

COSTING OF QUALITY IN BUSINESS BASE UNIT SEVERAL PRODUCTIONS, CIENFUEGOS

Gómez Alfonso, Elizabeth

Universidad Carlos Rafael Rodríguez de Cienfuegos
Cienfuegos, Cuba
egomez@ucf.edu.cu

Reception date: 07/13/12 – Approval date: 12/26/12

ABSTRACT

The calculation of quality costs as a component of the System of Quality Management, is a must for Cuban business managers, to provide a technique identified as an advanced instrument of management, which will lead to improved competitiveness and serve as an informative source. Identify and calculate the costs of quality, as well as propose measured plans, to promote a decrease in operating expenses, which can be used as a tool to improve processes. The Business Unit of Several Base Productions of Cienfuegos presents the fault to give way to Business Improvement and certification of its Quality Management System, according to the norm ISO 9001:2008 and the decree law 281, so that the objective research was to estimate the costs of quality processes in the company. To achieve this level were used empirical methods and techniques such as direct observation, document review and work in groups, which allowed to calculate the costs of quality in all processes. The results obtained are applicable to companies that operate in the Cuban economy and according to the Cuban economic model implemented from the year 2011.

KEYWORDS: Accounting; Costs; Quality; System; Management.

INTRODUCTION

Process Quality Improvement is a set of principles, policies, support structures and practices to continuously improve the efficiency and effectiveness of the current lifestyle. Quality Costs are not only an absolute measure of performance, its importance lies in indicating where it will be most beneficial corrective action for the company, and are used as indicators of the business areas for improvement in their products and processes.

“Visión de Futuro” Año 10, Volumen N°17, N° 2, Julio - Diciembre 2013

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URL del Documento: http://revistacientifica.fce.unam.edu.ar/index.php?option=com_content&view=article&id=335&Itemid=72

ISSN 1668 – 8708 - Versión en Línea

ISSN 1669 – 7634- Versión Impresa

E-mail: revistacientifica@fce.unam.edu.ar

This research has a wide application as it can be used in production and services companies, as long as they fit the characteristics of that entity to this procedure, it also addresses economic and financial concepts that have not been applied yet in the company and could be generalized to all Several Productions Companies (PROVADI) in Cienfuegos that exist in the country. The total cost of quality is composed as follows:

Prevention costs:	11,609.39 UM
Evaluation costs:	25,504.58 UM
Internal Failure Costs:	22,092.04 UM
External Failure Costs:	540.67 UM
Total Cost of Quality:	59,746.68 UM

The social impact is given to labor used by the company that comes from inmates Built in socially useful work from the Ariza prison system.

DEVELOPMENT

Management accounting covers a broad field of study and different from the general ledger so it is necessary to refer to basic concepts in order to provide foundations to the topics covered in this research work.

"The cost is the basis for product costing, performance evaluation and management decision making and is defined as the value sacrificed for goods or services. Cost accounting is the technique or method for determining the cost of a project, process or product, used by the vast majority of legal entities in a society to provide information required for planning operations, evaluation and control and participate in the strategic decisions, tactical and operational, helping to coordinate the effects throughout the organization". [Polimeri, R., 2003, p. 10]⁽¹⁾.

The turbulent and competitive environment in which we live today, means that companies make great efforts to achieve improvements on many fronts, recognizing that the only way to stay in business and prosper is by offering products and services of higher quality from the perspective customer, at the lowest cost.

"The quality understood as the ability of a product or service to meet the needs of users today is one of the cornerstones of management, it constitutes one of the most important strategic mechanisms for enterprises, so that the total control of quality within the organization is essential... quality improvement is the most profitable business strategy. It takes you to a larger share of the market, to sell at better prices,

lower costs, and excellent customer relations". [Juran, J., 1999, p. 28]⁽²⁾.

The above indicates the importance of quality as a management tool, being a representative factor as noted, of the competitive advantage of an organization, is one of the most influential among the world-class competitors, decisively influencing in the process of continuous improvement.

They have set international standards of quality, by region, by country or by productive sector, an example of this is the ISO 9000, developed by the International Organization of Standardization which constitutes a set of five standards for quality management that have been adopted by more than 80 countries, including Cuba.

In Cost of Quality, the keyword is cost, and thus, their study corresponds to the accounting and management costs; but quality is another key word in business and usually there is a quality department that takes this responsibility.

In this way, quality costs according to Climent are "the costs associated with collection, identification, repair and prevention of failures or defects. Quality costs can be classified into four categories: prevention costs, appraisal costs, internal and external failure costs". [Climent, S., 2003, p. 166]⁽³⁾.

Prevention costs: Campanella defined as "the costs of all activities specifically designed to prevent poor quality products or services." [Campanella, J., 1997, p. 22]⁽⁴⁾.

Evaluation costs: according Campanella are "the costs associated with measuring, evaluating or auditing products or services to ensure they meet quality standards and performance requirements". [Campanella, J., 1997, p. 23]⁽⁵⁾.

Internal failure costs: "occurs prior to delivery or shipment to the customer without these being direct participants". [Campanella, J., 1997, p. 23]⁽⁶⁾.

External failure costs: according to ISO "are the costs resulting from the inability of a product to meet quality requirements after delivery to the customer". [ISO, 2000, p. 17]⁽⁷⁾.

As shown below, Figure 1, shows the traditional model quality costs, as in Figure 2 which shows the emerging model quality costs, both models match the design quality and compliance with standards, and ignore oriented approach to customer satisfaction, cost approach and other more modern adaptation latent needs.

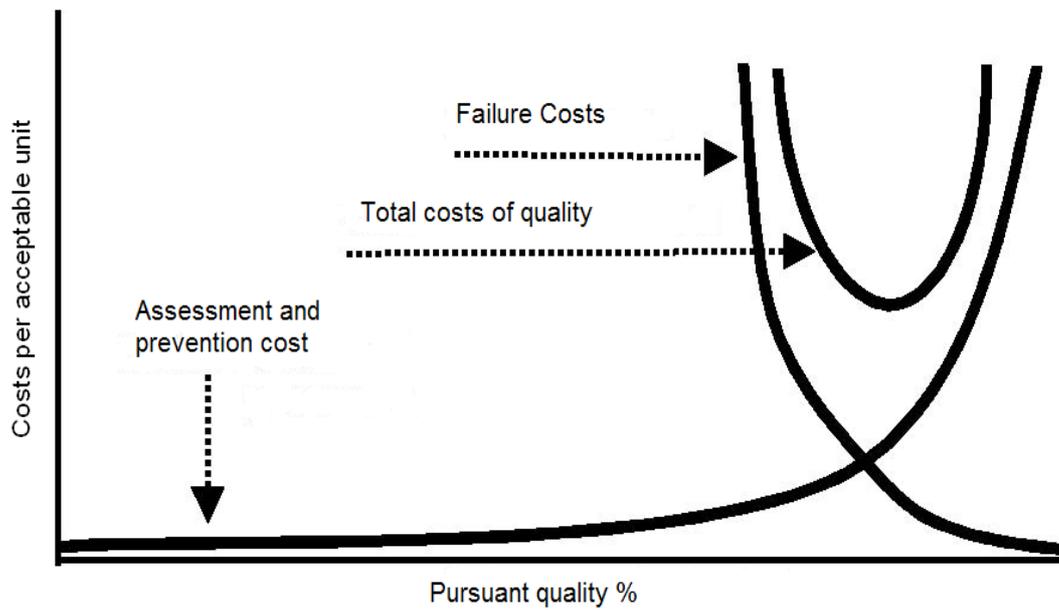


Figure 1. The traditional model of Quality Costs
Source: Rao et al. (1996)

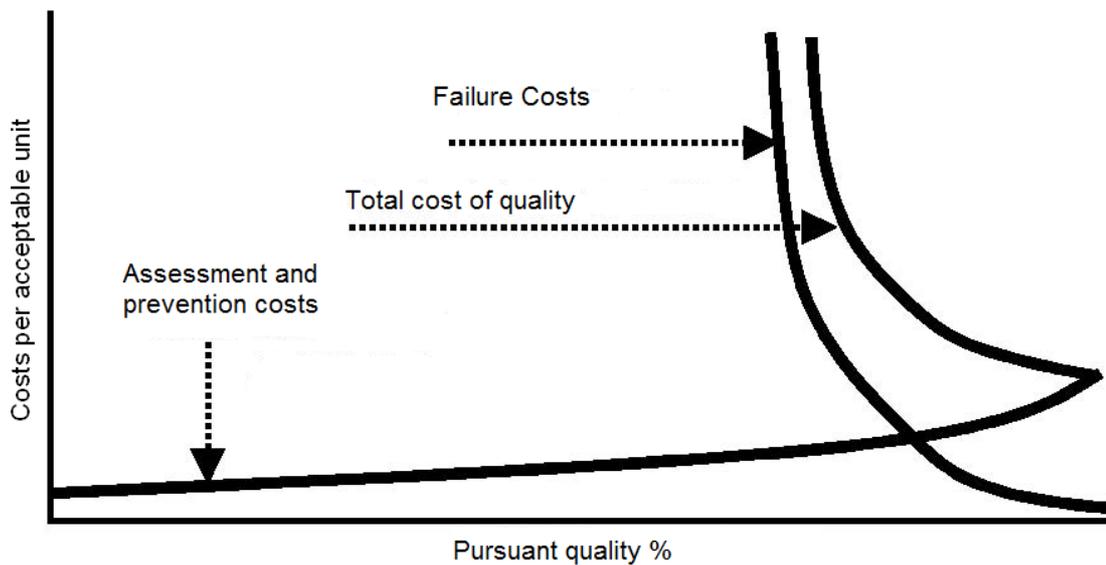


Figure 2. The emerging model of Quality Costs
Source: Rao et al. (1996)

There exists different behavior ranges of each cost about total quality costs, as shown

in Table No. 1.

Table 1: Range behavior of quality cost categories

Total Quality Cost	Harrington	Fawsi	Juran	Cuatrecasas
Prevention Costs	10%	0,5–5%	≈10%	<5%
Evaluation Costs	35%	10-50%	≈10%	10-50%
Internal Failure Costs	7%	20-40%	≈50%	20-40%
External Failure Costs	48%	23-40%		25-40%

Source: [Marrero, Y., 2010, p. 57]⁽⁸⁾

One of the objectives of the quality costs systems is to identify opportunities for improvement and then generate performance indicators over time. The best way to measure differences in quality cost -also called of poor quality- is to build on the percentages or relative to some appropriate basis. The total costs of quality, whether of enterprise or from a process, compared with base indicator, resulting in an index that can be graphed or analyzed periodically.

Various indicators can be used to measure and quantify the quality costs and four indicators are mentioned for this purpose, according to Evans (1999):

1. Index based on labor: quality costs per hour of direct labor. That is, for every hour I spend on a worker how much is lost. (Total Cost of Quality / Cost of direct labor).

2. Index based on cost: quality costs by weight of manufacturing costs. That is, for every dollar I spend on manufacturing (labor, material and overhead costs) how much is lost. (Total Cost of Quality / Cost of manufacture).

3. Index based on sales: Cost of quality by sales weight. That is, for every dollar you earn how much is lost. (Total Cost of Quality / Sales).

4. Unit based index: quality costs per unit produced. That is, for each unit produced, how much money is lost. (Total Cost of Quality / units produced). The most used indicator is calculated on the basis of sales, followed by labor, units produced and finally based on the cost of manufacturing. The special literature emphasizes use as comparison guide the company's net sales. For a long time analysis, they may be most comparable, but in industries it is where they vary significantly from period to period, it will not be a basis for short-term comparisons.

"It is best to have several bases and then kept only the most significant." [Juran, J., 1999, p. 86]⁽⁹⁾.

1. Percentage of total production costs for the case of internal failure costs.

2. Percentages of net sales to external and/ or internal failure costs.

3. Total percentage of purchases made for the costs of purchasing assessment.

4. Percentages of production costs for the total cost of quality. The chosen basis does not affect final interpretations on what costs should be reduced.

As a result of analysis of the methodologies of the most important authors in the field of quality costs it was decided to use for this research methodology steps of Jack Campanella (1992). This selection was based on three fundamental aspects:

- The author, Jack Campanella, has worked in Development, Research, Standardization, and application of the Cost of Quality in the ASQ (American Society for Quality), hence he is considered one of the most important personalities in this topic in the field world.

- This methodology currently has a large effect, since its author on the most recent publications made few modifications.

- The design presented is the most appropriate for deployment in the Base Business Unit, being enriched with elements of Resolution 281 and ISO 9001.

For the combination of the Methodology with ISO and Resolution 281 were considered important elements such as:

- The scientific rigor underpinning its principles and its easy adaptation to the Cuban socialist economic system, in need of tools that increase the commitment of management and employees, to raise the quality in processes and reduce costs.

- The development of a program which organizes the logical steps and procedures for the deployment of the project, staff preparation and analysis of the results to trigger the process improvements.

- These were punctuated methods, standards and procedures which govern the planning, determination and cost analysis. In order to calculate the Base Business Unit (BSU) Various Productions (PROVARI) were defined as the components of cost of quality in the processes selected and evaluated their behavior over a period of three months, taking for it the last quarter 2011 to be of interest to address the analysis due to deviation of the costs arising from this quarter. The outline of the procedure is shown in Figure 3.

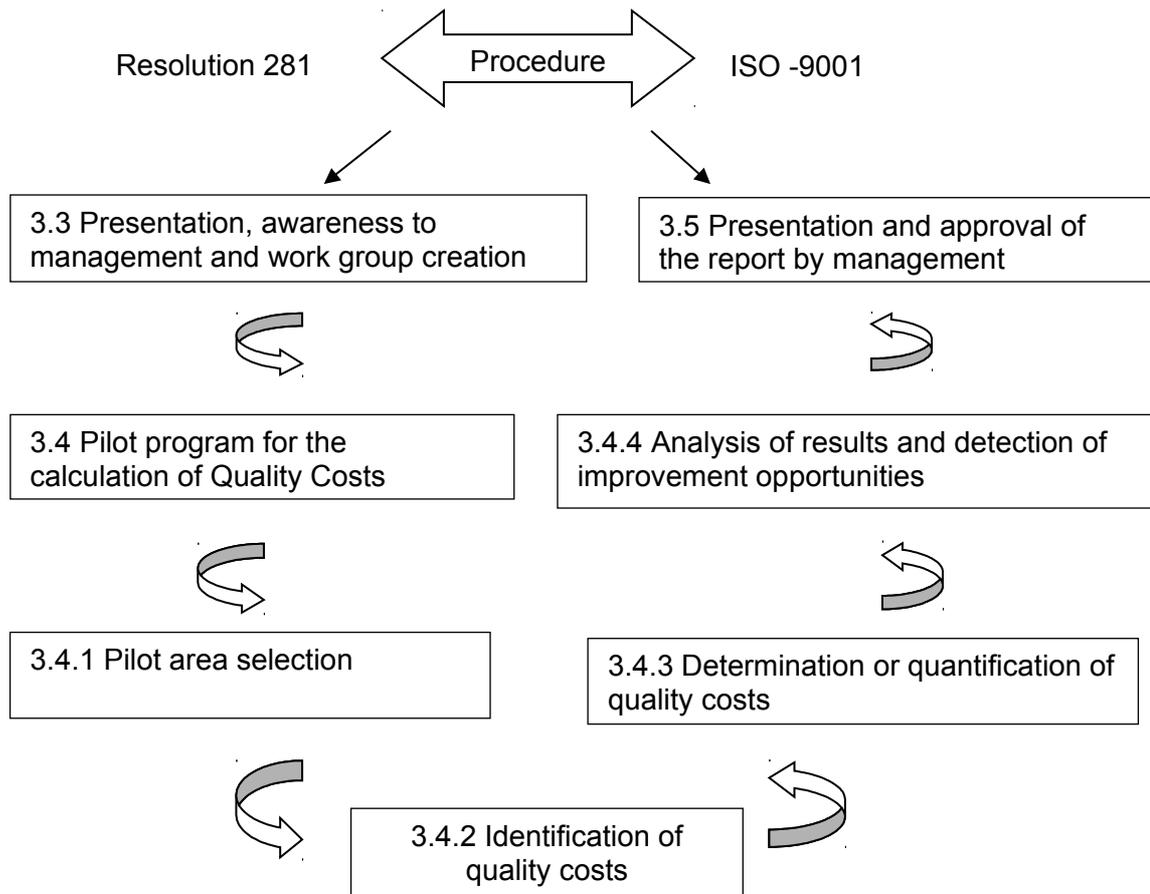


Figure 3: Procedure used to calculate the Cost of Quality in the Business Unit Base Various Productions (PROVARI) Cienfuegos
 Source: Own Elaboration

In the stage of Awareness and Presentation Management it is necessary that the entity management understands the importance of developing a program of quality costs, after discussing the subject and clarified doubts, the approval of this project is achieved as company's strategic aimed, with an action plan in two stages:

- 1.- Classification and analysis of the processes.
- 2.- Extension Program for the entire organization.

In order to create a working group to carry out the program and that most employees know and come to dominate the terms related to the calculation of the Cost of Quality, a seminar was held for all workers involved, where general aspects were treated calculating the costs of quality, objectives and advantages of calculating these costs, identification data provided by the information system of the enterprise and the system design to obtain all

costs.

In this way it was possible to fully identify, participation and commitment of everyone involved with the program, including senior management, and proposals were made to form the working group.

Given that all areas should be represented to meet the information needs for this research, it took the proposals of the most competent, reliable and qualified person to serve on the working group, which was composed of nine members.

The pilot program includes identification of the pilot area to determine their quality costs, quantification and then analyze the results and identify opportunities for improvement. BSU processes are ranked in Strategic, Operations and Support Processes.

Strategic Processes: Address Management and Measurement, Analysis and Improvement.

Operations Processes: Business Management and Technical Productive Management, with Threads, Textile Garments, Carpentry, Painting, Upholstery, Construction Materials, Graphics, Recycled Clothing, Chemistry.

Support Processes: Human Capital Management, Logistics Management, Economic Management.

This research is part of the thread of Construction Materials, part of the Productive Technical Management business process, leaving the bases for an immediate expansion of the program for the entire organization.

This program is applied on the previously stated area as its critical because of the impact it has on the overall costs of the Company, as the diagnosis that it was previously, determined that although it is the thread that generated higher profit the company, it is also presenting major concepts of Quality losses and therefore turns out to be the most interesting thread for the Direction Management right now.

For this selection the Working Group took into account criteria such as:

- Objective necessity to improve quality and reduce costs with impact at company level.
- That they were allowed autonomous areas and assess the effect of costs on sales.
- The proper state to consolidate its databases on costs, given the level of structuring the process.

- Staff characteristics, interest, commitment and willingness to develop the project, with an open mind to new ideas and changes.
- Possibility, reserves and need of improvement opportunities.

Once classified BSU processes and activities are broken down it is able to classify the activities which affect quality costs, attending to the categories presented according to the literature and based on the nature of the entity. It was decided to classify these quality costs in: Costs of Prevention, Assessment, internal and external faults.

Once identified as activities that affect quality and costs assigned categories to which each belongs, they are assigned to expense items incurred by each activity. The following illustrates the costs elements used by UEB PROVARI Cienfuegos, consecutively numbered, numbers that will be used for this identification.

1. Raw materials and fundamental
2. Auxiliary materials
3. Labor costs
4. Fuel
5. Energy
6. Depreciation and Amortization
7. Other cash expenses

Subsequently were identified and recorded quality costs reflecting the results obtained by processes and activities. Was used as a benchmark for this calculation, the total costs of quality which have determined the working group that this was the most appropriate basis for comparison:

Percentage of Prevention Costs for Total Cost of Quality:

$$C = \frac{\text{Prevention. Costs}}{\text{Total. Quality. Costs}} \times 100$$

Percentage of Costs of Assessment for Quality Total Cost:

$$C = \frac{\text{Assessment. Costos}}{\text{Total. Quality. Costs}} \times 100$$

Percentage of Internal Failure Costs for Total Costs of Quality:

$$C = \frac{\text{Internal. Failure. Costos}}{\text{Total. Quality. Costs}} \times 100$$

“Visión de Futuro” Año 10, Volumen N°17, N° 2, Julio - Diciembre 2013

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ISSN 1668 – 8708 - Versión en Línea

ISSN 1669 – 7634- Versión Impresa

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Percentage of External Failure Costs for Total Costs of Quality:

$$C = \frac{\text{External. Failure. Costos}}{\text{Total. Quality. Costs}} \times 100$$

It is important to note that at another time there may be used in this company other bases of comparison for determining the impact of quality costs, which can be calculated as follows:

Percentage of the Total Cost of Quality for Sales:

$$C = \frac{\text{Total. Quality. Costs}}{\text{Total. Sales}} \times 100$$

Percentage of the Total Cost of Quality for the Cost of Production:

$$C = \frac{\text{Total. Quality. Costs}}{\text{Production. Costs}} \times 100$$

Percentage of Internal Failure Costs for Salary Expenses:

$$C = \frac{\text{Internal. Failure. Costos}}{\text{Salary. Costs}} \times 100$$

At this stage the techniques used to display the results are:

- Information
- Draw
- Workgroup Sessions
- Brainstorming
- Charts and bar

The analysis of the results of quality costs by category in different sections relating to the fourth quarter of 2011, show that:

The operating process Business Management proved to be the most frequent in the calculation of quality costs, while the thread of Construction Materials, belongs to the operating process Productive Technical Management which is the next in representation, as shown below.

- Commercial Management:

Total Cost of Quality: 25,566,75 UM, representing 42.79%.

Items of Expense: The largest representation is given by UM 21432.23 Other Monetary Expenditure concept in transport activity blocks with a value of 17,549.00 UM, and UM 3,176.61 Fuel Spending in the same activity.

Cost of Quality category: The highest incidence was found to be the Internal Faults by poor planning of products, processes and services, followed by Evaluation costs which accounted for UM 3,932.57, under the heading Monitoring the production process and service and Prevention Costs with 199.34 UM. Although External Fault represent only 2.61 UM in the quarter under review, they exist; which indicates that they should not be ignore.

- Thread Building Materials

Total Cost of Quality: 14,600.95 UM, representing 24.44%.

Items of Expense: It is important to note that in this thread are present almost all expenditure items, with amounts well representative:

- Spending Workforce: 6,766.69 UM
- Expense of Raw Materials and Materials: 4,094.13 UM
- Depreciation and amortization expense: 1,948.36 UM
- Other Monetary Expenses: 1,065.00 UM
- Energy Expenditure: 509.39 UM
- Expenditure of Auxiliary Materials: 217.38 UM

Cost of Quality category: The highest incidence was found to be for the Evaluation Costs 13,941.14 UM, heading the Production process monitoring and Measurement service and customer satisfaction, in addition to internal faults with 659, UM 81, in the Reworking of blocks. It is valid to point out that in this quarter there are not External Fault.

In achieving the representativeness of Quality Costs in the quarter under review followed the Support Process Management Logistics, and with similar values to those obtained in this, the Strategic Measurement, Analysis and Improvement Process.

- Logistics management

Total Cost of Quality: 94,5. 94 UM, representing 15.75%.

Items of Expense: In this process are present almost all elements of spending, with representative amounts:

- Depreciation and amortization expense: UM 4,982.67
- Other Monetary Expenses: UM 3,455.28
- Workforce Spending: UM UM 366.25
- Fuel Expense: UM 360.00
- Energy Expenditure: UM 197.94
- Expenditure of Auxiliary Materials: UM 53.80

Cost of Quality category: The highest incidence was found to be for Prevention Costs with UM 9,295.97, under the heading Administration of Quality System, Safety, security and occupational health and preventive maintenance, followed by the category of Evaluation Cost with 104.51 UM in the Production process supervision and service and last but not least, the External Fault category representing 16.16 UM due to problems in contracts. No Internal Faults in this period.

- Measurement, Analysis and Improvement

Total Cost of Quality: UM 8,366.12, representing a 14%.

Items of Expense: In this process the elements of spending, with the highest incidence were:

- Other Monetary Expenses: UM 6,885.00
- Workforce Spending: UM 1,407.47
- There are fuel costs, raw materials and auxiliary materials, but they are not representative values.

Cost of Quality Category: The highest incidence was found to be for the Evaluation Costs 7,167.35 UM under headings Monitoring the Production process and service and Customer Satisfaction Measurement. It follows the Prevention Costs category in the Administration of Quality System and the Acquisition, verification and calibration of measuring equipment. There are no Internal or External Fault.

Continuing the analysis of the results, it shows the remaining processes that only accounts for 1.60% and 0.95% of the total costs of quality, being negligible compared these values with the other processes, but not to be missed of view, to try not to increase in subsequent periods.

The Economic Management Support Process with an amount of up to 634.01 UM, represents only 1.6% of the total costs of quality, mainly due for the item Other Monetary Expenses.

The Strategic Management Process Director presented a cost in terms of quality of UM 597.95, for 1.00% of the total, given the expense of the labor force.

In the Support Process in Human Capital Management, there was obtained only 564,96 UM, to 0.95% for the same spending item in the previous process.

When comparing the results in Table 1 with those of the author Harrington allowable range for the different categories we have:

- Prevention Costs in an allowable range by the author of up to 10%, are found in 19.43% elevated in 9.43%.

- Evaluation Costs in an allowable range by the author of up to 35% are at 42.69%, elevated in 7.69%.

- Internal Failure Costs happen to be the most deviation from its rank as the author admits up to 7% and the research conducted in the last quarter of 2011 are at a 36.98%, which represents a 29 above 98%.

- External Failure Costs are the only in its class that are below the range and also represent only 0.90%, which is very good for the company. After analyzing the above results and taking the Total Cost of Quality for the different categories amounted to 59,746.68 UM, we propose the following Plan of improvements to help reduce operating expenses and increase the profits of the Company.

Upgrade processes:

- Commercial Management

- Perform proper transportation planning in moving the blocks, according to the requirements of this type of product, without damage and affect the quality of concept reelaborate obliging breaks.

- Planning more than Evaluation, to decrease in this way quality costs by Oversight concept to the production process.

- Thread Building Materials (part of the Productive Technical Management process)

- Prevention, through proper planning, the block production process, which allows reducing the labor expense and the Commodities and Materials, by concept of evaluation in this process.

- Control the quality expenditures that directly affect production.
- Logistics Management
 - Analyze the Prevention category in preventive maintenance to assess a possible element decreased of Depreciation and Amortization expense that was high.
 - Measurement, Analysis and Improvement
 - Train staff of the entity involved in this process for adequate prevention to be effective and cost-saving allows for evaluation.

After prepared by the working group, the process-improvement plan, is carried above Report Quality Costs to the Department where the results are discussed and approved this report is for the pilot area and proposes subsequent application the rest of the threads belonging to the process Productive Technical Management.

CONCLUSION

After the research raises the following conclusions:

- As a result of the literature review and the development of the theoretical framework and procedures were studied several renowned authors methodologies for calculating Quality Costs, being able to identify the most appropriate for its application.

- By characterizing Base Business Unit (BSU) Various Productions (PROVARI) Cienfuegos, it was found that neither the system nor the Quality Management System Costs, collect data on quality costs.

- In the UEB PROVARI it used a Cost System for production orders, in this type of costing, physically identify each separate order and related costs, plus direct material requisitions, and the cost of direct labor carry specify order number and manufacturing overhead costs generally apply to individual orders, these based on a predetermined overhead rate, you can determine the gain or loss for each order and the cost per unit.

- After applying the procedure yields the following results:

- The Cost of Quality in Construction Materials thread in the preparation of blocks, representing 7% of the costs for the quarter.

- Lack of education and training of personnel employed and lack of awareness on quality issues by technicians and workers.

- In the company they only have a Quality Specialist, which is responsible to monitor

and evaluate everything about this concept.

- They have not designed the Quality Management as a process, this is within the Strategic Process so-called Measurement, Analysis and Improvement.

- It spends most quantitative in costs of Prevention that is, 11,609.39 UM, representing 19.43% of total quality costs, while Evaluation costs represents 42.69% (25,504.58 UM).

- It Represents a considerable expense for the entity the transportation in respect of production and testing laboratories.

- There are no Prevention costs in construction materials thread about making blocks.

- The breakage of the blocks are accepted up to 5% of the total monthly production, representing quality issues, accept 950 good and 50 bad.

- By applying the procedure it is demonstrated the importance and the need for the incorporation of calculating the Cost Accounting Quality of Cuban companies.

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ISSN 1668 – 8708 - Versión en Línea

ISSN 1669 – 7634- Versión Impresa

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