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"Building Quantitative Model for Improving Quality Costs"

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Abstract:

The paper aims to design a model to analyze the cost of quality, and discovered positive role of improvement in reduction total costs of quality , the model analysis depended on the relationship between the reduction in quality costs, and improve quality, the model based on the relationship between the three categories of quality costs (current total costs of quality, future total costs of quality, and total improvement costs), The model was characterized by adding invisible costs to the quality total costs., a model achieve target results through positive difference between (current and future total costs at one side, and future and existing cost of improvement at other side), pointing out that the reduction in the total cost of quality is greater than the increase in total costs for improvement, the model also downloaded and solved computerized.

Key words: Quality costs, Quantitative model, improving quality costs, computerized model.

First: Introduction:

has become the basis strategy adopted by business organizations in the face of The quality in the contemporary stage competition , and can be win the competition in the international market , (disposal of various types of losses) , This results in economic (time, effort and costs), because modern procedures for quality analysis and improvement are quality improvement, cost conducted according to the rule : improvement based on cost analysis can lead to the reduction, and delivery speed) simultaneously, However, cost analysis associated with competitive priorities follows two paths. The first, analysis based on the relationship between the main costs (total improvement costs or conformity costs, and total failure costs or non-conformity costs), Second, the analysis based on the relationship between sub-costs (prevention, evaluation, internal failure, external failure) , The first analysis results in a single competitive advantage (improved quality versus higher cost, and vice versa). While the second analysis results in more than one competitive advantage at the same time (See also, *Vahevanidis* et al. 2009), several quality cost analysis models have been developed to reveal the relationship between cost analysis and competitive advantage , that are often In the end result focused on cost reduction and quality improvement , however, they was centered on two main models, as previously mentioned (the analysis of the relationship between the main costs (improvement and failure), and (the second analysis of the relationship between the sub-costs (prevention, evaluation, internal failure, external failure). While the proposed model, which will be developed later, has attempted to describe the quality costs of the analysis by (the set of perceived costs that are accountable , and the invisible costs that are not accountable .this costs summarized as (the current total costs and associated improvement costs , and Expected future costs) , One of the characteristics of this proposed model is that it takes into account the invisible costs, and its revealed the role of the new relationship in achieving the (quality improvement , and the cost reduction) simultaneously ,The design of the new model is important for the Iraqi director, Because it offers to the Iraqi manager a ready-made model that can be used to improve quality and reduce costs in the Iraqi industrial establishment, The problem lies in the possibility of determining the characteristics of the model, its components, and its implementation requirements, The method of constructing the model was based on this question (Can be developed a new computer model to analyze quality costs contribute in achieving quality improvement and cost reduction simultaneously?), the paper follow in forming and computer operating of model four stages sequential and integrated , : (Identify and define quality costs by focusing on components and relationships, and present and discuss some quantitative The paper structure included (6) models of cost analysis , Proposed Model: Characteristics, Enablers and Determinants), sections (the first: introduction, the second: research methodology, the third: design and method of study, and the fourth: Finally, the paper concludes theoretical framework, and the fifth: the proposed model, and the sixth: Concluding remark with a summary showing the most important observations related to the implementation of the model and its computer operating.

Second: Research Methodology

1 -The Problem: The quality analysis literature showed many models that try to link the results of cost analysis with reduce of quality costs and improve quality (individually or in combination) (see also , Andrea Schiffauerova et al , 2006) , And from These models that available to the researcher is model of (prevention, evaluation, failure P, A, F), and model of (prevention, evaluation, internal failure, external failure P + A + IF + EF) , and Conformance costs and Non-Conformance model (COC + CONC) , As well as the (A B C Model) that (Including the relationship between Costs of Schiffauerova , , 2009 : 10) , this models in general they did not ( )achieving value added , And non-value added costs

take into account invisible costs, And the extent of appropriateness of improving costs For the financial position of the business organization , As well as the Iraqi organizations Lack to any of these models , And it needs a ready and easy to implement model, The problem was defined by the question (Can be designed and operated a new computerized model for quality cost analysis that leads to quality improvement, &quality cost reduction , or other competitive advantages simultaneously?) .

2 – objectives.

- Disclosure the possibility of designing a computer model to analyze the cost of quality and It helps to identify the advantages of quality improvement, quality cost reduction, or any other competitive advantages.
- Detect the possibility of downloading and running the model by computer.
- Improve the internal capabilities of the Iraqi firms to overcome competition pressures locally and globally.

3 – The Importance

- Scientific and academic importance: Provide researchers and students with information and models that help them to make the best use of Different models to analyze quality costs, and their continuation in improving the overall accounting performance of the firm.
- Professional and economic importance: Improve the skills of administrative and accounting specialists in the use of computers in the analysis of different models of quality costs, and invest the quality economics in improving the overall economic performance of the business

4 - Determinants of the study: The design and implementation of the quality cost analysis model faces some challenges arising from the nature of the Iraqi environment, and the existing accounting systems, the most important of which are:

- Poor awareness and attention to quality improvement programs and the role of cost analysis procedures in quality improvement.
- Iraqi accounting systems still lack to the role played by the organizing and controlling of quality costs in improving the overall accounting and administrative performance of the firm.
- Weak perception of managers and accountants to understand the concepts of quality management and ways to improve them.

Third: Study design and method: The study focuses on developing a quality cost model, which includes the presentation and analyzing of all possible quality costs Through (reviewing of quality cost models, quality cost components, quality cost measures), The proposed model can be used as a tool to calculate different quality costs. And its competitive advantages, the study design was based on (5) sequential stage, lead to design the target model, and operating it computationally, According to the following:

Stage 1: Review of quality costs in order to identify and describe the quality costs that constitute the inputs of quality cost analysis model.

Stage 2: The Organizing of the relationship between the quality costs which the model contains is based as following: - Current Total Costs ⟶ the Costs of improvement procedure ⟶ Level of future costs after improvement).

Stage3: Design of the model under study.

Stage 4: the possibilities and determinants of the implementation of the model.

Stage 5: loading and operating the computerized model.

Fourth: Theoretical Framework (Quality Costs: Types, Models, and Relationships)

1- **Quality Costs: Types and Relationships:** Quality costs are related to the production of goods and services, and in some way are reflected in their quality and value in the market, Controlling total quality cost trends, requires knowing their cost classifications, and their relationship, Including improved internal manufacturing processes, Re-work with suppliers to reduce purchase costs, Because its form of significant proportion of total costs, So should build a long-term relationship with suppliers based on trust, These lead to the adoption of quality projects aimed at reducing costs and improving quality,(Drob Catalin et al , 2003 : 134), Quality costs can be classified as conformance costs and non-conformance costs (failure costs). Quality costs are generally classified into four main categories of costs (prevention costs, evaluation costs, internal failure costs, and external failure costs) or (PAF). (See also. Dan Mircea HEDE[a]IU et al, 2018.)

- Costs of prevention: The costs of activities specifically designed to avoid or prevent errors, these costs include: procurement of materials, market analysis, staff training and evaluation, planning and forecasting, verification of documents and data, controlled stocks, etc. Investment in prevent costs has the following effects: reducing the cost of defects, and costs of increasing customer satisfaction, and the need for screening, and costs result from screening, and increase in productivity, competitiveness and the number of market shares, and an increase in profits

- Evaluation costs: are the cost of monitoring or inspection costs. this Costs include the costs of maintaining the QC department, evaluating the methods, materials, processes and product samples used in the test.

- **Failure costs:** Means the costs of poor quality, such as the cost of repairing errors and the cost of handling customer complaints. Failure costs typically represent a large proportion of quality costs in companies that do not have an effective quality program.
- **Total failure costs:** are the sum of variable costs, indirect materials costs, disappearance costs, fixed production costs, and others contributing to management costs.

- **Internal Failure Costs:** These are costs that arise when defects and problems are detected within the facility, such as: scarp, rework, redesign, fault analysis, modification, corrective action, Leave. work, external failure costs and
- **External costs:** Costs that arise when defects are first detected outside the facility. They are also discovered by the customer, as well as loss of reputation that results in loss of goodwill, which results in the loss of some profits in the future, in order not lose some customers, it is better to address the problem before shipping the product to customers, External failures include two types of costs:

a -seller's external failure costs: (verifying customer complaints, added expenses to support multiple product versions in this area, and technical support calls; discounts for vendors to encourage them to continue selling the product; Loss of sales),

B -the cost of external failure of the customer: they are (lost time and / or data or lost business, lost, the cost of replacing the product, the cost of technical support, leaving some staff to work, injury / death.),

- total quality costs (TQC): are the sum of (the following costs: prevention P, evaluation A, IF internal failure, EF external failure), it describes the difference between the actual cost of a product or service, and the reduced cost, if there is no possibility of a low service, or product failures or manufacturing defects. In order to respond to the needs of customers with the required quality while taking into account the cost, other perspectives of improvement, along with quality cost analysis, were presented (Victor et al, 1987). Of which: -

- Provide rewards and other incentives feasible to employees in the facility.
- The development of knowledge and skills specialized in the field of quality.
- Improve the capacities involved in the implementation of the quality program.
- Good coordination between the quality improvement program and other specialized public agency.
- Build a plan for a quality improvement program.

The following should be noted when performing the above points:
A - These procedures should be based on the results of prior analysis.
B - These procedures do not take into account the nature and level of costs involved.
C - These Procedures do not have indicators or measures distinguish the importance of emphasizing some factors of improvement from other factors.
So it has become necessary to move towards quality cost analysis, and get to know Interactions between quality activities associated with quality costs, such as (prevention and evaluation, internal and external failure costs) , Depending on the method in which the entity's management classifies these costs, because The application of quality management costs analysis methods effectively, contributes to the identification of losses and eliminates the increase in operational problems related to improving the conversion process, In addition, quality strategies in all establishments seek to detect and develop the capabilities that contribute most to improving quality and reducing costs. Or avoid them, or reproduced them, It is described by various and multiple name (Gary Cokins et al, 2006: 47), According to the presentation below: -
Group (1): the cost of complete quality (error free cost): It is the set of costs resulting from the completion of quality from the first time, or costs (I do it right from the first time), it excludes the costs of failure in general.
Group (2): invisible costs: the set of costs or expenses that do not appear in the accounting records.
:-Group 3: conformance and in conformance costs: It was clarified by the following
- Costs conformance: Expenses arising from evaluation and control activities for conformity with the specified criteria.
- In conformance costs: the costs of internal failure, i.e., the costs of post-evaluation procedures, and before shipping the product to the customer.

Table (1) some quality costs Classifications

Some costs examples	Symbols	component	The main classification of costs
(Training and education, eliminate of the causes of failure, Preventive maintenan (control), Examination and testing Problem analysis), (Damaged, Reworked, Lost Time) Sales returns, customer Complaints Replacement, los of reputation	P , A , IF , EF	Prevention, assessment, internal failure, external failure	Total quality costs
,Training and education eliminating the causes of failure, preventive maintenance, audit	P , A	Prevention, Evaluation	Costs of conformity quality for all
Costs of lost time as a result o audit and disclosure & correct errors in records, activities not covere by cost accounting, time lost during quality procedures)	In visible Costs (IVC)	Costs that do not appear in the accounting records	Invisible costs
Training and education, eliminating the causes of failure, preventive maintenance, audit	P , A	Prevention, Evaluation	conformity costs
(Damage, Rework, Lost Time (Sales Returns, Customer Complaints, Replacement, Loss of Reputation)	IF , EF	Internal failure, External failure	non-conformity costs

Source: Prepared by researchers

The following is summarized from the above:

- Quality control costs is four main costs (prevention, evaluation, internal failure, and external failure), but in sometimes dealt with on the basis of two groups (costs of conformity, and non-conformity costs), and on the basis of these two groups, the relationship between quality costs is determined and analyzed.
- According to the above classification, the researcher draws two methods to analyze the quality costs and their implications on (quality cost reduction, and quality improvement) are: -

First: the analysis is based on the relationship between two groups of costs (conforming costs, non-conforming costs), and the result tends to (improve quality versus high cost, and vice versa).

Second, the analysis is based on the relationship between the four groups of costs (prevention, evaluation, internal failure, and external failure), and the result in general is directed towards improving quality and reducing costs simultaneously.

Depending on the method in which the management of the enterprise classifies these costs, because the application of quality costs analysis methods contributes effectively to the identification of losses and eliminates the increase in operational problems related to the improvement of the conversion process. (Leif *I. Solberg et al, 2006*), In addition, quality strategies in all establishments seek to avoid financial losses resulting from poor customer response. On this basis, several different models have been developed to improve quality costs.

2 - Some quantitative models for quality cost analysis:

(Andrea, and Thomson, Vince, schiffauerova ,2009) provided various models for cost-quality analysis, all aimed at improving quality, and reduce costs simultaneously, but two important points need to be noted, (One: adopting a standardized formula for quality costs Among multiple perspectives on determining types of quality costs) (Machowski & Dale 1998), Both (conforming costs + non-conforming costs), and (Dale & plunkett, 1995) determined All of by: (evaluation costs, implementation costs, operation costs, maintenance of QMS, resources for continuous improvement, failure costs, or any other costs necessary to maintain the quality of the product or service) . The two above classifications represent the main costs of quality, The classification is based on the total major costs (costs of conformity and non-conformity), The second is the organized of the relationship between Sub-costs (evaluation, implementation, operation, prevention and control), their relationship results to both quality improvement and cost reduction), as illustrated in table below :

Sources	Industry Field of study	Other expected benefits plus costs of improvement	Quality costs and their relationship	General form code
Fruin , 1986	telecommunications	Reduced from 23% to 17%	Prevention + Evaluation + Failure	P,A,F
Purgslove & Dale, 1996	Coatings Industrial manufacturing	Reduction in Costs from 4.1% to 2.5% in four years	Prevention + evaluation + internal failure + external failure	P + A+IF+EF
Carr, 1992	Service Business	Reduce $ 54 million in the first year	Costs of prevention + evaluation + internal failure + external failure + excess requirements + opportunity cost	(P+A+IF+EF+EX(R+OC)
Goulden,& Rawlins,1995	----------	Reduction in costs only	conforming costs + non-conforming costs	Process Cost Model (COC + CONC)
Jorgenson an Enkerlina. 1992	Computer systems	Reduction in Cost to the equivalent of 22% in the first year	Value Added Costs + Value No Added Costs	A B C Model Process quality costs + test costs + repair costs + benchmark costs + cost analysis costs)

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Source: Schiffauerova, Andrea and Vince Thomson, 2009, p.10

from the table above, some of the available quality cost models are as follows: Summaries

- All cost analysis models are established on the relationship between prevention, evaluation and failure costs (p-A-F), and rarely adds new costs to the basic model.

- The cost analysis based on the above models is based on the relationship between the main costs (conformity costs, and non-conformity costs), or between the components of these costs (prevention + evaluation + internal failure + external failure) costs, the first case has consequences (either improving quality or reducing costs), resulting from Second case (quality improvement and cost reduction together).

- The previous models did not take into account the effects on the financial position of the company, and on the requirements for improvement.

- The above cost analysis models are often not concerned with other types of costs when analyzing such as (Opportunity cost, invisible costs).

- Models did not pay much attention to explain the variation in cost reductions, or the variation in quality improvement ratios.

- Hence the need for a model aimed at the accuracy of the analysis by including other costs that were not exposed by the analysis models of (p-A-F), As well as simultaneous improvement in cost and quality levels.

Fifth: Proposed model (Structure and Building Requirements)

1 - Initial notes about the model: -

while increasing quality improvement quality costs, • The model aims to reduce the overall

• The model works to align quality improvement with quality cost analysis

• The continuity of incremental improvement costs should be paralleled with the continuation of non-conformity reduction.

• The increase in optimization costs is much lower than the reduction in non-conformity costs (failures)

• The model uses quantitative formula to identify and analyze relationships between quality costs

• The model focuses on the costs of time to combine the visible costs of quality (shown in the records) and the invisible costs of quality (It does not appear in the accounting records).

2- The model assumptions.

A1: The increase in conformity costs is consistent with the continuing reduction in non-conformity costs.

A2: Increase in optimization costs versus greater reduction in failure costs.

A3: there is an increase in the difference between a small increases in optimization costs versus a significant reduction in failure costs during the comparative time period?

A4: The costs of (both visible and invisible) calculated by the time period, essentially be used to achieve the targeted cost of reduction and improvement.

3 - The types of costs on which the model is based and its contents

- The model is based on the level of difference between the total costs of quality before improvement and after improvement

Current quality total costs	Future quality total costs
- (Real-time costs) for conformance products from the first time ..	**- (Real-time costs) for conformance products from the first time ..**
- Checking costs of all units produced	**- Checking costs of all units produced**
(Delay Time Costs): Damage Costs + Rework Costs + Re checking Costs	**(Delay Time Costs): Damage Costs + Rework Costs + Re checking Costs**
(Invisible costs): paper costs + documentation costs + opportunity cost + cost of lost time	**- (Invisible costs): paper costs + documentation costs + opportunity cost + cost of lost time**
	(improvement costs) : costs of eliminating causes of failure + failure treatment costs + maintenance + training

It should be noted as the following: -

- The overall costs of improvement are mediated between the total costs before and after improvement, and treated as intermediate costs, when determining the final state of cost reduction.
- The final result of the relationship achieved from the cost analysis is measured on the basis of (the reduction in total quality costs after improvement is greater than the increase in total quality costs before improvement).

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4 - Requirement of model designing

- Precise identification of terms and symbols used in the model.
- Defining the main objective of the model and the sub-objectives that supported it.
- Identify the elements and components model contained, and have an impact on the mechanism of its operation, and the relationship between them.
- Identify the type of costs that the model adopts at analyzing, and how they relate to each other.
- Clarify the movement of the model towards the achievement of its objectives, in order to detect the possible reduction due to cost analysis.
- Clarify the mechanism of the relationship between groups on which the model relies upon it at analysis, (Total costs before improvement, total costs for improvement, and total costs after improvement), to detect potential cost reductions.
- Determine precisely the improvement activities and their costs; because these needs vary from status to other.
- Accurately distinguish between checking and re-checking costs, and their relationship to activities before and after improvement.
- Exclude recurring costs before and after improvement, and their value remains constant in both status, because it's not affect the results of the model targeting. The model aims to detect the costs of rechecking.
- Choose the most appropriate method for calculating invisible costs, or percentage of unit costs, or based on time delay).
- The model builds and operates on three sets of costs (total cost before improvement, total cost of improvement, and total cost after improvement).
- Define a standard cost reduction ratio that enables to detect cost reduction when the model is applied.

5 - Model formulation and operating mechanism

A. Symbols used in the model:

s	Present cost	Future costs	Explain
1	PTC	FTC	Total Quality Costs
2	IC	I C1	Inspection cost
3	REC	REC1	Re- examination costs
4	DC	DC!	Damaged Costs
5	RC	RC1	Repair Costs
6	FFC	FFC1	Field Failures Costs
7	PC	PC1	Paper Costs
8	DOC	DOC1	Documentation Costs
9	SC	SC1	Sorting Costs
10	OC	OC1	Opportunity Costs
11	IMC	IMC1	Improvement Costs
12	RCOFC	RCOFC1	Remove The Causes Of Failures Costs
13	TPC	TPC1	Training Program Costs
14	MC	MC1	Maintenance Costs
15	PPC	PPC1	Prevention Plan Costs
16	Number of units examined		N , n1 , n2 , n3 , …..

B - The relationship between the costs of the model

- Equations that explain model relationships

	The equation (Relationship)	Explain
	PTC – FTC > 1	Current costs are greater than future costs.
	(PTC – FTC) – IMC > 1	The cost reduction is greater than the increase in improvement cos
	IMC < (PTC - FTC)	Improvement costs are smaller than overall cost reductions.
	COC = COC	Conformance costs are equal

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	IC – IC1 > 1	The difference between the current inspection costs for conformar units and future inspection costs is greater than (1)
	DC – DC1 > 1	The difference between the Current damage costs and future damage costs is greater than (1)
	RC - RC1 > 1	The difference between the Current remanufacturing costs and future remanufacturing cost is greater than (1)
	REC - REC1 > 1	The difference between the Current re-inspection costs and futur re-inspection cost is greater than (1)
	FFC - FFC1 > 1	The difference between the Current field failure costs and future field failure costs is greater than (1)
	PC1 - PC > 1	The difference between the Future paper costs and current pape costs is greater than (1)
	DOC1 - DOC > 1	The difference between the Future documentation costs and curre documentation costs is greater than (1)
	SC1 - SC > 1	The difference between the Future sort costs and current sort cost greater than (1)
	OC - Oc1 > 1	The difference between the Current opportunity costs and futur costs is greater than (1)

2 - The relationship between major and sub-costs

PTC = IC + DC + RC + FFC + PC + DOC + SC + OC + REC + IMC

PTC = {(IC * N) + (DC * n1) + (RC* n2) + (FFC * n3) + (REC * n4) + (PC + DC + SC) + (OC * n5)) } (RECFC + TPC + MC + PPC) .

FTC = IC1 + DC1 +RC1 + FFC1 + PC1 + DOC1 + SC1 + OC1 + REC1 + IMC1

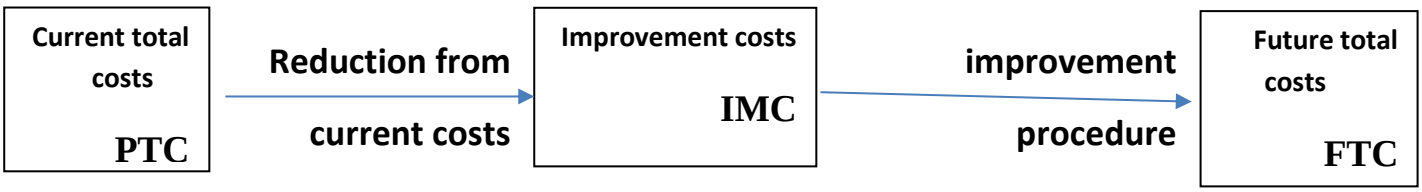
FTC = (IC 1 * N) + (Dc 1 * n1) + (RC1 * n2) + (FFC1 * n3) + (REC1 * n4) + (PC1+ DC1 + SC1) +
(OC1 * n5) + (RCOFC1 + TPC1 + MC1 + PPC1)

IMC = RCOFC + TPC + MC + PPC

The reduction in total quality costs is greater than the increase in improvement costs

) IMC1 – IMC(>)PTC – FTC(

3- - Mechanism of operating model: The model works according to the following scheme:



- The above scheme has been interpreted as follows:

The current total costs (PTC) are calculated on the basis of the sum of their sub-costs, as shown in the table above.

- Determine the type of costs with the highest value on the one hand, and the least impact in reducing the current total costs from other hand.
- Build the improvement plan by focusing on eliminating the reasons for the increase in some of the total costs, and have weak impact in reducing costs.
- Future costs (FTC) resulting from the optimization process are calculated in accordance with the information and data contained in item 3 above.
- Future total quality costs (FTC) are subtracted from the current total costs (PTC) to determine the level of cost reduction.

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- If the result is negative or less than (1), the goal of cost reduction has not been achieved, Therefore, the procedures should be reviewed.
- Re-analysis more than once until reaching the lowest possible cost reduction.
- Loading model and solution procedures on Computer, help to understand the operation mechanism and achieve more accurate results.

Data quoted from (Gary Cokins, Economic case for quality, 2oo6). 6 - Test model (Applied Case):

PTC ($)		FTC ($)	
IC = 1$	N = 100	IC1 = 15$	N = 100
REC =10	n1= 20	REC1= 10	n1= 10
RC = 15	n2 = 10	RC1 = 15	n2 = 6
DC =30	n3 = 5	DC1 = 30	n3 = 3
FFC = 30	n4 = 5	FFC1 = 30	n4 = 1
PC = 4		PC1 = 2	
DOC = 6		DOC1 = 3	
SC = 0		SC1 = 0	
OC = 0	n5 = 0	OC1 = 0	n5 = 0
RE COFC = 15		RE COFC1 = 50	
TPC = 15		TPC1 = 70	
MC = 20		MC1 = 40	
PPC = 15		PPC = 40	

N = Number of total units. n= Number of other units

Note: The model can be downloaded to a computer by a professional programmer.

PTC = {(IC * N) + (DC * n1) + (RC* n2) + (FFC * n3) + (REC * n4) + (PC + DOC + SC) + (OC* n5)) } (RECFC + TPC + MC + PPC .

PTC = (15 * 100 = 1500) + (30* 5 = 150) + (15 *10 = 150) + (30* 5 = 150) + (10 * 20 = 200) + (4 + 6 + 0 +0 = 10) + (0) + (15 + 50 + 20 + 15 = 100) = 2260 .

FTC = (IC 1 * N) + (Dc 1 * n1) + (RC1 * n2) + (FFC1 * n3) + (REC1 * n4) + (PC1+ DOC1 + SC1) + (OC1 * n5) + (RCOFC1 + TPC1 + MC1 + PPC1).

FTC = (15*100=1500) + (30*3=90) + (15*6=90) + (30*1=30) + (10*10=100) + (2+3+0+0=5) + (0) + (50+70+40+40= 200) =2015 .

IMC = RCOFC + TPC + MC + PPC

= 15+50+20+15 = 100

IMC1= = RCOFC1 + TPC1 + MC1 + PPC1

= 50+70+40+40 = 200

PTC – FTC < IMC1 – IMC

(2260 – 2015 =245) - (200 – 100=100) = + 145 $

Sixth: Concluding remarks The model is based on the relationship between three types of costs (current, improvement, and future).

- Model costs Included (invisible costs).
- The model determined the overall costs of improvement as part of the current and future total costs, to determine their level of impact on cost reductions.
- The model uses the relationship between current and future costs of quality, rather than the relationship between improvement costs and failure. that Included in the model (PAF).

- The criterion of the final result of the model is (comparison between the reduction in the total costs of quality, and the increase in the total costs of improvement), to guide the management in detecting the causes of difference and methods of treatment.
- Computer model solution helps on the ease of solution, and the accuracy of the results.

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ملخص الدراسة:

أصبحت الجودة في المرحلة المعاصرة هي الاستراتيجية الأساسية التي تتبناها منظمات الأعمال في مواجهة المنافسة ، ويمكن الفوز بالمنافسة في السوق الدولية ، (باالتخلص من الأنواع المختلفة من الخسائر) ، وهذا يؤدي إلى اقتصادية في (الوقت والجهد التكاليف) ، لأن الإجراءات الحديثة لتحليل الجودة وتحسينها تتم وفقًا قاعدة : يمكن أن يؤدي التحسين المستند إلى تحليل التكاليف يؤدي في نفس الوقت إلى (تحسين الجودة وخفض الكلفة وسرعة التسليم) ، ومع ذلك ، فإن تحليل التكاليف المرتبط بالأولويات التنافسية يتبع مسارين . الأول ، التحليل القائم على العلاقة بين التكاليف الرئيسية (إجمالي تكاليف التحسين أو تكاليف المطابقة ، إجمالي تكاليف الفشل أو تكاليف عدم المطابقة) ، والثاني ، التحليل القائم على العلاقة بين التكاليف الفرعية (الوقاية ، التقييم ، الفشل الداخلي ، فشل خارجي) ، ينتج عن التحليل الأول ميزة تنافسية واحدة (جودة محسنة مقابل تكلفة أعلى ، والعكس صحيح) . في حين أن التحليل الثاني ينتج عنه أكثر من ميزة تنافسية واحدة في نفس الوقت (انظر أيضًا ، Vahevanidis et al. 2009) ، تم تطوير العديد من نماذج تحليل تكاليف الجودة للكشف عن العلاقة بين تحليل التكاليف والميزة التنافسية ، والتي غالبًا ما تركز في النتيجة النهائية على خفض التكاليف وتحسين الجودة ، غير ان هذه النماذج العديدة تم اختصارها في نموذجين رئيسيين ، كما تم ذكره سابقًا (تحليل العلاقة بين التكاليف الرئيسية (التحسين والفشل) ، و (الثاني تحليل العلاقة بين التكاليف الفرعية – اي تكاليف (الوقاية ، التقييم ، الفشل الداخلي ، الفشل الخارجي) . بالمقابل فأن النموذج المقترح ، الذي سيتم تطويره لاحقًا ، يحاول وصف تكاليف تحليل الجودة بكل (مجموعة التكاليف المنظورة الخاضعة للمساءلة المحاسبية ، والتكاليف غيرالمنظورة اي غير الخاضعة للمساءلة المحاسبية . تم تلخيص هذه التكاليف في كل من (إجمالي التكاليف الحالية ، وتكاليف التحسين المرتبطة بها ، والتكاليف المستقبلية المتوقعة) ، من خصائص النموذج المقترح هو الأخذ بالاعتبار التكاليف غير المنظورة ، والكشف عن دور العلاقة الجديدة في تحقيق (تحسين الجودة ، وخفض التكاليف) في نفس الوقت ، تصميم النموذج الجديد مهم بالنسبة للمدير العراقي ، لأنه يقدم للمدير ا نموذجا جاهزا يمكن استخدامه لتحسين الجودة وخفض التكاليف في المؤسسة الصناعية العراقية ، تكمن المشكلة في إمكانية تحديد خصائص النموذج ومكوناته ، ومتطلبات التنفيذ ، وتم وصف المشكلة و طريقة بناء النموذج باالسؤال الآتي : (هل يمكن تطوير نموذج جديد يمكن ان يحمل على الحاسوب لتحليل تكاليف الجودة ويؤدي الى تحقيق تحسين الجودة وخفض التكلفة في وقت واحد؟) ، تتبع الورقة في التشكيل والتشغيل الحاسوبي للنموذج أربع مراحل متسلسلة ومتكاملة: (تحديد وتعريف تكاليف الجودة من خلال التركيز على المكونات والعلاقات ، وتقديم ومناقشة بعض النماذج الكمية لتحليل التكاليف ، ومن ثم النموذج المقترح : الخصائص ، الممكنات ، والمحددات) ، تضمن هيكل البحث (6) أقسام (الأول: المقدمة ، والثاني: منهجية البحث ، والثالث: تصميم وطريقة الدراسة ، والرابع: الإطار النظري ، والخامس: النموذج المقترح ، والسادس : خاتمة تتضمن ملاحظات أخيرة ، ختتمت الورقة بملخص يوضح أهم الملاحظات المتعلقة بتنفيذ النموذج وتشغيله بحاسوبيا .