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TOTAL COST OF POOR QUALITY

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Contents

List of abbreviations.....	2
1. Introduction	3
2. Theoretical framework	4
2.1. Introduction to Quality.....	4
2.1.1. Total Quality Management.....	4
2.2. Lean Manufacturing	6
2.2.1. The eight wastes or Muda	6
2.3. Introduction to Cost of Poor Quality	9
2.3.1. Visible and invisible Costs of Poor Quality	9
2.3.2. Measuring poor quality costs: The Quality Loss Function	11
3. Classification of the Costs of Poor Quality	12
4. Differences between product quality and service quality	20
5. Definition of quality	22
5.1. Quality in manufacturing organizations	22
5.2. Quality in Services organizations	24
5.2.1. Importance of service quality	25
5.3. Quality assessment in higher education institutions using the SERVQUAL model ..	26
6. Culture of Quality.....	28
6.1. Creating a Culture of Quality in manufacturing and service companies.....	30
7. Conclusions	33
References	35
Appendix	37

List of Figures

Figure 1. The cost of quality iceberg.....	10
Figure 2. Taguchi Quadratic Loss Function	11
Figure 3. The classification of CoPQ according to Feigenbaum	13
Figure 4. The classification of CoPQ according to Gryna	15
Figure 5. Model of optimum quality costs	15
Figure 6. The classification of CoPQ according to Giakatis	17
Figure 7. The classification of CoPQ according to Harrington.....	19
Figure 8. Gap analysis	27

List of Tables

Table 1. The classification of CoPQ according to Dahlgaard.	20
Table 2. Definitions of Quality.....	23
Table 3. Product Quality Dimensions.....	24
Table 4. Service Quality Dimensions	25
Table 5. SERVQUAL questionnaire adapted to HSN	39

List of abbreviations

In order to simplify the reading and understanding of the report, we used common abbreviations in the report. Every abbreviation that was used can be found in this list:

HSN/USN	- Høgskolen i Sørøst-Norge/ University College of Southeast Norway
TQM	- Total Quality Management
CoPQ	- Cost of Poor Quality
Ref.	- referring to (certain pages in the report)

1. Introduction.

The purpose of this study is to evaluate the importance of Total Quality Management and analyse non-quality costs that are considered the problem of most companies in the market situation today, which are challenged to provide their customers with products and services at a low cost without affecting the quality of the product. Quality costs contribute to a high proportion of the total costs of an organization. Their importance is that they cannot be fully reflected in the accounting documents and many of them cannot be measured in practice. In order to get a closer insight into the topic, the knowledge was obtained through books and scientific articles, which were chosen from the recommendation of the supervisor Rolf Qvenild, own searches at HSN Library or Google Scholar and own experience from literature in previous course, Total Quality Management (by Rolf Qvenild) at HSN. To find the relevant literature keywords such as *cost of poor quality*, *quality costs*, *poor quality costs*, *lean manufacturing*, *evaluation of non-quality* and *quality management* have been used.

It is important to first get an overview of the research topic in order to get an understanding and later go deeper into the specific are of interest. Therefore, this approach started firstly with a broad search to acquire a wide basis of knowledge in quality management and the concept of quality and the deepened into CoPQ. However, when the deeper knowledge was acquired in CoPQ, a need to include Lean Manufacturing together with theory regarding CoPQ was considered necessary and consequently it had to be added in the study. Besides, this report will evaluate the difference between quality in product and service organizations. Finally, the Culture of Quality will be discussed as the best way to improve the control costs of non-quality of the organizations, helping them to make better decisions.

2. Theoretical framework

The theoretical framework is divided into following sections: Introduction to Quality, Lean Manufacturing and Introduction to Cost of Poor Quality.

2.1. Introduction to Quality.

Quality is a concept with many different meanings, since for each person quality has different meanings with regard to a particular product or service. This is because they have different expectations and needs, and sometimes they do not even know which their needs are. Therefore, it can be said with certainty that quality for any individual is something that will give him/her a degree of satisfaction and delight¹. Nowadays, it is still usually said that if the price is higher, the quality is higher too. But that thinking is wrong, inasmuch as quality can be measured based on a number of attributes and the level of these attributes within a product or service compared to the price. The consumer will be satisfied as long as the value provided by a product or service is equal or higher than the money he/she is paying for. Otherwise, Quality can also be measured based on the experience the customer has with a product or service and the expectations he/she had before. Hence it is recommended to give a little bit more than expected, however it is not necessary. But it is indispensable to provide exactly what he/she expects through a previous and full knowledge of their needs.

There is no doubt that quality plays a key role in any organization, and must be built not only into the product or service produced, but should be built into whole the organization, therefore in creation of quality all the employees should be involved. In order to achieve this goal there should be many sustainable quality improvement programs, though which will be possible the identification and total elimination or reduction of all types of failures events or failures within the organizational system.

2.1.1. Total Quality Management

Total Quality Management (TQM) is management approach that search for growth in production efficiency through the constant improvement of the quality of products. TQM is discussed by many authors, such as Deming, Juran and Crosby, all presenting different approaches. Deming emphasizes the systematic nature of organizations, the importance of

¹ Krishnan, S. K. (2006): *Increasing the visibility of hidden failure costs*. Measuring Business Excellence, Vol. 10 No. 4, pp. 77-101

leadership and the need to reduce variation in organizational processes. Juran is considered to be one of the earliest leaders in the quality field and has contributed to the building of the conceptual basis of quality management. His framework involves three sets of activities – quality planning, control and improvement – and stresses the use of statistical tools in order to eliminate deviations. Crosby focuses on reducing cost through quality improvement and stressed that both high-end and low-end products can have good quality.

Despite these researches the concept of TQM is very ambiguous due to continuous evolution of techniques. In order to solve that ambiguity, Dean and Bowen propose a study of quality management that captures its most important features. According to Dean and Bowen, quality management is a philosophy or an approach to management that can be characterized by its principles, practices and techniques. Its three principle are customer focus, continuous improvement and teamwork, which are implemented by practices such as collecting customer information or analysing processes. The practices are, at the same time, supported by different techniques such as customer surveys, flowcharts, Pareto analysis, and team-building methods.

The first and the most important principle is customer focus. The goal of satisfying customers is fundamental to quality management and it involves designing products or services that meet or exceed the customer's expectations. Customer satisfaction is the most important requirement for long-term organizational success and that this satisfaction requires that the entire organization be focused on customers' needs, which include promoting direct contact with customers, collecting information about customers' expectations, and disseminating this information within organization. Techniques used to accomplish these activities include customer surveys and more elaborate methods such as quality function development.

Continuous improvement is the second principle and it means a commitment to constant examination of technical and administrative processes in search of more effective or efficient ways of working, striving for excellence all the time. Underlying this principle are the concept of organizations as systems of interlinked processes and the belief that by improving these processes, organizations can continue to meet the increasingly stringent expectations of their customers. Relevant practices include process analysis and reengineering. Many techniques, including flowcharts and statistical process control are associated with this principle.

The third TQ principle is teamwork, which is based on the familiar assumption that non-managerial employees can make important contributions to the organization when they have

power and necessary preparation. Teamwork among functions is based on the notion that organizations as systems cannot be effective if subunits emphasize their own outcomes over those of others. The principle of teamwork with customer and suppliers is based on the perceived benefits of partnerships. Teamwork practices include identifying the needs of all groups and organizations involved in decision making, trying to find solutions that will benefit everyone involved, and sharing responsibility and credit. These practices are promoted by forming teams, through techniques such as role clarification and group feedback.

These three principles relate closely to one another. Continuous improvement is undertaken to achieve customer satisfaction, and it is most effective when driven by customer needs, because the processes targeted for continuous improvement transcend hierarchical, functional, and organization boundaries, teamwork is essential. Therefore, TQM is no simple a mixture of slogans and tolls, but a set of mutually reinforcing principles, each of which is supported by a set of practices and techniques, and all of which are ultimately based on fulfilling customers' needs².

2.2. Lean Manufacturing

Nowadays, the market is in situation of strong competition and, the consumer is becoming more choosy and selective in choosing products. In this regard, any company must establish itself on the market as a producer of high-quality and affordable products, not only meeting customer demands and providing what the customer wants, but also minimizing the costs and the delivery time. For this reason, more flexible and fast processes are required. This production system was created during 1950s by the Japanese car manufacturer Toyota. The purposes of Lean are to eliminate non-value added activities and create a consistent flow by continuously working on improvements. To be able to work with Lean management it is necessary to have the fundamentals in TQM established in the company. Therefore Lean can be seen as an improvement or extension of TQM.

2.2.1. The eight wastes or Muda

In Lean the value of a product or service is defined solely by what the customer actually requires and is willing to pay for. Processes that deliver the product or service to the customer fall into

² James W. Dean, Jr. and David E. Bowen: *Management Theory and Total Quality: Improving Research and Practice through Theory Development*. The Academy of Management Review, Vol. 19 No. 3, Special Issue: "Total Quality" (Jul., 1994), pp. 392-418.

two groups:

- Value-added activities create the precise solution that the customer requires. An activity adds value if it is performed in a process that the customer is willing to pay for, it is done right the first time, and it transforms the product or service.
- Non-value-added activities are those activities that aren't required but still occur. Anything that adds unnecessary time, effort, or cost is considered non value-added and may be defined as waste. To put it another way, waste is any material or activity for which the customer is not willing to pay.

Through a continual focus on the identification and elimination of waste, Lean tools help a business optimise its processes. To help identify waste, the Lean philosophy breaks down waste into seven specific elements:

1. Transport includes any movement of materials or products from one location to another, adding cost to creating it, but does not add any value to the product, therefore the customer is not willing to pay for it. Besides, products have the risk of being damaged during transport and becoming obsolete.
2. Inventory is a drain on an organization, adversely affecting cash flow and often masking poor processes. Waste of inventory increases overhead and hides quality issues in finished goods or work in process. It also means having unnecessarily high levels of raw materials, works-in-progress, and finished products. Extra inventory leads to higher inventory financing costs, higher storage costs, and higher defect rates. However, in order to remain responsive to the customer's requirements and ensure control of variance, it is necessary to maintain a minimum inventory levels. But, excess inventory, disguises issues like unacceptable changeover times, downtime, and operator inefficiency because there is no sense of urgency to produce product since there is plenty available in storage. As excess inventory to accommodate problems in processes is built, the costs increase. Safety stock levels are driven by downtime, quality problems, supplier delivery problems, and job imbalances. Lowering the amount of in-process inventory forces organizations to improve your processes.
3. Any movement of people or equipment that does not contribute value to the product is waste of motion. It can be found both in the machine and the method of the production

system, including production systems for services.

4. Waste of waiting is any idle time produced when two interdependent processes are not completely synchronised. Operators are kept waiting, or simply work slowly whilst the machining cycles. The Waste of Waiting disrupts flow, one of the main principles of Lean Manufacturing, as such it is one of the most serious of the seven wastes or 7 Mudras of lean manufacturing.
5. Overproduction is the worst kind of waste because it hides other types. It means unnecessarily producing more than is demanded or producing it before it is needed. Overproduction increase the risk of obsolescence, the risk of producing the wrong thing, and the possibility of having to sell the excess items at a discount or even discarding them. The waste of correction is often amplified by overproduction. Not only do you generate the mistake once, but unknowingly you generate the same error multiple times.
6. Over processing occurs through processing, such as excessive levels of approval for a purchase requisition that provides no value to the product or service. Of all the types of waste, this is often the most difficult to identify.
7. The waste of defects is the most obvious of the seven wastes, although not always the easiest to detect before the products reach customers. Quality errors that cause defects invariably can cost far more than expected. Every defective item requires rework or replacement, it wastes resources and materials, it creates paperwork, and it can lead to the loss of customers, therefore it should be prevented as soon as possible.
8. Over skilled organization is the eighth waste and it refers to not properly utilising the skills and abilities of employees, causing waste of time, non-use of skills and ideas, missed improvement opportunities and learning opportunities, usually due to simply not listening to the employees. Companies must realize that their employees are their biggest assets and need to be involved in the complete production process, since they can generate ideas which can eliminate the other seven wastes³.

Some activities that do not add any value to the product but are essential for the process and daily work, are called necessary non value adding activities. Those should be identifies as fast

³ Six Sigma Qualtec (Sept/Oct 2004): *Learning about Lean: Eliminate Waste and Increase Value*. Six Sigma today, pp 42-46.

as possible and reduced, but cannot be completely eliminated, because, although they do not add value to the product directly, they may increase the efficiency of the employees.

2.3. Introduction to Cost of Poor Quality

Quality and measuring quality costs has been emphasized by many authors as an important part of quality improvement since early 1950. However, as Harrington explains, for years management assumed that it was more expensive to provide high-quality products and services to customers, and used this excuse to keep the organization's output from reaching its full potential⁴. This attitude started to change when the companies realized that in international markets quality products provided an increase on market's shares. Therefore, in this study, henceforth, will be used the term of Cost of Poor Quality, since to provide high-quality products is not more expensive. Actually, in many cases, it is less expensive. Gryna separates them into three categories: Cost of non-conformities, Cost of inefficient processes and Cost of lost Opportunities for sales revenue.

It is estimated that European manufacturing company operates with a cost of poor quality of about 15 to 40 percent of turnover, which increase as 40 to 50 percent in the service sector, and even more in some public sector organization. These real problems are having a significantly negative impact on company's sales⁵.

2.3.1. Visible and invisible Costs of Poor Quality

Some Costs of Poor Quality can be difficult to identify and measure, since when traditional managerial accounting systems are structured poorly, there is a risk that only a small amount of the costs will be found, but represented as the Total CoPQ in a company, which will lead to a false picture of the effects of poor quality. The costs that are easily found by the accounting system and whose effects are known are visible costs. The opposite of these are invisible costs, also called hidden or intangible. They are difficult to find and measure in numbers, since they are not revealed directly by the accounting systems however, these costs cannot be unnoticed or ignored, because they affect the business heavily. Visible and invisible CoPQ can be visualized as an iceberg (see *Figure 1*), where only a little amount of them can be seen, and the

⁴ Harrington, H. J. (1999): *Performance improvement: a total poor-quality cost system*. The TQM Magazine, Vol. 11 No. 4, pp. 221-230.

⁵ Krishnan, S. K. (2006): *Increasing the visibility of hidden failure costs*. Measuring Business Excellence, Vol. 10 No. 4, pp. 77-101

rest are hidden under the water. Unfortunately, the companies usually take in consideration only visible CoPQ and the hidden costs of the iceberg are omitted, as they cannot be measured. However, when the data for these costs are credible and manageable, the estimations can be done, and therefore they will be included as visible costs.



Figure 1. The cost of quality iceberg⁶

Additionally, Gryna has divided invisible costs into ten categories, and the visible costs into five categories. These categories are presented in declining visualization which can be compared to the iceberg described by Krishnan: traditional CoPQ, hidden CoPQ, lost income, customer's costs and socio-economic costs. According to Krishnan, only traditional CoPQ are visible, while the four remaining costs are invisible.

The main part of invisible CoPQ is unrecognized in companies due to that they are neither measured. Further, invisible costs are unrecognized due to that they are inadequately registered in the organization or not discovered at all.

The authors differently describe the amount of invisible CoPQ, where Gryna states that invisible CoPQ is three or four times of visible costs, while Krishnan states that invisible costs can be as high as three to ten times visible costs. These differences might be because Gryna

⁶ Krishnan, S. K. (2006): *Increasing the visibility of hidden failure costs*. Measuring Business Excellence, Vol. 10 No. 4, pp. 77-101

includes more costs in the top of iceberg, i.e. as visible costs. In contrast, Krishnan includes more costs in the invisible part of the iceberg, due to the difficulty of measuring them.

From another point of view, the amount of visible and invisible costs can vary depending on the type of organization. The top of the iceberg of manufacturing companies is usually composed of costs associated with defects that are found prior to transfer of the product to the customer. However, in service companies the amount of visible costs is smaller, and the amount of hidden costs is bigger, because costs such as scrap, rework or inspection do not exist, since the production and consumption occur simultaneously and services are often intangible. This leads to the uncertainty, since consumers can easily change the supplier without any particular reason.

2.3.2. Measuring poor quality costs: The Quality Loss Function

The traditional definition of quality was conformance to specifications. However, Taguchi diverges from the traditional view of conformance quality. According to Taguchi, ideal quality refers to a reference point or target value for determining the quality level of a product or service. This reference point is expressed as a target value. Ideal quality is delivered if a product or a tangible service performs its intended function throughout its projected life under reasonable operating conditions without harmful side effects. In services, because production and consumption of the service often occur simultaneously, ideal quality is a function of customer perceptions and satisfaction. Taguchi measures service quality in terms of loss to society if the service or the product is not performed as expected. This approach is represented by Taguchi's loss function, which is based on the assumption that any deviation from the target value of a characteristic will result in a loss to society (see *Figure 2*).

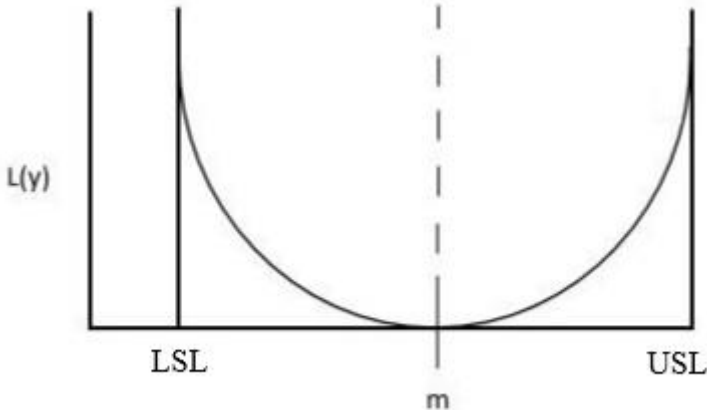


Figure 2. Taguchi Quadratic Loss Function

Where m represents the target value, or the most desirable value of the parameter under consideration. USL and LSL in the figure represent upper specification limit and lower specification limit of a design parameter, respectively. If the product is within specification limits, the traditional conclusion assumed that it was not a problem. However, according to Taguchi, performance begins to gradually deteriorate as the design parameter deviates from its optimum value. These deviations from a target value represent a potential loss to society, and are identified not only in items of rejection, scrap or rework, but also in items of pollution that is added to environment, products that wear out too quickly, or other negative effects that occur⁷. This loss can be quantified by the following basic quadratic form:

$$L(y) = k(y - m)^2 \text{ Where } k = \frac{c}{d^2}$$

Where $L(y)$ is the loss in dollars, due to a deviation away from targeted performance as a function of the measured response, y , of the product; m is the target value of the product's response; m is the target value of the product's response; y is the actual value of the products response; and k is an economic constant called quality loss coefficient, which depends on the actual cost to society at a point (c), and distance (d) of the actual value of the products response from the target value.

In recent years, the loss function proposed has been used to monitor external quality costs including a primary component of lost sales and intangible quality costs such as customer's dissatisfaction, loss because of bad reputation and lost market shares.

Taguchi emphasis on optimization of customer satisfaction by developing products which meet the target value on a consistent basis. Therefore, the most important aspect of Taguchi's quality control philosophy is the minimization of variation around the target value.

3. Classification of the Costs of Poor Quality

Traditionally, quality costs have been the responsibility of the quality control department, which used to ensure that quality products are being produced, and to inform management about defective products. However the whole company must be involved in producing quality, since errors occur in all departments. Analysis of the cost of quality can be considered as an economic assessment of the effectiveness of the system and the results of this analysis are taken as a basis

⁷ S. Thomas Foster (2013). *Managing Quality: Integrating the Supply Chain*. London: Pearson. 5th edition.

for making a decision on the improvement of quality assurance programs. Information on expenditures should be in the focus of constant attention of the firm's management for monitoring and for linking these costs to other expense of the organization. The cost of quality should be considered as a basis for establishing the size of investment in the quality assurance system. Reduced quality costs - one of the main objectives of the quality management system.

In order to get the attention of managers, Feigenbaum developed a dollar-based reporting system (the language of top management and stakeholders) called “cost of quality”. He divided the concept of cost of quality into the following categories: Prevention costs, Appraisal costs, internal failure costs and external failure costs (PAF model)⁸, see *Figure 3*.

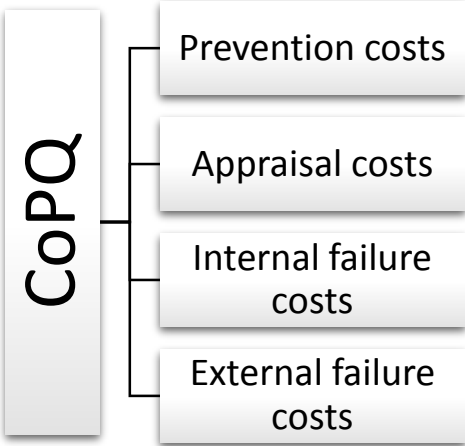


Figure 3. The classification of CoPQ according to Feigenbaum

Preventive costs include costs related to the design, organization and implementation of quality management systems. It is all activities required for avoiding poor quality which take place in the pre-production stage of product and services and can be seen to be proactive costs related to building quality into the product or service, as they occur in order to minimize appraisal costs and failure costs.

Appraisal costs are costs to determine conformance with quality standards. Measurement systems include inspection, checking, auditing, surveying, inquiries, etc.

Failure costs are costs connected to the consequence of failure of meeting the requirements in the company and with the customer. They are divided into internal failure costs and external

⁸ Harrington, H. J. (1999): *Performance improvement: a total poor-quality cost system*. The TQM Magazine, Vol. 11 No. 4, pp. 221-230.

failure costs. Internal failure costs are those which occur within organization before delivery to the external customer. In manufacturing this would include scrap, rework, or design changes during production. External failure costs occur when the product or service is offered to the customer and found defective. These costs include returned products and rejected services or unhappy customers⁹.

Feigenbaum's categorization of quality costs was a basis for other authors who followed his classification. But many authors (including Feigenbaum) and companies do not include invisible costs in their classification, although they mention that they are important to take into consideration. In their classifications the most prioritized activities to improve are failures, rework, and negative feedback from customers after the problems have occurred. These measurements are usually very poor and insufficient in estimating the company's total quality costs, since customer requirements, needs and expectations are not used proactively to direct quality improvement, and increased customer satisfaction and loyalty are not included in the measure. Therefore, performance measurements and top management decisions are usually based on traditional accounting information, which is inadequate to monitor and direct quality improvement, since a substantial amount of failure costs (included rework) is normally hidden¹⁰. Consequently a new categorization of quality costs is needed.

Gryna expands the original model costs of Feigenbaum, but adding a difference in classification of internal and external failure costs. He divides internal failure costs into Failure to meet customer requirements and needs, and Costs of inefficient processes, whereas external failure costs into Failure to meet customer requirements and needs, and lost opportunities for sales revenues¹¹.

⁹ Bank, J. (2000): *The essence of Total Quality Management*. London: Financial Times Prentice Hall. 2nd edition.

¹⁰ Rune, M. Moen (1998): New quality cost model used as a top management tool. *The TQM Magazine*, Vol. 10 No 5, pp 334-341.

¹¹Gryna, F. M. (1999): *Quality and Costs*, Juran, J. M. & Godfrey, A. B. (1999): *Juran's Quality Handbook*. 5th edition, McGraw-Hill, New York.

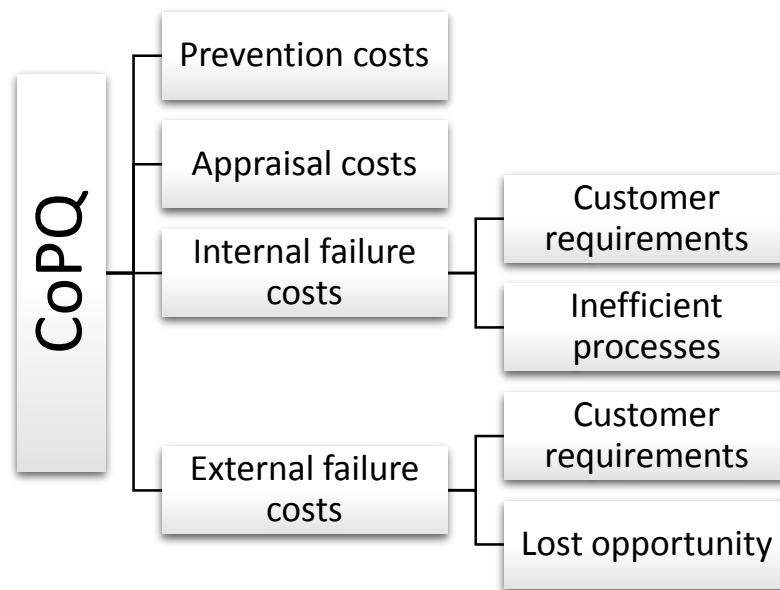


Figure 4. The classification of CoPQ according to Gryna

Gryna expresses a similar view as Feigenbaum and Harrington regarding to that an increase in appraisal and prevention costs results in a reduction in failure costs, and consequently the level of quality increases and the productivity improves. This model show three curves: failure costs, costs of appraisal and prevention, and the total costs of poor quality.

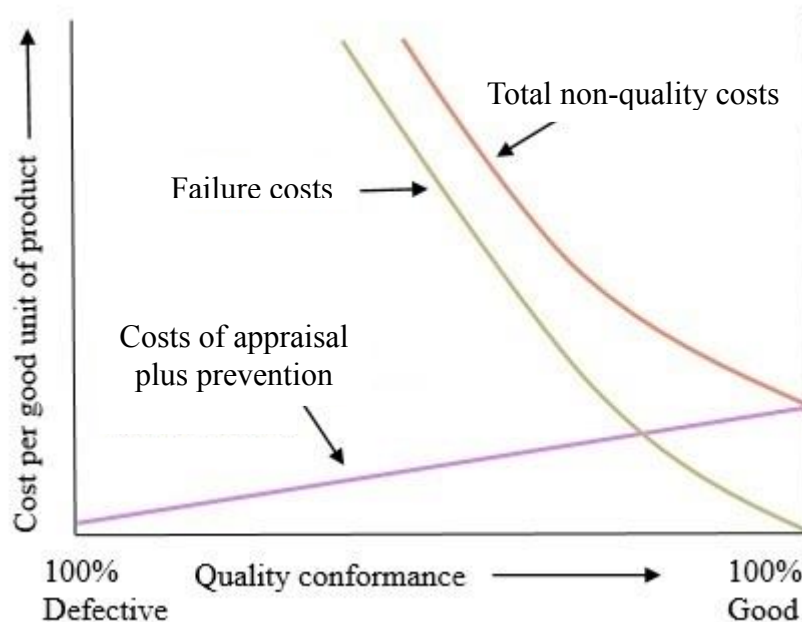


Figure 5. Model of optimum quality costs

Failure costs are zero when the product is 100 percent good. When non-conformance increases, the failure costs rise rapidly a 100 percent of non-conformance, therefore the product is 100 percent defective. In this situation, none of the products are good, since the failure costs per good unit becomes infinite. When the product is 100 percent defective the sum of appraisal and prevention costs is zero. In order to achieve the optimum value, costs of appraisal and prevention must be increased until the perfection is approached. As quality increases, the costs of appraisal and prevention rise, becoming infinite at 100 percent of conformance. Gryna states that perfection is a goal for the long run, it does not follow that perfection is the most economic goal for a short run, or for every situation¹².

On another hand, Giakatis develops the model adding some important differences. He believes that it is better for any company to make a distinction between quality costs and quality losses and then to try to reduce quality losses, instead of considering the total quality costs. According to this distinction, prevention and appraisal costs are divided into prevention losses and appraisal losses. The main reason for that division is that because the investment is not always successful, i.e. when the investments are successful the organization saves money, but if they are not, the organization can lose the invested money and also cause further losses. Besides, appraisal costs occur when money is spent on unsuccessfully checking the incoming materials and the products. Nevertheless, this stage would not be necessary if all the necessary preventive measures taken fully effective. From that point of view, appraisal could be considered as a loss. But this situation cannot be achieved, therefore appraisal activities will always exist and a distinction between appraisal costs and losses should be made¹³.

¹² Omachonu, V. K. et al. (2004): *The relationship between quality and quality cost for a manufacturing company*. International Journal of Quality & Reliability Management, Vol. 21 Issue 3, pp. 277-290.

¹³ Giakatis, G. et al. (2001): *Hidden quality costs and the distinction between quality cost and Quality loss*. Total Quality Management, Vol. 12 No. 2, pp. 179-190.

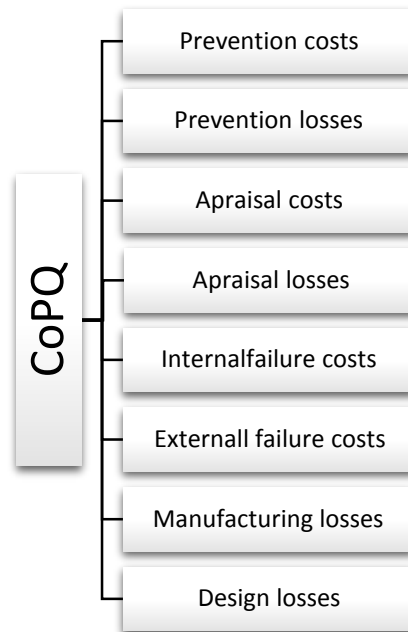


Figure 6. The classification of CoPQ according to Giakatis

In addition, Giakatis also mentions another two important hidden quality losses: manufacturing losses and design losses. They are generated in order to compensate for the occurrence of potential failure loss, and are large enough not to overlook in manufacturing companies. Manufacturing losses might be the cost of inefficient use of resources, while design losses might occur from the requirements on the product are sharpened which results in more expenses in order for the new requirements to be reached.

Sometimes a company does not have a clear view of its quality costs because it mixes them with quality losses or hides quality costs under quality losses. A company should first eradicate the quality losses in order to have a clear view of its quality costs and then try to reduce its quality costs. Such an improvement programme could be incorporated in a kaizen (continuous improvement) programme.

Another author discussing the concept of CoPQ and their classification is Harrington¹⁴. However, he expresses slightly different model for classifying CoPQ, where the main division is between direct and indirect costs. The direct and indirect costs are costs that Krishnan divided into visible and invisible costs.

Direct costs can be directly measured and reflected in an organization's *cost* structure. The

¹⁴Harrington, H. J. (1999): *Performance improvement: a total poor-quality cost system*. The TQM Magazine, Vol. 11 No. 4, pp. 221-230.

direct CoPQ are composed of PAF costs (prevention costs, appraisal costs, failure costs), non-value added costs and equipment costs. The reason for including non-value added costs is according to Harrington that ineffectiveness designed into the processes is more costly than problems created by the process. The non-value added costs are activities, which are not related to the product that the external customer wants. Thus it is activities that creates no value to the customer but creates costs to the process. Equipment costs are costs to invest in equipment used for measuring, accepting or controlling a product and the space the equipment occupies. Equipment costs are also mentioned by Feigenbaum, but referred to as capital investments in quality information equipment constructed to measure product quality.

Overwide, the indirect CoPQ are difficult to measure, as they are more subjective, and therefore less usable for management in running the business. These costs occur when the company does not manage to completely satisfy the customers, but merely meet their requirements. The indirect costs are divided into customer-incurred, customer-dissatisfaction, loss of reputation, and loss opportunity.

According to Harrington customer-incurred costs appear when the output fails when it comes to meet customer's expectation. The customer-dissatisfaction costs arise when the customer are dissatisfied of the products or services, where bad quality level of a product results in low revenue. Loss of reputation costs are more difficult to measure and predict the other indirect costs. The costs differ from customer-dissatisfaction and affect the whole company and all product lines manufactured by an organization, and not only a single product. The lost opportunity costs refer to money that the company does not realize due a poor judgment or poor output, and therefore does not take an advantage of an opportunity. On the other hand these cost also relate to a loss of customer, who turns away from you products to your competitor and are considered very important.

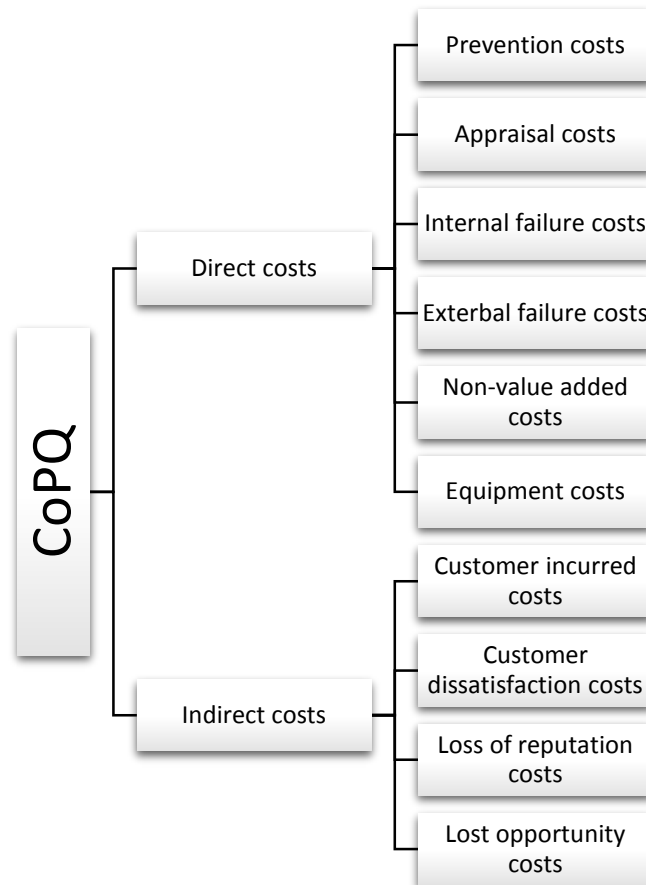


Figure 7. The classification of CoPQ according to Harrington

Harrington model includes all costs related to quality in the organizational system which must be reported and measured, however he expresses that “quality costs” is not the most adequate term. The reason for this is that this term reflects the thinking of the 1950, when it was believed that it was more expensive to produce products with better quality, and it was seen to cause extra cost. Therefore he insist in using the term CoPQ, even is he talking about all costs related to quality, i.e. costs for ensuring quality, preventing poor quality, controlling quality, correcting errors, and all other costs for not being able to meet customers’ need.

Dahlgaard has a similar view as Harrington, by including visible and invisible costs in the classification. However, Dahlgaard chooses to classify it in a table where the costs on the one side is subdivided into internal and external failure costs, equally to Feigenbaum, where prevention and appraisal costs is included and on the other side these costs are subdivided in visible and invisible costs respectively.

	Internal costs	External costs	Total
Visible costs	1a. Scrap/Repair costs 1b. Prevention/Appraisal	2. Warranty costs (complaints)	1+2
Invisible costs	3a. Costs due to internal inefficiencies 3b. Prevention/Appraisal costs	4. Loss of goodwill (loss of future sales)	3+4
Total	1+3	2+4	1+2+3+4

Table 1. The classification of CoPQ according to Dahlgaard¹⁵.

Dahlgaard describes hidden costs as failure costs which are inadequately registered in the firm and, on some occasions, failures are never discovered. Hidden costs are of great importance, because they are a much larger amount that managers usually think. One of the reasons for this is that many managers do not understand the concept and definitions of quality costs and therefore, a very big amount of quality failures is attributable to management, because management has done very little, or even nothing at all, in this vital area. In order to achieve quality, it is necessary that all the employees, including management, will be involved in preventing the faults in order to avoid any such failures happening in the future.

The author mentions several benefits from the investments in preventive quality management activities, such as reduction in failures and failure costs, increase in customer satisfaction, rise in productivity, increased market share, etc. Additionally, it will also provide the employees with the knowledge of doing 'things right the first time'. It will change the company culture, provide more creative employees, and will encourage new ways of improving quality. But Quality Culture will not emerge overnight, as K. Ishikawa says "Quality begins with education and ends with education". Therefore, all the employees must be taught, trained, and motivated to understand and apply the fundamentals of quality management in their own work place.

4. Differences between product quality and service quality

It has been widely accepted that the characteristics of services and products are very different,

¹⁵Dahlgaard, J. J. et al. (1992): *Quality costs and total quality management*. Total Quality Management, Vol. 3 No. 3, pp. 211-221.

and therefore different marketing and management strategies are necessary to satisfy the customers.

According to the textbook of author Thomas Foster, service quality is more difficult to define than product quality. Although they share many attributes, services have more diverse quality attributes than products, often as a result of wide variation created by high customer involvement.

Foster identifies three major realities that affect the approaches to quality adopted by services providers; these are intangibility, simultaneously production and consumption, and customer contact. They lead us to the major differences between services and manufacturing when it comes to quality, and have an impact on the approach and substance of quality management.

Because services' attributes can be intangible, it is sometimes difficult to obtain hard data relating to services. In manufacturing, dimensions such as height, weight, and width are available for measurement. Conformance to these measurements implies a certain dimension of quality. However in services, such measureable dimensions are often unavailable. For this reason many services organizations that use quality control charts encounter difficulty in using them, or use them incorrectly. This is not to say that the control charts cannot be used in services. However, compared with manufacturing, their use in services is quite low. Generally speaking, time (such as cycle time or response time) is a primary measurement available in service environment.

Simultaneous production and consumption of services means that you have to do it right the first time. You can't easily inspect and rework defects in hair salon the way you can in manufacturing.

Customer contact leads to an increase in variability in the process. This leads to a high degree of customization in services as well as great variability in time required to perform services. In manufacturing, repetitive tasks are easily measured, and cycle times are generally consistent. When customers are intimately involved in process, there is much more customization and much more variability than in manufacturing.

Services design, is also very different from the design in manufacturing. Because services involve intangible, warranty or repair processes are not important as recovery or reimbursement processes. Also, the design of the services must take into account such variables as customer

mood and feelings because these affect customer perception of service quality.

Product liability issues in services are very different from manufacturing. Whereas in manufacturing liability issues centre around safety concerns, in services liability issues often relate to malpractice, which refers to the professionalism of the service provider and whether reasonable measures were taken to ensure the customer's well-being. However, services also may have liability issues.

Services do not have as long a history of quality practice as does manufacturing. Although many quality techniques such as control charts have been adopted by services companies, this trend is still new. Certainly, as time passes, more quality techniques are being developed specifically for services. For example, a new tool is emerging for service supply chains known as process chain network (PCNP diagrams).

5. Definition of quality

Nowadays, managers are aware that quality is a sustainable competitive advantage for a company, and it is the best way of differentiation, since it captures customer's loyalty. However, quality can be much more complicated to define than it appears, because it varies in every organization. For example, when asked how to differentiate their product or service, the banker will answer "service", health care worker will answer "quality health care", the hotel restaurant employee will answer "customer satisfaction", and the manufacturer will answer "quality product". Despite different answers, none is more correct than another, since the definition of quality is different in every company, even in every department. But understanding that different definitions and dimensions of quality exist allows measures to be taken to provide a good basis for communication and planning. By sharing a common definition of quality, each department within a company can work toward a common goal. In addition, understanding the multiple dimensions of quality desired by customers can lead to improved product and service design. In order to achieve this understanding, the textbook of author Thomas Foster (p.27) is going to be used¹⁶.

5.1. Quality in manufacturing organizations

There are several definitions of quality, or quality dimensions. According to David Garvin of

¹⁶ S. Thomas Foster (2013). *Managing Quality: Integrating the Supply Chain*. London: Pearson. 5th edition

the Harvard Business School (mentioned in the textbook of Foster) five most principal approaches to define product quality are transcendent, product-based, user-based, manufacturing-based, and value-based, which meanings are explained in the table below.

Transcendent	Quality is something that is intuitively understood by everyone but nearby impossible to communicate.
Product-based	Quality is found in the components and attributes of a product.
User based	If the customer is satisfied, the product has good quality.
Manufacturing-based	If the product conforms to design specifications, it has good quality.
Value-based	If the product is perceived as providing good value for the price, it has good quality.

Table 2. Definitions of Quality

The product based and manufacturing-based approaches are more or less measure, demand and engineering oriented for which quality is objective and everything is measured. In contrast, the user, transcendent and value based approaches are subjective, since the customer decides how to perceive the delivered product.

Using these five definitions of quality, Garvin develops a list of eight quality dimensions, which describe product quality.

Dimension	Definition
Performance	Refers to the efficiency with which a product achieves its intended propose. It involves measurable attributes of the product that might be the return on a mutual fund investment. Therefore a better performance means better quality.
Features	Attributes of a product that supplement the product's basic performance. They can be tangible or non-tangible.
Reliability	Refers to the propensity for a product to perform consistently over its useful design life. A product is considered reliable if the chance that it will fail during its designed life is very low, and in that case the brand will develop trust with customers.
Conformance	This is the most traditional dimension of quality. It is the degree to which a product's physical and performance characteristics meet

	design specifications.
Durability	It is the degree of useful product life, i.e. the amount of use a customer gets from a product before it deteriorates or must be replaced.
Serviceability	Means the ease of repair for a product. A product is very serviceable if it can be repaired easily and cheap. Many products require repair service by a technician, so if this service is rapid, courteous, easy to acquire and competent, then the product is considered to have good serviceability.
Aesthetics	This dimension involves highly subjective characteristics such as taste, feel, sound, look and smell. It is measured as the degree to which product attributes are matched to consumer preferences.
Perceived quality	Quality based on image, brand name, advertising, word of mouth and other factors that can affect consumers' perceptions of quality

Table 3. Product Quality Dimensions

5.2. Quality in Services organizations

According to the textbook of author Thomas Foster, service quality is more difficult to define than product quality. Although they share many attributes, services have more diverse quality attributes than products, often as a result of wide variation created by high customer involvement. Service quality is the difference between customer perceptions of how well the service meets customer expectations. In order to understand well the quality of services, their dimensions should be identified which could determine what the quality of service is for the customer. Foster describes five widely recognized dimensions of service quality which have been used in many service firms to measure quality performance.

These dimensions are tangibles, service reliability, responsiveness, assurance and empathy, which are explained in the table below.

Dimension	Definition
Tangibility	This dimension includes the physical appearance of the service facility, the equipment, the personnel, and the communication materials.
Reliability	Service reliability differs from product reliability in that it relates to the ability of the service provider to perform the promised service

	dependably and accurately.
Responsiveness	Responsiveness is the willingness of the service provider to be helpful and prompt in providing service. This dimension involves dealings with the customer's requests, questions, complains, etc.
Assurance	Assurance refers to the knowledge and courtesy of employees and their ability to inspire trust and confidence. This dimension is very important for the services that the customers perceive a high risk and the outcome of using the service is uncertain. For example, medical and healthcare services.
Empathy	Consumers of services, desire empathy from the service provider, i.e. they desire caring, individualized attention from service firms. It means an additional plus that the trust and confidence of customers and at the same time increase the loyalty.

Table 4. Service Quality Dimensions

Service firms must strive to manage these different service dimensions simultaneously, since it is not sufficient to provide some of them, while others are inadequate.

5.2.1. Importance of service quality

Service quality is considered a critical determinant of competitiveness. Attention to service quality can help an organization to differentiate itself from other organizations and though it gain a lasting competitive advantage. High quality of service is considered an essential determinant of long-term profitability not only for service organizations, but also of manufacturing organizations. In some manufacturing industries service quality is considered a more important order winner than product quality. Superior service quality is a key to improved profitability, and not the cost of doing business.

Service quality affects the repurchase intentions of the customer. Market research has shown that customer dissatisfied with a service will divulge their experiences to more than three other people. Thus, it is reasonable to conclude that poor service will reduce the potential customer base. According to the Technical Assistance Research Project (TARP), it costs about four times more to attract new customers. Their research indicates that six times more people hear about a negative customer service experience than hear about positive one. Positive word of mouth can be a very powerful tool for attracting new customers. Negative word of mouth can have a

devastating impact on the credibility and effectiveness of organizations' efforts to attract new customers. In addition, customers' service expectations are constantly rising, while their tolerance for poor service is declining. As result customers are increasingly likely to migrate to competitors with perceived higher service quality¹⁷.

5.3. Quality assessment in higher education institutions using the SERVQUAL model

Higher education institutions as well as other service organizations are in search of improvements in service quality to satisfy the expectations of their customers and the market. However, as stated and explained previously services have very particular characteristics, therefore the SERVQUAL model must be adapted for assessing different dimensions of service quality. Although the SERVQUAL method is not as widely used as Statistical Quality Control, it is a standardized approach to gathering information about customer perceptions of service quality. As such, it provides a base to get started in assessing customer perceptions of quality.

According to Foster this model survey has two parts: customer expectations and customer perceptions. The original SERVQUAL, uses 22 questions to measure firstly the expectations and then the perceptions of the five dimensions of service quality: reliability, tangibility, assurance, empathy and responsibility. Based on questionnaire in Foster's textbook, I have developed a questionnaire adapted to Higher education institution, specifically HSN (*see Appendix: Table 5. SERVQUAL questionnaire adapted to HSN*). These questions should be scored from 1 to 7. The extremes are marked as strongly agree (excellent) and strongly disagree (mediocre). The result of the two sections (perceptions and expectations) are compared to reach parameter (gap) for each of the questions, and the final score is generated by the difference between them (gap analysis). A negative result indicates that perceptions are below expectations, revealing service failures that generate an unsatisfactory result for the client, therefore they should be viewed as an opportunity for improvement and not as a simple problem. A positive score indicates the service provider is offering a better than expected service.

Because services are often intangible, gap in communication and understanding between employees and customers have a serious negative effect on the perception of service quality.

¹⁷ Ghobadian, A. et al. (1994) *Service Quality Concepts and Models*. International Journal of Quality & Reliability Management, Vol. 11 No. 9, pp 43-66.

The figure 1 shows the gaps that commonly occur and can affect perceptions of service quality. Each of the gaps in the model demonstrates differences in perceptions that can have a detrimental effect on quality perceptions in services. The SERVQUAL survey instrument can be administered in a variety of ways that examine each of these gaps.

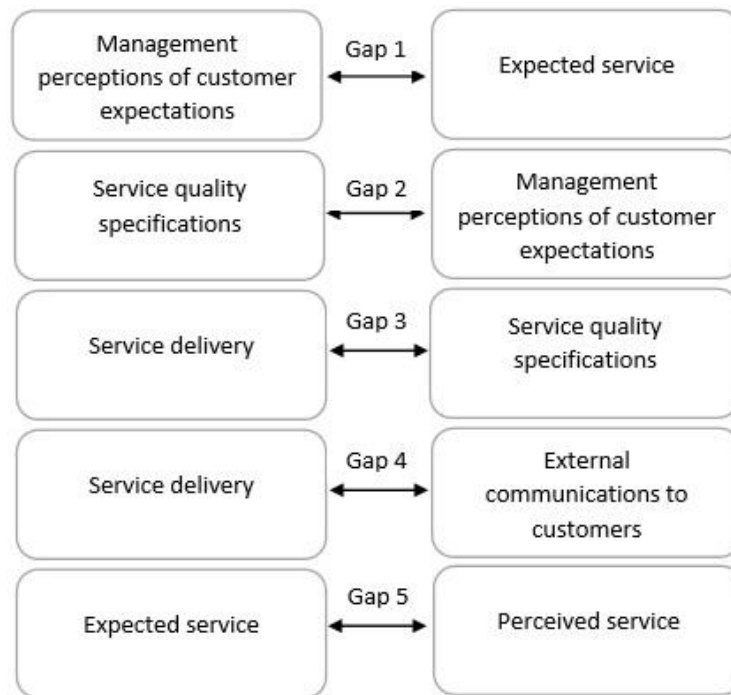


Figure 8. Gap analysis

Gap 1 shows that there can be a difference between actual customer expectations and management’s idea or perception of customer expectation. It is very difficult for managers or employees to break out of the internal, process-oriented view of business and understand what truly the customer wants.

Managers’ expectations of service quality may not match service quality specifications, as demonstrated in gap 2. Managers must understand what the customer wants, then the system can be developed to help provide exactly what customer wants.

Once service specifications have been established, the delivery of perfect service quality is still not guaranteed, since inadequate training, communication, and preparation of employees who interact with the customer can lower the quality of service delivered, illustrates gap 3.

Gap 4 shows the differences between service delivery and external communications with customer. Companies influence customer expectations of services through word of mouth and through other media such as advertising. There could be a difference between what the customer

hear and the service provided, and this can lead to seriously negative customer perceptions of service quality.

Gap 5 is the difference between perceived and expected services. This difference is directly related to the perception of service quality and as long as the gap exist, there will be lowered perception of customer service.

If there is enough variation in the responses given to different dimensions, the two-dimensional differencing technique is very useful for evaluating SERVQUAL responses. This technique helps to determine which services should emphasize to improve customer perceptions and those that make little difference.

6. Culture of Quality

As stated in previous section, word of mouth is a very powerful tool, and even more when new technologies have empowered customers to search and compare products worldwide. Therefore, when they are unhappy with a product or service, they can use social media to broadcast their displeasure.

Quality have never mattered more, hence managers must find a new approach to quality that moves beyond the traditional tools of TQM. Recent researches have been exploring how companies can create a culture in which quality is found in all the actions of employees, i.e. they are passionate about quality as a personal value rather than simply obeying an edict from on high. Culture of Quality is defined as an environment in which employees not only follow quality guidelines but also consistently see others taking quality-focused actions, hear others talking about quality, and feel quality all around them.

Many of the traditional strategies used to increase quality with monetary incentives, training, and sharing of best practices, for instance this have little effect. Instead, companies that take a grassroots, peer-driven approach develop a culture of quality, resulting in employees who make fewer mistakes and the companies spend far less time and money correcting mistakes.

There are four factors that drive quality as a cultural value: leadership emphasis, message credibility, peer involvement, and employee ownership of quality issues. Researches indicate that companies could do much better with all four.

- Maintaining a leadership emphasis on quality.

Even when executives have the best intentions, there are often gaps between what they say and what they do. As a result, employees get mixed messages about whether quality is truly important. Leaders must know the gaps between the expected and the current state of the culture. Executive participation is the most important factor driving culture change, since it develops enthusiasm and commitment through the organization.

- Ensuring message credibility.

Most companies promote messages about the importance of quality but their efforts are wasted if the messages are not believed. Leaders must realize that quality messaging, like any campaign, needs to be refreshed over time, and they should regularly test messages with their employees and use the feedback to ensure sustained relevance.

- Encouraging peer involvement.

In creating quality everyone must be involved, including managers. However, fostering peer engagement is a delicate balancing act. If leaders become overly involved, then impact and authenticity suffer but if they show too little support, they miss important opportunities. In order to achieve this goal, enthusiasm must be created through positive social pressure to encourage employees to generate quality initiatives. For example, quality competitions through which employees' ideas are displayed, and it also provides a reminder that everyone at the company should work on quality. Besides managers should evaluate employees' quality-improvement projects and reward them.

- Increasing employee ownership and empowerment.

One of the defining traits of an organization with a true culture of quality is that employees are free to apply judgment to situations that fall outside the rules. A culture of quality requires employees to apply skills and make decisions in highly ambiguous but critical areas while leading them toward deeper reflection about the risks and payoffs of their actions. In an environment where customers' tolerance for quality problems is declining, a workforce that embraces quality as a core value is a significant competitive advantage¹⁸.

¹⁸ Srinivasan, A. and Kurey, B. (2014) *Creating a Culture of Quality*. Harvard Business Review.

6.1. Creating a Culture of Quality in manufacturing and service companies

In launching TQM, manufacturing companies had a lead on service companies, and it is important to realize that some of the variation between the two is as much to do with maturation as with actual cultural dissimilarity. However, service companies have had the opportunity to learn from the mistakes of TQM pioneers, therefore services become more competitive, and increasingly sophisticated in anticipating and measuring changing customer expectations, then the gap is likely to narrow. On another hand, the service industry is broken into two segments, financial services and other services (utilities retailers, transport...). Financial service companies report much greater difficulty in garnering support for TQM at all levels of the organization, probably due the tradition-bound culture of this industry that is slowing progress towards the changes in attitude and behaviour necessary for TQM to thrive.

Regarding to Culture of Quality to develop in each of the sectors, should be mentioned that there are some differences, therefore some statements are more important in service companies than in manufacturing companies, and vice versa.

Firstly, the intangibility of the services leads to an emphasis on exhaustive knowledge of the customer and on the value of timeliness, responsiveness, accuracy and empathy. Hence in service sector, the customer needs must be defined and focused constantly. Service companies must stress the many details of service delivery and customer transactions, whereas manufacturing exclusives have to concentrate on the causes of output variation.

Reducing variation in manufacturing processes is a primary means of decreasing product defects and improving product quality. In turn, improved product quality may lead to decreased production costs. The use of statistical tools in service sector is not effective, because of heterogeneity of services, so it is important to do it right the first time.

Moreover, companies should develop a portfolio of incentives tied to quality. These can include performance appraisal, compensation and promotion, as well as formal and informal recognition and award programmes. Showing appreciation for a job well done can be as informal as a supervisor's spontaneous "thank you" or as formal as an annual award celebration. One way to ensure that managers pay sufficient attention to recognition is to build it into the management development programme. Service companies have a slight edge over manufacturers in adopting this practice, although they are likely to rely on internal courses, while manufacturers may use company orientation programmes, visits to other companies and

monitoring activities as well. Service companies must realize that it is very important, since dealing with customer is extremely important in services, but the people who are dealing with them are often badly paid.

In a quality company or organization everyone should be involved and feel important. However, service industries appear to have bought into employee involvement to a lesser extent than has manufacturing. Less formal training is provided, particularly in the case of non-managerial employees. The high labour turnover and lower wages in many service jobs are contributing factors. But an additional factor may be that customer-sensitivity training, involving attentiveness, empathy and responsiveness, may be harder to accomplish than would be teaching the intellectual skills required for problem solving and reduction of variation in machine processes. However, employees' feedback could be one way of involvement of employees in service sector. Ask others about their ideas can also be very motivating and energizing. It has strong links to employee satisfaction and productivity. People like to feel involved and identified with their organisation. Feedback can help achieve that state. The use of employee feedback devices coupled with appropriate action, demonstrates to employees that management listens and takes their opinions seriously. Service companies are much more likely to use employee surveys and focus groups than are manufacturers, and about as likely to devise employee suggestion programmes and conduct communications audits.

The lowest commitment to the values of involvement and empowerment is shown by the financial service sector. There is less support for TQM and less satisfaction with the rate of progress in involving employees in TQM compared with non-financial services and manufacturing. It is possible that deregulation, restructuring and downsizing in an industry noted historically for employment security have contributed to slow acceptance of TQM, particularly among middle managers.

Quality practitioners agree that teams are the primary vehicle for continuous quality improvement, especially in manufacturing companies. Short-term teams are beneficial because they involve people at all levels and give tangible results quickly. These groups meet over a brief time-span to investigate issues, solve specific problems, or make recommendations. Long-term teams not only make recommendations but also have the power to implement solutions. Financial service companies are behind other industries in implementing long-term teams, although being especially important in this sector. Indeed, service companies trail manufacturing companies in the scope of their team effort. As services take on tougher process

improvement challenges, more extensive team participation and longer-lived, self-managing teams are likely to move to the top of the quality agenda. In order to get winning teams with shared goal and shared influence, quality training must be given. Quality training should focus initially on awareness and changes in attitude and behaviour. Once the quality process takes hold, the emphasis should shift to skills development, team building, process management and statistical tools. Service companies lag behind manufacturers in the use of quality training and in the number of hours of training offered to non-managers. This may be explained by the more recent implementation of quality in service companies. Moreover, workers in product development may require more technical training in the use of quality tools than will those in service delivery. Also, the high turnover in entry-level jobs in service companies may make management reluctant to invest in training for some employees.

Achieving quality requires constant learning for everyone in an organization, then leadership is essential in both sectors. To demonstrate that the company's managers are "walking the talk", they must show employees what the organizational values mean through their behaviours. Smart leaders should actively search out opportunities to catch employees doing something right and thank them for doing it, besides recognize and reward that behaviour is best way to ensure that it continues. Redirecting people who are not living the values is one of the most important things a leader must do. However, the involvement of leader must be balanced, since excessive involvement creates distrust and very dissatisfied people. Conversely, bosses that give important responsibilities to their employees, along with the freedom to complete the task their way, builds his employees' innovation, morale, enthusiasm and satisfaction. It is crucial for a leader to show those under him that he trusts them.

The differences between a culture in a service company and a products company are quite great, since services are characterized by unique properties not shared by products, which means intense and detailed customer focus, so service companies appear readier to listen to internal customers¹⁹.

¹⁹Troy, K. and Schein, L. (1995). *The quality culture: manufacturing versus services*. *Managing Service Quality*. Vol 5 No 3, pp 45-47.

7. Conclusions

To conclude, examining the Cost of Poor Quality allows the enterprise to identify, prioritize and monitor quality improvements. One way of saving costs is to spend money in the right place, by which is meant that spending more on prevention costs and appraisal costs early in the product life cycle lead to lower Total Cost of Poor Quality. This means that by spending more money on prevention activities, the money spent on appraisal, internal failure, and external failure activities can decrease, leading to that a lower cost in total is spent on activities that is related to quality.

Regarding to the classifications of CoPQ made by different authors (ref. chapter 3, pages 12 to 20), the recommendation for the companies is to use the classification which includes invisible costs, for example Dahlgaard's theory. As the identification of the CoPQ is the first step, companies need to see the whole picture in order to make right decisions.

However, regardless the classification the amount of hidden costs varies increasingly on service organizations, since the characteristics of services and product are very different (ref. chapter 4, pages 20 to 22). This leads to the need of different strategies marketing and management strategies, besides quality assessment methods.

In manufacturing companies, when problems occur and failures are discovered it is important to look for the root causes and eliminate them permanently through Statistical Quality Control methods. An appropriate analysis of cause and effect can lead to the reduction of real CoPQ, especially in the operating process that the failure is discovered. If the knowledge learned from analyses and improvements is taken along to new processes and products, prevention activities lead to lower CoPQ for these new processes and products. It is expensive for a company if a customer finds defects, but if the manufacturer had found them through appraisal activities much money could have been saved, and customers would have been more satisfied. To minimise the CoPQ the company should go one step further and improve their prevention activities.

On another hand, every service produced is different, therefore the variation is very big and Statistical Quality Control methods cannot be applied. SERVQUAL is the method that best suits to the services, so it assess different dimensions of service quality and has been demonstrated valid and reliable for a number of service situations. Besides, the intangibility of services leads

to the need of what exactly the customer wants, in all its dimensions of the service quality. Consequently, the company must provide to the employees adequate training and motivation, i.e. increase prevention costs.

Finally, the Culture of Quality is the best long term practice to become a top quality organization, for both product companies such as services. Companies must realize that to satisfy the customer the change is needed from inside the organization, so all the employees should care about quality. To reach this objective the four essentials of quality must be implemented. This way the organization can be in a continuous improvement and always satisfy customers.

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Appendix

SERVQUAL questionnaire adapted to HSN

	Expectations (E)	Perceptions (P)
Tangibility	<p>1- Excellent higher education institutions must have modern equipment, such as laboratories.</p> <p>2- Higher education installations must be well conserved.</p> <p>3- The material associated with the service provided in excellent institution of Higher education, such as journals and books must have a good visual appearance.</p> <p>4- Employees and teachers at excellent institutions of higher education must present themselves properly.</p>	<p>1- HSN has modern equipment, such as laboratories.</p> <p>2- HSN installations are well conserved.</p> <p>3- The material associated with the service provided in HSN, such as journals and books has have a good visual appearance.</p> <p>4- Employees and teachers at HSN present themselves properly.</p>
Reliability	<p>5- When excellent institutions of Higher education promise to do something by a certain time, they must do it.</p> <p>5- When a student has a problem, excellent institutions of Higher education show a sincere interest in solving it.</p> <p>6- Excellent institutions of Higher education will perform the service right the first time and will persist in doing it without error.</p>	<p>5- When HSN promises to do something by a certain time, it does it.</p> <p>5- When a student has a problem, HSN shows a sincere interest in solving it.</p> <p>6- HSN performs the service right the first time and persist in doing it without error.</p>
Responsibility	<p>7- Employees and teachers at excellent institution of Higher education promise their clients the</p>	<p>7- Employees and teachers at HSN promise their clients the services within deadlines they are able to</p>

	<p>services within deadlines they are able to meet.</p> <p>8- The employees and teachers at excellent institutions of higher education are willing and available during service providing.</p> <p>9- The employees and teachers at excellent institutions of Higher education are always willing to help their students.</p> <p>10- The employees and teachers at excellent institutions of higher education are always willing to explain doubts their students may have.</p>	<p>meet.</p> <p>8- The employees and teachers at HSN are willing and available during service providing.</p> <p>9- The employees and teacher at HSN are always willing to help their students.</p> <p>10- The employees and teachers at HSN are always willing to explain doubts their students may have.</p>
Assurance	<p>11- The behaviour of employees and teachers at excellent institution of Higher education must inspire confidence in students.</p> <p>12- Students at excellent institutions of Higher education feel safe in their transactions.</p> <p>13- The employees and teacher at excellent institutions of Higher education must be courteous with students.</p> <p>14- The employees and teachers at excellent institutions of Higher education must have the knowledge to answer students' questions.</p>	<p>11- The behaviour of employees and teachers at HSN inspire confidence in students.</p> <p>12- Students at HSN feel safe in their transactions.</p> <p>13- The employees and teacher at HSN are courteous with students.</p> <p>14- The employees and teachers at HSN have the knowledge to answer students' questions.</p>
Empathy	<p>15- Excellent institutions of Higher education must have convenient operating hour for all students.</p>	<p>15- HSN has convenient operating hour for all students.</p>

	<p>16- Excellent institutions of Higher education must have employees and teachers who provide personal attention to each student.</p>	<p>16- HSN has employees and teachers who provide personal attention to each student.</p>
	<p>17- Excellent institutions of Higher education must understand the specific needs of their students.</p>	<p>17- HSN understands the specific needs of its students.</p>

Table 5. SERVQUAL questionnaire adapted to HSN