company must have a dedicated research and development division for the continuing enhancement of its products.' (C13) 2nd rank with summation of (407). 'Company must be engaged in supplying machinery and equipment as well as cutting-edge technology in order to improve the quality of its products' (C15) ranked the 3rd with summation of (403).

Table 4.7: Continuous Development

No.	Concept	Mean Values		Std. Deviation	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	C11	3.93	0.079	0.799	0.639	401	5th
2	C12	4.00	0.076	0.771	0.594	408	1st
3	C13	3.99	0.082	0.826	0.683	407	2nd
4	C14	3.95	0.080	0.813	0.661	403	4th
5	C15	3.95	0.078	0.788	0.621	403	3rd

4.7.2.4 Customer - motivated quality

Table (4.8) shows the level of the concepts to achieve total quality management implementation that belongs to the customer-motivated quality element, where it shows 'Customers' requirements and wishes, as well as their level of product satisfaction, must be continuously evaluated by a business' (C16) as the maximum value with a ranking summation of (407).

This is followed by 'When implementing quality initiatives, the corporation must take into consideration client demand for its products.' (C20) 2nd rank with summation of (403). 'There must be a framework within the organization that facilitates access to management officials for client complaints' (C19) ranked the 3rd with summation of (401).

Table 4.8: Customer - Motivated Quality

No.	Concept	Mean Values		Std. D.	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	C16	3.99	0.088	0.884	0.782	407	1st
2	C17	3.88	0.101	1.018	1.036	396	4th
3	C18	3.86	0.089	0.901	0.813	394	5th
4	C19	3.93	0.082	0.824	0.678	401	3rd
5	C20	3.95	0.078	0.788	0.621	403	2nd

4.7.2.5 Suppliers engagement

Table (4.9) shows the level of the concepts to achieve total quality management implementation that belongs to the supplier's engagement element, where it shows 'The effectiveness of providers must be reviewed based on their dedication to quality and timeliness' (C23) as the maximum value with a ranking summation of (414).

This is followed by 'When designing new items for the company, suppliers' input must be considered' (C25) 2nd rank with summation of (410).

'The comments of suppliers concerning the materials and costs must be considered' (C24) ranked the 3rd with a summation of (407).

Table 4.9: Suppliers Engagement

No.	Concept	Mean Values		Std. D.	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	C21	3.93	0.084	0.847	0.718	401	5th
2	C22	3.94	0.076	0.768	0.591	402	4th
3	C23	4.06	0.079	0.794	0.630	414	1st
4	C24	3.99	0.074	0.751	0.564	407	3rd
5	C25	4.02	.072	.731	.534	410	2nd

4.7.2.6 Organizational environment

Table (4.10) shows the level of the concepts to achieve total quality management implementation that belongs to the organizational environment element, where it shows 'Principles and beliefs that are prevalent in a firm would promote growth and lessen reluctance to change' (C28) as the maximum value with a ranking summation of (434).

This is followed by 'Top management is concerned with implementing organizational cultural changes to support availability to quality' (C30) 2nd rank with summation of (416). 'Top management promotes discussion among employees about ideas and opinions' (C29) ranked the 3rd with a summation of (414).

Table 4.10: Organizational Environment

No.	Concept	Mean Values		Std. D.	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	C26	3.95	0.080	0.813	0.661	403	4th
2	C27	3.94	0.075	0.755	0.571	402	5th
3	C28	4.25	0.073	0.740	0.548	434	1st
4	C29	4.06	0.099	1.003	1.006	414	3rd
5	C30	4.08	0.081	0.817	0.667	416	2nd

4.7.2.7 Utilizing statistical control and feedforward

Table (4.11) shows the level of the concepts to achieve total quality management implementation that belongs to the utilizing statistical control and feedforward element, where it shows 'To minimize variance and deviation in the manufacturing cycle, the company must employ statistical methods extensively' (C32) as the maximum value with a ranking summation of (416).

This is followed by 'The company maintains (daily or electronic) records of inspection and testing findings for future utilization' (C35) 2nd rank with summation of (410). 'The completed product must be sampled to ensure that it conforms to the relevant criteria' (C34) ranked the 3rd with a summation of (402) but with a standard deviation (0.78).

Table 4.11: Utilizing statistical Control and Feedforward

No.	Concept	Mean Values		Std. D	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	C32	3.93	0.075	0.761	0.579	401	5th
2	C32	4.08	0.071	0.713	0.509	416	1st
3	C33	3.94	0.090	0.910	0.828	402	4th
4	C34	3.94	0.077	0.781	0.610	402	3rd
5	C35	4.02	0.072	0.731	0.534	410	2nd

4.7.3 The Obstacles to the Achievement of total quality management implementation

As shown in Table (4.12), the obstacles facing to the achievement of the application of the concepts of total quality management in Iraq.

Table 4.12: The Obstacles to Achievement TQM Implementation

No.	Items	Code
1	The devotion of top management to conventional management principles.	O1
2	Absence of top-level commitment to and comprehension of quality programs.	C2
3	Top management concentrates on short effectiveness.	C3
4	The company lacks a defined plan for quality management.	C4
5	Implementing a quality system necessitates altering the organizational environment of the company, which is not possible.	C5
6	Costs associated with implementing a quality program are superfluous.	C6
7	Real effects of quality program execution do not inspire continuity.	C7
8	Implementing a quality program cannot address the company's difficulties.	C8
9	The team responsible for quality improvement is preoccupied with basic issue-solving rather than identifying the fundamental cause of a challenge.	C9
10	Lack of excellent education and training courses for employees to drive the company's development approach.	C10
11	Absence of staff dedication and enthusiasm for the company's quality efforts.	C11
12	Employee opposition to quality programs within the organization.	C12
13	Lack of recognition and rewards for personal accomplishments.	C13

After statistically analysis by SPSS, The percentage of obstacles to achieving the implementation of quality concepts in Iraq is depicted in table 4.13, where the results revealed (13) obstacles, the first five the as the maximum value with a ranking index are;

Table 4.13: The Level of the Obstacles Facing the Implementation of the Principles of Quality in Iraq

No.	Code	Mean Values		Std. D.	Variance	Total amount of points	Rank
		St.	Std. Err. of M.				
1	O1	4.02	0.078	0.783	0.613	410	3rd
2	O2	3.85	0.089	0.894	0.800	393	10th
3	O3	3.87	0.089	0.897	0.805	395	7th
4	O4	3.81	0.081	0.817	0.668	389	12th
5	O5	4.18	0.087	0.883	0.780	426	2nd
6	O6	4.42	0.077	0.776	0.603	451	1st
7	O7	3.85	0.092	0.927	0.859	393	11th
8	O8	3.87	0.093	0.941	0.885	395	8th
9	O9	3.90	0.077	0.777	0.604	398	5th
10	O10	3.98	0.079	0.796	0.633	406	4th
11	O11	3.89	0.089	0.900	0.810	397	6th
12	O12	3.85	0.082	0.825	0.681	393	9th
13	O13	4.18	0.087	0.883	0.780	426	2nd

O6 “Costs associated with implementing a quality program are superfluous” ranked with level 1st , **O5** and **O13** “ Implementing a quality system necessitates altering the organizational environment of the company, which is not possible“ and “Lack of recognition and rewards for personal accomplishments “ at level 2nd , **O1** “Lack of knowledge of sustainable buildings among building experts” ranked at 3rd level, **O10** “Lack of excellent education and training The team responsible for quality improvement is preoccupied with basic issue-solving rather than identifying the fundamental cause of a challenge” ranked with level 4th . While **O4** “The company lacks a defined plan for quality management” ranked with the latest level (12th).

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was to identify the benefits of implementing a Quality Management System Improvement for the Iraqi Chemical Industry (ICI), which can easily be included into their existing business and project quality management procedures. This goal was accomplished in the context of Iraqi production organizations by examining issues relating to the effectiveness and continuous improvement of quality management systems that were implemented within the country's chemical industry. With the assistance of a strong organizational culture and the extensive collection of data, this goal was accomplished.

The research helps to fill in the problems of implementing ISO 9001's stated ideals and the presence of actual proof of the QMS in the Iraqi chemical sector. This ensures the ultimate delivery of a well-operated QMS that is capable of giving customer satisfaction. This study emphasizes a lack of research purpose in the organizational culture profiles of Iraqi chemical businesses to evaluate the role of organizational culture in driving effective QMS-ISO 9001 adoption.

Another finding of this study is that there is a lack of research purpose in the organizational culture profiles of Iraqi chemical organizations. The following is a list of the findings that were derived from the research. In accordance with the study's results, the status of good business performance enjoyed by production firms that have been awarded the ISO 9001 certification cannot be directly associated to the certification of their achievement of the ISO 9001 status.

As a result of this, Iraqi manufacturers are compelled to remain in their "safe zone" and do not view the certification as having any substantial value-adding consequences, other than the requirement to fulfill tender administration standards for domestic infrastructure projects.

This post will not be available for a considerable amount of time due to the fact that Iraqi producers are currently dealing with reforms in the national construction sector

as well as worries regarding global competitiveness. If the Culture-based Quality Management System Improvement Implementation Framework can be made to function properly, it suggests that the frameworks can assist the ISO 9001 certified Iraqi producers in utilizing the adoption of QMS-ISO 9001 in helping them with better project quality delivery, as well as making them more competitive in their industry.

The chemical fields are crucial to any nation's economy because of the significant contribution they make to GDP via the goods and services they produce and the fact that they overlap and are intricately intertwined with the other sectors of production, agriculture, and assistance. Phosphorus has many applications in the food industry and other sectors, and its production often necessitates the use of chemical fertilizers, making it a scarce resource. To illustrate, some cars and materials generated by the chemical sector are utilized in the leather enterprises and tanning leather, and textiles, but this crucial component does not enter into food production.

5.2 Conclusions of Study

TQM is viewed as a commitment to creativity, innovation, and continuous improvement, and it can also be viewed as the success of implementing this new management strategy in a variety of businesses. This is contingent on the degree to which all members of the organizations contribute to its implementation and participate in it, and the management of the organizations plays a major role in all of these many activities.

This chapter, as the name suggests, provides a summary of the most important findings from the research as well as the inferences that can be made based on these findings. At the end of the chapter, there are a the amount of recommendations and proposals created.

1- The findings of the assessment of the data highlighted that the chosen Iraqi chemical industry was devoted to the implementation of "TQM", where the specialists were engaged in continual enhancement of "TQ" and the implementation of statistical management and resulted was applied.This was shown to be the case by the results of the assessment of the information.

2- The findings demonstrate a significant commitment and support from top management in the chosen chemical industry in Iraq for the submission of TQM. When it comes to the application of TQM, top management is regarded as the most important component.

This is as a result of the level of understanding that organization management possesses on the significance of using this system. This observation is congruent with the findings of many previous research, in which senior management shown strong support.

3- The chosen Iraqi chemical industry placed a high priority on the patronage of the business. The exclusively method to keep present consumers and acquire new clients in time to come is to satisfy the constantly shifting demands, expectations, and wants of external clients.

This attention is not only paid to the company's exterior clients, but also to those on the inside. Obtaining an advantage over one's competitors requires this, as it is an essential component. On the other hand, the periodic meetings that took place between these businesses and their clients did not live up to the standards that were desired. The transmission of feedback from customers to appropriate administrative personnel was ineffective.

4- Regarding the ongoing improvement, which is one of the TQM stage's applications, the selected Iraqi chemical industry shown a motivation to fulfill the duty collectively accountable for a variety of management stages, by producing products of a high quality.

This was accomplished by delivering products that met the requirements of the customers. They also devoted adequate attention to the process of evaluating the performance of workers in accordance with the principle of constant enhancement. In addition to this, they shown a significant interest in the perspectives of staff members regarding the various ways in which the company's operations may be enhanced.

5- In the past, the firms would brief their suppliers on the quality standards that were expected of their products. The examination of the efficiency of the potential suppliers with regard to the quality of their manufacturing need materials served as the basis for choosing one of the providers.

The evaluation of the materials was required of the providers as part of the regulations. These data demonstrate that there was an emphasis placed on a particular group of vendors. Establishing long-term partnerships with suppliers is extremely significant since it guarantees that materials will be supplied in accordance with the necessary criteria.

Nevertheless, there were some businesses that demonstrated an interest in the requirements of purchases made from suppliers offering lower expenses, regardless of the quality. Historical studies have, for the most part, highlighted the significant relevance and attention that have to be paid to the various suppliers in the chemical sector. Nevertheless, there were research studies that argued towards giving the suppliers like a significant role in the decision-making process for a particular reason.

6- The management is constantly interested in offering all possible methods to promote organizational patriotism and connection among staff members, but the values and beliefs that are predominant in a firm do not support the advancement and raise resistance to change.

Additionally, the organizational environment that predominates in the company does not foster an environment that is conducive to innovative thinking and creativity to an adequate degree.

7- Selected firms in Iraq's chemical industry conduct quality checks at multiple points in the manufacturing process, including sampling intermediate and finished goods to ensure they meet standards, but these businesses are unable to make adequate use of statistical methods, which are crucial for minimizing sources of error.

8- The implementation of the TQM system was met with a number of challenges. To begin, the management concentrated their efforts on short-term efficiency and outcomes correlating with the application of the TQM approach, and they viewed the expense related with this endeavor as being unneeded. Second, there appeared to be deficiency in the number of high-quality education and development programs that were made available to personnel in order to propel the process of progress within the organization.

In addition, the corporations struggled or were unable to alter the culture of their respective organizations. They additionally failed to provide the job application of the quality culture the appropriate attention it deserved in order to adapt it to the new structure of work founded on complete quality.

9- Monitoring on the difficulties of work constituted one of the most significant challenges that needed to be overcome before the TQM system could be applied. The administrative productivity can be improved by attending to the issues and errors that have been raised. As a consequence of this, they contribute to a reduction in the number of client complaints and a reduction in the cost of quality, which ultimately leads to satisfied clients.

Another obstacle was the efforts of businesses to boost their productivity and earnings, which ultimately led to a rise in their market share.

10- In the end, the researcher believed that the level of engagement of their employees was a vital aspect in accomplishing progress and providing the appropriate product the first time and every time in order to make the most of the advantage they had over their competitors.

5.3 Recommendations

Based on the findings of the interviews and the assessment of the relevant literature, the study made several recommendations for steps that the government and various participants in the Iraqi chemical industry should take in order to embrace TQM in order to create a more effeciency of these industries.

1- Proceeding with the work that is being done to acquire the participation of suppliers in order to accomplish a comprehensive implementation of combined TQM characteristics. This will make it possible to evaluate suppliers not on the foundation of pricing but rather on the foundation of the quality of the components that they supply.

Companies shouldn't broaden their relationships with all of their suppliers; instead, they should focus on cultivating such relationships with a select group of skilled providers.

2- Putting a larger emphasis on the utilization of statistical methods and quality control technologies. They contribute to the process of locating and analyzing quality issues.

3- After getting the proper training and qualification, providing employees sufficient authority to adjust and enhance their working ways is a good way to motivate them.

Understanding of their accomplishments enables them to release optimal utilization of the staff through teamwork, establish an atmosphere that is suited for regulatory compliance, and provide individuals with the opportunity to express their thoughts, not to mention instill trust in the workforce as a whole.

4- It is critical for businesses that have not previously used this system to put into practice the principle of total quality management (TQM). This is what's known as a system of management, and part of it involves investigating its many benefits, which can include things like lowering costs, raising productivity, boosting performance levels, boosting customer satisfaction, maximizing their competitiveness, raising the bar on optimum use of resources, and raising profits over the course of time.

5- Enhancing people's understanding of the submision of total quality management in order to create it the most essential aspect of the overall organizational enviromental that exists in Iraq's chemical facilities.

6- Developing a robust projects for importation and exportation and easing the movement of products and services produced in Iraqi industries into international markets are two goals of this project.

7- As a result of the direct influence it has on people's health, the chemical sector in Iraq is devoting increasing emphasis to improving the quality of its products.

As a result, raising awareness not only among the manufacturers but also among the customers is very crucial for the growth of their sector.

8- Finding a way to collaborate on research projects among pharmaceuticals industries and academic institutions is necessary for the progression of the

industry. Systems that are efficient in terms of costs, as well as economic and management knowledge systems, are required.

9- It is strongly advised that comparable studies be carried out based on either the “ISO” approach or the “Six-Sigma” approach. This is because such research would assist to the spotlighting of the significance of the quality application and its effect on the Iraqi chemical industry.

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RESUME

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