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Escuela de Ingeniería

Maestría en Sistemas Integrados de Manufactura y Estrategias de Calidad

QUALITY STRATEGIES AS A COMPETITIVE ADVANTAGE IN MEXICAN AND RUSSIAN COMPANIES

Tesis que para obtener el Grado de Maestro
en Sistemas Integrados de Manufactura y Estrategias de Calidad

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Se aprueba la Tesis:

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RUSSIAN COMPANIES**

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ABSTRACT

Nowadays, all the companies have to survive in conditions of market changes, technological innovations and globalization. It pushes enterprises to improve their management constantly. They must continuously get better quality of their process, services and products. In the last decades customers have been changing their shopping habits. We do not buy only for a specific brand, now we check the characteristics of the product or service that we want to buy and we take the best product or service that satisfies our necessities. Nevertheless, it does not only depend on the quality, also we need develop different strategies in other areas like marketing, logistics, human resources, production, etc. An important choice factor is the quality. Thus this research is focused on the quality strategies that improve the quality in the process, working environment and products/ services. The aim of this research is to know the main benefits of the implementation of quality strategies in Mexican and Russian companies. The quality strategies that will be taken into account for this research are Customer Relationship Management (CRM), Lean Manufacturing, Kaizen, Total Quality Management (TQM), evaluation 360° and Six Sigma.

This first chapter of the thesis describes the theoretical framework that supports this research. It describes the stages of quality throughout history. It shows the main exponents of the quality as well as their contributions that have allowed the growth of quality making it one of the most important aspects of the industries. Describe the quality strategies to be addressed in this research, the advantages of using these strategies and the methodology for their implementation in the company.

The second chapter will describe and develop the instrument that will allow data collection. In this section, the questions will be elaborated to apply the interview in Mexican and Russian companies. Also, will be shown the information obtained with the application of these interviews.

In the last chapter, the data obtained from the interviews are analyzed and compared. It will examine the benefits that these companies have achieved with the implementation of these strategies. Also, compare the strategies that each enterprise has implemented and know which are the most concerned.

CONTENT

INTRODUCTION.....	7
GENERAL OBJECTIVE.....	9
SPECIFIC OBJECTIVES.....	9
CHAPTER 1 CONTEXTUAL FRAMEWORK	10
1.1 Stages of quality	10
1.1.1 Craft step.....	10
1.1.2 Stage of industrialization	10
1.1.3 Final control stage.....	10
1.1.4 Process control stage.....	10
1.1.5 Stage of design control	11
1.2 Quality gurus	12
1.2.2 W. Edwards Deming.....	13
1.2.3 Joseph M. Juran	15
1.2.4 Kaoru Ishikawa	17
1.2.5 Armand V. Feigenbaum.....	18
1.2.6 Philip B. Crosby.....	19
1.2.7 Genichi Taguchi and Shigeo Shingo	20
1.3 Quality strategies.....	21
1.3.1 Customer Relationship Management (CRM)	21
1.3.1.1 CRM methodology.....	22
1.3.2 Lean Manufacturing.....	23
1.3.2.1 Lean Manufacturing Methodology	24
1.3.3 Kaizen	27
1.3.3.1 Kaizen Methodology	27
1.3.4 Total Quality Management (TQM)	29

1.3.4.1 Total Quality Management Methodology	30
1.3.5 360° evaluation	31
1.3.5.1 360° Evaluation Methodology.....	31
1.3.6 Six Sigma.....	33
1.3.6.1 Six Sigma Methodology.....	34
CHAPTER 2 DEVELOPMENT OF METHODOLOGY AND ANALYSIS OF DATA	35
2.1 Interview.....	35
2.2 The open-ended interview	36
2.3 Interview application.....	37
2.4 Main benefits of quality strategies	41
3.2 Quality strategies most used in Mexican and Russian companies	42
3.3 Improvement of economic indicators in Russian companies after the implementation of quality strategies.....	45
CHAPTER 3 RESULTS.....	47
CONCLUSION.....	53
GLOSSARY.....	54
ANNEX A INTERVIEW RESPONSES APPLIED TO COMPANIES.....	55
REFERENCES.....	69
Figure 1. 1 Timeline of the evolution of quality	11
Figure 1. 2 The philosophy of Frederick W. Taylor	12
Figure 1. 3 Deming's philosophy.....	13
Figure 1. 4 Cycle Deming.....	14
Figure 1. 5 Parameters of suitability for use	15
Figure 1. 6 The trilogy of quality	16
Figure 1. 7 Ishikawa diagram, cause-effect or fish diagram.....	17
Figure 1. 8 CRM-Iris Methodology	23
Figure 1. 9 Kaizen Methodology	28

Figure 1. 10 Kaizen Methodology - Process DMAIC	29
Figure 1. 11 360° Evaluation Methodology	33
Figure 1. 12 Six Sigma Methodology	35
Figure 2. 1 Benefits of implementing quality strategies	42
Figure 2. 2 Quality strategies used by Mexican companies.....	43
Figure 2. 3 Quality strategies used by Russian companies	43
Figure 2. 4 Strategies with greater incidence	44
Figure 2. 5 Most used quality strategies	45
Table 2.1 Information of Mexican companies	40
Table 2.2 Quality strategies implemented in Russian companies.....	41
Table 2.3 Economic indicators of the company Neftemash	45
Table 2.4 Economic indicators of the company KNAUF INSULATION.....	46
Table 2.5 Economic indicators of the company SHLUMBERGER	46
Table 2.6 Economic indicators of the company ETAGI.....	47

INTRODUCTION

The organizations seek to improve their products and / or services, in order to increase their productivity, competitiveness or recognition and ensure their survival and growth in the market, which becomes more demanding every day. One of the mechanisms that have had the best results is the implementation of a management based on quality. (Torres, Suguey, Solís & Martínez, 2012)

Quality is a concept that has a long history and over time becomes more important. It has great precursors like Frederick Taylor, Henry Ford, Edward Deming, Joseph Moses Juran, Kaoru Ishikawa, Taiichi Ohno, etc. They contributed great advances in the development of quality and we continue to occupy and improve those philosophies.

Nowadays every country has its own standards for quality control like the international Organization for Standardization (ISO), European foundation for quality management (EFQM), Russian certification GOST, etc. The objective of each country is to ensure and control the quality of its products or services and to meet the quality standards of the country to which it exports.

MEXICO

Mexico is a highly industrialized country and in agreement with the National Institute of Statistic and Geography (INEGI), in Mexico there are a total of four million 926 thousand companies (Valencia, 2015). However, not all are big companies. Most of these companies are small and medium-sized enterprises (SMEs).

The production plant in Mexico is made up of 97% by micro, small and medium enterprises. According to Center for the Development of Business Competitiveness (CETRO-CRECE), only 10% of Mexican SMEs reach ten years of age, while 75% of the country's new companies fail and must close their businesses only two years after starting their activities.

According to the National Commission for the Defense of Financial Services Users (Condusef), the most frequent causes of failure in Mexican companies are: (Marker)

1. Problems to sell their products or services
2. Inconveniences to produce and operate
3. Negligence in controls
4. Inadequate planning
5. Mismanagement

As we can read the organizations have to survive at the constant change of the market and in accordance with Esteves, (2000) “Not all small and medium-sized enterprises can participate in a global process. In order for this to happen, they must meet certain conditions of competitiveness, total quality and ecological efficiency.” (Esteves, 2000)

RUSSIA

According to Federal State Statistics Service (2014) Russia has a total of 315 thousand 996 companies of which 12 thousand 623 are mining and quarrying companies, 263 thousand 201 are manufacturing companies and 40 thousand 172 are electricity, gas and water supply companies.

Russia also have smalls and medium business in 2010 the Federal State Statistics Service did a study and the results of full-scale Federal statistical observation on activities of subjects of small and medium entrepreneurship show that there are a total of 1 million 669 thousand 439 small and medium-sized enterprises. 1 million 415 thousand 186 are micro-enterprises, 229 thousand 083 are small enterprises and 25 thousand 170 are medium enterprises. (Russian Federation Federal State Statistics Service, 1998)

All the companies are an important part in the Structure of Gross Domestic Product (GDP). The industrial sector accounted for 32.6 % of GDP in 2015. This sector is made up of companies of mining, manufacturing, electricity, gas and water, and construction. The service sector accounted for 62.8 % of GDP in 2015. This sector is made up of services such as: commerce, hotels and restaurants, transport and communications, finance, real estate, public administration and social security, education, health, etc. (Oficina de información diplomática, 2017)

We live in a time when not only is difficult for small and medium-sized companies to survive at the constant market changes also the biggest companies have to do it. One of the surest roads for survive and be competitive is the quality. At present, we can find different quality strategies that can facilitate the way to success, survival and competitiveness of a company.

These quality strategies improve the quality in the product/service, processes, relationship with their customers and suppliers, work environment. Each company can adapt the quality strategy to their needs and obtain the best result.

GENERAL OBJECTIVE

Establish the main benefits provided by quality strategies to companies in Mexico and Russia, through the application of interviews and thus to know if these strategies are a competitive advantage in the face of globalization.

SPECIFIC OBJECTIVES

1. To know the quality strategies used in Mexican and Russian companies.
2. To develop a series of questions to apply to companies.
3. To know the main benefits of these strategies towards the company.

CHAPTER 1 CONTEXTUAL FRAMEWORK

1.1 Stages of quality

Quality is a concept that has a beginning in history; this concept has evolved through different stages such as craftsmanship, industrialization, final control, process control and continuous improvement. The concept of quality that we conceive today is not fixed; it continues to evolve as man evolves in the same way over time. In the following paragraphs we will describe how the concept of quality has evolved to what we mean by quality today.

1.1.1 Craft step

The objectives that are pursued in this stage are the satisfaction of the artisan and the buyer. At this stage the time is not important; the important thing is to do things well at any cost. Even today we can find products that are made in a traditional way, especially in the food area. (Rico, 2005)

1.1.2 Stage of industrialization

At this stage, production replaces quality, what matters is the quantity and not quality, the quantity and time are the most important things. The goal is to meet demand and increase profits. (Rico, 2005)

1.1.3 Final control stage

At this stage, the important thing is not quantity. The important thing is that the customer obtains a product according to their specifications. In this part of the evolution of quality, the customer is no longer satisfied and begins to demand that the product he receives complies with what he has specified. This originates the control of the quality understood like final control. The quality control consisted in ensuring that the product is optimal and meets the requirements. Inspection is done at the end of the process, the defective products are lost or recover, and it results in an additional cost for the product and the deadline is not met. (Rico, 2005)

1.1.4 Process control stage

At this stage, inspection points are established in the raw material and in the process. However, the quality was not improved and the defects were not avoided. Now the customer wants that all the products that are manufactured are good and delivered within the agreed period. At this stage the process control is born, which allows preventive actions to be taken. (Rico, 2005)

1.1.5 Stage of design control

At this stage, the process is already controlled and corrective and preventive measures are taken, but quality problems continue to be detected during the life of the product. The problem is in the design; here the quality begins to be programmed from the project. The product adapts to the production process and can have a guaranteed shelf life (product reliability). At this stage quality no longer focuses on the product and begins to be part of the people. All members of the organization intervene directly or indirectly. (Rico, 2005)

1.1.6 Continuous improvement

Nowadays, if a company wants to be competitive it has to be excellent and this is only achieved through continuous improvement of the products / services. A company has to implement a management system that allows achieving the client's requirements. A company has to look for total quality (Rico, 2005). In the following figure we can see a timeline showing the stages of quality and the events and important people that emerged in the evolution of this concept. (Torres et al., 2012)

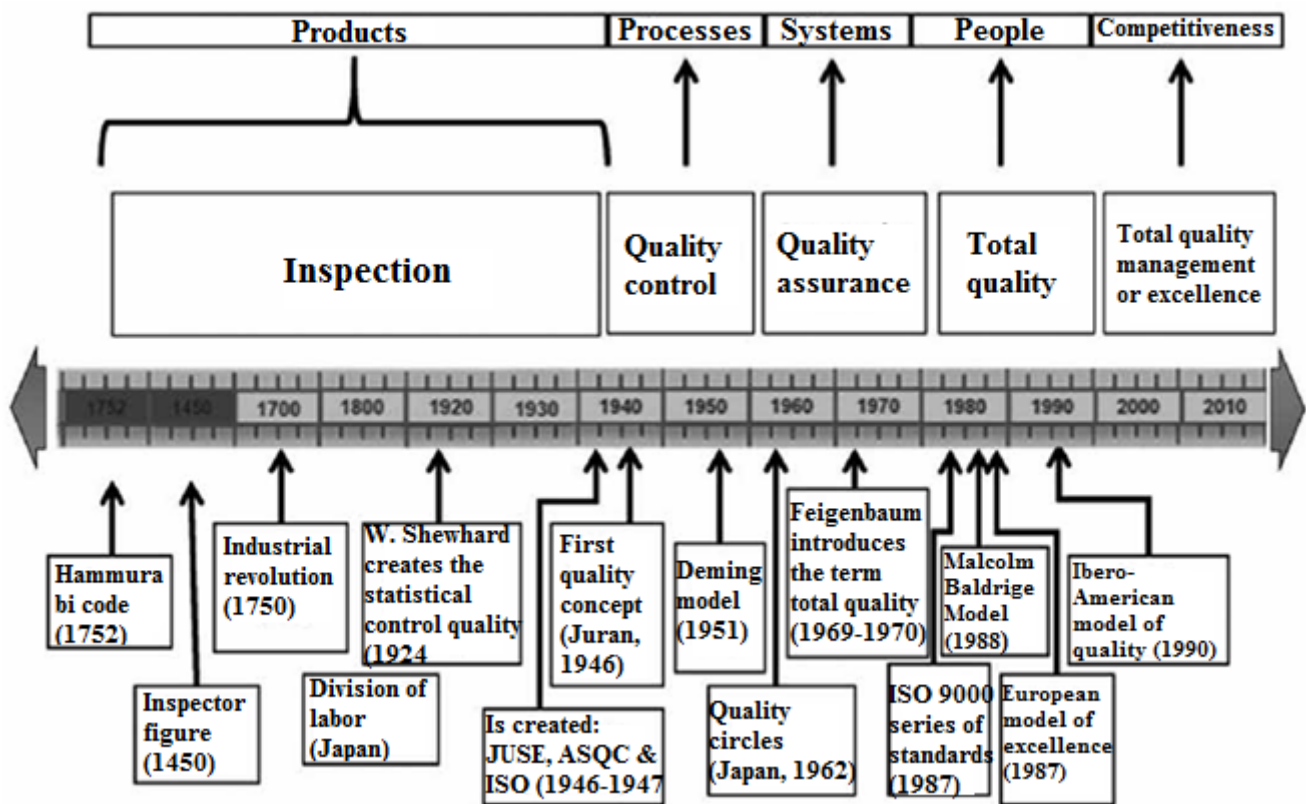


Figure 1.1 Timeline of the evolution of quality

1.2 Quality gurus

In order to understand quality it is important to know the great masters of the different philosophies and tools as well as the environment where they developed. Knowing this we will have a clearer idea of when, how, where and why we can apply them to our daily problem. In this part of the contextual framework we will briefly describe the contributions of these quality teachers or gurus that emerged after the Second World War. Most of them are Americans, but their philosophies and concepts helped to make Japan an industrial power and then to Europe and America. (Guajardo, 2003)

1.2.1 Frederick W. Taylor

Frederick W. Taylor revolutionized production methods in factories. He was able to multiply the level of productivity mainly in the production lines of products with multicomponent. With him “the administration of quality grew towards the standardization of the works, the organization by functions and the development of methods”. In the figure 1.2 we can see the work of Taylor. (Guajardo, 2003)

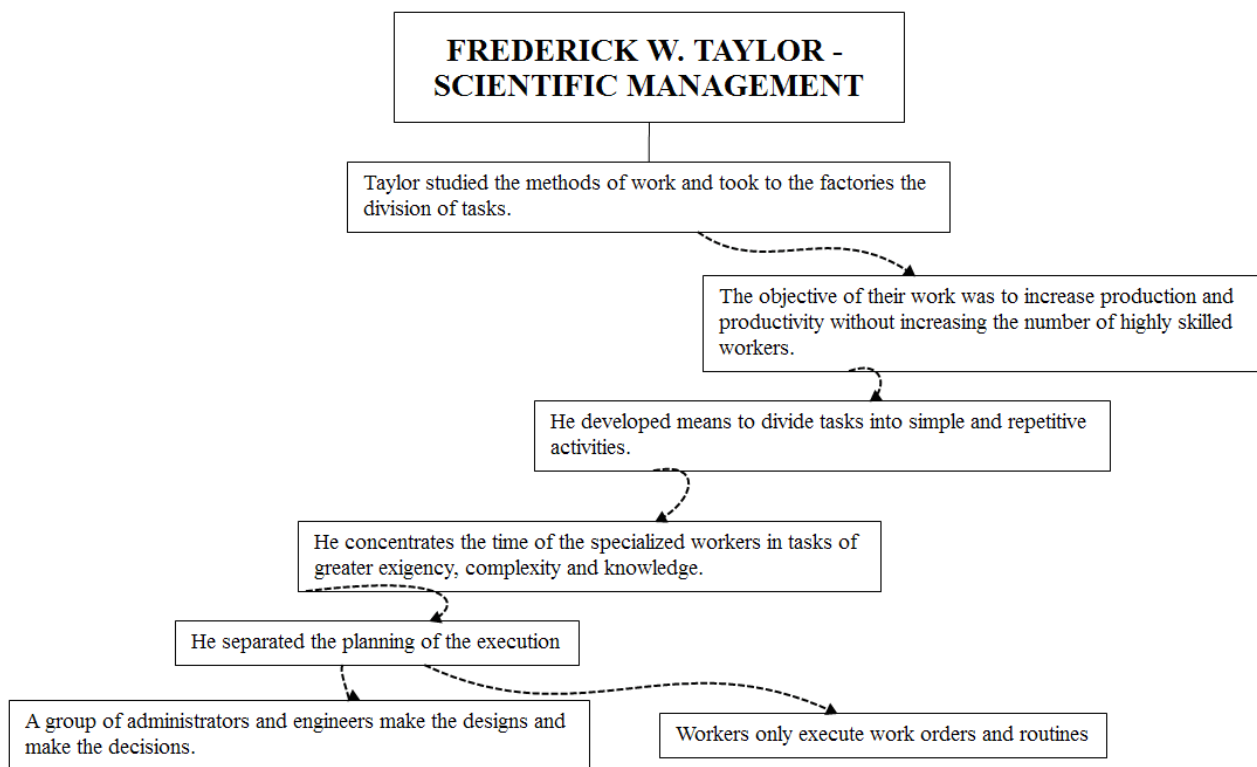


Figure 1. 1 The philosophy of Frederick W. Taylor

1.2.2 W. Edwards Deming

Edwards Deming had a doctorate in physics. He was a specialist in the application of statistical sampling techniques. He demonstrated the high costs that a company commits when it does not have a process planned to manage its quality that is reflected in: (Guajardo, 2003)

1. Waste of materials
2. Rejected products
3. The cost per rework
4. Refunds and compensations paid to customers for defects

In the figure 1.3 show us the Deming's philosophy that was the discoveries and contributions that he did to Quality, the figure 1.4 are one of the most important contributions and it is a quality strategy that companies use until today . (Guajardo, 2003)

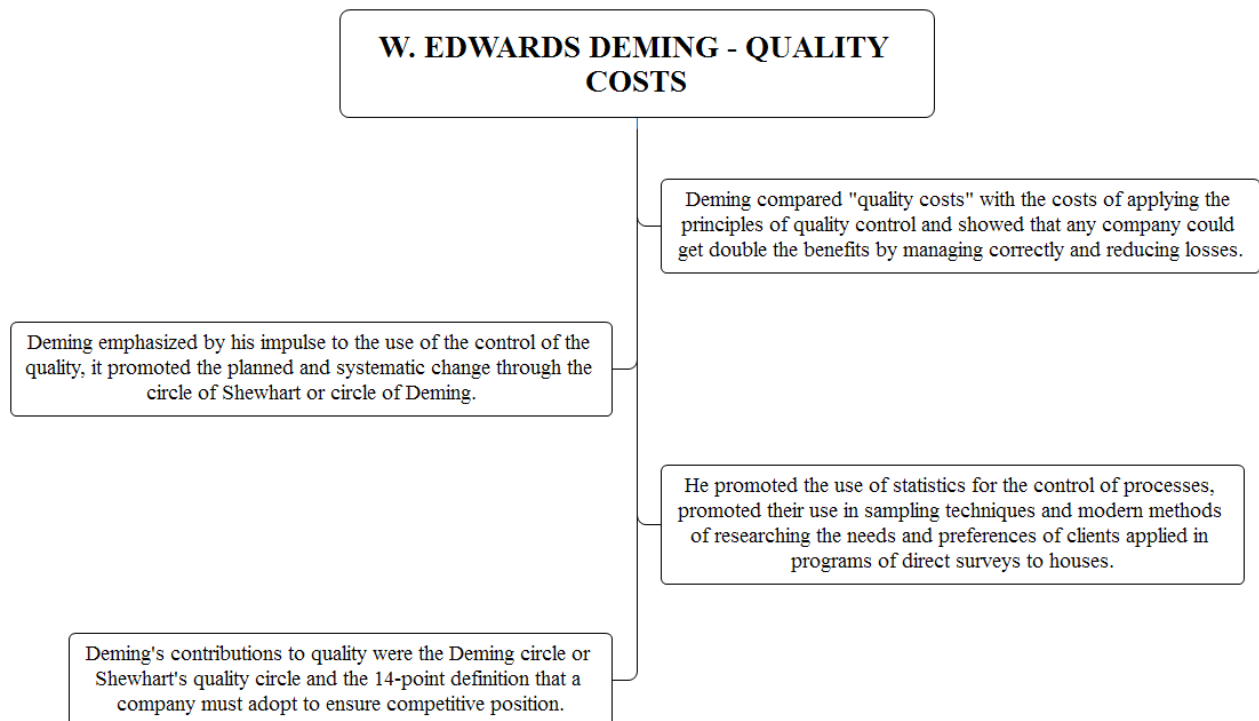


Figure 1. 2 Deming's philosophy

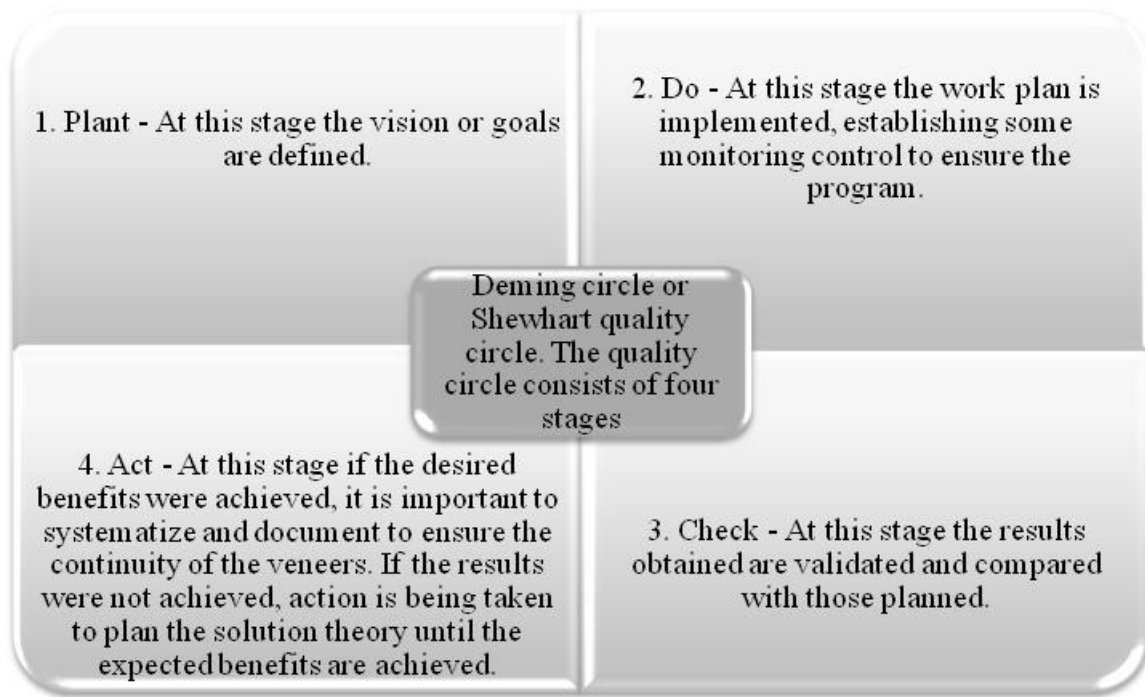


Figure 1. 3 Cycle Deming

Deming defined 14 points that companies must adopt to ensure their competitive position. The criteria imply a new business philosophy. The 14 points are (Guajardo, 2003):

- Create awareness of purpose
- Adopt the new philosophy
- End dependence on inspection
- End the practice of deciding business based on prices.
- Improve the system of production and services on a constant and permanent basis
- Institute methods of training at work
- Adopt and institute leadership
- Expel fear
- Break the barriers between departments
- Eliminate slogans, exhortations and numerical goals.
- Eliminate working standards and numerical targets
- Remove barriers that prevent the worker from being proud
- Institute an active education and self-development program for employees.
- Involve all staff in the transformation.

1.2.3 Joseph M. Juran

Juran began his career as an engineer in 1994, in 1951 published his first book "The quality control manual". He focused on the administration giving priority to the planning, organization and responsibilities of quality management, and the need to set goals and objectives for improvement. Juran defines the quality of a product as: "suitability to use". (Guajardo, 2003)

The suitability for use implies all those characteristics of a product that the user recognizes that benefit him. The suitability for use will always be determined by the user, not by the producer, the seller or the person who repairs the product. Figure 1.5 summarizes the parameters that determine the suitability for use. (Guajardo, 2003)

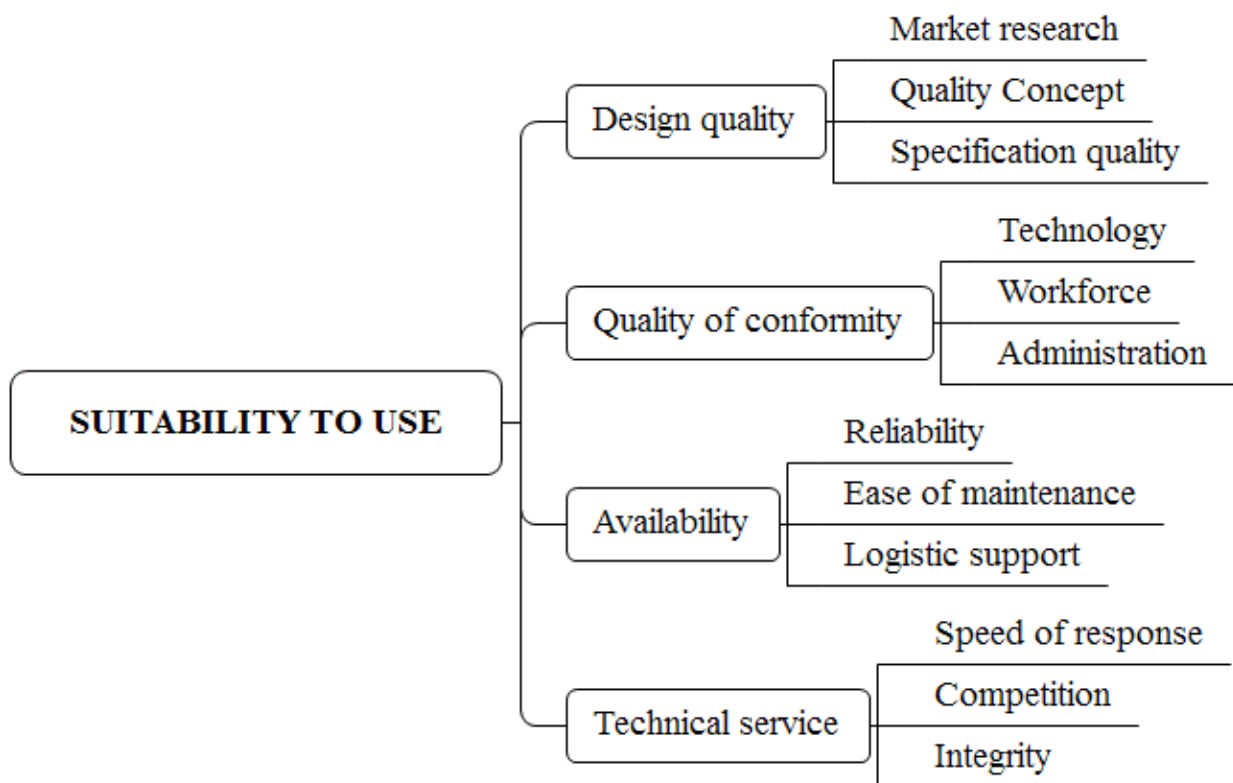


Figure 1. 4 Parameters of suitability for use

This part describes the parameters that determine “suitable to use”: (Guajardo, 2003)

- The **design quality** ensures that the design of the product meets the needs of the user and the design reflects the use that is going to give.

- The **quality of conformance** defines the process of the elaboration of a product or service. Here we can see the degree to which the product or service adheres to the characteristics designed, and that the specifications of the process and design are met.
- **Availability** is the part of the quality of the product that is defined during the use of the product and where its performance and useful life are valued.
- The **technical service** of the product defines the part of the quality that has to do with the human factor of the company. The technical support service must have an **optimal response, be full and competent**.

Figure 1.6 shows the quality trilogy that was another of Juran's contributions to quality where he shows three important points for the improvement of quality in a company. (Guajardo, 2003)

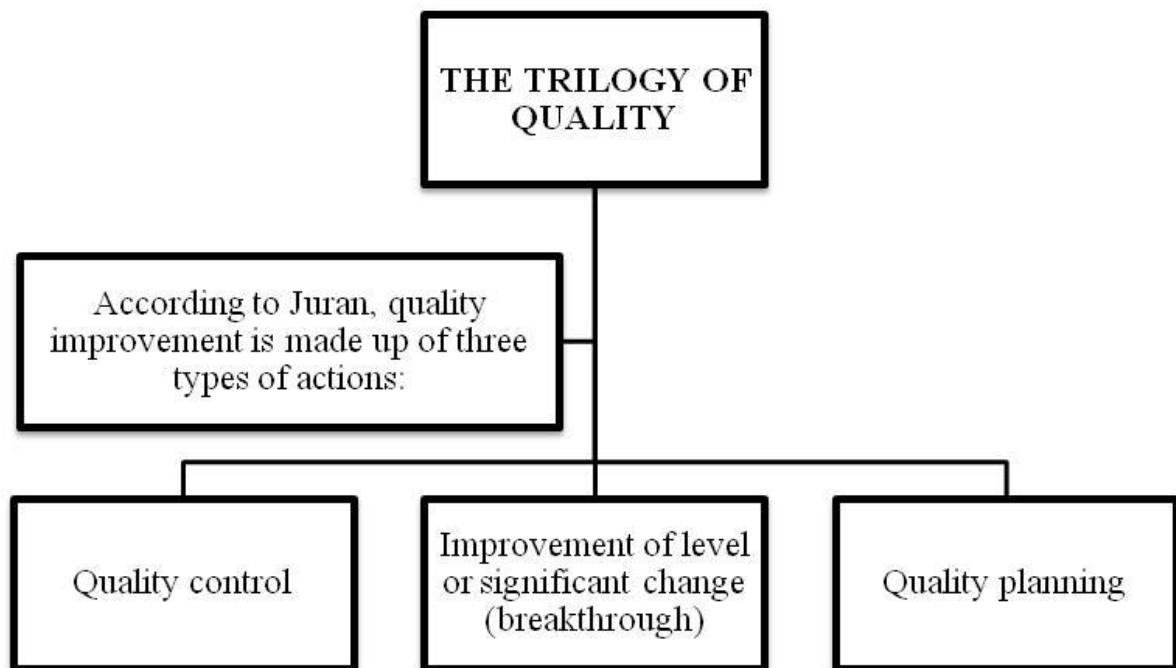


Figure 1. 5 The trilogy of quality

The "quality planning map" was another contribution by Juran to the quality which includes 9 steps to be written below. (Guajardo, 2003)

1. Identify who the client is.
2. Determine customer needs.
3. Translate those needs into the company language.
4. Develop a product that can respond to those needs.

5. Optimize the characteristics of the product, so that they meet the needs of the company and the customer.
6. Develop a process that can produce the product.
7. Optimize the process.
8. Prove that the process can produce the product under normal operating conditions.
9. Transfer the process to operation.

1.2.4 Kaoru Ishikawa

Kaoru Ishikawa graduated in applied chemistry, was also assistant professor and later professor of the university of Tokyo. He obtained a doctorate in engineering in 1960 in the same university. Ishikawa's work focuses on the collection and presentation of data, the use of the pareto diagram to prioritize quality improvements and the Cause-Effect diagram, also called the Ishikawa or fish diagram. The most important contribution of Ishikawa was the cause-effect diagram. The diagram was later adopted throughout the Japanese and foreign industry. Ishikawa presented the cause-effect diagram as another support tool for Quality Circles in their improvement process. Figure 1.7 shows an example of the Ishikawa diagram where we can observe the most common areas where we can find some cause that causes us a problem or can also be used as support to achieve a goal. (Guajardo, 2003)

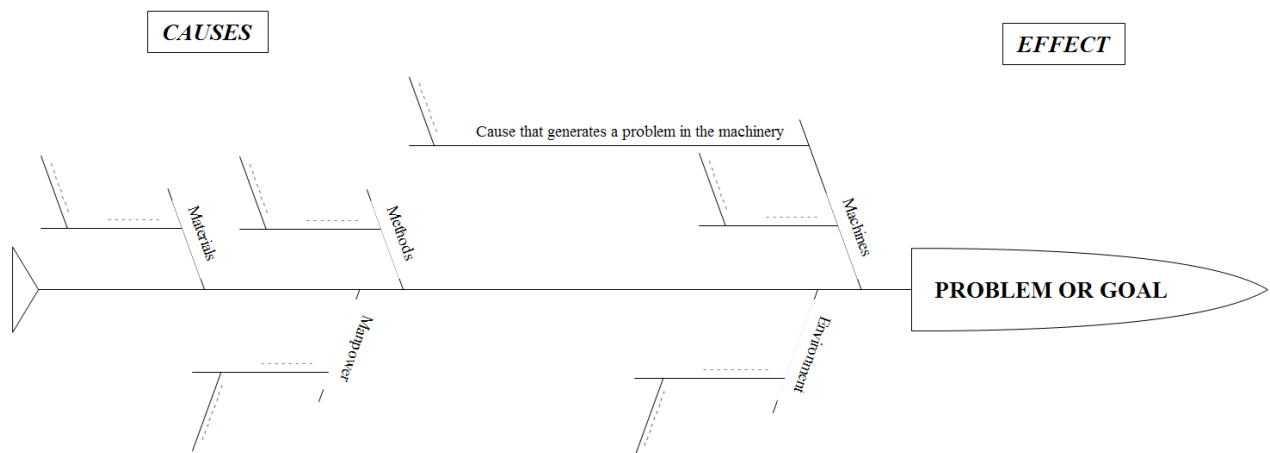


Figure 1. 6 Ishikawa diagram, cause-effect or fish diagram

According to Ishikawa, the quality control of the company is not only directed to the quality of the product, also to the quality of the service after the sale, the quality of the administration, the company, the human, etc., which allows us to achieve the following effects: (Guajardo, 2003)

1. The quality of the product is improved, is more uniform and costs are reduced.
2. Improves the reliability of products.

3. Lower costs.
4. The levels of production increase.
5. Waste and reprocessing are reduced.
6. The technique is established and improved.
7. Inspection and testing costs are reduced.
8. Are more rationalized the contracts between seller and buyer.
9. The market for sales grows.
10. Improves the relationship between departments.
11. Decrease false data and reports.
12. It is argued with more freedom and democracy.
13. The meetings are done quietly.
14. Repairs and equipment inspections are made more rationally.
15. Improve human relationships

1.2.5 Armand V. Feigenbaum

Feigenbaum was born in 1922. In 1944 he was hired by General Electric in New York to work in the quality area. In 1951 he received a Ph.D. from the Massachusetts Institute of Technology (MIT). In 1956 he introduced for the first time the phrase "total quality control" and published a book with that title. His idea of quality is: "a corporate way of life, a way of managing an organization". Total quality control is a concept that covers the entire organization and involves the implementation of customer oriented activities. (Alfaro, 2009)

According to Feigenbaum "quality" does not mean "better" but "the best for the customer in service and price". In quality control the word "control" represents a management tool and consists of four steps: (Alfaro, 2009)

1. Define the quality characteristics that are important.
2. Establish desired standards for these characteristics.
3. Act when these standards are exceeded.
4. To plan improvements in quality standards.

Quality control is present in all phases of the production processes in the industry, from the specification of the customer until the sale of the product. For this reason, is important that effective controls have to be

established on the important stages of the production process that affect the quality of the product. These controls are classified into: (Alfaro, 2009)

1. Control of new designs
2. Control of reception of materials
3. Product control
4. Special process studies

Another important point are the quality costs these are defined as those costs incurred in a company to give the customer a quality product. These are divided according to their origin, in: (Alfaro, 2009)

1. Prevention costs.
2. Evaluation costs.
3. Costs of internal failures.
4. Costs of external failures.

Feigenbaum proposes that the program should be developed gradually within the company. Total quality control is a supplier of structures, plans and tools to manage quality. Total quality control programs are highly cost-effective, reducing operating and service costs, improving resource utilization, and increasing customer satisfaction. (Barrios, 2007)

1.2.6 Philip B. Crosby

Crosby was president of his management consulting firm and Quality College in Winter Park, Florida. Was 14 years Vice President of the company "International Telephone and Telegraph". He is best known as the creator of "zero defects". (Alfaro, 2009)

The "four absolutes of quality improvement" are considered the key principles of his philosophy. Crosby states that quality is based on four absolute principles that are:

1. Quality is to meet the requirements
2. The quality system is prevention
3. The performance standard is "zero defects"
4. The measure of quality is the price of non-compliance

Another of Crosby's contributions to quality is the 14 steps of quality management that will be listed below. (Castillo & Salazar, 2009)

1. Establish the commitment of the administration to participate in the quality program and ensure the cooperation of all members of the organization.
2. Form a quality improvement team with representatives from each department.
3. Define indicators of all the activities of the company with the purpose of establishing quality measurements.
4. Evaluate the cost of lack of quality as an indicator that provides evidence of where to take corrective action.
5. Develop a quality consciousness in the employees to have a continuous improvement in the organization.
6. Take action to correct the problems identified in the previous steps.
7. Establish a team to implement the zero defect program.
8. Train supervisors and employees to comply with the quality improvement program.
9. Plan the "zero defects" day to symbolize a change in the company towards quality
10. Motivate staff to set goals for improvement towards themselves and their team.
11. Identify problems and eliminate their causes.
12. Establish a recognition program for those who achieve their quality objectives through their participation in the quality improvement program.
13. Create quality advice made up of administrative staff and leaders of quality teams.
14. Repeat the whole process.

1.2.7 Genichi Taguchi and Shigeo Shingo

Dr. Genichi Taguchi was born in Japan in 1924, graduated from the technical school of Kiryu University. He did a doctorate at Kyushu University in 1962. The most prominent publications are Introduction to Quality Engineering, System of Experimental Design, Robust Engineering y The Mahalanobis-Taguchi System.

The most important contribution of Dr. Taguchi is the application of statistics and engineering for cost reduction and quality improvement in product design and manufacturing processes. Their methods employ small-scale experimentation in order to reduce variation and discover robust and cheap designs for series production. (Alfaro, 2009)

Shigeo Shingo was born in Japan in 1909. After graduating in Mechanical Engineering at the Yamanashi Technical School in 1930, he joined the Taipei railway manufacturer in Taiwan where he

introduced the methods of scientific management. Shigeo Shingo's two major contributions to quality are the POKA-YOKE and Single-Minute Exchange of Die (SMED) systems. (Alfaro, 2009)

Poka-yoke systems improve process efficiency, avoid waste and reduce costs; Critical factors for the measurement and improvement of any organization. These systems comprise two phases: the detection aspect and the regulation aspect. The detection can be performed in different ways such as: limit switches, photoelectric cells, pressure sensitive switches, thermostats, etc. The regulation can be produced by an alarm (a flashing light, a siren), or by assuming control (pre-start, automatic stop of a machine), or both at the same time. (Alfaro, 2009)

The purpose of SMED is to minimize the amount of time spent when performing utility changes, reduce downtime, increase production flexibility, and avoid long manufacturing processes and large lots. (Alfaro, 2009)

1.3 Quality strategies

1.3.1 Customer Relationship Management (CRM)

Nowadays the financial challenges and the increment competitiveness between firms mark the environment in which companies have to work. The success of firms depends on their ability to satisfy customers. CRM has gained momentum and companies are implementing it to improve customer satisfaction and retention. (Garrido Moreno, Lockett, & García Morales, 2014)

CRM is useful for companies because they detect changes in customer needs, personalize their service, be different from customers, and create a competitive advantage. It involves the use of customer knowledge and a technological infrastructure. The technology infrastructure plays a vital role, as enabler of the strategy, because the integration of databases, data mining, and internet technologies allows the company to collect and store unprecedented amounts of customer data and build the relations base on interactions. (Garrido, Lockett, & García, 2014)

(Chen & Popovich, 2003) define CRM as “Customer Relationship Management (CRM) is a combination of people, processes and technology that seeks to understand company’s customers.”

This strategy helps the different kind of companies to have contact with their customers for different touch points like: internet, e-mail, sales, direct mail, telemarketing operations, call centers, advertising, fax, pagers, stores and kiosks. (Chen & Popovich, 2003)

How helps CRM at the customer and the organization? For customers, CRM offers customization, simplicity and convenience for completing transactions, regardless of the channel used for interaction. CRM help organizations assess customer loyalty and profitability on measures such as repeat purchases, dollars spent and longevity. (Chen & Popovich, 2003)

1.3.1.1 CRM methodology

The methodology that will be described is a model that was designed by Iris Group

The Research Group on Integration and Re-Engineering of Systems (IRIS Group) is a multidisciplinary group, constituted at the end of 1997 and formed by professors from different departments of the Jaume I University of Castellón, whose main investigator is Dr. Ricardo Chalmeta

CRM-Iris methodology

The methodology considers various aspects of a CRM System, such as the definition of a customer strategy, the re-engineering of customer-oriented business processes, the human resources management, the computer system, the management of change and continuous improvement.

The figure 1.8 we can observe the methodology and the steps that we can follow. The CRM system, in accordance with the CRM-Iris methodology, is summarized in the following sections (Chalmeta, 2006):

1. Project management and prerequisites.
2. Definition of the company's organizational framework.
3. Definition of a customer strategy.
4. Designing a customer relationship assessment system.
5. Process map.
6. Human resources organization and management.
7. Construction of the information system.
8. Implementation.
9. Monitoring

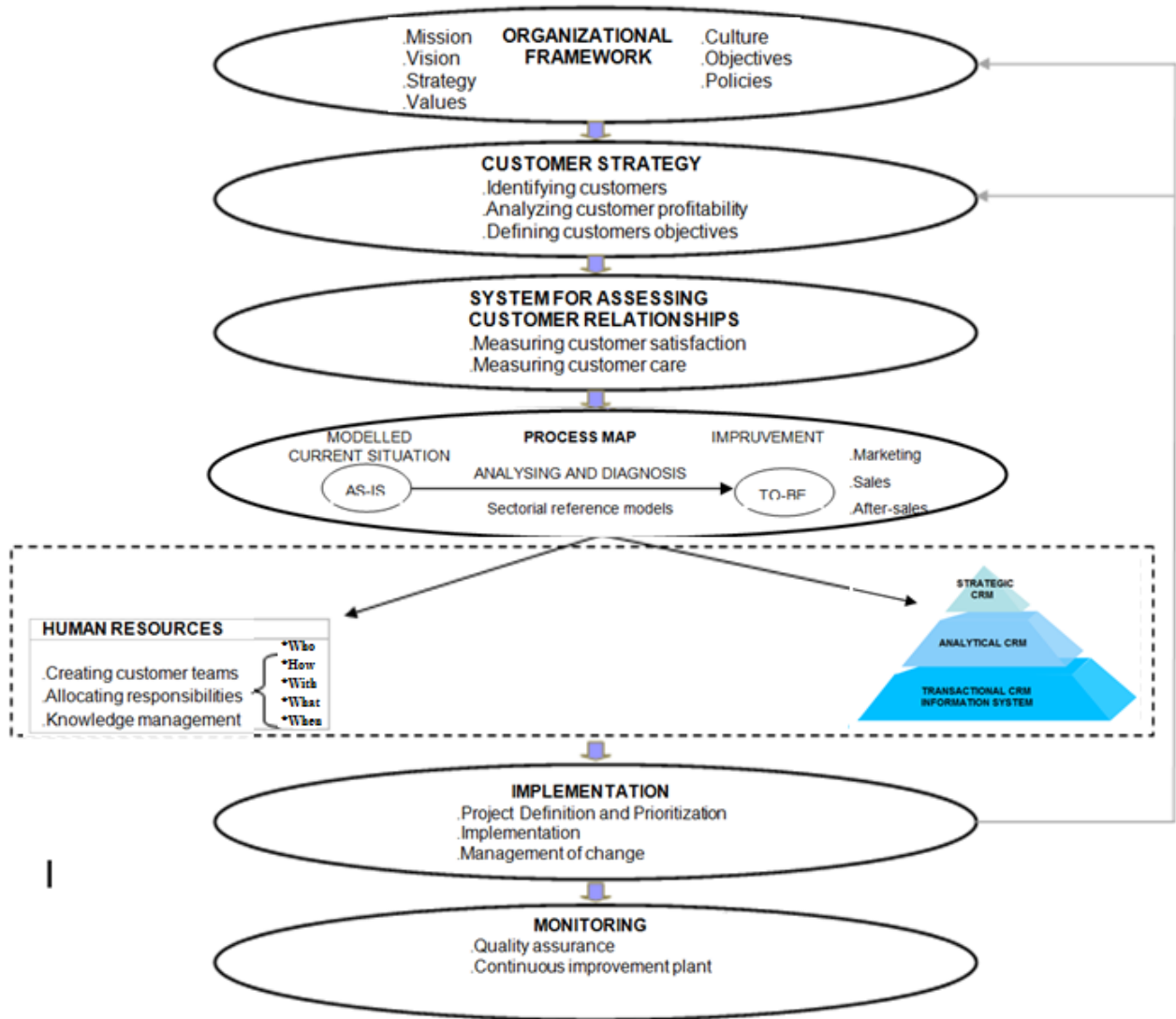


Figure 1. 7 CRM-Iris Methodology

1.3.2 Lean Manufacturing

According to National Steel & Shipbuilding Co. (2000) we can define lean manufacturing as a “manufacturing philosophy that shortens the time between the customer order and the product build/shipment by eliminating sources of waste.” Waste is all that do not contribute to the final product it can be reflected in: over production, defective products, inventories, motion, processing, transportation and waiting. (The University of Michigan, 2000)

Waste is classified into seven categories: (Tinoco, 2004)

1. Overproducing: Is when a company produces before the customer requires it.

2. Waiting: Is when the operators have to wait until the machines finish their cycle, wait for the material, information, etc.
3. Transport: It is when the material moves more than necessary.
4. Processing: Doing more to the product than necessary and the customer is willing to pay.
5. Inventory: Excess of stock from raw material or finished goods.
6. Motion: Any motion that is not necessary to the completion of any operation.
7. Defects and spoilage: Defective parts that are produced and need to be reworked.

This philosophy or set of techniques was developed by Toyota, these techniques allow us to improve and optimize the operational processes of any company and any size. (Padilla, 2010)

The advantages that give us lean manufacturing are: (The University of Michigan, 2000)

1. Production lean times short
2. Imbalances in operation timing (bottlenecks) are apparent – improvement can focus on bottlenecks.
3. Defects are immediately apparent and the underlying cause can be quickly determined.
4. Constant motivation for improvement – problems have immediate production impact.
5. Operation can quickly shift to a new product without interrupting the flow, each operation makes just what is needed when it is needed.
6. There is minimum part handling.
7. Inventory holding cost is minimized.

1.3.2.1 Lean Manufacturing Methodology

According to Anand and Kodali (2010) there are ten levels in the implementation of Lean Manufacturing. These levels will be describing below: (Anand & Kodali, 2010)

Level 0 “Evaluate”: This first stage involves an analysis to the organization to know where there is waste. This step can be done by external Lean Manufacturing consultant in conjunction with the managers of each area to quickly identify the Non-Value Added (NVA) activities and quantify it into cost savings. This step will enable the top management to understand the problem in a language they understand “money”, and obtain all necessary commitment from the top management. (Anand & Kodali, 2010)

Level 1 “Prepare”: In this stage all the organization have to be prepared for Lean Manufacturing implementation. The announcement of the implementation of lean manufacturing can be made to the entire organization including the suppliers. Then, a team conforming by members of different functions or areas

will take the responsibility of lean manufacturing implementation. These team have to be training on lean manufacturing will be arranged for the Cross Functional Team (CFT) and the top management, while training on Problem Solving Tools (PST), teamwork, personality development, etc. (Anand & Kodali, 2010)

Level 2 “Identify”: In this stage is necessary to “Define Value”. This can be achieved by identifying the product, which is critical for the organization’s survival. It can be identify on the basis of experience or by evaluating various factors like customer requirement, sales/demand, technology used, investments made, etc. using some decisions-making tools. For example, risk analysis or cost-benefit analysis or Multiple-Attribute Decision Making (MADM) models such as Analytic Hierarchy Process (AHP). (Anand & Kodali, 2010)

Level 3 “Draw”: The most important in this stage is “identify the value stream”. Once the critical product is identified, the next stage is to understand the manufacturing process by drawing the process flow chart. Also is necessary to understand the flow of materials and information, apart from understanding the Value Added (VA) and (NVA) Non-Value Added activities in that process. This can be accomplished by developing a Value Stream Mapping (VSM). Value Stream Mapping is of two types: the current state map and the future state map. The mapping current state, give data such as cycle time, idle time, preceding and subsequent operation/activity, number of operators, maintenance time, setup time, etc. are collected, which will be used to calculate different parameters such as takt time, process ratio or Value Stream Index (VSI). The future sate map, the team identifies potential areas for improvements apart from identifying the lean manufacturing tools to be implemented to achieve those improvements. They also can estimate how much of wastes can be eliminated based on which a new process ratio is found. (Anand & Kodali, 2010)

Level 4 “Initiate”: “Create a flow”- the lean manufacturing implementation starts in this stage. It is better to start with Housekeeping (HOK) or 5’s because it is easier to implement. It improves the productivity and morale apart from providing confidence to the employees at the Bottom of the Pyramid (BOP) that they are also part of the lean manufacturing team. Others elements like “Work Standardization (WST)”, “Defect At Source (DAS)”, “Successive Check (SUC)” improve the quality and reduce the defects. Nevertheless, elements like “Andon (AND)”, “Jidoka (JID)”, “Quality Circles (QCC)”, “Suggestion Schemes (SUS)”, etc. require some training. (Anand & Kodali, 2010)

Level 5 “Improve”: This stage is the continuation of the previous one. The implementation of some of the lean manufacturing elements like: “Pokayoke (POK)”, “Single Minute Exchange of Dies (SMED)”, “Statistical Process Control (SPC)”, “Automation (AUT)”, “Work Load Balancing (WLB)”, “Product and

Process Simplification”, etc., require technical and mathematical Knowledge in addition to “common sense”. These elements can only be implemented with the support of engineers and shop floor associates in Bottom of the Pyramid should be trained adequately as it may involve changes in the way they are functioning currently. The managers or departmental heads should provide necessary resources, support and motivation to implement these lean manufacturing elements. (Anand & Kodali, 2010)

Level 6 “Stabilise”: In this stage is necessary to implement lean manufacturing that are related with other areas in the company. The area of design and development of products have to implement elements like: “Communization and Standardization of Parts (CSP)”, “Design for Manufacturing (DFM)”, “Modularity (MOD)”, etc. Also the engineers and managers of area like production/industrial engineering, Research and Development (R&D) have to implement elements that are competent with each area. For instance, elements such as buying New Product Equipment (NPE), grouping similar parts/components using Group Technology (GRT), forming work cells using Cellular Manufacturing (CEM) concepts, etc. have to be implemented by the industrial engineering team along with adequate support from the managers and members of other supporting departments. (Anand & Kodali, 2010)

Level 7 “advance”: this stage is related whit the fourth step, “Let the customer pull”. In this level, all advanced elements (Mixed Model Scheduling (MMS), Production Smoothing (PSM), Pull system (PUL), Kamban system (KAN), etc.) of lean manufacturing have to be implemented. The success of implementing these elements is depend on internal and external members such as Research and Development, Production Planning and Control (PPC), suppliers, etc. The suppliers play an important part in this stage and the company has to implement elements like: Sole Sourcing (SSO), Long-Term Relationship (LTR), Electronic Data Interchange (EDI), Supplier Training and Development (STD), etc, which require the support of purchasing and quality department apart from the suppliers. In addition to these elements, it may be required to reduce the number of suppliers and identify suppliers who are nearer to the organization due to the concept of Supplier Proximity, which is a pre-requisite for establishing Just-In-Time (JIT) delivery. (Anand & Kodali, 2010)

Level 8 “Establish”: when the previous levels are implemented properly, it will be easy for the organization to introduce other management philosophies like Total Quality Management (TQM), Total Productive Maintenance (TPM) or Six Sigma. (Anand & Kodali, 2010)

Level 9 “Continue”: -“Pursue Perfection”- this stage focuses on continuous improvement of the existing value stream apart from replicating it in other value streams of the organization. Nevertheless, the

replication will be possible, if there is proper documentation of the implementation procedure, problems faced, solutions developed, etc. (Anand & Kodali, 2010)

The description of the previous steps may be different for each type of company, but in general these steps will help the proper implementation of lean manufacturing. The support that the company give to the team in charge of develop the philosophy will be of vital importance. The last step always has to be active to always offer continuous improvement to the company.

1.3.3 Kaizen

The word kaizen in Japanese means “good change” or “improvement” and according to Paul and Michael (2014) Kaizen can be defined as “set of practices that focus on continuous quality improvement.”

The goal of kaizen is the quick analysis of the small, manageable components of a problem and the rapid implementation of a solution with ongoing, real-time reassessment. “Kaizen not only eliminates unnecessary work but builds consensus and enthusiasm for change and teaches people a systematic, scientific method for identifying and eliminating waste in the process”.

Kaizen events are particularly well suited for addressing small, manageable, focused problems. (Knechtges & Decker, 2014)

Advantages of kaizen: (Atehortua & Restrepo, 2010)

1. Participation and contribution to the construction of a new system.
2. Inventory reduction, in-process and finished products.
3. Reduction in machining time.
4. Strategic advantage in relation to competitors, having a continuous improvement in processes, products and services. By reducing costs, improving quality, design, response times and services to consumers.
5. Improvement in the attitude and aptitude of managers and staff for the continuous implementation of changes.

1.3.3.1 Kaizen Methodology

In this part we will describe two methodologies the first methodology is according to Knechtges & Decker (2014) and will be describe in the figure 1.9:

When selecting a Kaizen team, it is important to identify all stakeholders. Stakeholders are all the groups affected by the process you are improving.

Another essential element of a successful kaizen event is a commitment to the PDSA cycle. (Knechtges & Decker, 2014)

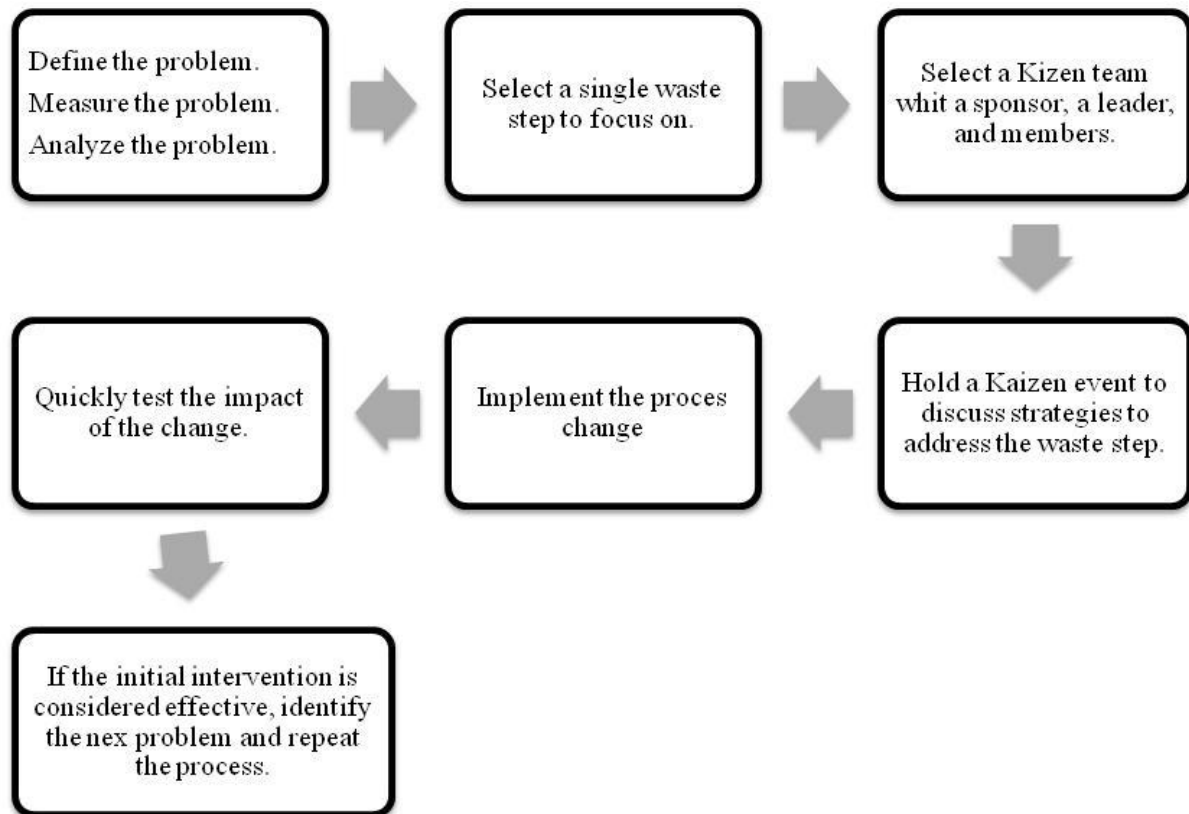


Figure 1. 8 Kaizen Methodology

The second methodology is according to Ortiz & Rodríguez (2006). They said that other way to apply the Kaizen methodology is to follow the process of DMAIC (Define, Measure, Analyze, Improve and Control) the figure 1.10 will be describe the methodology. (Ortiz & Rodriguez, 2006)

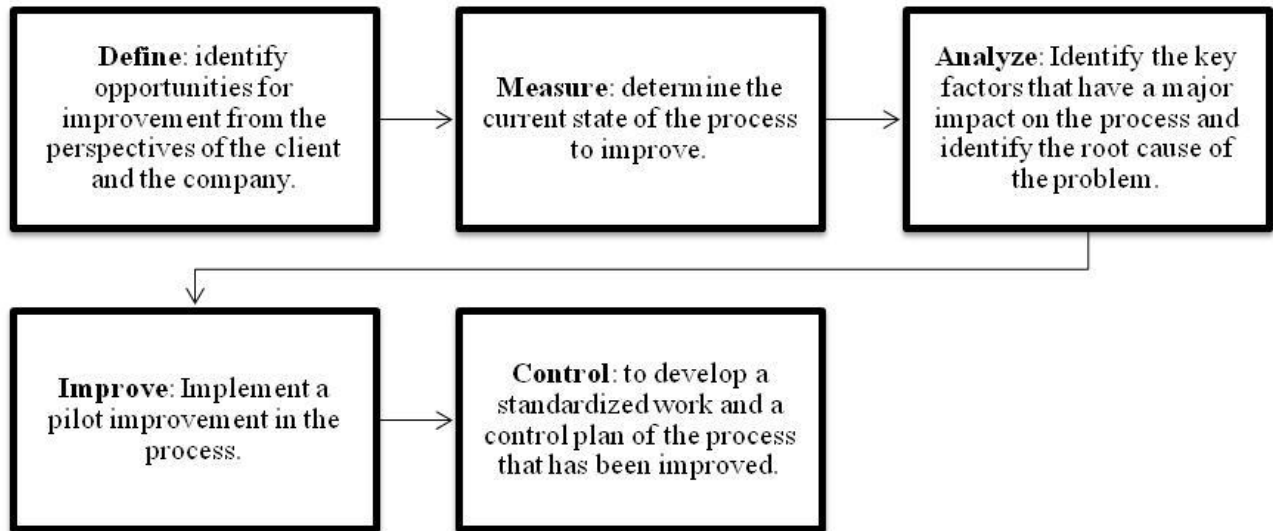


Figure 1. 9 Kaizen Methodology - Process DMAIC

At the end of each phase of the DMAIC process, you should evaluate whether the objectives and benefits are not far from the plan that was established at the beginning of the project.

In the definition phase, it is necessary to describe the problem and include what is happening?, Where is happening?, When did the problem start ?, What is the magnitude of the problem ?, What are the main consequences of the problem?. Also is necessary to identify the goal, the key project measures and the scope. (Ortiz & Rodriguez, 2006)

1.3.4 Total Quality Management (TQM)

TQM is a philosophy that emphasizes the continuous improvement, meeting customers' requirements, reducing rework, long-range thinking, increased employee involvement and teamwork, process redesign, competitive benchmarking, team-based problem-solving, constant measurement of results and closer relationship with suppliers. (Powell, 1995)

The concepts of Total quality Management are based on the work of: Deming, Crosby, Feigenbaum and Ishikawa.

1. "Management leadership and employee participation in the new philosophy (Deming). Make quality the concern of everyone in the company (Crosby, Feigenbaum)".
2. "Emphasis on meeting the requirements of both the internal (Crosby, Feigenbaum) and external customer (Ishikawa)".

3. “Eliminate non-conformance. Appraise conformance to standards. Have Zero Defect standard of performance (Crosby). Reduce costs of appraisal, prevention and failure (Feigenbaum)”.
4. “Use statistical and quantitative control methods. Implement problem solving using Quality Control Circles, Shewart/PDCA cycle and Quality Assurance (Ishikawa, Deming)”.
5. Search continually to improve processes and products (Deming). Develop new products and processes. Quality is a continuous program (Crosby, Feigenbaum)”.

All these components conforms the Total Quality Management. (Goh & Ridgway, 1994)

1.3.4.1 Total Quality Management Methodology

TQM is composed by five pillars that support this philosophy and give to the company a guide to be able and implement this methodology easily. Without one of these pillars, an enterprise cannot be a full Total Quality Management company. These pillars will be describe bellow: (Goh & Ridgway, 1994)

- **Management commitment (commitment to quality).** In this pillar is vital the management leadership. The first thing that management has to do is establish the quality policy. The quality policy together with the objectives, mission and vision will highlight the quality of the company's products and the company's commitment to its clients. The content of the policy have to be made known to all employees and it have to be understood in all levels of the company.
 - **Customer focus**
 1. Customer surveys and trials.
 2. Work closely with key customers.
 3. Competitor analysis.
 4. Analysis of customer complaints and compliments.
 - **Quality costs** are the costs of non-quality products; all these costs are avoidable through the implementation of Total Quality Management. Scrap and rework are a significant part of the cost of non-conformance. These unnecessary costs can be eliminated by identifying the causes of non-conformance and failure through the implementation of prevention activities.
 - **Quality systems.** The Quality System have to ensure that its principles, procedures and processes are appropriate and adequate for it business operation, this Quality System can be develop for the company. The company has to write and document the procedures and practices.
 - **Continuous improvement (increasing growth and profitability).** In this last pillar the company has to focus on continual research for excellence and customer satisfaction. The

research for excellence involves a constant review and improvement of all management and planning activities, and processes in the company. One technique which can be usefully used is benchmarking with other companies to provide reference points for comparison.

The advantage that give us this pillars are the customer satisfaction, costs reduction, improvement in the process and the continuous improvement in the company.

1.3.5 360° evaluation

The 360-degree assessment consists of evaluating the worker by a group of people through predefined understandings based on the worker's behavior in the daily development of his/her professional practice. The staff is self-evaluated and evaluated by their environment (bosses, peers, external, clients, subordinates, etc.). They receive objectively the perception of all those people who observe and know their work. In this way the worker identifies his strengths and weaknesses, analyzes and evaluates the evaluations received, allowing him to compare the results obtained to improve his personal and professional development. (Lara, Moras, Morales & Galán, 2010)

The advantages that give us the 360 degrees evaluation are the follow: (Capuano, 2004)

1. The person has the opportunity to see his performance through the eyes of those who work with him.
2. Feedback is anonymous and consequently more honest.
3. Allows individuals to visualize their strengths and weaknesses. Employee performance is more focused and effective.
4. The expectations of success are visualized with greater precision by the evaluated one.
5. A clear and focused communication base is established between the employees and the supervisor.
6. Training needs are easily identified.
7. The members of a team receive a greater amount of inputs that strengthen the performance of the same.

1.3.5.1 360° Evaluation Methodology

The methodology that will be show is according to Lara et al., (2010). The methodology for the application of 360° evaluation is composed of the following steps:

1. **Staff Identification:** This step consists in selecting the best worker from the position to be evaluated. The worker will be taken as a basis and the competencies required to be considered "competent" in that position can be defined. In order to identify the best employee, indicators must be defined that help to know their performance.
2. **Conducting interviews with staff:** In this step, the best employee identified in the previous step is interviewed. The interview is done in order to obtain in detail the method of work. The interview is done in a personal and confidential manner. The interview takes place in the area where the worker works, in order to show in a practical way the steps he is describing.
3. **Definition of cardinal and specific competences:** The definition of competences in a company is a process of analyzing the work that is carried out with the purpose of establishing the knowledge, abilities, skills and understanding that the worker uses to effectively perform a job function.
4. **Operationalization of variables:** Operating a variable means defining it to be measurable and manageable. So that the cardinal and specific competences are measurable, quantifiable and manageable variables are defined and the operationalization of the same is performed.
5. **Elaboration of a questionnaire with identified competencies:** In this step a questionnaire based on the Likert scale is elaborated. The Likert scale consists of 46 questions, which will be distributed according to the number of competencies and variables defined above.
6. **Application of a pilot test and the final evaluation:** In this step an evaluation test is performed. At this stage the evaluator and the evaluators are defined. The selection of the personnel is made based on the methodology of the 360° evaluation. The evaluators have previously had a sensitization course where the questions and the evaluation process are explained.
7. **Analysis and interpretation of evaluation reports for their feedback:** The objective of the reports is to make known the results of the workers of the evaluation process carried out. These results are confidential and are not known by anyone inside or outside the organization.

The figure 1.10 will be showing the steps of the 360° evaluation methodology.

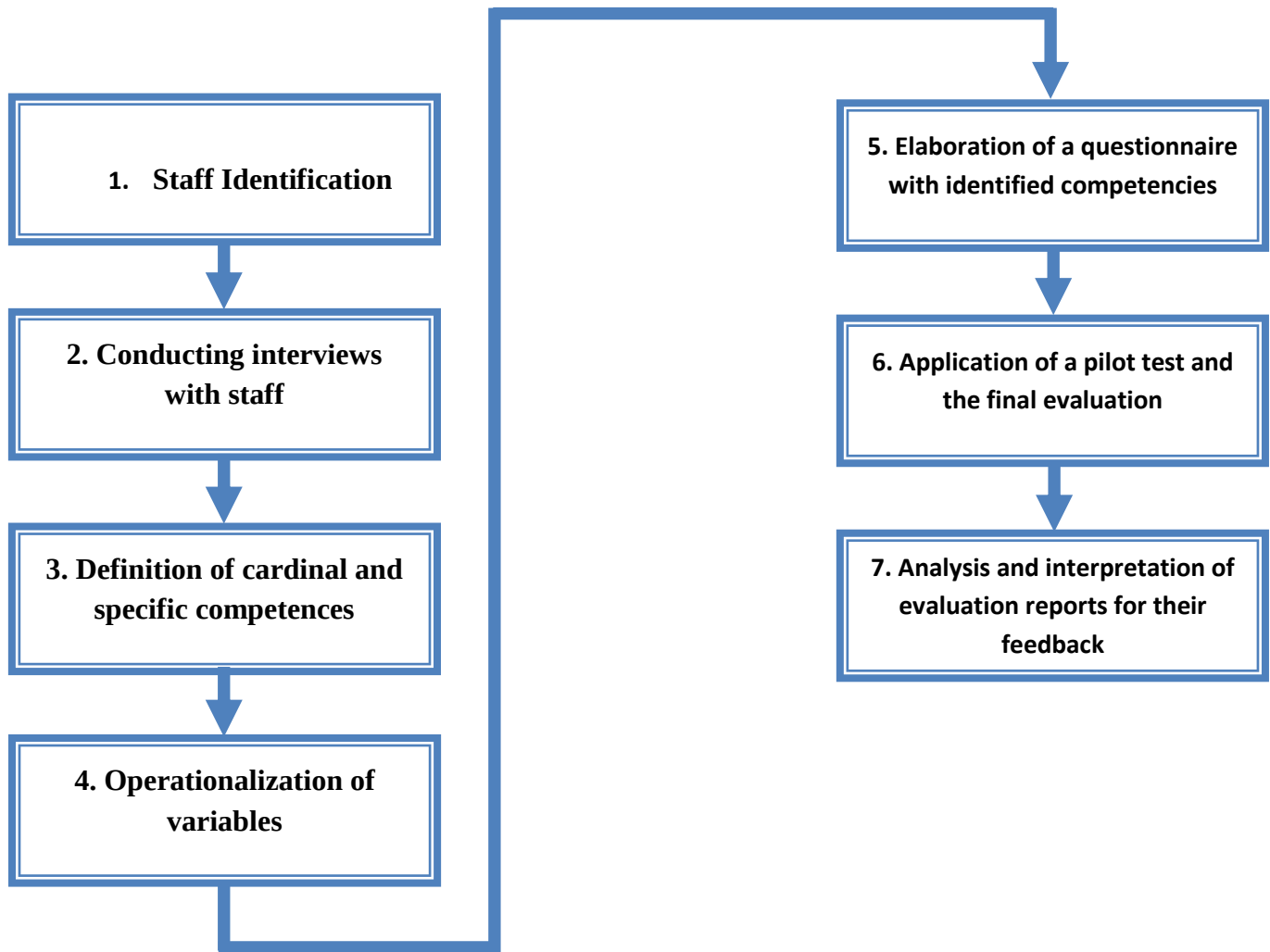


Figure1.10 360° Evaluation Methodology

1.3.6 Six Sigma

The term sigma is a measure indicating the deviation in the performance characteristic of a service from its mean performance. The goal of a six sigma strategy is to reduce variation within the tolerance or specification limits of a service performance characteristic. In order to improve the quality of a typical service, it is imperative to measure or quantify variation and then develop potential strategies to reduce variation. In essence, six sigma quality level relates to 3.4 defects per million opportunities (DPMO). The primary means to achieving six sigma quality level is to eliminate the causes of quality or process related problems before they are transformed into defects. The focus of “six sigma” is not on counting the defects in processes, but the number of opportunities within a process that could result in defects. (Jiju, 2006)

1.3.6.1 Six Sigma Methodology

The six sigma methodology also is adapted to the DMAIC (Define, Measure, Analyse, Improve and Control) methodology. This methodology is divided into five phases that will be described below: (Bañuelas, Jiju, & Brace, 2005)

Define phase: In this phase the scope and goals of the improvement project have to be defined. The scope and the goals must be related with the customer requirements. In this phase the following four steps have to be developed.

1. Define the scope and the boundaries of the project;
2. Define defects;
3. Define team charter;
4. Estimate the impact of the project in monetary terms.

Measure phase: The aim of this phase is map the current process and set metrics to reduce the problem. In this phase the following steps have to be developed.

1. Map process and identify process inputs and outputs.
2. Establish baseline process capability.
3. Establish measurement system capability.
4. Cause and effect analysis.
5. Data collection plan.

Analysis phase: the purpose of this phase is to start learning about data in order to generate, segment, prioritize and verify the possible root causes and the relationship whit the outputs. The data collected from the measure phase served as an input for the analysis phase.

Improve phase: this phase has the objective of considering the causes found in the analysis phase, and also selecting and targeting solutions to eliminate such causes.

Control phase: having identified the root causes of the problem and the possible solution to reduce the variation of the process, the six sigma team moved to the control phase. The aim of this phase is implement ongoing measures and actions to sustain the improvement by monitoring, standardizing, documenting and integrating the new process on a daily basis.

The figure 1.12 briefly describes the six sigma methodology. (Jiju, 2006)

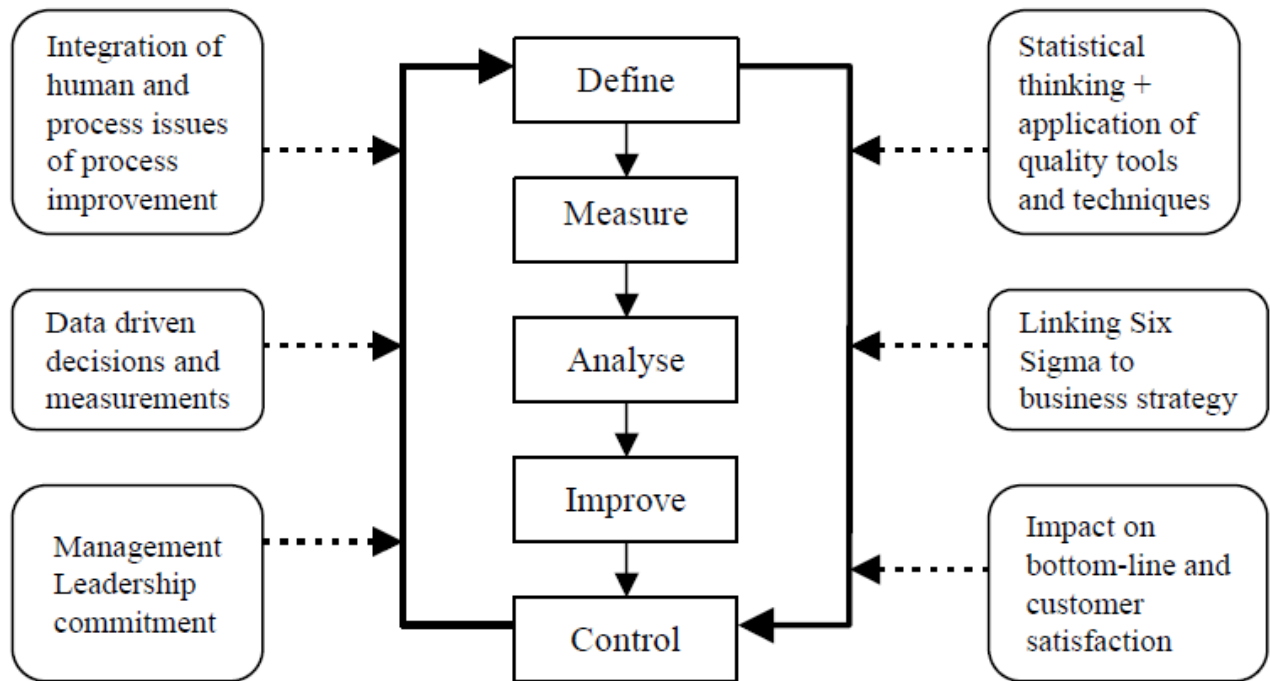


Figure 1. 11 Six Sigma Methodology

CH

APTER 2 DEVELOPMENT OF METHODOLOGY AND ANALYSIS OF DATA

This second chapter describes the instrument used to obtain information about the quality strategies used in Mexican and Russian companies to improve their quality. The instrument to be used in the investigation is an interview.

2.1 Interview

According to López & Pierre (2011), the interview is defined as: "the conversation between two or more people in a given place to deal with a subject. It is a scientific research method that uses verbal communication to collect information with a certain Purpose". In this process of communication, the researcher encourages the interlocutor to talk about what he knows.

The interview is a qualitative research technique and at the same time it is an inductive method. The interview can be classified into six types according to "degree of freedom" and "depth level". Resulting in the following types of interviews: (López & Pierre, 2011)

- The clinical interview (Psychoanalysis, psychotherapy).
- The deep interview.
- The interview of free answers.

- The focused interview or focused interview.
- The open-ended interview.
- The interview of closed questions.

2.2 The open-ended interview

According to the types of interview described above, the type of interview that will be applied in this research is the "open-ended interview". In the open-ended interview: precise pre-written questions are asked and a planned order is followed. The respondent is free to respond as he wishes, but within the framework of the question asked. (López & Pierre, 2011)

The first step of the second chapter is the writing of the questions that will form the interview that will be applied in the companies. The interview is composed of six questions and the objective of the interview is to obtain information about the quality strategies used by the companies to which the interview will be applied. The questions that formed the interview will be shown below.

1. Is the product exported or only sold within the country?
2. If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?
3. Under what quality regulations is the product manufactured within the country?
4. What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
	Lean Manufacturing	
	Six sigma	
	QFD (Quality Function Deployment)	
	Kaizen	
	CRM (Customer Relationship Management)	
	360° Evaluation	
	Benchmarking	
	TQM (Total Quality Management)	
	TPM (Total Preventive Maintenance)	
	Balanced Scorecard (BSC)	
	JIT (Just in time)	

	Cycle PDCA (Plan, Do, Check, Act)	
	Other	

5. What strategies would you like to implement in the company?
6. What was the biggest benefit the company has achieved with the implementation of these quality strategies?

2.3 Interview application

The interview was applied to Mexican and Russian companies. In the case of Mexican companies the questions were sent via e-mail to companies in the city of Puebla, Mexico. The interview was answered by eight companies in Puebla, seven of these companies are suppliers of the automotive industry and one manufactures refrigeration and heating equipment. The name of the companies is not mentioned for privacy reasons. In the case of Russian companies, the interview was applied directly in the companies that were visited in the city of Tyumen Russia. The companies visited in Tyumen were: ETAGI, NEFTEMASH, KNAUFINSULATION and SCHLUMBERGER.

ETAGI is a leader in the real estate market. The first office of the company was opened in the year 2000. It is a company that combines innovation, responsibility and human attitude to each client. The company invests in training, process automation, research and quality of services. They build relationships with partners throughout Russia: with developers, banks, insurance and valuation companies. “**Ildar Borisovich Khusainov**, director of "Etagi". (этажи, 2004)

NEFTEMASH is one of the leading manufacturers of modular packaged process equipment for oil and gas complex in Russia and in CIS (Kazakhstan, Uzbekistan, Turkmenistan, and Azerbaijan) countries. The company was established in 1965. Since 2005 it has been a part of a machine-building holding “HCM Group”. The company main activity is producing equipment for development of onshore and offshore oil and gas fields, oil and gas refining facilities, oil and gas chemical industries. JSC “HMS Neftemash” has proven track record in realizing projects of supplying a full set of process equipment for oil and gas complex equipment. (НЕФТЕМАШ, 2010)

KNAUF INSULATION was founded in 1932, is a family-owned manufacturer of building materials. Knauf Insulation is one of the leading manufacturers of thermal and acoustic insulation materials. With more than three decades of experience, it offers a complete range of solutions for sustainable and environmentally

friendly buildings. Knauf Insulation has companies in countries like Germany, Belgium, United Kingdom, Abu Dhabi, Turkey, Czech Republic, France and Russia. In 2007 the first production company for mineral glass wool was opened in Stupino, Russia and in 2012 the construction of the second company for the same production line in Tyumen Russia begins, starting in 2013. (INSULATION, 2004)

SCHLUMBERGER is the world's leading provider of technology for reservoir characterization, drilling, production, and processing to the oil and gas industry. Working in more than 85 countries and employing approximately 100,000 people who represent over 140 nationalities, Schlumberger supplies the industry's most comprehensive range of products and services, from exploration through production and integrated pore-to-pipeline solutions for hydrocarbon recovery that optimize reservoir performance.

The company operates in all oil-producing regions of Russia and Central Asia, including Azerbaijan, Kazakhstan, Uzbekistan and Turkmenistan. For more than 25 years of work in modern Russia and Central Asia, the company has managed to become a comprehensive independent enterprise in the region to provide long-term support to its customers with quality and timely service. (Schlumberger, 1997)

The companies to which the interview was applied are mostly manufacturing companies and two provide a service. The table 2.1 will show the information that was obtained through the application of the interview in local companies in the city of Puebla, Mexico. The interview was answered by a member of the quality department. The information that shows the table is the business turn, the quality strategies that use in the company, the quality standard in which is certificate and the year that begins to work in Mexico.

Business turn	Quality strategies	Quality standards	Beginning of operations	Year of implementation
Manufacture of automotive parts	Lean Manufacturing	ISO TS 16949	2003	2015
	Quality Function Deployment (QFD)			2008
	Benchmarking			2008
	Total Preventive Management (TPM)			2013
	Balanced Scorecard (BCS)			2008
	Cycle PDCA			2008
Welding, Prints and Automotive Painting	Lean Manufacturing	ISO TS 16949	1991	2008
	Quality Function Deployment (QFD)			2008
	Kaizen			2008
	Customer Relationship management (CRM)			2008
	360 degree evaluation			2016
	Benchmarking			2015

	Total Preventive Management (TPM)			2008
	Balanced Scorecard (BCS)			2007
	Cycle PDCA			2008
Steel cutting for interior and exterior parts of the automotive industry	Lean Manufacturing	ISO TS 16949	1987	2010
	Quality Function Deployment (QFD)	ISO 9001:2008		2008
	Kaizen			2012
	Customer Relationship management (CRM)			2008
	Benchmarking			2011
	Total Preventive Management (TPM)			2012
	Just in time (JIT)			2008
	Cycle PDCA			2008
	Six Sigma			2016
Manufacturers of refrigeration and heating equipment	Lean Manufacturing	ISO 9000 :2001 ISO 9001:2008	1967	-----
Manufacturers of Steering Systems and Cold Forging	Lean Manufacturing		1998	2012
	Six sigma	ISO TS 16949		2017
	Kaizen			2013
	Customer Relationship management (CRM)			2012
	Benchmarking			2012
	Total Preventive Management (TPM)			2014
	Balanced Scorecard (BCS)			2012
	Just in time (JIT)			2012
	Cycle PDCA			2012
Manufacture of automotive parts	Lean Manufacturing	ISO	1966	
	Six sigma	9001:2008		
	Quality Function Deployment (QFD)			
	Kaizen			
	Total Quality Management (TQM)			
	Total Preventive Management (TPM)			
Manufacture of automotive parts	Lean Manufacturing	ISO TS 16949	1998	
	Six sigma			
	Kaizen			
	Customer Relationship management (CRM)			

	Total Quality Management (TQM)			
	Total Preventive Management (TPM)			
	Balanced Scorecard (BCS)			
	Just in time (JIT)			
	Cycle PDCA			
Manufacture of automotive door locks	Lean Manufacturing	ISO 14001	1991	1995
	Six sigma	ISO TS 16949		2012
	Kaizen			1995
	Customer Relationship management (CRM)			2010
	360° Evaluation			2014
	Benchmarking			2012
	Total Quality Management (TQM)			1995
	Total Preventive Management (TPM)			1999
	Balanced Scorecard (BCS)			2010
	Cycle PDCA			2012

Table2.1 Information of Mexican companies

The table 2.2 will show the information that was obtained through the application of the interview in local companies in the city of Tyumen, Russia. The information that shows the table is the name of the company, the quality strategies that use in the company, the quality standard in which is certificate and the year that begins to work in Russia.

Name of the company	Quality strategies	Quality standards	Beginning of operations	Year of implementation
Neftemash	Lean manufacturing	GOST 12.1.003-83	1965	2012
	Six Sigma	GOST 12.1.004-91		
	Kaizen	GOST 12.1.012-2004		
	Total Quality Management (TQM)	GOST 12.2.003-91		
	Quality Function	GOST 12.2.007.0-75		
	Deployment (QFD)	GOST 12.2.049-80		
	Benchmarking	GOST R IEC 60204-1-2007		
	Cycle PDCA	GOST 2.601-2006		
		ISO 9001		
		ISO 14001		
Knauf Insulation	Total Quality Management (TQM)	OHSAS 18001	2013	2015
		STO Gazprom 9001		

	Lean Manufacturing Six Sigma	
Schlumberger	Lean Manufacturing Six Sigma	2002

Table 1.2 Quality strategies implemented in Russian companies

2.4 Main benefits of quality strategies

The first point that we will analyze are the benefits that the different companies have achieved with the use of the quality strategies.

The benefits that can be obtained with the strategies of quality are many and can be different according to the strategy that is used. The main advantage that can be achieved from these strategies is undoubtedly the reduction of costs and the satisfaction of the customers. These benefits are of greater interest to companies that manufacture products or provide a service. The following are the benefits that according to the interviews applied to the companies, are those that have been obtained with the implementation of the quality strategies.

The principles benefits are:

1. Reduction of scrap
2. Increment in the Overall Equipment Efficiency (OEE)
3. Reduction in the indicator of non-conforming parts in the process (Parts Per Million PPM)
4. Optimization of resources
5. Reduction cost
6. Increase in production
7. Improvement in customer service
8. Fault reduction
9. Record control
10. Commitment of staff
11. Meeting KPIs (Key Performance Indicator) targets
12. Decrease in internal and external claims
13. Continuous improvement

Figure 2.1 shows the main benefits that companies have obtained through the implementation of quality strategies. Indicating the benefits with more incidences according to the answers of the companies interviewed. Being the reduction of costs the significant advantage that is contained.

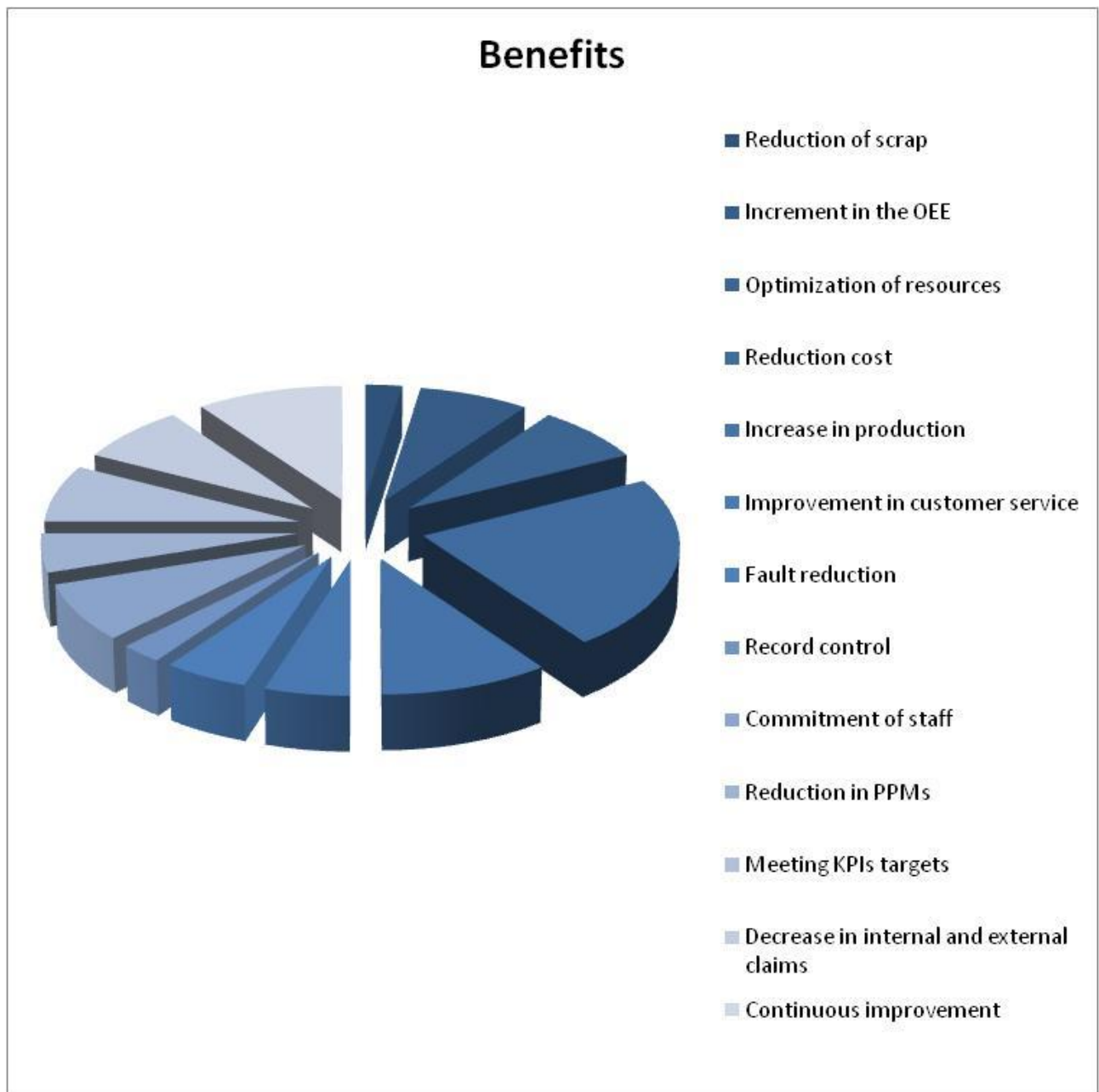


Figure 2. 1 Benefits of implementing quality strategies

3.2 Quality strategies most used in Mexican and Russian companies

It is important to know how many companies use quality strategies. It is also necessary to know what strategies to find the similarities between countries.

Figure 2.2 will show the strategies most used in Mexican companies according to the information obtained by interviews.

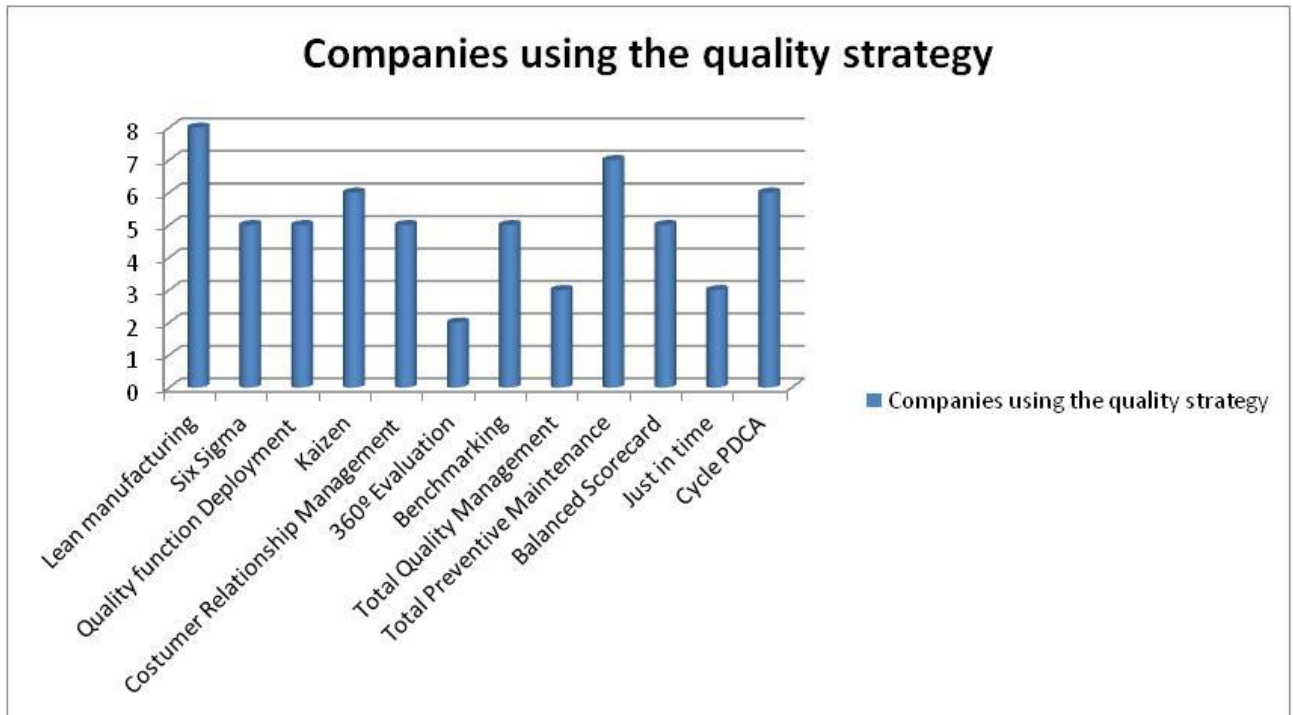


Figure 2. 2 Quality strategies used by Mexican companies

Figure 2.3 will show the strategies most used in Russian companies according to the information obtained by interviews.

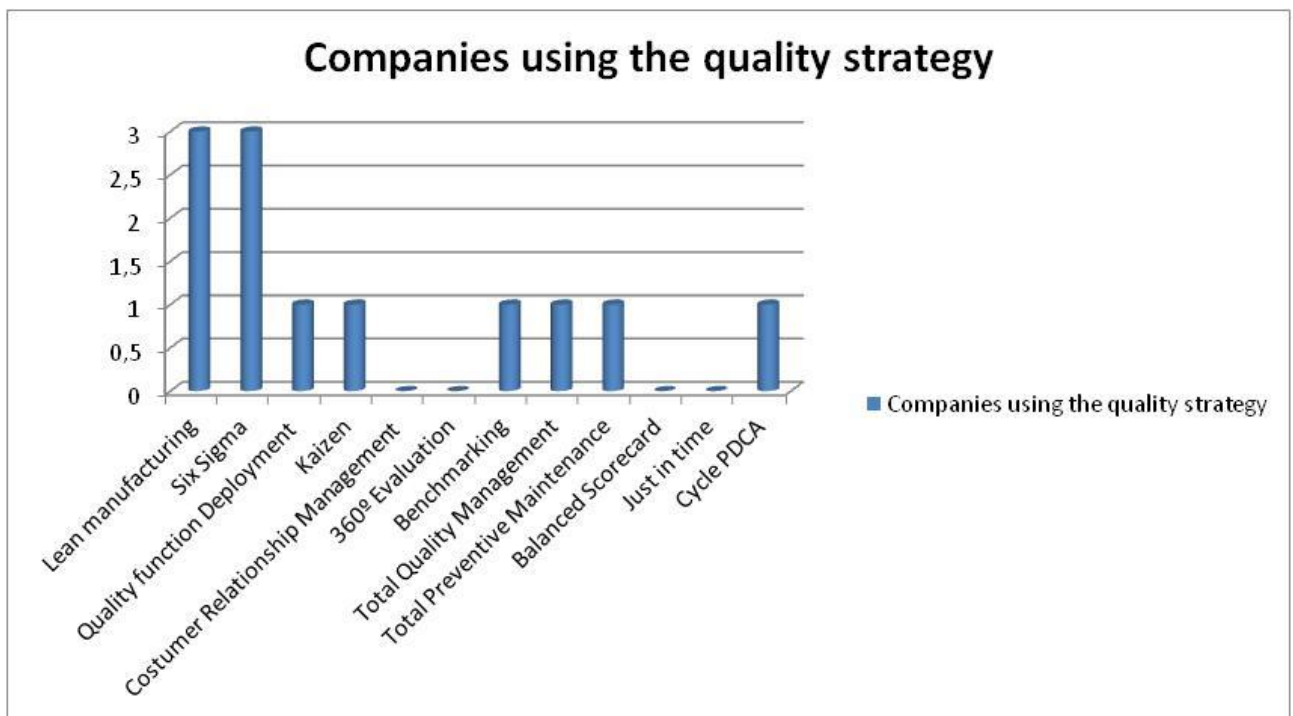


Figure 2. 3 Quality strategies used by Russian companies

According to the data obtained from the companies of both countries, we will be able to make a graph that will allow us to know in general which are the strategies that are most used. Figure 2.4 shows the total of the quality strategies used in the companies of both countries.

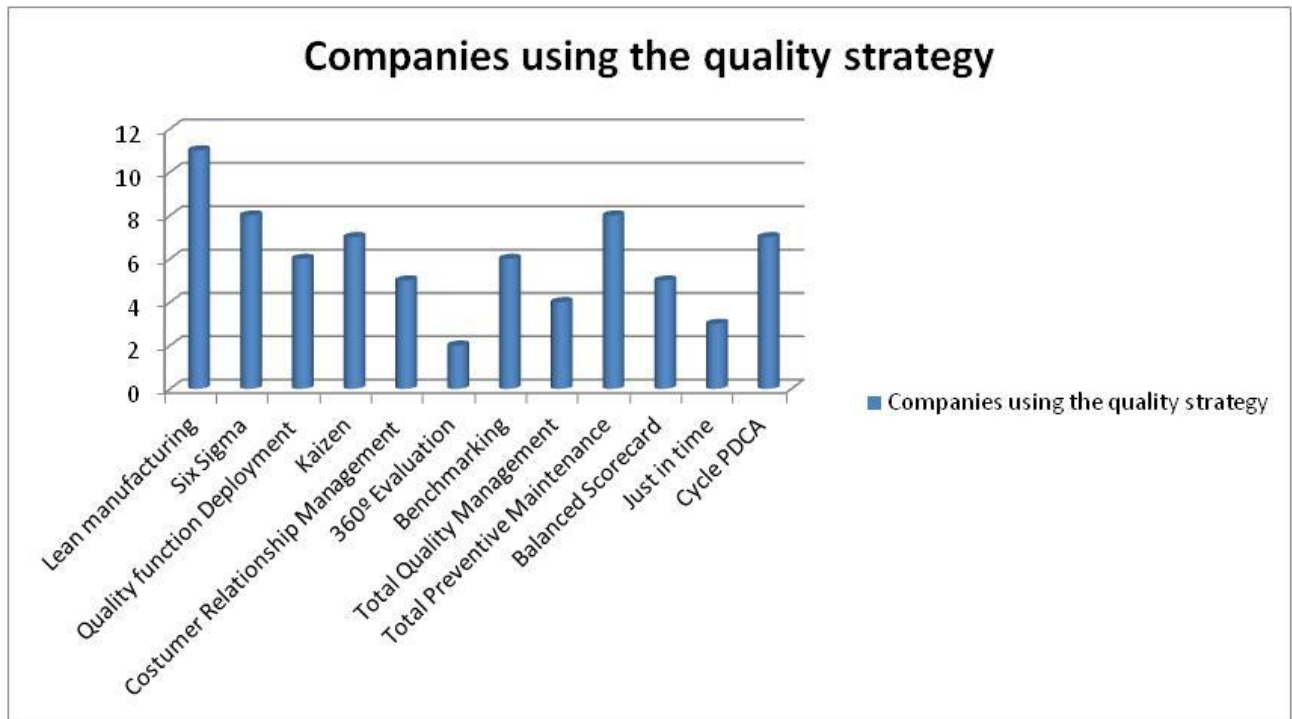


Figure 2. 4 Strategies with greater incidence

The figure 2.5 show the most used strategies resulting in:

- a) Lean Manufacturing
- b) Six Sigma
- c) Total Preventive Maintenance
- d) Quality Function Deployment
- e) Kaizen
- f) Cycle PDCA
- g) Benchmarking

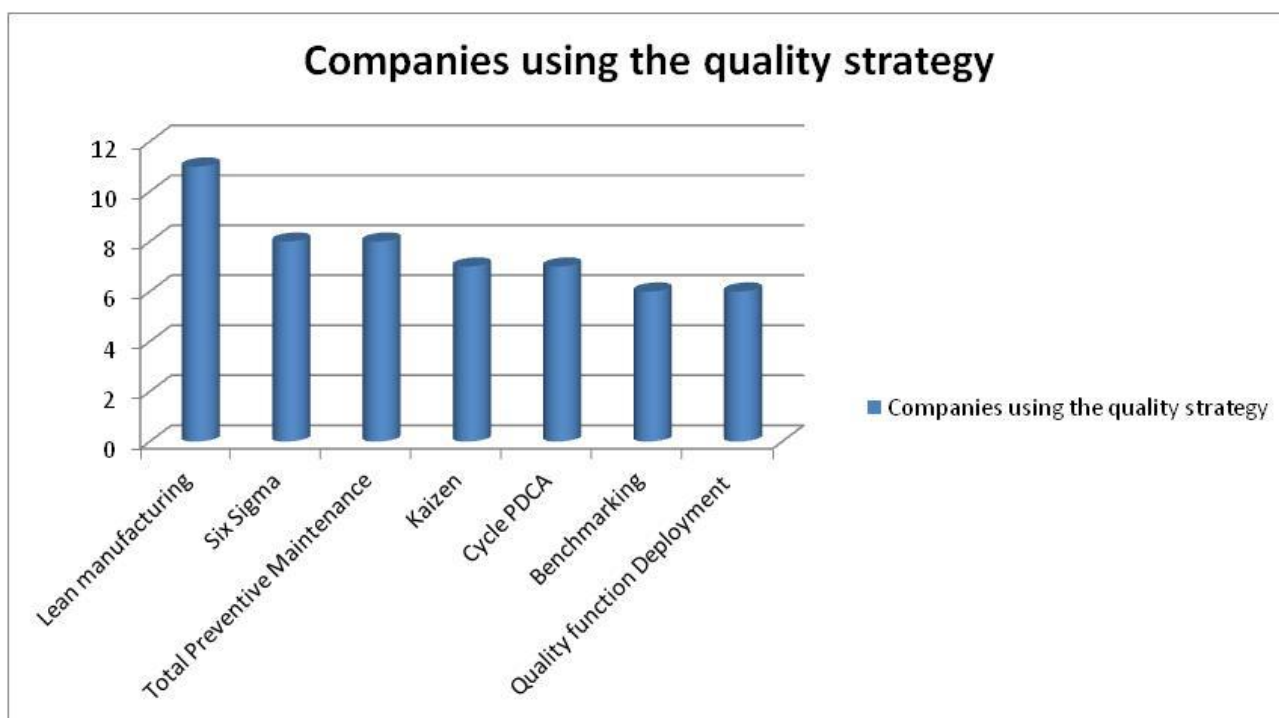


Figure 2. 5 Most used quality strategies

3.3 Improvement of economic indicators in Russian companies after the implementation of quality strategies

One of the main benefits of implementing quality strategies is the economic benefits that these strategies offer to companies. The following tables will present examples of the Russian companies that were visited in Tyumen. The indicators that will be submitted are costs, revenues and profits of the years before and after the implementation of the strategies.

Table 2.3 shows the annual report of economic nominees of the company Neftemash from 2009 to 2016. Lean Manufacturing, Six Sigma, Kaizen, Total Quality Management, Quality Function Deployment, Benchmarking and PDCA cycle were implemented in 2012 (НЕФТЕМАШ, 2010).

INDICATOR	YEAR							
	2009	2010	2011	2012	2013	2014	2015	2016
Costs, mil. RUB	2 945,3	3 293,2	3 985,0	4 827,3	4 827,3	4 477	9 752	11 268
Revenues, mil. RUB	3 701,9	4 170,5	4 012,6	5 119,6	5 031,9	6 807	12 551	15 321
Profit (net), mil. RUB	756,6	877,3	27,6	292,3	204,6	2 330	2 799	4 053

Table 2.3 Economic indicators of the Neftemash company

As can be seen in the table of economic indicators the change is perceived from the years 2015, having even better results in the next year. As we mentioned, the results offered by the implementation of quality strategies are not presented in the short term but provides positive and beneficial results to the company in the long term.

The table 2.4 shows the annual report of economic nominees of the company KNAUF INSULATION from 2011 to 2015. The quality strategies that were implemented in the company are: Lean Manufacturing, Total Quality Management and Six Sigma. (INSULATION, 2004)

INDICATOR	YEAR				
	2011	2012	2013	2014	2015
Costs, mil. RUB	231,5	125,3	49,74	1 105,2	1 163,3
Revenues, mil. RUB	309,5	168,13	74,76	1 513,3	1 632,1
Profit (net), mil. RUB	78	42,83	25.02	408,1	468,8

Table 2.4 Economic indicators of the company KNAUF INSULATION

The quality strategies were implemented from the year 2015. The results are not observed quickly, and the information provided only allows us to see until the year that was applied. But the information that could be obtained on the day that was visited the company showed significant changes in the indicators of the performance of the company from the implementation of quality strategies.

Table 2.5 shows the annual report of economic nominees of the company SHLUMBERGER from 2011 to 2015. The strategies that implemented the company were Lean Manufacturing and Six Sigma (Schlumberger, 1997).

INDICATOR	YEAR				
	2011	2012	2013	2014	2015
Costs, mil. RUB	5 470	6 870	10 486	17 855	18 619
Revenues, mil. RUB	5 986	7 574	12 377	22 512	25 260
Profit (net), mil. RUB	516	704	1 891	4 657	6 641

Table 2.5 Economic indicators of the company SHLUMBERGER

Schlumberger was founded in 2002, and the information about the date of implementation of quality strategies was not provided, but as can be seen in the table of economic indicators is a company that has stability and that its indicators have an upward line, with better results than the previous year.

Table 2.6 shows the annual report of economic nominees of the company ETAGI from 2011 to 2015 (этажи, 2004).

INDICATOR	YEAR				
	2011	2012	2013	2014	2015
Costs, mil. RUB	-----	-----	10	32	39,3
Revenues, mil. RUB	28,63	49,97	65,3	66,9	44,1
Profit (net), mil. RUB	-----	-----	55,3	34,9	4,8

Table 2.6 Economic indicators of the company ETAGI

The company has not implemented any quality strategy, but the company created their standards and quality strategies. The enterprise achieved the commitment of each of the workers of the company resulting in better and faster customer service. In this firm have developed strategies that allow the integration and commitment of its personnel managing to overcome the losses and grow in a fast way.

CHAPTER 3 RESULTS

Quality strategies are as we had previously mentioned methodologies and philosophies that help companies to improve quality. A quality strategy allows us to solve problems of production, work climate, staff competence, increase productivity, reduce costs and allow us to offer a better service and product to the client. Depending on the problem that is present in a company there is a strategy that can be implemented. Implementing a quality strategy entails a lot of work, time and commitment on the part of all staff in all areas and at all levels.

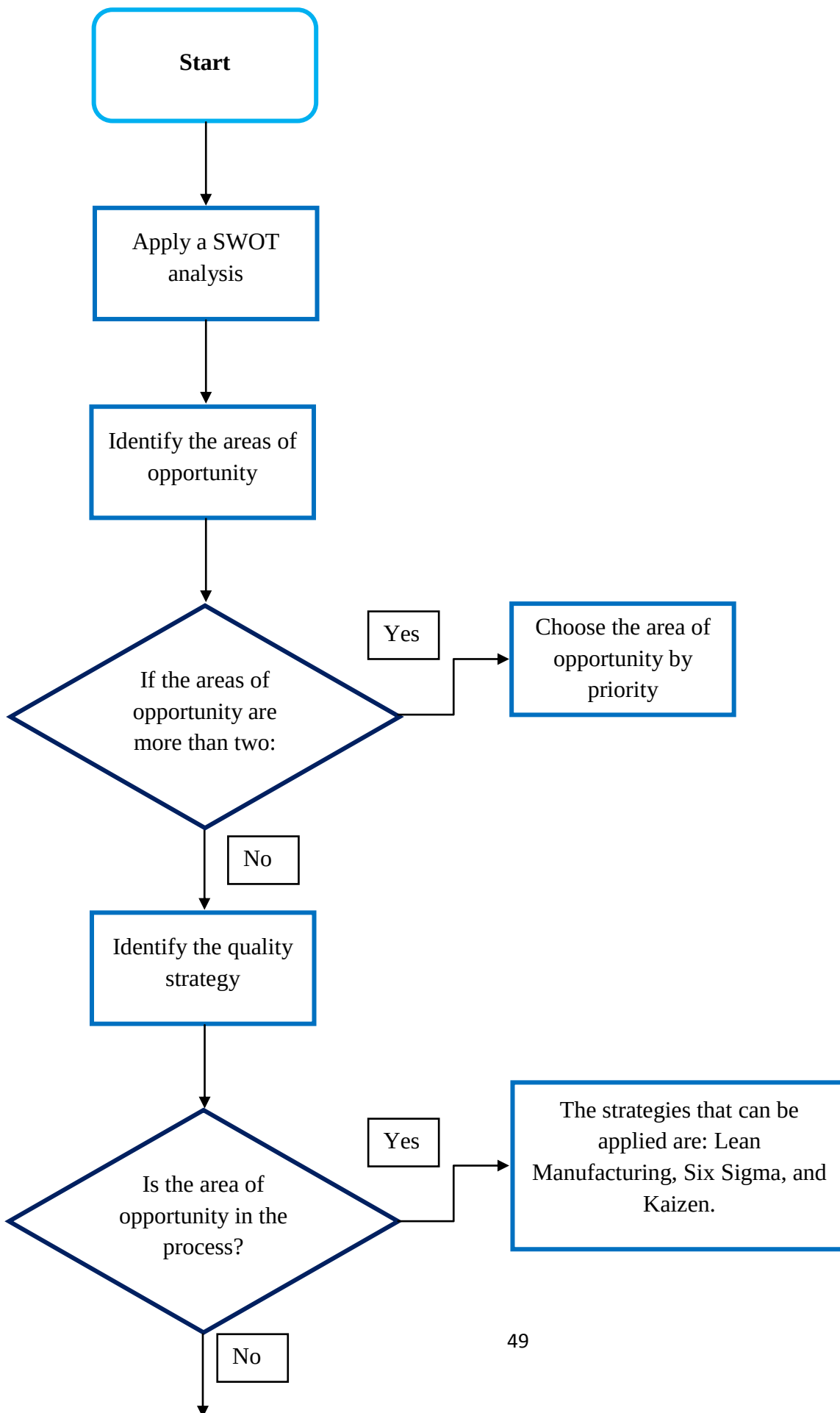
The economic indicators that we can observe in the previous chapter are not complete, only Neftemash Company gave the results that they obtained after the implementation of quality strategies. This company let us observe the economic results that they got after the year of implementation of these strategies. Unfortunately, the economic indicators from the Mexican companies could not be observed, and we don't have a complete view of the economic results that offer the quality strategies, however, the results that give us the interview are positives.

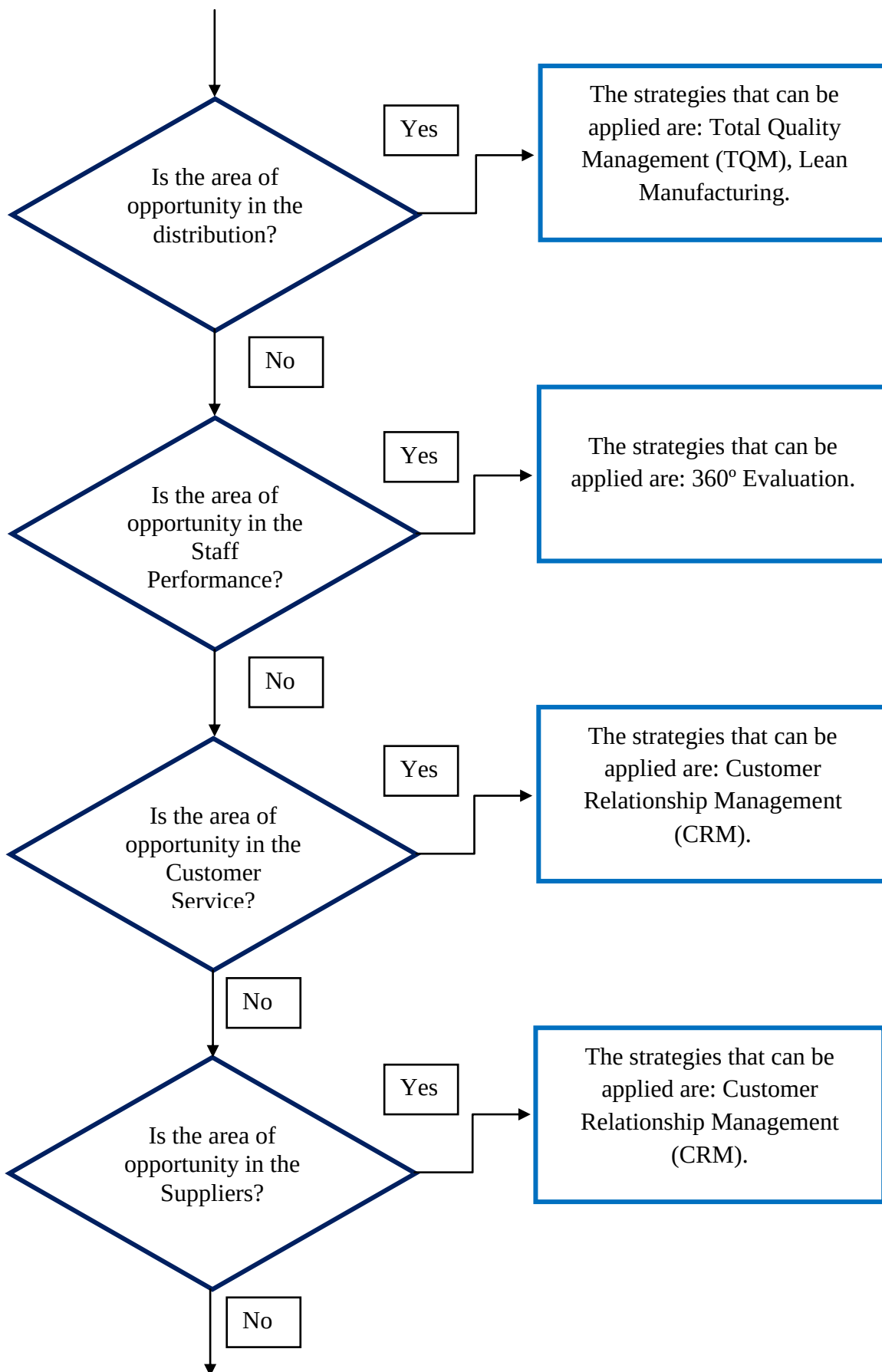
In this last chapter of the thesis a flow diagram will be developed to help any business in both countries implement a quality strategy depending on the area of opportunity that is intended to be improved.

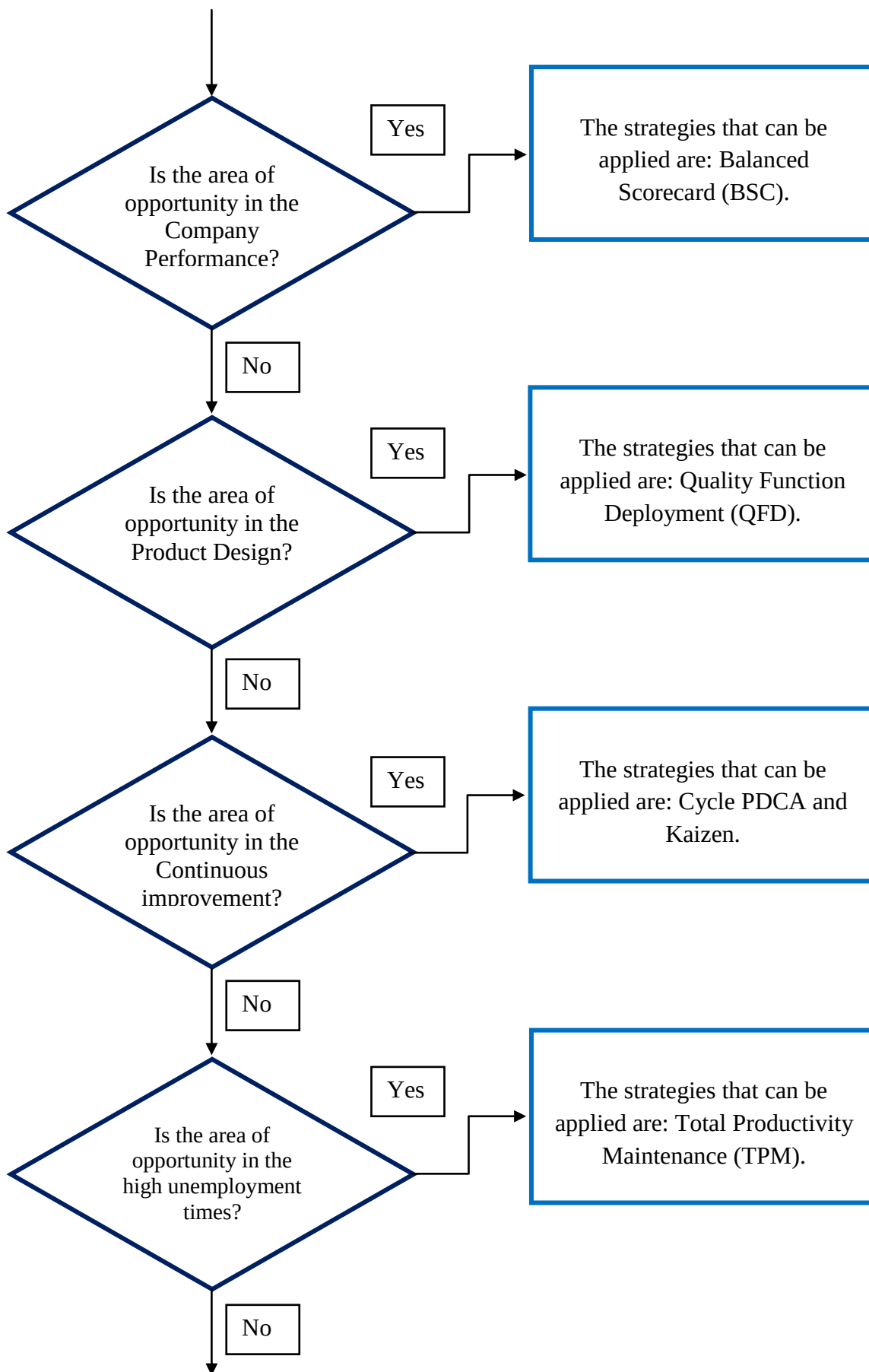
- a) Identify the area of opportunity. In this first step, you have to do an analysis to the company. You can apply a SWOT analysis that allows you to observe the areas of opportunity that exist in the enterprise.
- b) If the areas of opportunity are more than two must be addressed depending on the priority of each.
- c) Identify the quality strategy. Once the areas of opportunity are identified the next point is to determine the strategy that best suits the area of opportunity. The area of opportunity can be presented in the:

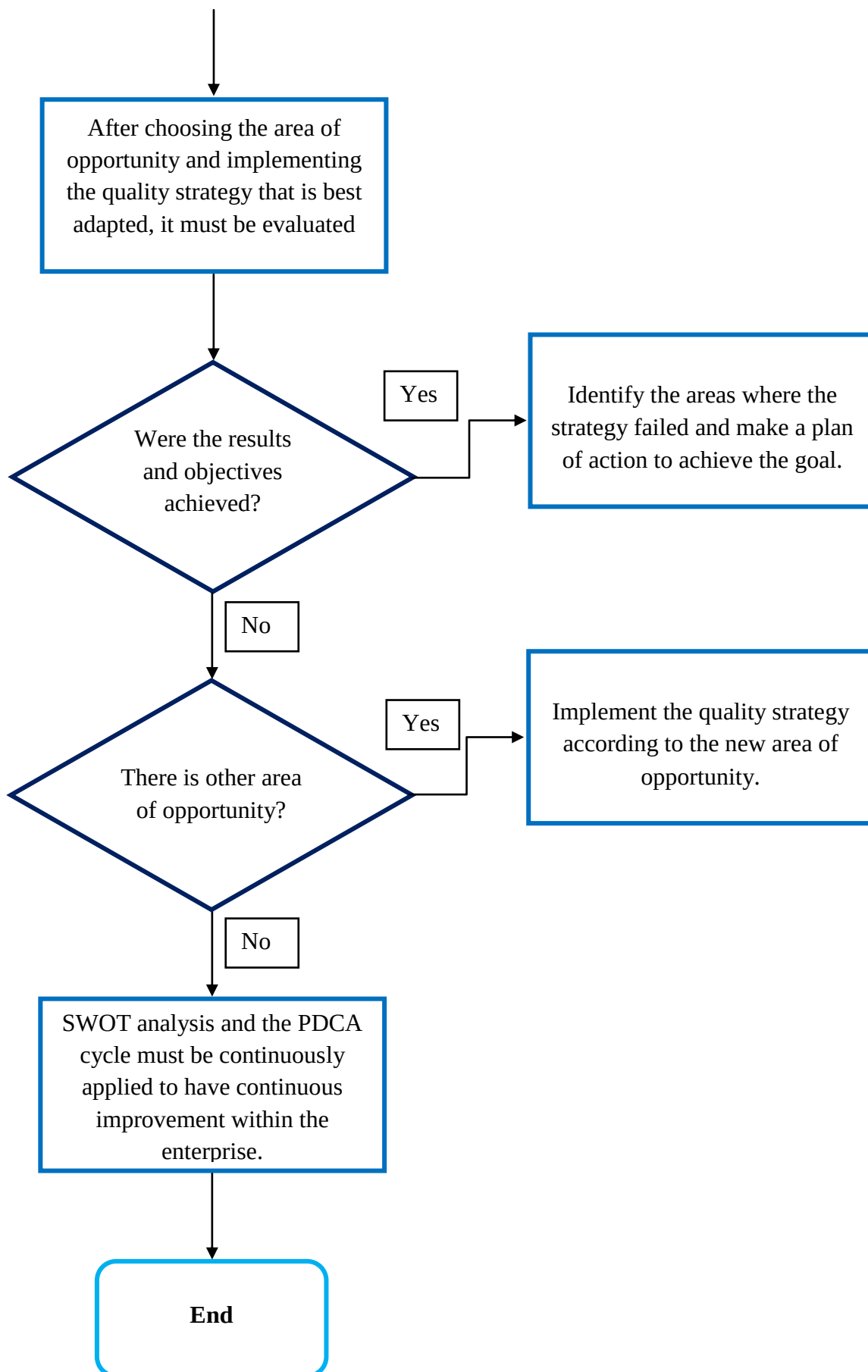
1. Process (process variation, overproduction, defective products, defective raw material, dead time, bottlenecks, etc.) 2. Distribution 3. Staff performance	4. Customer service 5. Suppliers 6. Product design 7. Performance of the company 8. Continuous improvement 9. High unemployment times
---	--
- d) If the area of opportunity is presented in the area of:
 1. Process the strategies that can be applied are: Lean Manufacturing, Six Sigma, Kaizen.
 2. Distribution: Total Quality Management (TQM), Lean Manufacturing
 3. Staff Performance: 360° Evaluation.
 4. Customer Service: Customer Relationship Management (CRM)
 5. Suppliers: Customer Relationship Management (CRM)
 6. Product Design: Quality Function Deployment (QFD)
 7. Company Performance: Balanced Scorecard (BSC)
 8. Continuous improvement: Cycle PDCA and Kaizen
 9. High unemployment times: Total Productivity Maintenance (TPM).
- e) After choosing the area of opportunity with the highest priority and implementing the quality strategy that is best adapted, it must be evaluated to know if the results and objectives were achieved. Once you have obtained the expected results, you can move on to the next opportunity area.
- f) When covering all areas of opportunity, a second analysis should be done to the company and to know if there are no more areas of opportunity. SWOT analysis and the PDCA cycle must be continuously applied to have continuous improvement within the enterprise.

The following flowchart will show the steps to follow to implement the quality strategies.









The goal of the flowchart is to make it easier to choose a strategy according to the area of opportunity in a company. The methodology that implies the implementation of each strategy is described in the first chapter of the thesis.

CONCLUSION

Each company in each country has a different way of working, but in general, there is a common goal: customer satisfaction, globalization is an issue that makes these companies compete to achieve this goal, there are different strategies that each company can apply, but a key point is "quality". The objective of this thesis is to establish the benefits of quality strategies in a company in Mexico and Russia, the information that was obtained from the application of the interview in companies of Mexico and Russia, gave us data that are important for know how to work in the companies of these countries and also know economic results that these companies got with the implementation of some strategies. The information that this research throws at us is that the benefits are varied but among the most important is: scrap reduction, improvement in process indicators, optimization of resources, increase in production, etc., but the main one is the satisfaction of our client and cost reduction.

The frequency with which a strategy is used is different, but both countries have in common the following strategies: Lean manufacturing, Six Sigma, Total Preventive Maintenance and Kaizen. An important point that has to be mentioned is that most of the companies that use some quality strategy in Russia are foreigners that were established within the country; the companies that are of Russian origin do not use or do not know any of these strategies. The strategies used in both countries are influenced by other cultures such as Japanese, for example, but these strategies have become important and useful for any company because the benefits they offer are good and these procedures are designed to improve the quality of any enterprise no matter if it offers a service or product. The company can be small, medium, large, international, transnational or global. We can choose the quality strategy that best suits the needs of the enterprise and develop it gradually. Just we need to have discipline and work as a team to get the best result that these strategies can give us. These will provide us the guidelines to be more competitive and adaptable to the constant market change. A company can develop their quality strategies that allow it to have greater control of its processes and the quality of its products or services. The success or failure of the implementation of a quality strategy will depend on the constancy, rigor, and commitment of all the people involved in the project.

GLOSSARY

Enterprise: An enterprise is an entity that through the organization of human, material, technical and financial resources provides goods or services in exchange for a price. It allows the company to replace the resources used and the achievement of certain objectives. (García & Casanueva, 2001)

Strategy: plan to achieve a long-term or global goal. (SlideShare, 2016)

Quality: Degree in which a set of inherent characteristics meets the requirements.

A quality-oriented organization promotes a culture that results in behaviors, attitudes, activities, and processes. This provides value by meeting the needs and expectations of customers and other relevant stakeholders.

The quality of the products and services of an organization is determined by the ability to satisfy customers and the expected and unexpected impact on stakeholders

The quality of products and services not only includes their function and expected performance. Quality also includes the perceived value and benefit to the customer. (SlideShare, 2016)

Requirement: Established need or expectation, usually implicit. (SlideShare, 2016)

Customers: Person or organization that could receive or receive a product or service intended for that person or organization required by it. (SlideShare, 2016)

Supplier: Organization that provides a product or service. (SlideShare, 2016)

Process: Set of mutually related activities that use inputs to provide an expected result. (SlideShare, 2016)

Work environment: Set of conditions under which the work is performed. (SlideShare, 2016)

Customer satisfaction: Customer perception of the degree to which their requirements have been met. (SlideShare, 2016)

Capacity: Suitability of an organization, system or process to produce a product that meets the requirements for that product. (SlideShare, 2016)

ANNEX A INTERVIEW RESPONSES APPLIED TO COMPANIES

In the part of annexes are added the interviews that answered the companies in the city of Puebla, Mexico, and Tyumen, Russia. The first eight companies are the answers of the Mexican companies, and the last three interviews are of the Russian companies.

Company number 1

7. Is the product exported or only sold within the country?

Export also

8. If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

Yes, C-TPAT (Customs-Trade Partnership Against Terrorism).

*C-TPAT is but one layer in U.S. Customs and Border Protection's (CBP) multi-layered cargo enforcement strategy. Through this program, CBP works with the trade community to strengthen international supply chains and improve United States border security. C-TPAT is a voluntary public-private sector partnership program which recognizes that CBP can provide the highest level of cargo security only through close cooperation with the principle stakeholders of the international supply chain such as importers, carriers, consolidators, licensed customs brokers, and manufacturers. The Security and Accountability for Every Port Act of 2006 provided a statutory framework for the C-TPAT program and imposed strict program oversight requirements. (U.S. Customs and Border Protection, 2001)

9. Under what quality regulations is the product manufactured within the country?

ISO TS 16949

10. What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	2015
	Six sigma	
X	QFD (Quality Function Deployment)	2008
	Kaizen	
	CRM (Customer Relationship Management)	
	360° Evaluation	

X	Benchmarking	2008
	TQM (Total Quality Management)	
X	TPM (Total Preventive Maintenance)	2013
X	Balanced Scorecard (BSC)	2008
	JIT (Just in time)	
X	Cycle PDCA (Plan, Do, Check, Act)	2008
	Other	

11. What strategies would you like to implement in the company?

Six Sigma, Kaizen and Total Quality Management.

12. What was the biggest benefit the company has achieved with the implementation of these quality strategies?

- Reduction of scrap percentage in the production lines and increase in the general efficiency of the equipment.
- Optimization of the space in the production lines, allowing only the use of the equipment needed in the work stations.

Company number 2

- Is the product exported or only sold within the country?
Some products are also exported
- If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

Yes, C-TPAT (Customs-Trade Partnership Against Terrorism).

*C-TPAT is but one layer in U.S. Customs and Border Protection's (CBP) multi-layered cargo enforcement strategy. Through this program, CBP works with the trade community to strengthen international supply chains and improve United States border security. C-TPAT is a voluntary public-private sector partnership program which recognizes that CBP can provide the highest level of cargo security only through close cooperation with the principle stakeholders of the international supply chain such as importers, carriers, consolidators, licensed customs brokers, and manufacturers. The Security and Accountability for Every Port Act of 2006 provided a statutory framework for the C-TPAT program and imposed strict program oversight requirements. (U.S. Customs and Border Protection, 2001)

- Under what quality regulations is the product manufactured within the country?

Is manufactured according to the specific requirements of each customer, IMDS (International Material Data System) and ISO TS 16949.

*International Material Data System (IMDS) is the material data system of the automotive industry. At IMDS, all materials used for automobile manufacturing are collected, stored, analyzed and archived. Using IMDS, automakers and their suppliers can meet their obligations, following national and international standards, laws and regulations. (DXC.technology, 2016)

- What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	2008
	Six sigma	
X	QFD (Quality Function Deployment)	2008
X	Kaizen	2008
X	CRM (Customer Relationship Management)	2008
X	360° Evaluation	2016
X	Benchmarking	2015
	TQM (Total Quality Management)	
X	TPM (Total Preventive Maintenance)	2008
X	CMI (Balanced Scorecard – BSC)	2007
	JIT (Just in time)	
X	Cycle PDCA (Plan, Do, Check, Act)	2008
	Other	

- What strategies would you like to implement in the company?

Corporate requirements

- What was the biggest benefit the company has achieved with the implementation of these quality strategies?
 1. Costs reduction
 2. Productivity increase

Company number 3

- Is the product exported or only sold within the country?

Only within the country

- If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

Does not apply

- Under what quality regulations is the product manufactured within the country?

ISO 9001:2008 and ISO TS 16949:2009

- What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	2010
X	Six sigma	2016
X	QFD (Quality Function Deployment)	2008
X	Kaizen	2012
X	CRM (Customer Relationship Management)	2008
	360° Evaluation	
X	Benchmarking	2011
	TQM (Total Quality Management)	
X	TPM (Total Preventive Maintenance)	2012
	Balanced Scorecard (BSC)	
X	JIT (Just in time)	2008
X	Cycle PDCA (Plan, Do, Check, Act)	2008
	Other	

- What strategies would you like to implement in the company?

Balanced Scorecard and 360° evaluation

- What was the biggest benefit the company has achieved with the implementation of these quality strategies?

1. Detection of product failures.
2. Better control of documents and records.

3. Commitment of all staff.
4. Efficiency in processes.
5. Customer-focused processes.
6. Customer satisfaction.
7. Optimization of resources
8. Reduction of KPIs
9. Reduction of internal and external PPM.
10. Reduction of material inventories.
11. Reduction of nonconforming product.
12. Fault prevention
13. Continuous improvement in process.
14. Cost reduction

Company number 4

1. Is the product exported or only sold within the country?
Is exported and sold within the country
2. If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?
Yes, it complies with international standards
3. Under what quality regulations is the product manufactured within the country?
ISO 9000/2001 and ISO 9001/2008
4. What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	-----
	Six sigma	
	QFD (Quality Function Deployment)	
	Kaizen	
	CRM (Customer Relationship Management)	
	360° Evaluation	
	Benchmarking	

	TQM (Total Quality Management)	
	TPM (Total Preventive Maintenance)	
	CMI (Balanced Scorecard – BSC)	
	JIT (Just in time)	
	Cycle PDCA (Plan, Do, Check, Act)	
	Other	

5. What strategies would you like to implement in the company?

The quality tool 5's

6. What was the biggest benefit the company has achieved with the implementation of these quality strategies?

1. Costs reduction.
2. Reduction in manufacturing times

Company number 5

1. Is the product exported or only sold within the country?

Both cases, national consumption and exports.

2. If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

Yes, the Quality standards are met in both cases.

3. Under what quality regulations is the product manufactured within the country?

ISO TS 16949

4. What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	2012
X	Six sigma	2017
	QFD (Quality Function Deployment)	
X	Kaizen	2013
X	CRM (Customer Relationship Management)	2012
	360° Evaluation	

X	Benchmarking	2012
	TQM (Total Quality Management)	
X	TPM (Total Preventive Maintenance)	2014
X	CMI (Balanced Scorecard – BSC)	2012
X	JIT (Just in time)	2012
X	Cycle PDCA (Plan, Do, Check, Act)	2012
	Other	

5. What strategies would you like to implement in the company?

TQM (Total Quality management)

6. What was the biggest benefit the company has achieved with the implementation of these quality strategies?

Compliance with the goals of:

- Reduction of PPM's.
- Decrease in internal and external claims.
- Increase in OEE.
- Costs reduction.

Company number 6

- Is the product exported or only sold within the country?

The company produces for the national and international market

- If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

All products leaving from the company must comply with the client's standards and specifications

- Under what quality regulations is the product manufactured within the country?

ISO 9001:2008

- What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	
X	Six sigma	

X	QFD (Quality Function Deployment)	
X	Kaizen	
	CRM (Customer Relationship Management)	
	360° Evaluation	
	Benchmarking	
X	TQM (Total Quality Management)	
X	TPM (Total Preventive Maintenance)	
	CMI (Balanced Scorecard – BSC)	
	JIT (Just in time)	
	Cycle PDCA (Plan, Do, Check, Act)	
	Other	

- What strategies would you like to implement in the company?

Cycle PDCA

- What was the biggest benefit the company has achieved with the implementation of these quality strategies?
 - a) Cost reduction
 - b) Improvement in customer service

Company number 7

- Is the product exported or only sold within the country?

Both are exported and distributed within the country

- If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

Yes, it complies with the regulations of each country.

- Under what quality regulations is the product manufactured within the country?

ISO TS 16949:2009

- What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	

X	Six sigma	
	QFD (Quality Function Deployment)	
X	Kaizen	
X	CRM (Customer Relationship Management)	
X	360° Evaluation	
X	Benchmarking	
X	TQM (Total Quality Management)	
X	TPM (Total Preventive Maintenance)	
X	CMI (Balanced Scorecard – BSC)	
X	JIT (Just in time)	
X	Cycle PDCA (Plan, Do, Check, Act)	
	Other	

- What strategies would you like to implement in the company?

Any

- What was the biggest benefit the company has achieved with the implementation of these quality strategies?
 - a) More order and cleanliness.
 - b) Organized and standardized work.
 - c) Costs reduction.
 - d) Resource Optimization.
 - e) Increase productivity.

Company number 8

- Is the product exported or only sold within the country?

Both of them

- If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

Yes it does.

- Under what quality regulations is the product manufactured within the country?

ISO 14001 and ISO TS 16949

- What quality strategies are implemented in the company?

Mark “X”	Quality Strategies	Year of implementation
X	Lean Manufacturing	1995
X	Six sigma	2012
	QFD (Quality Function Deployment)	
X	Kaizen	1995
X	CRM (Customer Relationship Management)	2010
X	360° Evaluation	2014
X	Benchmarking	2012
X	TQM (Total Quality Management)	1995
X	TPM (Total Preventive Maintenance)	1999
X	CMI (Balanced Scorecard – BSC)	2010
	JIT (Just in time)	
X	Cycle PDCA (Plan, Do, Check, Act)	2012
	Other	

- What strategies would you like to implement in the company?

Quality Function Deployment (QFD) to implement methods and achieve quality from design in subsystems and components.

- What was the biggest benefit the company has achieved with the implementation of these quality strategies?

- Reduced incidence on internal and external claims
- Reduction in costs.

Company number 9

- Is the product exported or only sold within the country?

No. In Russia and CIS countries

- If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

Compliant

c) Under what quality regulations is the product manufactured within the country?

- a) GOST 12.1.003-83
- b) GOST 12.1.004-91
- c) GOST 12.1.012-2004
- d) GOST 12.2.003-91
- e) GOST 12.2.007.0-75
- f) GOST 12.2.049-80
- g) GOST R IEC 60204-1-2007
- h) GOST 2.601-2006
- i) ISO 9001
- j) ISO 14001
- k) OHSAS 18001
- a) STO Gazprom 9001
- d) What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	2012
X	Six sigma	2012
X	QFD (Quality Function Deployment)	2012
X	Kaizen	2012
	CRM (Customer Relationship Management)	
	360° Evaluation	
X	Benchmarking	2012
X	TQM (Total Quality Management)	2012
	TPM (Total Preventive Maintenance)	
	Balanced Scorecard (BSC)	
	JIT (Just in time)	
X	Cycle PDCA (Plan, Do, Check, Act)	2012
	Other	

e) What strategies would you like to implement in the company?

- f) What was the biggest benefit the company has achieved with the implementation of these quality strategies?
- b) Continuous improvement
- c) Cost reduction

Company number 10

- a) Is the product exported or only sold within the country?
CI countries
- b) If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?
Yes. It does
- c) Under what quality regulations is the product manufactured within the country?
ISO 9001
- d) What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	2015
X	Six sigma	2015
	QFD (Quality Function Deployment)	
	Kaizen	
	CRM (Customer Relationship Management)	
	360° Evaluation	
	Benchmarking	
	TQM (Total Quality Management)	
X	TPM (Total Preventive Maintenance)	2015
	Balanced Scorecard (BSC)	
	JIT (Just in time)	
	Cycle PDCA (Plan, Do, Check, Act)	
	Other: CI Chart	

- e) What strategies would you like to implement in the company?

- f) What was the biggest benefit the company has achieved with the implementation of these quality strategies?
- a) Continuous improvement
 - b) Cost reduction
 - c) Meeting KPIs targets
 - d) Increment in OEE

Company 11

- a) Is the product exported or only sold within the country?

- b) If the product is exported: Does the product comply with the quality regulations of the countries to which they are exported?

- c) Under what quality regulations is the product manufactured within the country?

- d) What quality strategies are implemented in the company?

Mark "X"	Quality Strategies	Year of implementation
X	Lean Manufacturing	
X	Six sigma	
	QFD (Quality Function Deployment)	
	Kaizen	
	CRM (Customer Relationship Management)	
	360° Evaluation	
	Benchmarking	
	TQM (Total Quality Management)	
	TPM (Total Preventive Maintenance)	
	Balanced Scorecard (BSC)	
	JIT (Just in time)	
	Cycle PDCA (Plan, Do, Check, Act)	
	Other	

- e) What strategies would you like to implement in the company?
- f) What was the biggest benefit the company has achieved with the implementation of these quality strategies?
 - 1. Costs reduction
 - 2. Commitment of staff
 - 3. Continuous improvement

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