

-RESEARCH ARTICLE-

## THE ROLE OF THE DIMENSIONS OF VALUE ENGINEERING TECHNOLOGY IN ENHANCING QUALITY MANAGEMENT PRACTICES

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### —Abstract—

Quality management practices represent a critical area requiring enhancement and have been a focal point of recent research. Consequently, the current study seeks to elucidate the impact of value engineering, encompassing its dimensions of quality, function, and

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cost, on quality management practices. Additionally, the study investigates institutional awareness as a moderating variable influencing the relationship between value engineering dimensions—namely quality, function, and cost—and quality management practices. The research employed a purposive sample comprising department and division managers within the food industry sector in Iraq. Data collection was conducted via questionnaires, and the reliability and relationships among variables were analysed using SPSS. The findings reveal that value engineering dimensions, including quality, function, and cost, are positively associated with quality management practices. Furthermore, the results demonstrate that institutional awareness significantly moderates the relationship between value engineering dimensions and quality management practices.

**Keywords:** Value Engineering Dimensions, Quality, Function, Cost, Institutional Awareness, Quality Management Practices.

## INTRODUCTION

Quality management helps organisations improve quality continuously and create products and services with greater design and functionality. Effective quality management holds significant importance for organisational success. High-quality products and services are better positioned to meet consumer needs, attract a larger customer base, and foster customer loyalty. A loyal customer base contributes to consistent sales and profits for the organisation. Moreover, implementing quality management practices helps reduce operational costs. By identifying and addressing issues during the early stages of production, organisations can minimise defects and significantly decrease the need for rework or product scrapping. This leads to cost savings associated with rework, waste, and returns (Tambare et al., 2021).

Kaur et al. (2024) highlight the organisational benefits of quality management, noting that it fosters a structured work environment where employees derive satisfaction from observing the positive outcomes of their contributions. This, in turn, enhances employee morale, commitment, motivation, and productivity. Such adherence safeguards the organisation's operational legitimacy and credibility (Abbas, 2020). The critical role of quality management in the business sector underscores the necessity for further research into its practices and applications. Leadership quality, strategic planning, senior management commitment, customer relationships, information analysis and improvement, human resource efficiency, operational management, & business outcomes are all stressed in quality management. Organisational departments and projects must work well to adopt quality management practices. General Electric's 1940s value engineering strategy during World War II can influence this procedure. Due to frequent shortages, buying engineer Lawrence Miles and his team found cheaper, comparable components and supplies (Zonnenshain & Kenett, 2020).

Value engineering, often known as value analysis, is a methodical approach to completing project tasks at the lowest cost. The approach prioritises the functional requirements of materials and components rather than their physical characteristics (Elhegazy, 2022). The value engineering methodology is characterised by three key dimensions: quality improvement, cost reduction, and functional enhancement. The adoption of this technology enables organisations to enhance their operational efficiency and improve employee performance across various departments. By integrating value engineering principles, organisations can effectively support and implement quality management practices, fostering improved outcomes in business operations (Rosłon et al., 2020).

The study examines quality management practices in Iraq's food industry, focusing on firms in a developing, upper-middle-income economy. In 2024, Iraq's economy recorded a GDP of \$264.149 billion, ranking 46th globally, while its purchasing power parity (PPP) stood at \$655.420 billion, placing it as the 48th largest economy (Al Jabouri & Al-Akili, 2022). However, there was a notable decline in GDP growth, from 8.8% in 2023 to 3.66% in 2024. The food market in Iraq generated revenue of approximately \$36.75 billion in 2024, with an anticipated annual growth rate of 13.83% (CAGR 2024–2029). This expansion should yield a \$1.565 billion market by 2029. The meat segment, with a market value of \$6.21 billion in 2024, represents the largest sector within the food market. Key industries within Iraq's food sector include the production and processing of barley, wheat, rice, and maize, alongside the sugar, oil, and tobacco industries (Ali, 2021). The Iraqi food industry holds a significant share of the country's GDP and is anticipated to contribute further to economic growth. However, the performance of firms in this sector remains inadequate to meet the demands of both local and global markets, thereby hindering the generation of sustainable revenues. Quality-related challenges are a primary factor behind this shortfall, highlighting the urgent need for an effective quality management framework. Quality management practices are the subject of this study to fill this gap. Its primary objective is to examine the role of value engineering technology dimensions—such as quality improvement, cost reduction, and functional enhancement—in facilitating effective quality management practices. Additionally, the study investigates the moderating role of institutional awareness in strengthening the relationship between value engineering dimensions and quality management practices.

Total quality management (TQM) practices are hallmark features of the modern business era, designed to enhance product quality, optimise work processes, and establish organisational environments that foster employee accountability. These practices are crucial for ensuring an organisation's survival and continuity amidst intense market competition while maintaining its market share. The integration of value engineering technology into TQM practices plays a pivotal role in reducing production costs, addressing competitive pressures, and meeting customer needs and expectations.

The research problem can be encapsulated in the following question:

1. Does the value engineering technology dimension of cost reduction enhance TQM practices?
2. Is there a relationship between the value engineering technology dimension of improving functions and quality management practices?
3. Does the value engineering technology dimension of quality improvement enhance TQM practices?
4. Does institutional awareness moderate the relationship between value engineering technology dimensions and the enhancement of TQM practices?

In addition, based on the above discussions and highlighted questions, the present study has the following objectives:

1. To examine the impact of the value engineering technology dimension of cost reduction on enhancing TQM practices.
2. To analyse the relationship between the values engineering technologies dimension of improving functions and quality management practices.
3. To evaluate the role of the value engineering technology dimension of quality improvement in enhancing TQM practices.
4. To examine how institutional awareness moderates the relationship between value engineering technology dimensions and TQM improvement.

The current study makes significant contributions to the literature. First, while previous research primarily examined the overall impact of value engineering technology on quality management practices, this study extends the scope by focusing on specific dimensions such as quality improvement, cost reduction, and functional enhancement. Second, it addresses a gap in the literature by analysing institutional awareness as a moderating factor between these dimensions and quality management practices, an area that has received limited attention. Third, the study contributes to the field by applying its research framework to food organisations in Iraq, providing context-specific insights. The study is organised into five sections: the second section reviews previous studies, discusses relationships, and presents hypotheses; the third outlines research methods; the fourth tests the hypotheses; and the final section discusses results, conclusions, implications, and limitations.

## LITERATURE REVIEW

The dimensions of value engineering form a foundational framework for studies aimed at enhancing total quality management practices, particularly within productive organisations. As noted by [Lysak \(2024\)](#), value engineering is characterised by three primary dimensions: function, quality, and cost. Similarly, [Chatterjee et al. \(2022\)](#) identified additional dimensions, including efficiency and effectiveness, alongside

function, quality, and cost. For the purpose of this study, the three dimensions of function, quality, and cost have been adopted as they represent the core capabilities of value engineering technology and align with the research sample. These dimensions serve as essential tools for value analysis and will be elaborated on in detail as follows.

**Function:** One of the primary objectives of value engineering is to achieve the desired outcome at the lowest possible cost. According to [Lysak \(2024\)](#), value engineering encompasses all tasks performed by a worker within a specific project to deliver a final product, whether tangible or intangible, such as a service.

**Quality:** Quality is defined as the ability to achieve the optimal level of performance of a specific function through the characteristics of the product or service provided ([Chatterjee et al., 2022](#)). In other words, it reflects the capacity to meet the desires and needs of the customer. Quality can be further classified into three categories: design quality, conformity quality, and performance quality.

**Cost:** Cost is typically measured in monetary units and is associated with a specific product. It includes both direct and indirect costs, as well as operation and maintenance costs, representing the total expenses incurred over the product's lifecycle. Therefore, a unified definition of cost is the total amount spent to acquire a particular product or service ([Chatterjee et al., 2022](#)). In today's competitive and globalised environment, quality management has become a widely researched topic. Numerous studies have debated the relationship between value engineering technology dimensions, such as quality improvement, cost reduction, and functional enhancement, and the implementation of quality management practices. Researchers have explored these relationships from various perspectives. A review of relevant previous studies is presented below to inform the development of appropriate hypotheses.

Quality improvement is a fundamental principle of value engineering technology, focusing on enhancing the quality of materials or resources used in projects by providing alternatives to existing ones. This improvement helps overcome production issues and enhances the performance of products. It fosters an environment where employees can achieve quality outcomes in their roles, thereby facilitating the effective implementation of quality management practices ([Alzoubi et al., 2022](#)). [Othman et al. \(2020\)](#) examined the impact of quality improvement on quality management practices. Their study found that firms that prioritise the quality of energy resources, such as clean energy, experience reduced waste and environmentally friendly value addition to production. Thus, quality improvement is a crucial step in implementing quality management practices. Similarly, [Saffar and Obeidat \(2020\)](#) emphasised that when management focuses on quality improvement as part of value engineering technology, the flow of communication and information becomes more effective, leading to the successful conversion of quality management strategies into practical outcomes. Thus,

**H1:** *Quality improvement as value engineering technology has a positive association with the implementation of quality management practices.*

In value engineering, the cost of materials, resources, or components used in a project is assessed with the aim of replacing them with more affordable alternatives. Cost reduction, achieved without compromising quality, can be directed towards socially responsible projects, enhancing products and services to meet customer requirements. This process encourages the execution of quality management practices (Kukanja & Planinc, 2020). Henrique and Godinho Filho (2020) examined the relationship between cost reduction in value engineering and quality management. Their study demonstrated that cost reduction through value engineering improves a firm's financial capacity, enabling more effective implementation of quality management strategies. Similarly, Belanche et al. (2021) noted that socially or environmentally responsible plans, which form the foundation of quality management, require financial resources in addition to economic investments. Cost reduction through value engineering supports these socially responsible initiatives and accelerates the adoption of quality management practices.

**H2:** *Reducing cost as value engineering technology has a positive association with the implementation of quality management practices.*

Value engineering focuses on altering resources or materials and integrating them to perform their functions effectively, refining processes to achieve quality outcomes. Zaid et al. (2020) examined the relationship between function improvement in value engineering and quality management practices. Their study found that value engineering concentrates on the essential functions of materials or components, enhancing teamwork, resource integration, and production quality. Consequently, function improvement fosters the quality management process. Similarly, Werdhiastutie et al. (2020) demonstrated that eliminating unnecessary processes helps workers focus on core functions, ensuring quality outcomes and supporting quality management practices.

**H3:** *Improving functions as value engineering technology has a positive association with the implementation of quality management practices.*

Organisational personnel interested in applying value engineering technology for quality improvement need sufficient relevant knowledge and information. If business administrators foster institutional awareness among employees, they can identify and implement high-quality alternatives effectively, leading to successful quality management practices, efficient operations, and quality production. Werdhiastutie et al. (2020) explored the relationship between institutional awareness, quality improvement, and quality management practices, finding that higher institutional awareness enhances

the contribution of quality improvement to quality management implementation. [Azam et al. \(2021\)](#) suggested that institutional awareness strengthens the bond between the organisation and its employees, fostering commitment. This, in turn, motivates employees to actively engage in quality improvement as part of value engineering, benefiting quality management practices, particularly in the early stages of infrastructure, production, and marketing.

**H4:** *Institutional awareness plays a moderating role between the quality improvement and the quality management practices implementation.*

Institutional awareness equips employees with the knowledge, skills, and expertise to perform business functions effectively. It enables them to assess situations accurately and make informed decisions to overcome costs by introducing suitable alternatives for materials, resources, and methods in projects. By reducing project costs, firms can initiate sustainable programmes that align closely with quality management ([Chiarini, 2020](#)). [Ali et al. \(2020\)](#) Suggest that institutional awareness reinforces the relationship between quality improvement and quality management. Similarly, [Akdere et al. \(2020\)](#) found that high institutional awareness strengthens the professional capabilities of employees in cost reduction through value engineering, which enables firms to reinvest savings in innovation and implement quality management practices effectively.

**H5:** *Institutional awareness plays a moderating role between reducing cost and the quality management practices implementation.*

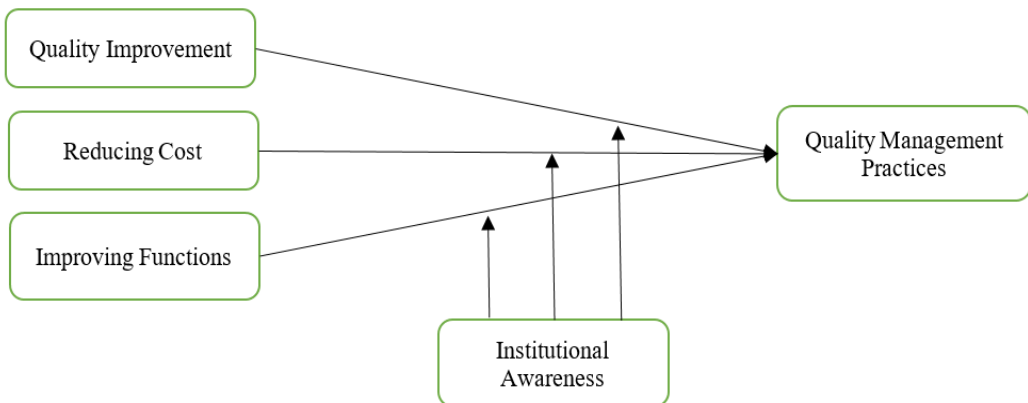
Where an organization makes its employees more institutionally aware, it develops better human resources with increased knowledge and skills. Hence, it creates efficient and cooperative teams that apply value engineering technologies effectively, such as the improvement of functions, to achieve quality management goals ([Kosiborod et al., 2020](#)). [Komalasari et al. \(2020\)](#) Analyze the relationship between institutional awareness, function improvement through value engineering, and the implementation of quality management practices. This study concluded that high institutional awareness enables employees to improve functions through value engineering and thus facilitates execution of policies pertaining to quality management. Similarly, [Hyman et al. \(2020\)](#) Argue that higher institutional awareness can enable employees to assess the functionality of resources and their positive impacts on business, which contributes to the development of functions and the implementation of quality management. Therefore,

**H6:** *Institutional awareness plays a moderating role between improving functions and the quality management practices implementation.*

## RESEARCH METHODOLOGY

The current work investigates the impact of value engineering dimensions (quality, function, and cost) on quality management practices, while also investigating institutional awareness as a moderating variable between these dimensions and quality management practices. Data for the study were collected from department and division managers within the food industry in Iraq. The study variables were measured using previously established scales: quality was assessed with five questions (McKendry et al., 2022), function with four questions (McKendry et al., 2022), and cost with five questions (McKendry et al., 2022). Institutional awareness was measured with four questions Soodmand Afshar and Moradifar (2021), while quality management practices were assessed using five questions (Kosiborod et al., 2020).

The study targeted department and division managers from the food industries in Iraq as respondents. Surveys were distributed through personal visits to the industries. The sample population consisted of 1,250 managers, and using Krejcie and Morgan(1970) sample size criteria, the study determined a sample size of 295. To enhance the response rate, 503 surveys were distributed, and after 15 days, 290 valid responses were received, yielding a response rate of approximately 57.65%. The SPSS software was used to assess data reliability and the relationships among the variables, providing robust results from both primary and secondary data (Hair Jr et al., 2020). The study employed 3 independent variables related to value engineering—quality improvement (QI), reducing cost (RC), and improving function (IF)—with institutional awareness (IA) as the moderating variable and quality management practices (QMP) as the dependent variable, as illustrated in Figure 1.



**Figure 1:** Theoretical Model

## RESEARCH FINDINGS

This study examines how value engineering factors (quality, function, and cost) affect quality management methods and how institutional awareness moderates this

relationship. The consistency of a scale in delivering identical results with the same sample under equivalent conditions is called reliability (Hair et al., 2014). A Cronbach's Alpha score below 0.60 suggests poor dependability, 0.60–0.70 is acceptable, and 0.80 or more shows good consistency. However, validity guarantees the scale measures what it should (Hair Jr et al., 2020). Content validity evaluates the researcher's definition of relevant variables and their relevance to the study. The variables' reliability coefficients are displayed in Table 1.

**Table 1: Reliability Coefficients**

Variables	Cronbach's Alpha	Items
Quality Improvement	0.872	5
Reducing Cost	0.731	4
Improving Function	0.724	5
Institutional Awareness	0.852	4
Quality Management Practices	0.819	5

The results of the correlation matrix revealed no issues of auto-correlation and demonstrated the relationships among the variables. The values were all below 0.90, indicating the absence of auto-correlation, while the positive values indicated a positive correlation between the variables. Additionally, the p-values were all below 0.05, suggesting statistically significant correlations among the variables. These results are presented in Table 2.

**Table 2: Correlation Coefficients**

		Quality Improvement	Reducing Cost	Improving Function	Institutional Awareness	Quality Management Practices
Quality Improvement	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	290				
Reducing Cost	Pearson Correlation	0.130*	1			
	Sig. (2-tailed)	0.027				
	N	290	290			
Improving Function	Pearson Correlation	0.061	0.444**	1		
	Sig. (2-tailed)	0.301	0.000			
	N	290	290	290		
Institutional Awareness	Pearson Correlation	0.110	0.636**	0.421**	1	
	Sig. (2-tailed)	0.062	0.000	0.000		
	N	290	290	290	290	
Quality Management Practices	Pearson Correlation	0.168**	0.395**	0.517**	0.401**	1
	Sig. (2-tailed)	0.004	0.000	0.000	0.000	
	N	290	290	290	290	290

\*. Correlation is significant at the 0.05 level (2-tailed).  
 \*\*. Correlation is significant at the 0.01 level (2-tailed).

The results indicated that the value engineering dimensions—quality, function, and cost—are positively associated with quality management practices, thereby supporting H1, H2, and H3. Additionally, the findings revealed that institutional awareness significantly moderates the relationship between the value engineering dimensions and quality management practices, confirming H4, H5, and H6. These results are presented in [Table 3](#).

**Table 3: Regression Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	2.537	0.308		8.223	0.000
	Quality Improvement	0.034	0.009	0.032	3.777	0.000
	Reducing Cost	0.131	0.044	0.147	2.977	0.005
	Improving Function	0.286	0.131	0.310	2.181	0.030
	QI x IA	0.026	0.009	0.131	2.888	0.009
	RC x IA	0.061	0.030	0.411	2.033	0.025
	IF x IA	0.023	0.010	0.145	2.300	0.015
a. Dependent Variable: Quality Management Practices						

## DISCUSSION

The study found that quality improvement through value engineering positively influences the implementation of quality management practices, supporting ([Hamel & Tan, 2022](#)), who highlight that prioritising better-quality materials and components accelerates quality management practices. Similarly, [Franco et al. \(2020\)](#) argue that value engineering, without compromising material quality, improves labour quality and productivity, thus enhancing quality management practices. Additionally, reducing costs through value engineering was positively associated with quality management practices. Cost reduction enables organisations to focus on essential tasks while maintaining quality, facilitating the achievement of quality goals. This aligns with [Alsawafi et al. \(2021\)](#), who assert that cost reductions through value engineering foster environmentally and socially beneficial projects, unrelated to economic objectives.

The study found that quality improvement, as a dimension of value engineering, positively influences the implementation of quality management practices. This supports the findings of [Sony et al. \(2020\)](#), who suggest that under value engineering, various project functions are assessed, ensuring the enhancement of essential functions, thereby facilitating quality management practices. Similarly, [Arifin et al. \(2022\)](#) assert that emphasising the improvement of functions in value engineering aids quality management personnel in effectively implementing quality practices. Moreover, [Zhu et al. \(2024\)](#), argue that high institutional awareness enables employees to apply quality improvement more effectively, enhancing its impact on quality management practices. Similarly, [Wang et al. \(2020\)](#) highlight that greater understanding of value engineering

and quality management, fostered by institutional awareness, strengthens the link between quality improvement and quality management practices.

The findings of [Kulenović et al. \(2021\)](#) support the results, suggesting that employees with institutional awareness are more effective in reducing costs through value engineering and implementing quality management practices. This is consistent with [Shwedeh et al. \(2023\)](#), who state that increased institutional awareness strengthens the link between cost reduction and the application of quality management practices. The study also indicates that institutional awareness moderates the relationship between improving functions as value engineering and quality management practices. [Kaiseroglou and Sfakianaki \(2020\)](#) further support these results, noting that institutional awareness enhances organisational effectiveness in function improvement and quality management. Additionally, [Toke and Kalpande \(2020\)](#) confirm that high institutional awareness allows function improvement in value engineering to more effectively contribute to quality management practices.

## IMPLICATIONS

This study offers guidance for academics on the relationship between value engineering technology and quality management practices. It explores three key dimensions of value engineering—quality improvement, cost reduction, and function improvement—and their impact on quality management. The findings are particularly relevant for developing economies, like Iraq, where businesses need to enhance quality and performance. The study advises business administrators to implement value engineering techniques, such as improving the quality of components and materials, to ensure effective quality management. It also recommends focusing on cost reduction and improving functions as part of value engineering to achieve better quality management outcomes. Additionally, the study highlights the importance of increasing institutional awareness to enhance the effectiveness of quality improvement, cost reduction, and function improvement in quality management practices.

## CONCLUSION

The study aimed to explore the impact of value engineering technology dimensions—such as quality improvement, cost reduction, and function improvement—on quality management practices, while also analysing the role of institutional awareness. Based on data from Iraq, the study found that these value engineering dimensions positively influence quality management. The findings suggest that improving the quality of materials and components can accelerate the implementation of quality management practices. Additionally, when value engineering effectively reduces project costs, quality management practices are more successfully launched. The study also highlighted that enhancing essential project functions through value engineering leads

to more effective quality management. Furthermore, institutional awareness was found to moderate the relationship between value engineering dimensions and quality management practices, with higher awareness enabling more effective application of value engineering techniques, thus facilitating quality management.

## RECOMMENDATIONS

The study recommends that companies should foster the integration of value engineering by organising training sessions and workshops for employees. It is equally important for top management to be made aware of the role value engineering plays in delivering quality products, alongside the availability of practical programmes to support this. Management should focus on enhancing customer loyalty by prioritising customer satisfaction and promoting the positive aspects of their products. The study also suggests broadening customers' understanding of the importance of quality management practices by developing strategies that enhance both internal and external perceptions of the company. Additionally, department and division managers should be involved in developing work-related plans that are aligned with customer needs, ensuring strategic priorities are defined with greater accuracy.

## LIMITATIONS

The study has various shortcomings. First, the study framework concentrates on value engineering technology's three dimensions—quality improvement, cost reduction, and function improvement—in quality management procedures. Energy efficiency, HR management effectiveness, and innovation also affect quality management practises and should be considered in future studies. Additionally, this analysis uses data from Iraqi enterprises. Thus, the findings may not be generally applicable, and future research should include data from different regions to improve generalisability.

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