

The Effect of Management (Style) on Cost of Quality for Sustainable Engineering Projects

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Abstract: *Management styles affect quality and the cost in the construction industry. Despite this, little has been done to counter the negative effects of failing to implement quality while reducing cost in construction projects to achieve sustainability in the sector. This study investigates the relationship between management style and the cost of quality in the construction industry which is an important factor for sustainability in any sector. 108 self-administered questionnaires were distributed among employees of two construction firms in Libya, Tripoli state. The data was analyzed using the statistical package tool for social sciences (SPSS) to arrive at the results. Statistical analysis such as T-Test, ANOVA and Regression analysis were employed to test the relationships between the three variables: quality, management style and cost as related to quality. The results showed that management styles have an impact on the cost of quality which can affect the sustainability in the industry. Meanwhile, the findings reveal that most employees lack adequate information on the importance of cost of quality, thus information and education are seen as key to ensuring that firms as well as employees adopt and implement cost of quality. Additionally, an effective leadership is seen to support employees to achieve quality in construction projects, maximize on profits, thus achieving company's and client's objectives.*

Keywords: Construction projects, management style, quality cost management, cost of quality, Libya

1. Introduction

Recently, there's been a raising interest and requirement for attractive management systems in the construction and engineering industries. To cut on costs and maximize on profits, in order to sustain in the sector, several firms have factored in efficient quality management styles. However, due to operational and attitudinal barriers, there has been a slow uptake.

Management styles in the engineering sector affect the quality and cost of projects. As such, firms should adopt a style that promotes quality, reduces cost and guarantees profits.

Every manager or leader in a firm has an operating style which affects how things are done. Schmidt et al. note that one's management style is a reflection of their basic philosophy regarding how tasks should be accomplished [1]. Style refers to how a manager employs this philosophy in the workplace. If management employs a style which promotes quality while reducing the cost, there is no doubt that company will sustain.

There are different management styles including autocratic, paternalistic, democratic, participatory, supervisory etc. A particular style might be more suitable for a certain type of business or employee group than another whereas a blend of styles can be also suitable for today's dynamic business environment. As a whole, a management style in an organization can be defined as a leadership method used by a firm or business in carrying out its operations including managing its employees to achieve the highest degree of effectiveness.

This research works to investigate the effect of these management styles on the cost of quality in the construction industry in Tripoli state, Libya.

In their research, Hokoma et al. found that Libya's industrial companies suffered major difficulties due to operational and managerial challenges [2]. At the time, according to the study, Libya's industrial firms operated at about 50% of their overall capacity. The findings added to other studies that showed that both private and public companies in Libya did not invest in research and lacked proper administrative skills which do not contribute to sustainability at all.

Although recent studies on firms dealing in iron, steel, cement, oil and gas in Libya show that however they are implementing total quality management (TQM) principles, the adoption rate is still very low.

The role of TQM is key to the success of a business. Evidently, statistical analysis prove that organization action rely totally on management action. That means if the management action changes, transformation of an organization action is possible. In the same way, TQM has a direct effect on management of an organization leading to better output (products and services) to survive in the rapidly changing environment.

Thus, TQM can be defined as the skill set of the whole management in a bid to gain excellence. In other words, TQM can be defined as the process of consecutively improving an organization. The techniques of TQM especially human resources provide an opportunity to improve an organization as well as deliver customer satisfaction.

Correct implementation of TQM techniques ensures that the mission and strategy of the firm are achieved. In most firms however, Glover observes that there is a disconnect between TQM approaches and the management leading to failure [3]. TQM should thus be implemented as a new style aimed at changing organization culture as well as maximize on quality

at firms. In their study Khattak and Arshad [4] note that top management are responsible for ensuring proper implementation of quality management systems. Poor management results in inefficiency and consequently poor projects. To counter this, Hokoma et al. [2] encourage firms to use information on quality costs for the inquiry of performance deficiency and overcome those deficiencies for business sustainability.

While Zhou [5] observes that most successful firms utilize total quality management strategies, in contrast, Neyestani and Juanzon [6] argue that project success varies from one industry to another and as such, success should be defined differently in each field.

On the other hand, Kerzner [8] argues that irrespective of industry, a project is dubbed successful when primary and secondary factors are satisfied. Primary factors include observing the set timelines, working within a budget, and the attainment of highest degree of quality. Secondary factors on the other hand include customer satisfaction. The iron triangle below best describes Kerzner's view point. Figure 1: Iron Triangle – The reflection of organization objectives[7]

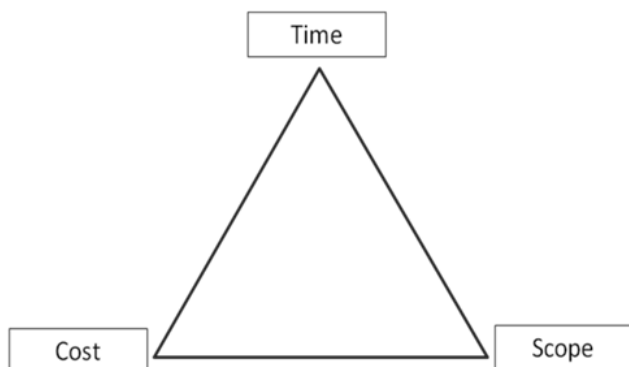


Figure 1: Iron Triangle – The reflection of organization objectives

Although Enshassi et al. [9] do not refuse Kerzner's definition of project success, they reveal other vital factors that must be attained for a project to be accurately successful. These elements include, cost, time, quality, project efficiency, owner's satisfaction, project effectiveness, safety, risk, HR, communication, procurements, and environment. Ramsy et al. observe that time, cost, and customer's requirements must be met for the achievement of project success [9].

In a future oriented view, Perkowski [11] noted that the characteristics of successful engineering and construction companies in years to come will be as follows:

- 1) Understand change
- 2) Adopt a systems approach
- 3) Accept mistakes happen and reward sensible risk-taking; and
- 4) Provide innovative services

Ali and Rahmat [12] observe that most project managers hardly concentrate on project quality. For most construction projects quality is a general philosophy where processes are carried out in a broad perspective. On the other hand, Aized

[13] proposes that a quality management system is an inclusive and systemic approach that should include guidance, documentation and audit such as in the ISO 9001 guidelines.

In essence, achieving quality is not expensive, rather non-adherence to quality is. Unfortunately, most companies today are often handling the costs that come with the non-achievement of quality. By so doing, companies are condoning this behavior by allowing project planners and managers to downplay quality leading to a form of resistance to management measures, such as total quality management. This is especially true in the location of this case study, Libya.

The study shows that the use of management style that is cost related will not hamper or show any negative effect on the construction project.

The first two Hypotheses, i.e. H1 and H2 were proven to be correct according to the study, while the third hypothesis, H3 was found incorrect.

- H1: use of cost of quality concept improves the construction project.
- H2: implementation of quality cost does not affect the construction project
- H3: use of management of quality related to cost does not show positive effect on the constructions projects.

1.1 Quality

Rahnamayroodposhti observes that quality is achieved when a product or service is able to affect a customer's buying decision and satisfies the need it was purchased for [14]. Thus, if a product meets a customer's expectations, it is considered of high quality. On the other hand, if the need (satisfaction) is not fulfilled, the product may be labeled 'low quality'. In short, quality is defined as the ability of a product to fulfill customer's expectations and needs however the criteria affecting it varies from product to product or service to service [14].

1.2 Quality Management

Given the previous definitions of 'quality' and 'management' we can thus, say that quality management is about utilizing available resources within a reasonable time frame, at a worthy cost and minimal risk to provide customer satisfaction and expectations. It is important for the management to have a long-term dedication to quality assurance and a consistent improvement pattern if merits and benefits are to be accomplished. [22].

1.3 TQM principles

According to the extant literature, it is possible to list the TQM principles as follows:

- The top management of an organization will be responsible for quality of product.
- The product quality should only be judged by customers.
- The working procedures should be designed in such a way that high-quality goods can be produced[2].

- The workers should realize that it's their responsibility produce high quality products.
- The special inspection of quality in a product is the first step and should be given priority.
- The monitoring process of the quality product is also very important.
- The company or an organization should continuously strive to achieve the goal of improving quality of products.

Under these seven basic principles of TQM it is possible to achieve success and sustainability in management of an organization and improve quality of products.

One major setback in the implementation of TQM is awareness and acceptance. Most organizations become aware of the need for TQM when they experience losses and they accept the importance of TQM afterwards.

However, the best approach would be for firms to engage strategies to improve product quality, at all times.

1.4 Cost of quality or Quality Cost

Traditionally, cost is defined as the price of creating goods and services. For an organization to be termed as efficient, it should be able to achieve its set goals within the smallest possible expenditure with a simple definition. Quality cost is thus the ability of an organization to utilize its resources (input) to achieve products (output) within the lowest cost. Prickett and Rapley outlines the benefits of cost of quality in manufacturing organizations is as follows [15]:

- 1) Focusing upon areas of poor performance that need improvement;
- 2) Monitoring the progress of ongoing improvement activities;
- 3) Planning for quality improvement; and
- 4) Aiding communication within the organization to assist in the overall control of quality.

Additionally, quality cost is the related costs that prevent an organization from suffering losses through product defects. Costs associated with defects and incompetent projects can be very damaging to a firm and affects the sustainability of the projects in a negative manner.

Often, quality management tools are treated as a problem solving kit; instead, they should be incorporated as a means of operations in the production, in this case, construction process. By so doing, construction projects will be more satisfying both to the client and the construction/engineering firm.

1.4.1 Categories of cost of quality

Quality cost or cost of quality system is formalized into four cost categories as listed by Sower et al Figure 2: The improvement Cycle (Source: Deming, 1982): prevention cost, appraisal cost, internal failure cost and external failure cost [16]. Prevention cost is put in place to prevent poor product quality. It includes the prevention of defects from occurring and to keep the cost of appraisal and failure to a bare minimum. These costs might be incurred through

product reviews, supplier surveys, education and training as well as quality planning among others.

Appraisal cost is put in place to detect the problems in the quality of the product (it involves measuring, evaluating or auditing) to assure quality conformance. A good example of appraisal cost includes inspection of products, service audits, receipt inspection etc. Internal failure cost is the cost incurred before a product reaches the customers. It includes all costs incurred when re-inspecting, re-testing, or redesigning products before they reach the end user. Further, external failure cost is such failure that arises after customers receive the products. Zimak observes that external failure is associated with processing customer complaints, warranty claims, product recalls, or customer returns [17]. Over and above, total cost of quality is the sum of all these costs that affect the production process.

According to the ISO 8402 'quality improvement' is defined as actions taken within the entire organization to enhance the effectiveness and efficiency of activities and other processes as to provide all the added merits to the organization and their customers.

A common and general challenge faced by many project planners in the construction industry is inadequate resources for the attainment of quality.

According to Fan and Sheu project management is the act of planning, channeling and controlling available resources in order to attain specific set goals and project objectives [18]. Afshar et al. [19] observes that the integral aspect of project management is information associated with the maximum balance of the project objectives. Most companies take quality management as a means to meet clients' satisfaction only.

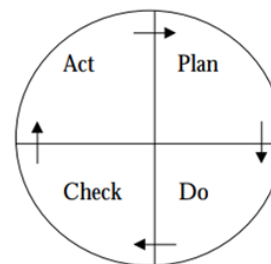


Figure 2: The improvement Cycle
(Source: Deming, 1982)

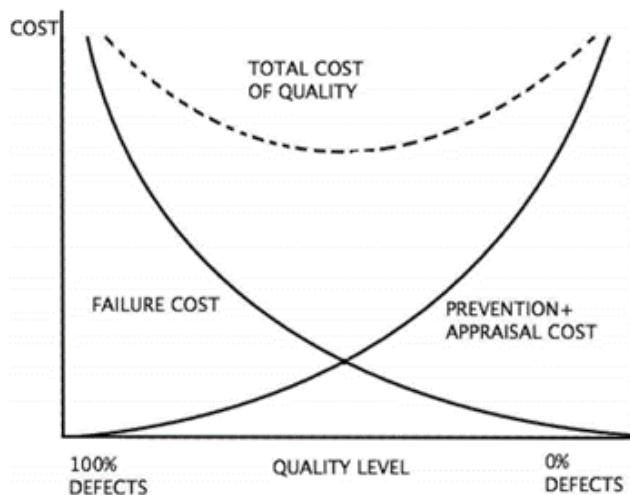


Figure 3: Cost and Quality level, according to PAF model, (Source: Kazaz, et al, 2005)

A typical example of this scenario is seen in a study that was carried out by Caldwell and Hagen, they examined the principal factors that influenced the conventional practices of quality in the United States of America [20]. It was discovered that the commercial and outright assumption in companies and organizations that offered services was the notion that quality is fulfilling the requirements of a client.

While achieving client satisfaction is necessary, minimizing the firm's costs to the lowest possible rate while maintaining quality is also essential. The two aspects should thus be targeted concurrently.

To improve quality, Vaxevanidis and Petropoulos [21] advise organizations to consider costs associated with attaining quality as the objective of continuous improvement plans is not only to satisfy customer's expectations, but to do it at the lowest cost possible.

Quality cost is best used as a way to handle failure either perceived or actual. It should be considered from the inception to the completion of projects.

Therefore, it is safe to conclude that an increase in the costs of prevention leads to reduction in the cost of failure as indicated in figure 3 above.

1.5 Quality Management System (QMS)

In pursuit of quality, organizations should have a well-defined system to satisfy the needs of all stakeholders including internal and end users (customers).

Companies executing QMS normally have planned and documented procedures that are followed to meet the set expectations. According to Natarajan ISO 9001- the international quality standard- outlines the requirements of quality management system constantly satisfy customer expectations and the set statutory regulations [22].

Generally, 9001 QMS processes are divided into four steps: Plan, Do, Check, and Act (PDCA) cycle. For the purposes of meeting the expectations of the customer and employees,

firms must establish procedures and product engineering documents.

In the construction industry an ideal and comprehensive quality management system is that system which is independent of simple control and inspection methods but instead is a complete system, which comprises of the following:

- 1) System document used in recording pass or fail
- 2) Confirmation when faults or damages are restored
- 3) Safe, suitable and highly efficient equipment's
- 4) Clear communication of instructions to everyone.
- 5) Training which aids in rendering skills and necessary abilities.
- 6) Adequate site working condition and sufficient inspection
- 7) Functional authority with the power to correct faults
- 8) Motivation for quality production
- 9) Proper records for checking and testing of completed works

1.6 Present investigation

The last few decades have seen a considerable paradigm shift in improving the quality of products in different industries, thanks to the Total Quality Management (TQM) gurus such as Juran, Deming, Crosby and Feigenbaum. Through their TQM theories, firms have realized the importance of improving business quality in the 20th Century.

Edward [23] developed a systematic approach to problem solving known as Plan, Do, Check, Act (PDCA) cycle. While Crosby [24] popularized the Cost of Quality concept, Hellesten and Klefsjö [24] on the other hand, defines TQM as a system that integrates values, techniques and tools for quality-development, quality-maintenance, and quality-improvement for purposes of marketing, engineering, production and service geared towards customer satisfaction.

The main role of TQM is to meet customer's expectations while remaining complete. By their very presence in an organization, quality management system improves the level of quality awareness across all departments. Consequently, this impacts positively the general behavior towards quality assurance amongst company's employees.

The second function is to provide certification. This is a process whereby products and processes are certified so as to equip the organization with competitive advantage in today's global business space which has become very quality conscious.

In this study, authors addressed the question whether management style in a given organization has any effect on quality cost of a construction project which can directly affect the sustainability of the projects..

Specifically, the question adopted was: "What effect do managerial styles have on the cost of quality in sustainability of construction or civil engineering projects?"

This study is motivated by Dr. Armand Feigenbaum's notion that most companies operate without the knowledge of what things cost.

In an interview dubbed 'Dr. Armand Feigenbaum on the Cost of Quality and the Hidden Factory' Feigenbaum as cited by Schmidt et al. notes that "many decisions with respect to what is the best way to go for business or quality improvement are made incorrectly" [1].

He observed that traditional cost accounting fails to pick on the fact that quality cost deals with delivering customer satisfaction effectively. In particular, like Feigenbaum's concept, the paper arrives at the conclusion that cost of quality is not only about dealing with the cost of getting it right, but also the cost of failing to get it right.

The costs of getting it right and getting it wrong is majorly affected by the management styles employed in a given firm. Even with the best management systems, solely depending on them for total quality management implementation is not enough. The achievement of cost of quality involves not only a good quality management system but also effective leadership to educate and communicate the necessary information right from the market research department to customer service. "All levels of management must be trained in how to implement their part of the quality improvement program," as reported by Ross [26].

To capture the ideal settings and operational plans of the two identified construction firms in Libya questionnaires are distributed among company employees including the managers, consultants, contractors, engineers, surveyors, and architectures.

2. Materials and Methods

Data collection methods are categorized into primary and secondary. Several researchers begin research process by analyzing previous data that has already been analyzed and were obtained for other uses, this is usually done as starting point and as guide to answer and tailor the research questions of the study, aims and objectives as well as support the study with literatures and appropriate references. This is termed as secondary data collection method. The research then moves to the actual work of obtaining new data on the particular study at hand in this case using the primary data collection method.

For the purpose of this research study, both primary and secondary data collection methods were used in conducting the research. The primary method was used to record the implementation process of management styles as related to the cost of quality in the two construction firm. Cost drivers within the organization and perception of all the respondents are studied intensively so as to identify their various needs and expectations, thus meeting the set out objectives.

The present investigation worked with employees from two firms in Libya.

The study seeks to establish the relationship between management style and its effects on cost of quality for sustainable construction projects. After careful analysis of

previous studies, the questionnaire was drafted to obtain data from the two construction firms with over 350 employees in total. The questionnaires were self-distributed considering available resources, time frame and nature of the study.

180 questionnaires were distributed among the participants who included managers and other employees working in construction departments and 107 questionnaires returned and 101 of them found to be valid. The two companies had approximately 350 employees in total which led to 7% margin of error and 90% confidence level when 101 questionnaires were taken as the sample size of the study.

Further, journals and articles and other secondary sources were used to further gather information on the topic under investigation.

The questionnaire is divided into three sections to capture essential and suitable data. The first section captures the respondent's basic information making it a quantitative analysis. The other two sections are designed to analyze the degree to which a participant agrees or disagrees with a question, thus it's a qualitative analysis. The questions are related to the effect of leadership style on cost of quality in engineering projects.

The questionnaire contains closed ended questions. Respondents give answers to the questions by either ticking the correct answer or identifying the most suitable number using a five point Likert rating scale. To maintain confidentiality and anonymity of the respondents, they were not required to give their names or any information that would identify them.

The results from the questionnaires are carefully examined, assessed to ensure they capture the reality on the ground.

Respondents were required to give their responses by picking a variable on the Likert scale that best describes their experiences or opinions. The scale (1-5) was representative of their disagreement or agreement to a given question with 1 being strongly disagreement and 5 being strongly agree.

Data was analyzed using the SPSS (Statistical Package for the Social Sciences). The results are demonstrated in figures, statistical tools and pie charts which are later, discussed and analyzed in the next section of study.

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The respondents' gender, education level, job position were assessed and seniority in the organization (years spent in the same organization) the first section of the study. The target respondents picked the right answer to the question concerning the above mentioned demographic measures. These variables were represented as follows:

Table 1: Respondents' basic information

Variable	Frequency	% Percentage	Cumulative percentage
Female	17	16.8 %	83.2 %
Male	84	83.2 %	83.2 %
Level of education			
Undergraduate	38	37.6 %	37.3 %
Master Degree	37	36.6 %	37.6 %
PhD	26	25.7 %	100.0 %

The table captures the respondents' basic information including gender, marital status, and education level

- 1) Respondents found to be 17 females and 84 males.
- 2) Highest level of education was recorded as; university 38, master degree 37, PhD 26.
- 3) The department of the respondents was as follows: Construction (17); Architecture (3); Consulting (4); Project manager (16); Project engineers (4); Engineers (53); and Surveyor (4).

3. Results

Data collected from the questionnaires was analyzed using the statistical package tool for social sciences (SPSS) to get the various percentages. Statistical tools were used in representing the final results.

Questionnaires were excluded before analysis based on whether a participant completed the whole set of questions. Out of 180 questionnaires distributed, 107 were returned. Of the returned cases, only 101 were analyzed in this study as 6 were incomplete rendering them invalid.

Through SPSS, data was analyzed using T-Test, ANOVA and Regression analysis. The data was analyzed to test the relationships between the three variables that are quality, management style and cost related quality.

To increase differentiation in the respondents' answers, a number of scales were introduced from which participants picked the most suitable answer. This resulted in the clearest differentiation of the factors.

In summary, there were 84 men and 17 women who took part in the study which is represented as 83.2% and 16.8% respectively.

A total of five age groupings were used. There were four (4) or 4% between 41-4 years old, the highest number was those in the age group 26-30 years old with 36 % respondents or 35.6%, 32% were between 20-25 years old, 36-40 were 22% respondents while 7% were those in the 31-35 age group.

Table 2: Interpretation of respondents' feedback on effect of implementing quality cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improve customer satisfaction	28	27.7	27.7	27.7
	Improve suppliers performance	7	6.9	6.9	34.7
	Improve company's image	49	48.5	48.5	83.2

	Increase market share	3	3.0	3.0	86.1
	Increase profit	14	13.9	13.9	100.0
	Total	101	100.0	100.0	
The table captures views on why implementing is important in a firm					

In general, there were more single people than married people. 26.7% of the respondents are married and 73.3% are single.

When it comes to education level of the respondents, 38 (37.6%) of them have university degree. 37 (36.6%) have master degree, while 26 (25.7%) of them have a doctorate degree. Table 1 (above) summarizes the first section of the questionnaire which dealt with the respondents' basic education.

Section two of the questionnaire focused on the degree which respondents agreed or disagreed with a particular question. A Likert scale was used to capture the opinions, and experiences of the target participants. The results of the question: "What are the benefits obtained from implementing quality applications?" were captured in table 2 above.

Respondents were asked to indicate the benefits of implementing quality applications.

27.7% percent of participants indicated that implementing quality cost improves customer satisfaction. 6.9 % of respondents indicated that it is used to improve suppliers' performance. A total of 48.5 % noted that implementing cost of quality improves company's image. 3% indicated that implementing cost of quality increases market share, while 13.9% indicated that it increases profit.

Furthermore, the study tested the type of certification implemented in the organizations. All respondents' scales were related with certification type(s) used in a given firm. The most common certification among the respondents was ISO 9000 at 30.7%. The second was ISO14001 with 13.9%; and third was ISO 18001 with 12.9%. The rest include ISO 22000 (12.9%); 17025 (3%); 27001 (1%). (13.9%) of the respondents indicated that while there is a quality management program in place, the firm did not seek to get any form of quality certification. 4% noted that they do not have any quality certificate, while, 7.9% observed that they use other forms of certification than those mentioned above. Further, there were consultant engineers following up to ensure that ISO-related objectives were met, giving guidelines to enhance the organization's ability to achieve a sustainable process. This directive conforms to the principle of quality management.

Further, the study sought to know the stage of construction at which quality was mostly ensured. Up to 44.6% percent of the participants indicated 'in design'. Those who picked 'in construction' were 26.7%, while 28.7% indicated that quality was mostly ensured in purchasing. (Table 3 below) shows the outcome.

Table 3: Respondents’ views on what stage quality should be ensured most

Table 6: Respondents’ views on elements of cost quality that contribute to success of projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	11	10.9	10.9	10.9
	Neutral	17	16.8	16.8	27.7
	Agree	60	59.4	59.4	87.1
	Strongly Agree	13	12.9	12.9	100.0
	Total	101	100.0	100.0	

The elements of cost quality that makes project management effective

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	In design	45	44.6	44.6	44.6
	In construction	27	26.7	26.7	71.3
	In purchasing	29	28.7	28.7	100.0
	Total	101	100.0	100.0	

Respondents outline views on the stages at which quality should be ensured the most

Additionally, respondents were asked whether company objectives and expectations of quality cost implementation had been achieved. Table 4 (below) outlines the responses. A Likert-type scale was used.

A total of 69.3% agreed that the objectives and expectations were met. 24.8% of the respondents neither agreed nor disagreed with the question. Those who disagreed were four percent and those who strongly agreed were two percent of the participants.

On being asked whether respondents would like to get the quality award of excellence, the following results were given. 38.6% of the participants indicated they strongly want a quality award of excellence.

48.5% showed interest in the award while 12.9% did not know if they want the award or not.

Respondents were asked if the products of their company matched the quality of foreign products.

A total of 63.4% of the respondents agreed that the quality of their products meet international standards. 10.9% were neutral on the question. 8.9% of the participants disagreed that their products meet international standards while 16.8% strongly agreed.

Participants were then asked about their perception on whether lack of clarity or inadequate information on cost of quality contributed to making the cost of quality failure relatively unknown in construction projects.

A total of 41.6% of the respondents had neutral responses. Those who disagreed with the notion were Respondents’ views on how quality cost implementation helps in the achievement of firm objectives 27.7%. 23.8% agreed with the statement, and respondents who strongly agreed stood at 6.9%.

Table 4: Interpretation of respondents’ experiences with the achievement of objectives and expectations of quality cost implementation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	4.0	4.0	4.0
	Neutral	25	24.8	24.8	28.7
	Agree	70	69.3	69.3	98.0
	Strongly Agree	2	2.0	2.0	100.0
	Total	101	100.0	100.0	

Participants were asked if collecting quality-related costs was necessary. A total of 75.2% of the respondents agreed that collecting quality-related costs was necessary. 12.9% neither agreed nor disagreed with the notion.

11.9% of the respondents did not think that collecting quality-related costs was of any importance (See Table 5 below).

Table 5: Respondents’ view on the importance of collecting quality related costs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	12	11.9	11.9	11.9
	Neutral	13	12.9	12.9	24.8
	Agree	67	66.3	66.3	91.1
	Strongly Agree	9	8.9	8.9	100.0
	Total	101	100.0	100.0	

The importance of analyzing the cost related to cost of quality

Responding to whether cost of failure during construction should be collected as soon as a failure occurs or at least on a weekly basis, the following results were recorded: 63.3% were of the opinion that such information should be collected on time and as frequently as possible. 13.9% of the participants did not agree or disagree with the notion, while 22.8% disagreed. The next question sought to know whether the important elements of cost quality in project management can help achieve project quality without incurring additional costs. (See Table 6 below).

The information was tallied: Those who agreed accounted for 72.3% of the respondents, while those who disagreed were 10.9%. The remaining number (16.8%) was neutral

Respondents were asked their view on whether the concept of quality cost in construction is unclear making the cost of quality failure relatively unknown during construction even though quality cost is perceived as a useful indicator of Performance.

A total of 65.4% of the respondents agreed with this notion. 25.7% had neutral opinions, while 8.9% of the respondents disagreed (see Table 7 below).

Table 8: Participants' opinion on adopting improvement methods for future purposes

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Disagree	3	3.0	3.0	3.0
Neutral	14	13.9	13.9	16.8
Agree	51	50.5	50.5	67.3
Strongly Agree	33	32.7	32.7	100.0
Total	101	100.0	100.0	

How implementation of cost of quality affect morale and attitude

Table 7: Respondents' opinion on the general perception of quality cost in construction

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Disagree	9	8.9	8.9	8.9
Neutral	26	25.7	25.7	34.7
Agree	54	53.5	53.5	88.1
Strongly Agree	12	11.9	11.9	100.0
Total	101	100.0	100.0	

How familiar is cost of quality and how does this affect performance in construction firms

ecting information on the effect of quality costs on morale and attitude and use of proper management practices would create opportunities for improvements in the future. A total of 83.2% of the respondents agreed.

Three (3) percent of the participants disagreed, while 13.9% remained neutral. (Table 8 below gives detailed information).

Reliability of the variable

The reliability of the construct was tested using cronbach Alpha. The accepted alpha value should exceed 0.7. As indicated in the Table 9, the cronbach Alpha value ranged from 0.772 to 0.888, suggesting that the variables are reliable for the study.

Table 9: Cronbach Alpha value

Variable	Cronbach Alpha
Management of Quality	0.888
Implementation of Quality	0.772
Cost of Quality o	0.872

Question: What is the perception of employees about the implementation of quality?

The survey questionnaires were measured using a five Likert scale of three items (1-Strongly Disagree, 2-Disagree, 3-Neutral, 4 -Agree, 5-Strongly Agree) with 2.5 as the midpoint. Table 10 displays the mean and standard deviation (SD) scores on the perception of employees about the implementation of quality. The mean score of the three items ranged from 4.208 to 4.257, suggesting that all the items greater than the midpoint of 2.5.

This shows that the employees agreed with all the items. On the average, the employees have objectives and expectations of implementation of quality applications been achieved (M=4.257, SD=1.074), would you like to get the quality award and excellence (M=4.248, SD=0.953) and believe that quality of your products match the quality of Foreign products (M=3.19, SD=0.659).

Question: What is the perception of employees about the quality of cost?

Table 12: Employees' perception on management of quality

Item	N	Mean	Standard Deviation
Do you think the important elements of quality in project management can help achieve project quality without incurring additional costs?	101	4.208	0.816
Do you think In manufacturing, quality cost is most commonly categorized into prevention, appraisal and failure expectations of	101	4.218	0.867
Implementation of quality applications in construction is vague making the cost of	101	4.237	0.776
Why failure is relatively unknown during construction? However quality cost is perceived as a useful indicator of performance	101	4.248	0.953
Do you think the effect of quality of your products matches the quality of Foreign products that will eventually create opportunities for improvements in the future	101	4.356	0.855

The survey questionnaires were

measured using a five Likert scale of three items (1-Strongly Disagree, 2-Disagree, 3-Nuetral, 4 -Agree, 5-Strongly Agree) with 2.5 as the midpoint. Table 11 presents the mean and standard deviation (SD) scores on the perception of employees about the quality of cost. The mean score of the three items ranged from 4.208 to 4.248, indicating that all the items greater than the midpoint of 2.5. This suggests that the employees agreed with all the items.

On the average, the employees think the concept of quality cost in construction is unclear making the cost of quality failure relatively unknown during construction (M=4.218, SD=0.816), think that in manufacturing, quality cost is most commonly categorized into prevention, appraisal and failure costs (M=4.218, SD=0.867), think that the concept of quality cost in construction is vague making the cost of quality failure relatively unknown during construction? However quality cost is perceived as a useful indicator of performance (M=4.237, SD=0.776), think that the concept of quality cost in construction is vague making the cost of quality failure relatively unknown during construction and however quality cost is perceived as a useful indicator of performance (M=4.356, SD=0.855).

Question: What is the perception of employees about the management of quality?

The survey questionnaires were measured using a five Likert scale of three items (1-Strongly Disagree, 2-Disagree, 3-Nuetral, 4 -Agree, 5-Strongly Agree) with 2.5 as the midpoint. Table 12 indicates the mean and standard deviation (SD) scores on the perception of employees about the management of quality. The mean score of the four items ranged from 4.208 to 4.356, showing that all the items greater than the midpoint of 2.5.

Table 11: Employees' perception on management of quality

Item	N	Mean	Standard Deviation
Do you think the concept of quality cost in construction is unclear making the cost of quality failure relatively unknown during construction	101	4.218	0.996
Do you feel it is worth the effort to collect quality-related costs	101	4.208	0.864
Do you think Cost of failure during construction must be collected as soon as a failure occurs or at least on a weekly basis	101	4.248	0.876

On the average, the employees think the important elements of quality in project management can help achieve project quality without incurring additional costs (M=4.208, SD=0.816), think that in manufacturing, quality cost is most commonly categorized into prevention, appraisal and failure costs (M=4.218, SD=0.867), think that the concept of quality cost in construction is vague making the cost of quality failure relatively unknown during construction? However quality cost is perceived as a useful indicator of performance (M=4.237, SD=0.776), think that the concept of quality cost in construction is vague making the cost of quality failure relatively unknown during construction and however quality cost is perceived as a useful indicator of performance (M=4.356, SD=0.855).

3.1 Test of the Significance of Combined Factors

The employees' responded data from the five point Likert scale items on the variables: Cost of Quality, Management of quality and Implementation of quality were aggregated and computed. This is to find their overall means and standard deviation as displayed in Table 13.

Cost of Quality of 4.277 (SD=0.705) which shows that employees perceived cost of quality in construction organization is high. The mean for Management of Quality is 4.248 (SD=0.932).

This indicates that the employees have positive perception about the management quality of construction organization. In addition, Implementation of quality recorded a high mean of 4.224 (SD=0.757) indicating that employees concern about implementation quality in construction organization, particularly in Libya.

Table 13 shows the Analysis of Variance (ANOVA) test of statistical significance of regression model and Table 8 indicates the standard regression model summary. From the ANOVA (Table 14), F = 12.150 and p = .000 (< .05) which suggests that the test was statistically significant. This revealed that, the linear combination of independent variables (management and implementation quality) significantly relates to the cost of

Table 14 : ANOVA of regression significant

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	9.882	2	4.941	12.150	.000b
Residual	39.855	98	.407		

Table 15: Standard regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.446a	.199	.182	.63772	.199	12.150	2	98	.000

a. Predictors: (Constant), Implementation_quality, Management_quality

quality			
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quality (dependent variables).

The standard regression model summary

(Table 15) shows the value of the multiple correlation (R = 0.446). This indicates how the combination of perceived management and implementation quality related to employees cost of quality.

Furthermore, the Adjusted R2 = 0.182 suggests that all the combination of perceived management and implementation quality contributes 18.2% of the variances in employees concern about cost of quality in construction organization.

3.1.1 Test of the Significance of Individual Variables

The significance of the individual variables was investigated using the regression coefficient (Beta weights) as displayed in Table 16. The independent variables management of quality ($\beta = 0.220$, $t = 2.429$, $p = 0.017 < 0.05$) and implementation of quality ($\beta = 0.398$, $t = 4.397$, $p = 0.000 < 0.05$) were found to significant relate to the cost of quality.

Table 16: Test of the Significance of Individual Variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Dubin-Watson
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	2	.475		4.224	.000			
1 Management_ quality	.166	.069	.220	2.429	.017	.998	1.002	1.889
Implementation_ quality	.371	.084	.398	4.397	.000	.998	1.002	

Figure 4: parts and partial correlation of significant variable

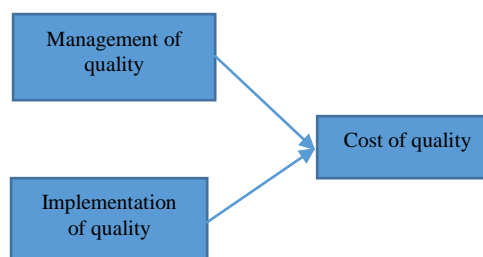


Figure 4: Result of research model

Table 17 and Figure 4 indicate the parts and partial correlation of significant variable. Zero-order correlation is the correlation coefficients of the variable individually with the dependent variable (cost of quality). The part-squared values show the contribution of individual variables of the overall fit of the regression model. Implementation of quality is the most important variable for predicting the cost of quality by contributing 39.8% (Part-Square = .0807). Management of quality contributed 22.0% (Part-Square = .0243) to the value cost of quality in construction organization.

Table 17: Parts and partial correlation of significant variable

Independent Variable	Correlations		
	Zero-order	Partial	Part
Management of quality	.201	.238	.220
Implementation of quality	.388	.406	.398

4. Discussion

The present study analyzed effects of management style on quality cost of a construction project.

According to the data tabulated on the tables and charts, the study has 101 respondents in total. 84% of the respondents were male and 17% percent were female. In essence, this reflects the demographics in Libya, where there are more male employees compared to females in the construction industry.

There are more youthful employees ranging between 26-30 years in the construction firms. The lowest age group are those between 41-46 years. Construction firms tend to employ younger people because they are seen as stronger and resilient.

As earlier observed, the majority of the employees are young which also shows in their marital status. A total of seventy-four percent of the respondents are single compared to 27% who are married.

The two firms under study have employed qualified staff, with a majority of them holding either a bachelor or a master degree.

A majority of them are engineers. Most of these employees have work experience between 5-10 years (translating to 87%).

According to the analysis ISO 9000 was found to be common in the two companies studied.

In the era of immense competition, most companies want to be highly recognized, as such, many of them are utilizing cost of quality tools for the purpose of improving the company image. This is also the reason why a number of employees noted that they would like their company to receive an award of quality of excellence.

Responding to the best stage of implementing quality costs, a higher percentage of the respondents were of the opinion that cost of quality should be embedded in the design stage to improve quality.

While 70% of the respondents mentioned that they have objectives or working towards attaining quality, more than half of the respondent agreed that quality cost in construction is obscure making it less prominent in construction industry.

Generally, most employees agreed that collecting data on quality cost is not only necessary, but it should also be obtained regularly to ensure quality or success both in the project and the business itself.

Although cost of quality is unclear, many firms are categorizing cost of quality under specific cost types which will see a positive effect on the businesses moving forward.

The study shows that the use of management style that is cost related will not hamper or show any negative effect on the construction project.

The first two Hypotheses, i.e. H1 and H2 were proven to be correct according to the study, while the third hypothesis, H3 was found incorrect.

- **H1:** use of cost of quality concept improves the construction project.

- **H2:** implementation of quality cost does not affect the construction project

- **H3:** use of management of quality related to cost does not show positive effect on the constructions projects

Despite efforts to have many female respondents in the study, only 16.8% took part in the actual research. This is because of the current situation in Libya which has forced many people especially women to remain at home for safety reasons.

Prevailing organizational culture has created many gaps that fail to support the application of total quality management system. Thus, many respondents had little or no knowledge on quality management systems implemented in their organizations.

5. Conclusions

The result of this research has proven that the use of cost of quality concepts improves the construction process in general. Furthermore, it was also discovered from this study that the use of quality implementation procedures does not affect the construction process, or deter organizations from normal operations. However, it is important to note that management style has a direct effect on the cost of quality.

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