ISCTE Business School
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CONTRIBUTION OF QUALITY MANAGEMENT PRACTICES FOR BUSINESS INNOVATION

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Resumo

A qualidade costumava ser um importante fator de diferenciação, no entanto, hoje em dia, a inovação é considerada o fator chave para as empresas sobreviverem no moderno mercado global altamente competitivo. Esta mudança pode fazer as empresas considerarem também passar de um objetivo de qualidade para um objetivo de inovação, visto que elas podem ter a perceção que os dois objetivos são concorrentes e não complementares. Realizou-se uma revisão da literatura sobre a relação entre qualidade e inovação e, apesar de a literatura não fornecer uma resposta geral e clara para o tipo de relacionamento entre qualidade e inovação, a maioria dos estudos sugere que existe uma relação e, de fato, a qualidade pode ter um impacto positivo no desempenho inovador, proporcionando uma plataforma positiva para o seu surgimento. O estudo empírico realizado durante esta dissertação também demonstra que as empresas têm maioritariamente a perceção que as práticas de qualidade que utilizam são benéficas para os seus processos e desempenho inovadores.

Keywords: Gestão da qualidade, *Total Quality Management*, *TQM*, práticas de gestão da qualidade, inovação

JEL Codes: M1, O30

Abstract

Quality used to be an important differentiation factor, however, nowadays, innovation is considered the key factor for firms to survive in the modern highly competitive global market. This shift may take firms to consider also a move from a quality goal to an innovation goal, as they may perceive that the two goals are competing rather than complementary. A literature review on the relationship between quality and innovation performance was conducted and, despite the literature not be able of providing one general and clear answer for the type of relationship between quality and innovation, most studies suggest that a relationship exists, and quality can have a positive impact regarding innovation performance, providing a positive platform for its arising. The empirical study conducted under this dissertation also demonstrates than firms mostly perceive the quality practices they use as beneficial to their innovative processes and performance.

Keywords: Quality management, Total Quality Management, TQM, quality management practices, innovation

JEL Codes: M10, O30

Acknowledges

It was an hard and long journey, with moments of both hope and despair, confidence and insecurity, which finally comes to an end.

I would like to thank my supervisor for his patience and knowledge.

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Sumário Executivo

A presente dissertação tem por base alcançar o objetivo de melhor compreender a relação entre gestão da qualidade e performance inovadora, nomeadamente ao nível do impacto que as práticas de gestão da qualidade possam ter relativamente ao desenvolvimento de inovação dentro das empresas.

Primeiramente, é efetuada uma revisão de literatura que inicia pela exposição do que se entende pelos dois conceitos que integram a questão que se encontra implícita nesta dissertação, qualidade e inovação, de forma a um melhor entendimento das características dos mesmos e das empresas que os empregam. Ainda na revisão de literatura, será focada a relação entre qualidade e inovação e as várias perspetivas que existem tendo em conta diversos estudos empíricos que têm vindo a ser realizados nesta esfera, sendo que não existe uma resposta clara e geral para a forma como o desempenho inovador é afetado pela gestão da qualidade, seja esse efeito positivo ou negativo.

Seguidamente, é apresentado um estudo empírico realizado no âmbito de empresas de Lisboa que possuem certificação ISO 9001 de gestão da qualidade, bem como os resultados obtidos, tendo em conta uma análise descritiva dos mesmos que, embora não possam ser alvo de extrapolação, indica as perceções que as empresas têm nomeadamente ao impacto positivo e negativo que as práticas de gestão da qualidade têm no desenvolvimento da inovação.

A revisão de literatura sobre a relação entre gestão da qualidade e inovação revelou lacunas naquilo que se encontra estudado acerca desta temática, lacunas essas que a presenta dissertação não poderia corrigir na totalidade mas que pretende diminuir. Os resultados obtidos ainda que, como já referido, não possam ser extrapolados à população, vão de encontro a perspetivas que têm vindo a ser abordadas acerca de um impacto positivo das práticas sociais de gestão da qualidade, tais como, liderança e compromisso com a qualidade.

1. Introduction

Nowadays, in the present global competitive market, firms' need to remain competitive has increased, and innovation has been substituting quality as the vehicle to survival. The present dissertation aims to explore the relationship between quality management practices and innovation, and understanding in which ways those practices may be helpful or harmful for the innovative processes.

As it will be made clear in the literature review point, the relationship between the two mentioned concepts has not been easy to clarify, since through the times quality and innovation goals have mostly been seen has competitive rather than complementary. The literature review will focus on three aspects: quality, innovation and the relationship between both of them. First, it is necessary to understand both quality and innovation separately, in order to comprehend the concepts and practices in which they are based on. Then, various points of view regarding quality management and innovation relationship will be presented, where essentially two views exist: the view which sees quality management practices as beneficial for the innovation development within the firms and the view which sees quality management practices as practices which hold back innovative initiatives.

In order to understand firms' perception regarding the way the quality practices they are applying influence in a positive and in a negative ways their innovative processes, a questionnaire was developed and distributed through quality management ISO 9001 certified companies. The results of the empirical study suggest the same ideas pointed in the literature review, that social quality management practices are especially beneficial for innovation development. In general, it can be stated that firms mostly do not see those practices as negative for their innovation efforts.

Despite its limitations, the dissertation mainly supports the idea that quality management practices may be beneficial regarding innovation development, being that also the perception of the firms that have answered the questionnaire of the empirical research. It can then be considered the fact that management is more aware that they may not have to choose innovation over quality and that both goals may be achieve together.

2. Literature Review

2.1. Quality Management

2.1.1. Quality

Quality is not a concept easy to define due to its complexity and consequently each author may defend a different definition for it. As António *et al.* (2009) say, even the philosophy of quality says that we should not wish for one general and absolute definition for it. The following table summarizes six relevant quality authors' definitions of quality.

Author	Perspective	Quality definition
Taguchi	Consequences	The lost that a product causes to society after being launch.
Juran	Consequences	Usage adaptation.
Crosby	Results	Conformity to requirements.
Ishikawa	Results	No variance in quality characteristics.
Deming	Process	The process that leads to results through products/services that satisfy the clients.
Shingeo Shingo	Process	Process of continuous supervision and instrumentation of potential feedback.

Table 1 - Quality authors' definitions of quality. Source: António, N., Teixeira, A. .2009. ***Gestão da qualidade, de Deming ao modelo de excelência da EFQM***, Edições Sílabo, Lisboa

There are four perspectives to bear in mind regarding quality: product-based approach, production-based approach, valor-based approach and user-based approach. Concerning the product-based approach, quality is associated with product characteristics while quality variance is represented by the differences in those characteristics (António *et al.*, 2009). For the production-based approach, quality is defined according with the level of conformity of the product with its conception. Authors such as Crosby would state that variability in quality can be completely eliminated while others, such as Deming or Juran, refer that not all kinds of variance can be controlled (António *et al.*, 2009). Quality can also be seen as the level of excellence at a fair price or the control of variability at a fair cost according to the valor-based approach. The user-based approach understands that quality is related with the product or service capability of satisfying or exceeding consumers' needs. Moreover, we can add four critical perspectives: transcendental perspective, constructivist perspective, discursive

perspective and slogan perspective. For the transcendental perspective, quality, despite being something that can be recognised, cannot be defined. On the other hand, constructivist perspective sees quality has something that is made through the opinions of powerful agents (such as clients, for example) which spread, being quality something which is not part of the product/service itself. The discursive perspective says that the language is essential in order to achieve quality. Finally, the slogan perspective believes that quality has become nothing more than a slogan and that the obsession around it made quality lose its true meaning and made it became nothing more than a word.

Concerning product quality, and using the transcendent, product-based, user-based, manufacturing-based and value-based perspectives, David Garvin cited by Foster (2007) developed eight quality dimensions: performance; features; reliability; conformance; durability; serviceability; aesthetics; and perceived quality. On the other hand, regarding service quality, different dimensions can be observed: tangibles; service reliability; responsiveness; assurance; empathy; availability; professionalism; timeliness; completeness; and pleasantness (Foster, 2007).

The quality management field can be seen as three spheres: quality control, quality assurance and quality management (Foster, 2007), as can be seen in figure 1. Quality control makes use of a scientific method, including analysis, relation, and generalization (Foster, 2007). The second sphere, quality assurance, is related with all the activities which objectives are to guarantee the quality of the product or service produced in the organization. Finally, the third and last sphere, quality management, represents the management processes which connect the control and assurance activities (Foster, 2007).

Figure 1 - Three spheres of quality. Source: Foster, S. T. 2007. ***Managing quality, integrating the supply chain*****.** New Jersey: Pearson Education

2.1.2. Total Quality Management (TQM)

Similar to quality, Total Quality is not easy to define. Davis *et al.* (2000) define it as the way businesses have found in order to maximize competitiveness by making use of continuously improving mind-set in the organization, this meaning, improving products, services, processes, environments and even people. Moreover, the same authors specify eleven characteristics that firms should have so that they can achieve Total Quality, being those characteristics strategically based, customer focus, obsession with quality, scientific approach to decision making and problem solving, long-term commitment, teamwork, continual process improvement, education and training, freedom through control, unity of purpose and, at last, employee involvement and empowerment.

In what concerns strategically based, organizations under a total quality approach follow a strategic plan with key elements, such as vision and mission for instance, and they should define objectives regarding the entire firm, being the ultimate goal of following such a plan to develop a sustainable competitive advantage, based on quality and continuous improvement (Davis *et al.*, 2000).

By being focused on the customer, the source of quality is the customer, being both internal and external customers extremely helpful in order to define quality. While external customers are important to define the quality of the product or service, internal customers are also relevant concerning the definition of the quality of people, processes and environments within the firm (Davis *et al.*, 2000). After quality been defined by the customers, the organization should combine all the efforts in order to meet or exceed that definition, and so it should become obsessed with quality, leading that obsession to a feeling that nothing is ever good enough (Davis *et al.*, 2000).

Using scientific knowledge in order to meet the requirements and goals previously established is an important part of the quality management approach. In this kind of approach, hard data is used so that the work can be structured in the best possible way and that decision making and problem solving can be efficient (Davis *et al.*, 2000).

Moreover, total quality approach requires a long-term commitment in order to make hard changes that are not always easy to implement, such as culture related changes, and success can only be achieved once that commitment is made (Davis *et al.*, 2000). As competition between

co-workers represents a waste of energy that could be being used for the common goal of quality improvement, teamwork is essential in order to improve (Davis *et al.*, 2000).

Regarding products and services' quality, continual process improvement is a strategic piece leading to the improvement of it, the systems responsible for its production needs to improve so that the products and services they are making can do the same (Davis *et al.*, 2000).

As mentioned before, people are important internal customers helping defining quality and so, when people are educated and trained on a continual basis they are improving, being this the reason why education and training are an important piece in the total quality approach, providing people the tools they need in order to work effectively and efficiently (Davis *et al.*, 2000).

Despite the fact that quality requires high levels of control, it also requires freedom so that employees feel involved and, consequently, by giving freedom through control, employees will ensure that the procedures are being followed. Collaboration is also very important in order to all members of the organization to follow the same purpose and vision and a unity of purpose to exist, being this essential in order to meet the quality objective (Davis *et al.*, 2000).

Finally, employee involvement means that people who are closest to the work which is actually being developed are bring to the decision-making process, which will consequently ensure better decisions and easier implementation, while empowerment means that employees will be given a real voice (Davis *et al.*, 2000).

Quality gurus and their contribution

Davis *et al.* (2000) point three major contributors for the development of Total Quality Management (TQM): W. Edwars Deming; Joseph M. Juran and; Philip B. Crosby. In addition to the previously presented authors by Davis *et al* (2000), Foster (2007) refers also as main contributors for the quality movement Kaoru Ishikawa, Armand Feigenbaum and Genichi Taguchi. All of the authors provided important milestones, which are still take into account when pursuing and managing quality.

Steps to achieve and improve quality

The quality gurus worked on the development of steps that could allow companies to reach and then manage quality. For instance, Deming elaborated a cycle that should be followed when developing a product if companies desire to achieve quality, which begins with planning,

followed by doing, which has to be followed by checking, and then acting, being the last step analysing, as can be seen in the figure bellow.

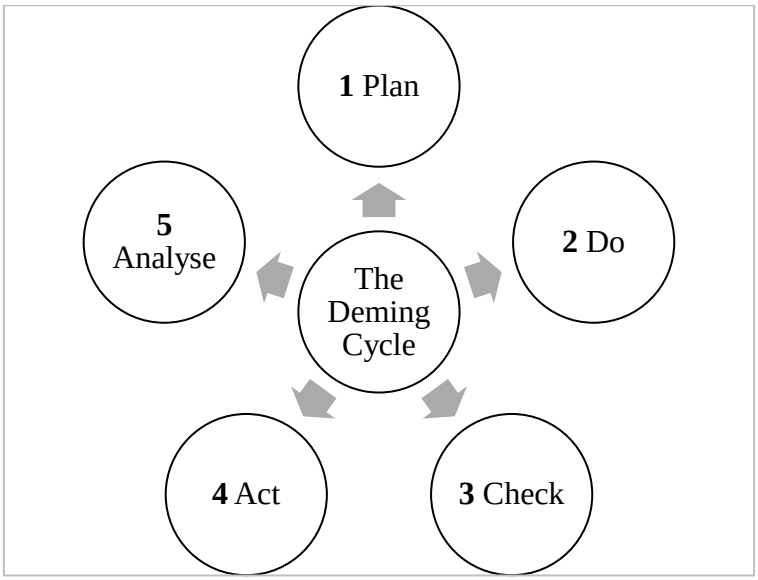

Figure 2 – The Deming cycle. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

1. Conduct consumer research and use it in planning the product (plan);
2. Produce the product (do);
3. Check the product to make sure it was produced in accordance with the plan (check);
4. Market the product (act);
5. Analyse how the product is received in the marketplace in terms of quality, cost, and other criteria (analyse).

In addition to the cycle, Deming also developed Fourteen Points that represent a summarization of what organizations would need to do in order to survive and keep competitive in the market through the transition to world-class quality (Davis *et al.*, 2000). Despite being numbered, the points do not follow a priority order – all of them are equally necessary so that the objectives can be achieved.

1	Create constancy of purpose toward the improvement of products and services in order to become competitive, stay in business, and provide jobs.
2	Adopt the new philosophy. Management must learn that it is a new economic age and awaken to the challenge, learn their responsibilities, and take on leadership for change.
3	Stop depending on inspection to achieve quality. Build in quality from the start.

4	Stop awarding contracts on the basis of low bids.
5	Improve continuously and forever the system of production and service, to improve quality and productivity, and thus constantly reduce costs.
6	Institute training on the job.
7	Institute leadership. The purpose of leadership should be to help people and technology work better.
8	Drive out fear so that everyone may work effectively.
9	Break down barriers between departments so that people can work as a team.
10	Eliminate slogans, exhortations, and targets for the workforce. They create adversarial relationships.
11	Eliminate quotas and management by objectives. Substitute leadership.
12	Remove barriers that rob employees of their pride of workmanship.
13	Institute a vigorous program of education and self-improvement.
14	Make the transformation everyone's job and put everyone to work on it.

Table 2 - Deming's fourteen points Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

Deming was not the only one to develop steps in order to make it easier to understand how a firm could achieve quality. Juran for instance has also developed steps which goal is to achieve quality, such as the Three Basic Steps to Progress, which in his opinion would allow organizations to reach excellent quality.

1	Achieve structured improvements on a continual basis combined with dedication and a sense of urgency.
2	Establish an extensive training program.
3	Establish commitment and leadership on the part of higher management.

Table 3 - Juran's Three Basic Steps to Progress. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

Likewise, Juran developed ten points that he believed were essential in order to improve quality, having these ten points similarities with the previously presented Fourteen Points provided by Deming.

1	Build awareness of both the need for improvement and opportunities for improvement.
2	Set goals for improvements.
3	Organize to meet the goals that have been set.

4	Provide training.
5	Implement projects aimed at solving problems.
6	Report progress.
7	Give recognition.
8	Communicate results.
9	Keep score.
10	Maintain momentum by building improvement into the company's regular systems.

Table 4 - Juran's Ten Steps to Quality Improvement. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

As Deming and Juran, Feigenbaum also contributes with steps for quality, going a little further and developed 19 steps for quality improvement.

1	Total quality control is defined as a system of improvement.
2	Big Q quality (company-wide commitment to TQC) is more important than little q quality (improvements on the production line).
3	Control is a management tool with four steps.
4	Quality control requires integration of uncoordinated activities.
5	Quality increases profits.
6	Quality is expected, not desired.
7	Humans affect quality.
8	TQC applies to all products and services.
9	Quality is a total life-cycle consideration.
10	Control the process.
11	A total quality system involves the entire company-wide operating work structure.
12	There are many operating and financial benefits of quality.
13	The costs of quality are means for measuring quality control activities.
14	Organize for quality control.
15	Managers are quality facilitators, not quality cops.
16	Strive for continuous commitment.
17	Use statistical tools.
18	Automation is not a panacea.
19	Control quality at the source.

Table 5 - Feigenbaum's Ten Points for quality improvement. Source: Foster, S. T. 2007. ***Managing quality, integrating the supply chain*.** New Jersey: Pearson Education

As the previously referred authors, also Philip Crosby developed 14 steps to quality improvement, the same number as Deming has done before.

1	Make it clear that management is committed to quality for the long term.
2	Form cross-departmental quality teams.
3	Identify where current and potential problems exist.
4	Assess the cost of quality and explain how it is used as a management tool.
5	Increase the quality awareness and personal commitment of all employees.
6	Take immediate action to correct problems identified.
7	Establish a zero defects program.
8	Train supervisors to carry out their responsibilities in the quality program.
9	Hold a Zero Defects Day to ensure all employees are aware there is a new direction.
10	Encourage individuals and teams to establish both personal and team improvement goals.
11	Encourage employees to tell management about obstacles they face in trying to meet quality goals.
12	Recognize employees who participate.
13	Implement quality councils to promote continual communication.
14	Repeat everything to illustrate that quality improvement is a never-ending process.

Table 6 - Philip Crosby's 14 steps to quality improvement. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

Ishikawa live work in order to improve quality in Japan (Foster, 2007) also provides 11 points that summarize his ideas regarding quality (presented in table 7).

1	Quality begins with education and ends with education.
2	The first step in quality is to know the requirements of the customer.
3	The ideal state of quality control is when inspection is no longer necessary.
4	Remove the root causes, not the symptoms.
5	Quality control is the responsibility of all workers and all division.
6	Do not confuse the means with the objectives.
7	Put quality first and set your sights on long-term objectives.
8	Marketing is the entrance and exit of quality.
9	Top management must not show anger when facts are presented to subordinates.

10	Ninety-five percent of the problems in a company can be solved by the seven tools of quality control.
11	Data without dispersion information are false data.

Table 7 - Ishikawa's eleven points. Source**:** Foster, S. T. 2007. ***Managing quality, integrating the supply chain*.** New Jersey: Pearson Education

All of the steps, despite having been developed by different authors, have more similarities than differences, all of them focusing, for instance, the importance of education and training, leadership, employee involvement and empowerment and evidence based decision making processes.

Managing quality

Concerning quality management, Juran developed a trilogy that summarizes his view regarding the three primary managerial functions being those quality planning, quality control and quality improvement.

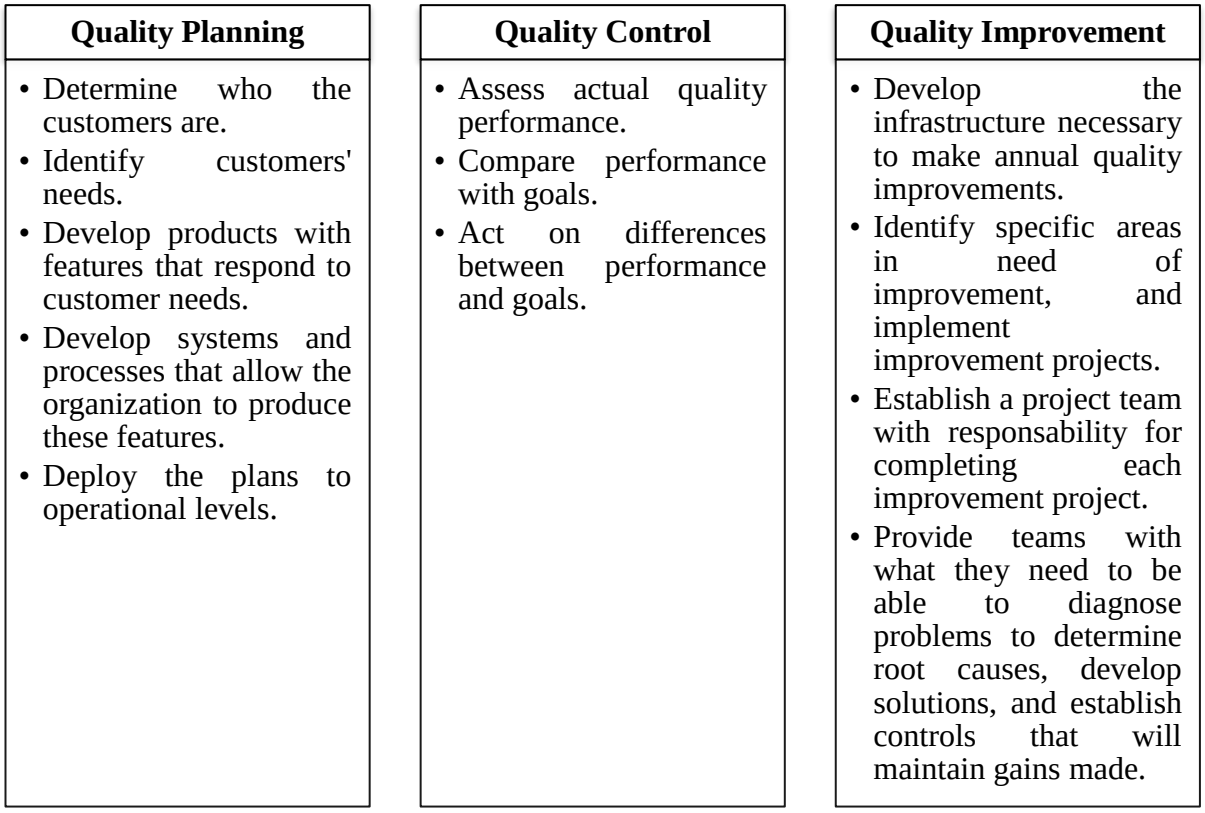

Figure 3 –The Juran trilogy. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

In addition to the fourteen steps to quality, Deming also presented Seven Deadly Diseases that harm the quality system and that firms should be aware of when dealing with quality management, taking into account the U.S. firms' reality (Davis *et al.*, 2000).

1	Lack of constancy of purpose to plan products and services that have a market sufficient to keep the company in business and provide jobs.
2	Emphasis on short-term profits; short-term thinking that is driven by a fear of unfriendly takeover attempts and pressure from bankers and shareholders to produce dividends.
3	Personal review systems for managers and management by objectives without providing methods or resources to accomplish objectives. Performance evaluations, merit ratings, and annual appraisals are all part of this *disease*.
4	Job hopping by managers.
5	Using only visible data and information in decision-making with little or no consideration given to what is not known or cannot be known.
6	Excessive medical costs.
7	Excessive costs of liability driven up by lawyers that work on contingency fees.

Table 8 - Deming's seven deadly diseases. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

Total quality can affect positively some of those diseases, but not all of them. For instance, the pressure to short-term profits, the medical costs or the excessive liability costs are diseases with different roots such as the nation's financial, health care, and legal systems, respectively, and quality can do little to affect them (Davis *et al.*, 2000).

Quality culture

Firstly, it is necessary to define what the organizational culture of a company is and it is represented by the manifestation of its values and traditions, and can be observed in the way people interacted between each other and their behaviour regarding the job itself and organization expectations (Davis *et al.*, 2000). It is represented by the combination of: business environment; organizational values; cultural role models; organizational rites, rituals and customs; and cultural transmitters. When looking specifically at quality culture, it represents the combination of values, traditions, procedures and expectations that the organization and people within the organization believe in and act according in order to promote quality (Davis

et al., 2000). Davis *et al.* (2000) summarize the characteristics shared by organizations with quality culture.

✓ Behaviour matches slogans.
✓ Customer input is actively sought and used continually improve quality.
✓ Employees are both involved and empowered.
✓ Work is done in teams.
✓ Executive-level managers are both committed and involved; responsibility for quality is *NOT* delegated.
✓ Sufficient resources are made available where and when they are needed to ensure the continuous improvement of quality.
✓ Education and training are provided to ensure that employees at all levels have the knowledge and skills needed to continuously improve quality.
✓ Reward and promotion systems are based on contributions to the continual improvement of quality.
✓ Fellow employees are viewed as internal customers.
✓ Suppliers are treated as partners.

Table 9 - Characteristics shared by organizations with a quality culture. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

In addition, Davis *et al.* (2000) also refer nine characteristics that would be observed in an organization with a strong quality culture:

- Widely shared philosophy of management;
- Emphasis on the importance of human resources to the organization;
- Ceremonies to celebrate organizational events;
- Recognition and rewards for successful employees;
- Effective internal network for communicating culture;
- Informal rules of behaviour;
- Strong value system;
- High standards for performance;
- Definite organizational character.

Furthermore, Davis *et al.* (2000) provides a checklist for conversion to quality, which points should be fulfilled by companies if they pursue that objective and are able of achieving the previous pointed characteristics.

✓ Identify the attitudes, behaviours, processes, and procedures that are to be changed.
✓ Put the planned changes in writing.
✓ Develop a comprehensive plan for making the changes.
✓ Make sure all change advocates are familiar with the emotional transition people go through when confronted with change.
✓ Identify the key people in the organization who can either make the conversion work or make sure it does not work.
✓ Get the identified key people on the team (turn them into advocates).
✓ Take a *hearts and minds* approach when introducing the new culture.
✓ Apply courtship strategies to bring people along slowly but steadily.
✓ SUPPORT, SUPPORT, SUPPORT.

Table 10 - Quality culture conversion checklist. Source: Davis, S., Goetsch, D. 2000. ***Quality management: introduction to total quality management for production, processing, and services***. New Jersey: Prentice-Hall

Quality leadership

As all the steps in order to achieve quality developed by different authors already suggested, leadership is an extremely important variable for quality management (Foster, 2007). A leader must develop several tasks such as organizing, planning, controlling, communicating, teaching, advising and delegating (Foster, 2007). Moreover, he must be able to delegate and share power with the ones who follow him. It is possible to define leadership as the way someone, in this case called leader, is able of influencing others in order to reach the same superordinate goals, being this type of goal the one that allow reaching a better end, from which everyone will benefit (Foster, 2007).

Especially regarding total quality, leadership can be defined as the capability to inspire people so that they are willing to, in a voluntary way, commit with the organization's goals (Davis *et al.*, 2000). It is important to focus on the relevance of the concept of inspiring, since it is this concept which makes the definition compatible with the total quality approach. In spite of motivation, which is temporary, inspiration means that employees already feel motivated as the motivation has been internalized and is always present (Davis *et al.*, 2000). According with

Davis *et al.* (2000) five characteristics can be observed in good leaders: balanced commitment; positive role model; good communication skills; positive influence; and persuasiveness.

Leadership Style in a Total Quality Setting

In a total quality approach the leadership style is very similar with the participative leadership. However, there is a difference between the traditional definition of that style of leadership and the style which is actually used in the quality setting. While a participative leadership style involves asking employees input, total quality involves much more, it is necessary to not only ask for input, but use the input from empowered employees, meaning, actually listening and acting according with it (Davis *et al.*, 2000). While implementing total quality, changes are not always easy to accept and consequently may be difficult to implement and so it is essential that management become the champion of change, making everyone understand it and believe that it will lead to a better end, from which everyone will benefit (Davis *et al.*, 2000).

2.1.3. Quality Management Tools

Ishikawa's Basic Seven Tools of Quality

The seven basic tools where developed by Ishikawa in order to better understand processes and are the following: process maps; check sheets; histograms; scatter diagrams; control charts; cause-and-effect diagrams; and Pareto charts (Foster, 2007).

A process map shows through a scheme how a process is composed. If all the phases of the process are known, then it is possible to understand in which one of the phases there is room for improvement (Foster, 2007). Check sheets can be tubular, computed based or schematic, being their goal to gather data from which histograms can be constructed from, providing then important data in order to detect defects, unnecessary costs and room for improvement (Foster, 2007). For instance, the example in figure 4, shows not only the total number of telephone interruptions (the identified problem) per day, but also the reasons for the interruptions, being explicit that most of them are due to “wrong number” and “boss”.

Telephone Interruptions

Reason	Day					
	Mon	Tues	Wed	Thurs	Fri	Total
Wrong number	𝍸	||	|	𝍸	𝍸 ||	20
Info request	||	||	||	||	||	10
Boss	𝍸	||	𝍸 ||	|	||||	19
Total	12	6	10	8	13	49

Check Sheet Example

Figure 4 - Check sheet example from ASQ (American Society for Quality. Source: http://asq.org/learn-about-quality/data-collection-analysis-tools/overview/check-sheet.html

A histogram is a way of representing data through a bar graph and it can only be used for continuous numerical data, when the data is categorical, frequency chart is the most adequate method (Foster, 2007). In the several examples below, it is possible to see the diverse forms a histogram can take, depending on the data.

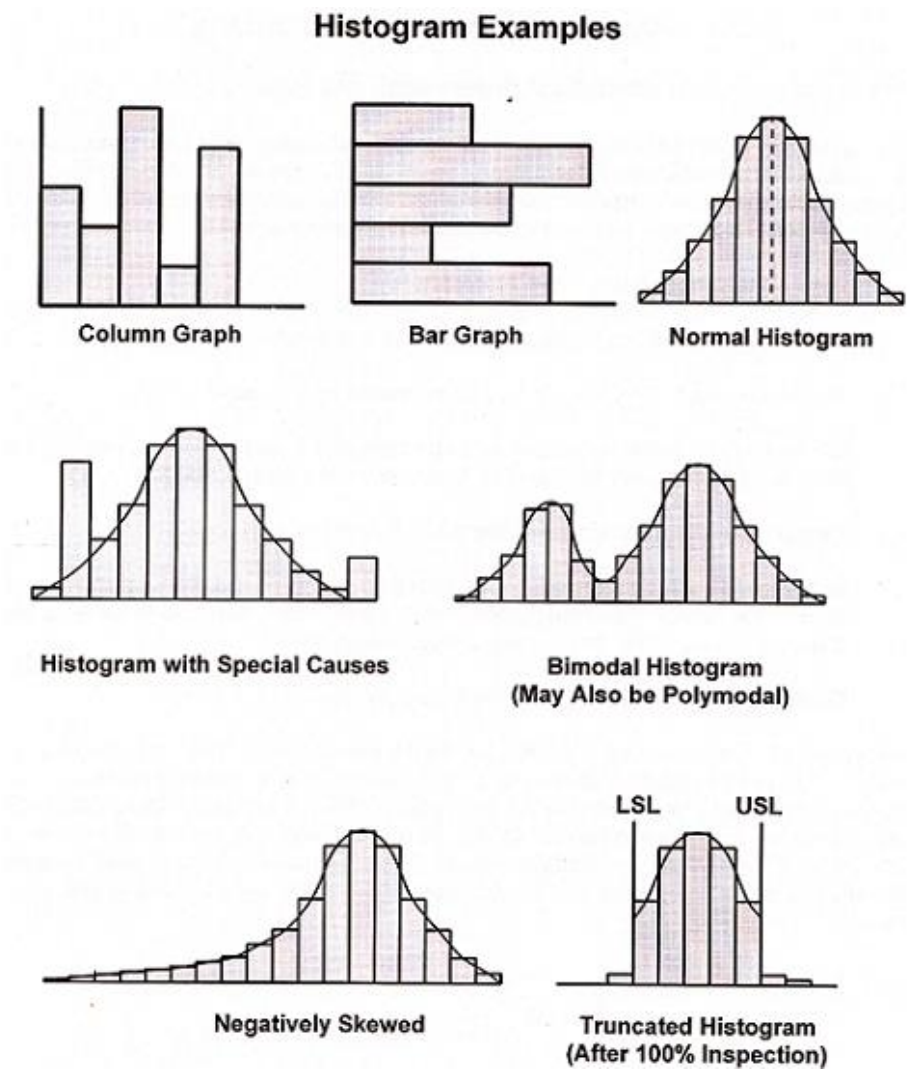

Figure 5 - Histogram exemples from APB Consultant. Source: http://isoconsultantpune.com/kaoru-ishikawas-basic-seven-qc-tools/#6

Scatter diagrams, also known as scatter plot, is a useful tool in order to examine if there is any kind of relationship between different variables (Foster, 2007). As can be seen in the example in figure 6, it shows the relationship between two variables, in that case as the dots are disperses, there is not a strong relationship between purity and iron.

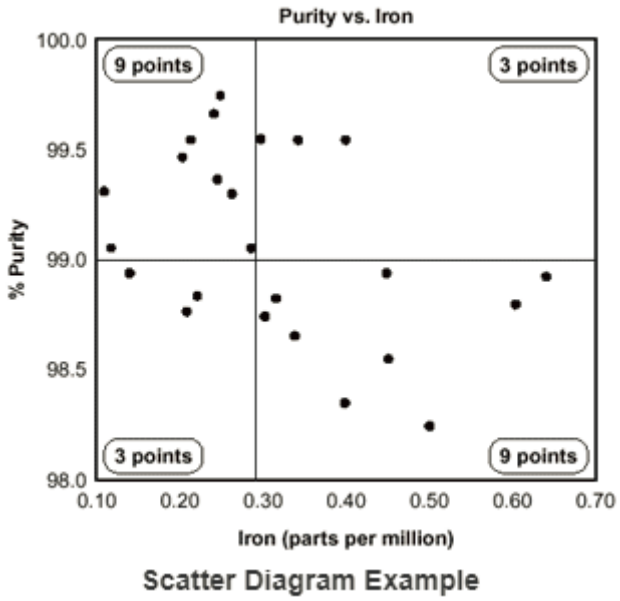

Figure 6 - Scatter diagram example from ASQ (American Society for Quality). Source: http://asq.org/learn-about-quality/cause-analysis-tools/overview/scatter.html

Control charts focus their attention in trying to understand if a process will produce a product or service with measurable properties (Foster, 2007) and are represented as the figure bellow exemplifies.

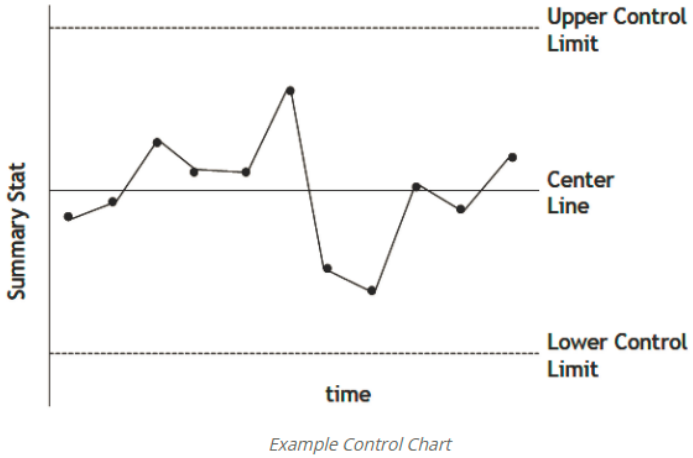

Figure 7 - Control chart example from APB Consultant. Source: http://isoconsultantpune.com/kaoru-ishikawas-basic-seven-qc-tools/#6

The cause-and-effect diagram, as the name says, is a diagram (which looks like a skeleton of a fish) that is used in order to understand the causes and effects of every phase of a process and how it contributes for a problem. The five "why?" technique is also helpful when drawing this diagram. By using this tool people focus their efforts in solving what is causing the problem (Foster, 2007). As the figure 8 displays, in the cause-and-effect diagram both the problem and the causes (main cause and other levels' causes) that contribute for the problem are identify, making it easier then to address the causes and solve the problem.

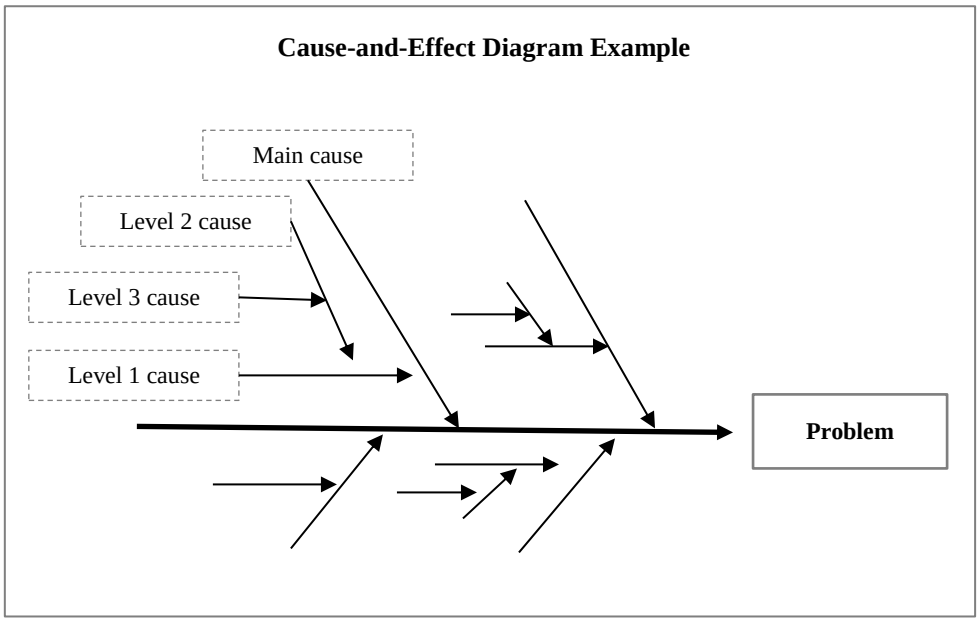

Figure 8 - Cause-and-effect diagram example. Source: Own elaboration.

Pareto charts are frequency bars that use categorical data that is related with the problem in study. This tool is helpful so that problems are not only identified but prioritized (Foster, 2007), as figure 9 exemplifies. For instance, regarding "Types of customer complains", "documents" has the higher response rate and so solving that specific complain must be prioritized, as it is seen in "Types of document complains", where that specific complain is seen in more detail.

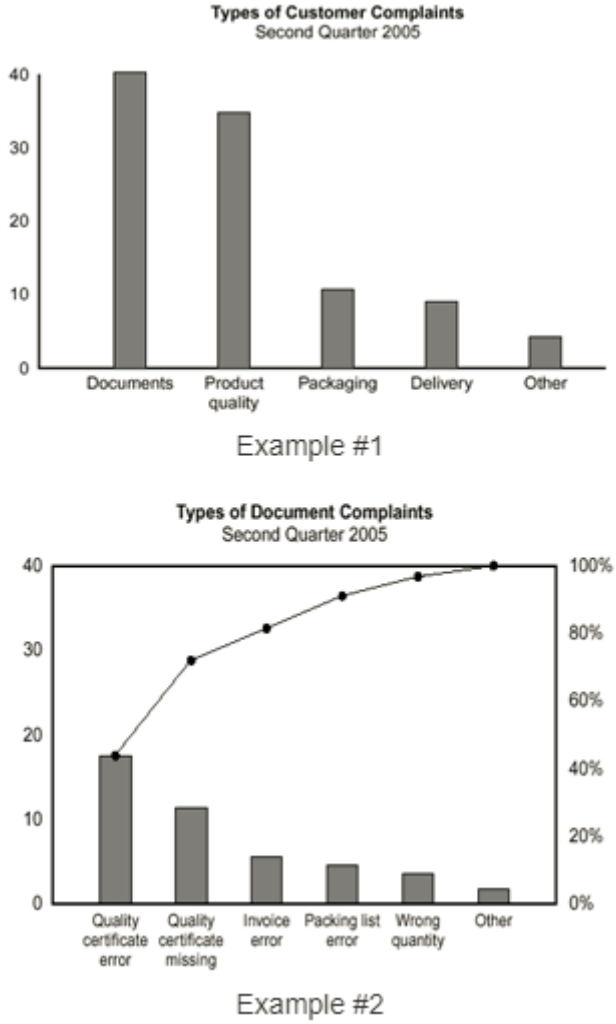

Figure 9 - Pareto charts examples from ASQ (American Society for Quality). Source: http://asq.org/learn-about-quality/cause-analysis-tools/overview/pareto.html

The Seven New Tools for Improvement

Moreover, we have the seven new tools for improvement, also developed by Ishikawa, the affinity diagram, the interrelationship digraph, tree diagrams, prioritization grid, matrix diagram, process decision program chart and activity network diagram.

The affinity diagram is useful in order to display all the issues which are related with a specific problem (Foster, 2007), and takes the form seen in the example in figure 10.

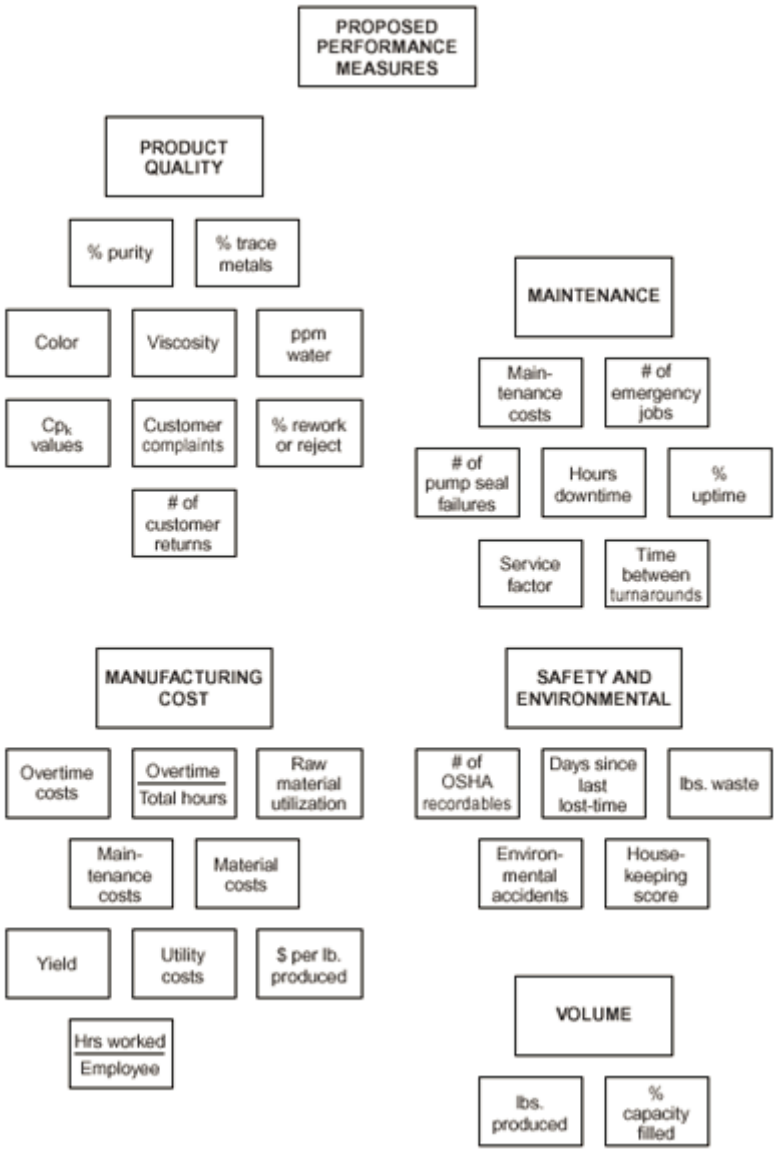

Figure 10 - Affinity diagram example from ASQ (American Society for Quality). Source: http://asq.org/learn-about-quality/idea-creation-tools/overview/affinity.html

The interrelationship diagraph is helpful after having made the affinity diagram, through it we can understand the relationship among the founded issues and we can also make a list by importance order (Foster, 2007). For instance, in figure 11 is an example where the different issues regarding computer replacement project are identified.

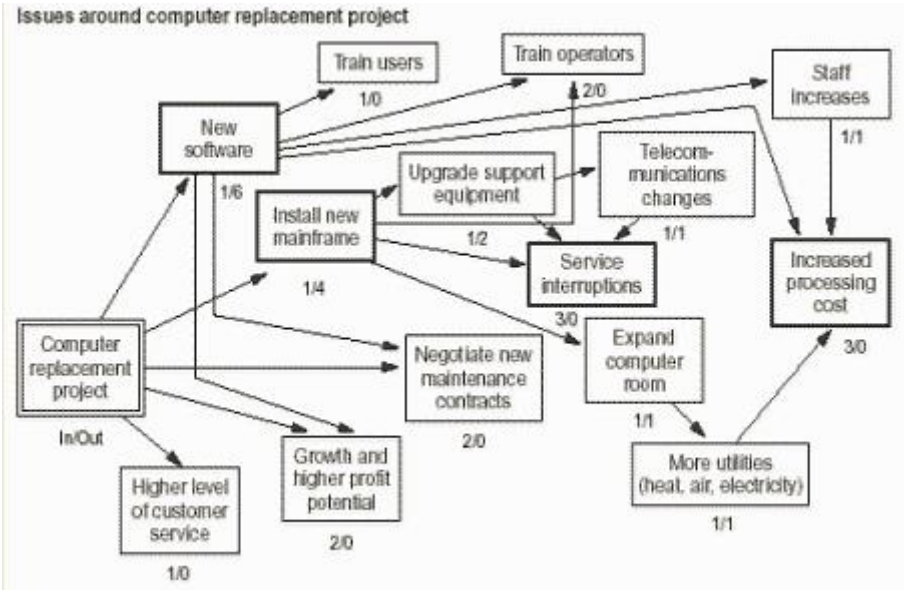

Figure 11 - Interrelationship diagraph example from ASQ (American Society for Quality). Source: http://asq.org/learn-about-quality/new-management-planning-tools/overview/relations-diagram.html

The tree diagram specifies which are the steps needed in order to solve a specific problem (Foster, 2007), for example, in figure 12, it shows the steps needed in order to improve academic performance.

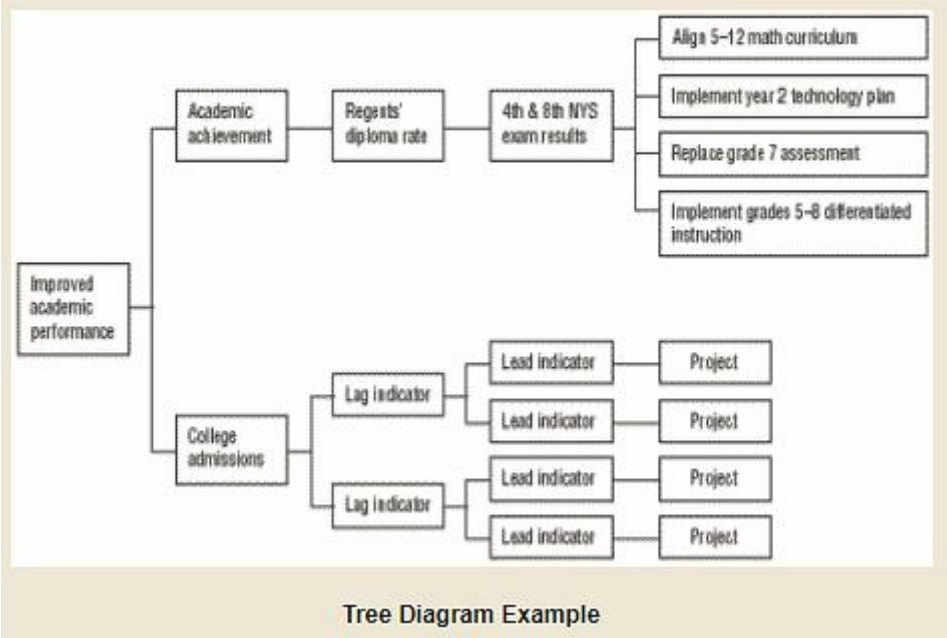

Figure 12 - Tree diagram example from ASQ (American Society for Quality). Source: http://asq.org/learn-about-quality/new-management-planning-tools/overview/tree-diagram.html

A prioritization grid is useful in order to make a decision based on multiple criteria (Foster, 2007). In figure 13, the example makes the relationship between projects A to D and the factors

safety, training, reward, people, cost and time, and its possible to choose the best project taking into account the factors that the firm wants to influence the most.

	Factors						
	Weight						
	1	1	1	1	2	1	
Projects	Safety	Training	Reward	People	Cost	Time	Sum
A	1	4	4	3	6	2	20
B	2	2	3	1	2	1	11
C	3	3	1	4	8	4	23
D	4	1	2	2	4	3	16

Figure 13 - Prioritization grid example from ASQ (American Society for Quality). Source: http://asqservicequality.org/glossary/project-prioritization-matrix/

A matrix diagram is a simple tool that uses symbols in order to address a problem (Foster, 2007). A process decision program chart is useful in order to determine problems which arise along with the implementation of some program or improvement (Foster, 2007), and an example can be seen in figure 14.

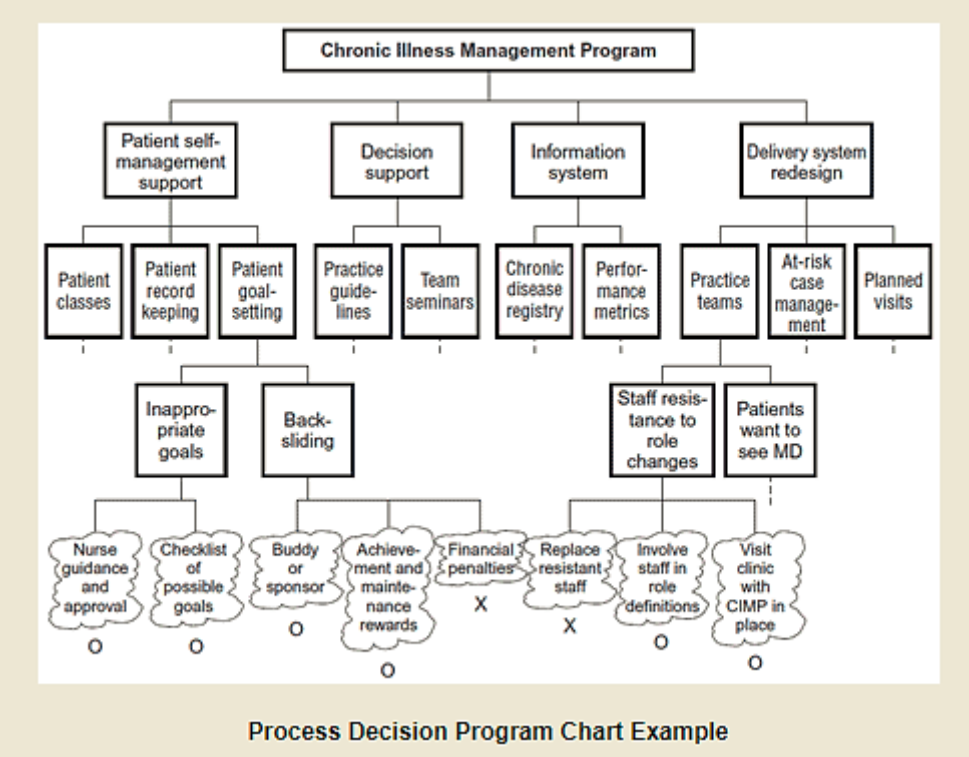

Figure 14 - Process decision program chart example from ASQ (American Society for Quality). Source: http://asq.org/learn-about-quality/new-management-planning-tools/overview/process-decision-program-chart.html

The activity network diagram is a tool used in controlling projects. It is also called Program Evaluation and Review Technique (PERT) diagram or critical-path diagram (Foster, 2007).

Other Tools for Performance Measurement

Furthermore, there are three other tools that are useful when communicating with employees in a clear and simple way, and they are spider charts, balanced Scorecards and dashboards (Foster, 2007)

The first one, spider charts, are graphs which include, in simultaneous, various metrics, as shown in the example below where safety, training, SS, SOP and metrics are shown, and are helpful because they show which are the goals which were achieved and the ones that were not (Foster, 2007).

Figure 15 - Spider chart example from ASQ (American Society for Quality). Source: http://asqservicequality.org/glossary/radar-chart/

Secondly, a balanced scorecard is a tool that has the objective of measuring performance and then communicates it through a spread sheet to management regularly. Finally, dashboard is a figure which resembles a car dashboard, showing different metrics and allowing people to quickly understand if the goals are being met or not.

2.1.4. Quality Consequences

Although it is possible for firms to achieve successful results regarding quality, not all firms succeed in their quality efforts. Foster (2007) suggest two reasons for the failure: (1) the effort to achieve quality is not the only variable affecting profitability and; (2) there are many firms which are implementing quality wrongly. It is relevant to focus the quality relationship with other five variables: price; cost; productivity; profitability; and environment.

Having into account supply and demand laws, firms are usually obliged to compete by price. This leads to the belief that a quality product will be the one that is most highly priced. On the other hand, high price can also be in the root of a perception of high quality (Foster, 2007). Moreover, different cultures may also have different perspectives regarding the relationship between quality and price. The recent increase in the production of low-priced goods with high-quality for instance is also affecting the assessment of price-quality relationship (Foster, 2007).

Regarding cost, when a firm follows a low-cost orientation based on continuous learning and production competence, it may achieve competitive advantage because it is achieving quality while incurring in low costs (Foster, 2007).

While pursuing a quality goal, firms will try to eliminate wastes and simplify processes and by doing that they will consequently increase productivity (Foster, 2007). However, a temporary decrease in productivity can be observed while companies are adjusting with quality changes. Usually, that decrease does not occur for a long time and can be moderated through the effect of training and the creation of a learning organization.

Many quality enthusiasts generally accept that quality will always lead to higher profitability (Foster, 2007). When that situation does not occur, the one to blame is the implementer, who failed to successful implement quality changes. Quality improvement may include better relations between management and employees, lower costs, higher customer satisfaction and higher market share. Foster (2017), however, points that high quality by itself will not be enough for firms to succeed, they also need to properly perform many other activities, such as market and manage cash, for instance (Foster, 2007).

Giving the fact that governments are increasingly given more attention to environment problems and thus they are increasingly regulating the subject, firms have also be increasingly paying more attention to the issue by including their environment impact on their business strategies. Moreover, environmental concerns will also benefit the corporate image –

environment protection, worker health and community relations, for instance. Because of this environmental awareness, firms are integrating the environmental aspect on the quality management systems, referred sometimes as total quality environmental management (TQEM) (Foster, 2007). Those systems consider processes that cause environmental degradation, involving measures, indicators and life-cycle costs. As Foster (2007) states, independently of political positions and views regarding specifically environmental issues, the debate is on and will be in the spot light for many years, meaning this that regulation will increase over time. Quality management and continuous improvement can be helpful when management tries to address these issues.

2.1.5. ISO 9001 – Quality Management Certification

According with ISO Survey (2016), an annual survey that validates the number of existing certificates of ISO, there were in 2016 more than one million firms with ISO 9001 certification, as presented in the graph below.

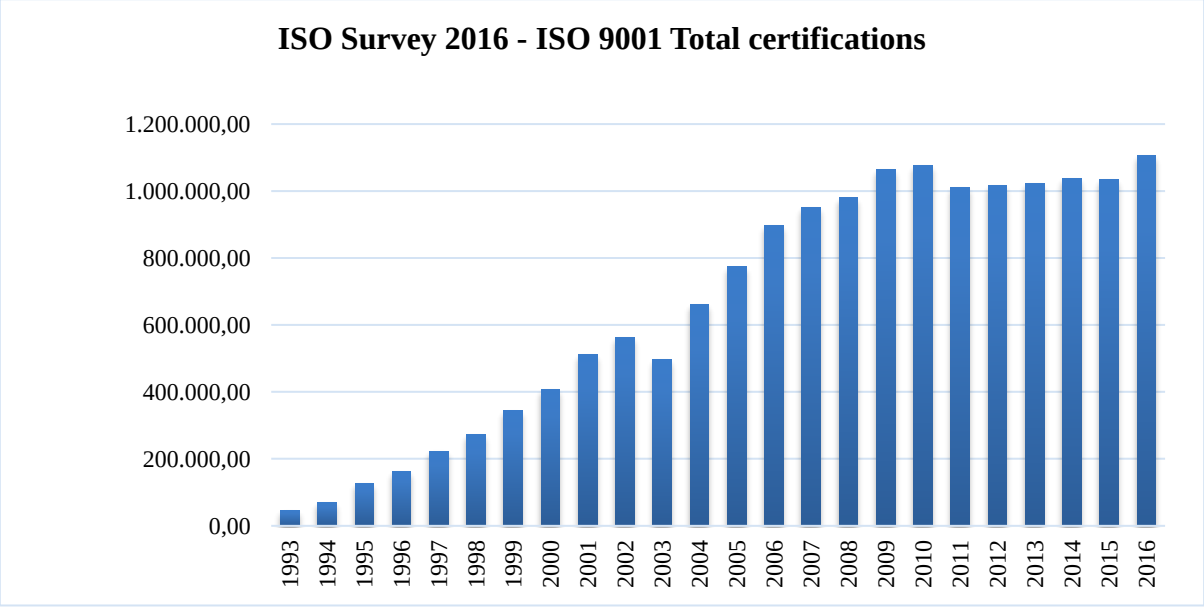

Figure 16 - ISO Survey 20016 - ISO 9001 Total certifications. Source: Own elaboration, with data from ISO Survey (2016)

ISO 9001 Quality Management Principles by ISO (2015) provide valid information regarding the quality management principles in the basis of the ISO 9001 certification, mentioning seven: customer focus, leadership, engagement of people, process approach, improvement, evidence-

based decision making and relationship management. When a firm understands its customer and is able of building a strong relationship with him advantages such as being able of reaching or even exceeding its needs can be achieve and, consequently, sustained success can be obtained. The same thing happens when solid relationships are built with suppliers, where synergies can be reached. Leadership is important so as to lead people in the right way and so that they all follow and pursue the same goals, leading this to more engaged employees and more efficient processes, where evidence must be the platform for decision-making and improvement must be always the objective.

Taking into account the need to remain competitive, Priede (2009) enumerates benefits from ISO 9001 implementation. ISO 9001 provides procedures which can easily be follow by firms given the fact that they are precise and well defined, leaving no room for error and make it easier to integrate new employees. In addition to consistent output, as quality is being measured in a continuous basis, management gets up-to-date information regarding processes and outputs and any deviations arising from it, which make them detect and solve any problems in a more efficient way, reducing defect's rates. The cause-and-effect diagram tool particularly useful in this situation.

On the one hand, the mentioned effects lead to the increase, or at least maintenance, of market share and revenue. On the other hand, those effects lead to lower costs given the fact that defects and errors are reduced.

Concerning ISO 9000 quality system certification's implementation and its relationship itself with innovative process, research from Guerrero *et al.* (2014) suggested that the certification has no impact on product innovation, having no impact on product innovation performance's measures, such as time-to-time market. The authors propose as an explanation for this lack of impact on product innovation the standardization implemented alongside with the certification. However, it has a positive impact on other measures related with process innovation performance, such as restructuring and application of the internal customer concept.

2.2. Innovation Management

2.2.1. Innovation

Innovation's importance is recognized, being the need to adapt and evolve in the basis of this recognition (Trott, 2012). Christopher Freeman, cited by Trott (2012) even said in 1982 that not to innovate is the same as dying.

Innovation has been studied for many years because it has long be seen as the engine of growth (Trott, 2012). One of the first authors to discuss innovation was Schumpeter, an economist who acknowledged the importance of new products in order to stimulate economic growth. Authors such as Marx, Schumpeter, Kondratieff and Abernathy and Utterback argued that innovations are related with waves of economic growth. Economists started to pay closer attention to the causes of economic growth especially after the Second World War. That period was fuelled by R&D and innovations in military area mostly, and so the need to understand how science and technological development affected economy arose (Trott, 2012). Studies undertook in the 1950s focus on: (1) the generation of new knowledge; (2) the application of this knowledge in the development of products and processes; and (3) the commercial exploitation of these products and services in terms of financial income generation (Trott, 2012). The conclusion was that firms behave differently from each other and so this lead to a new interest – trying to understand how firms managed the three points previously presented. New studies in 1960s pointed that the firm itself and the way it uses its resources were a relevant influence regarding innovation.

The Schumpeterian view believes firms are different and that how it manages resources and develops capabilities the accountable of how the firm performs regarding innovation (Trott, 2012). The following framework shows an overview of the innovation process which includes three issues: (1) an economic perspective; (2) a business management strategy perspective; and (3) the organisational behaviour. In addition, it recognizes the importance of linkages between firms and the importance of creative individuals.

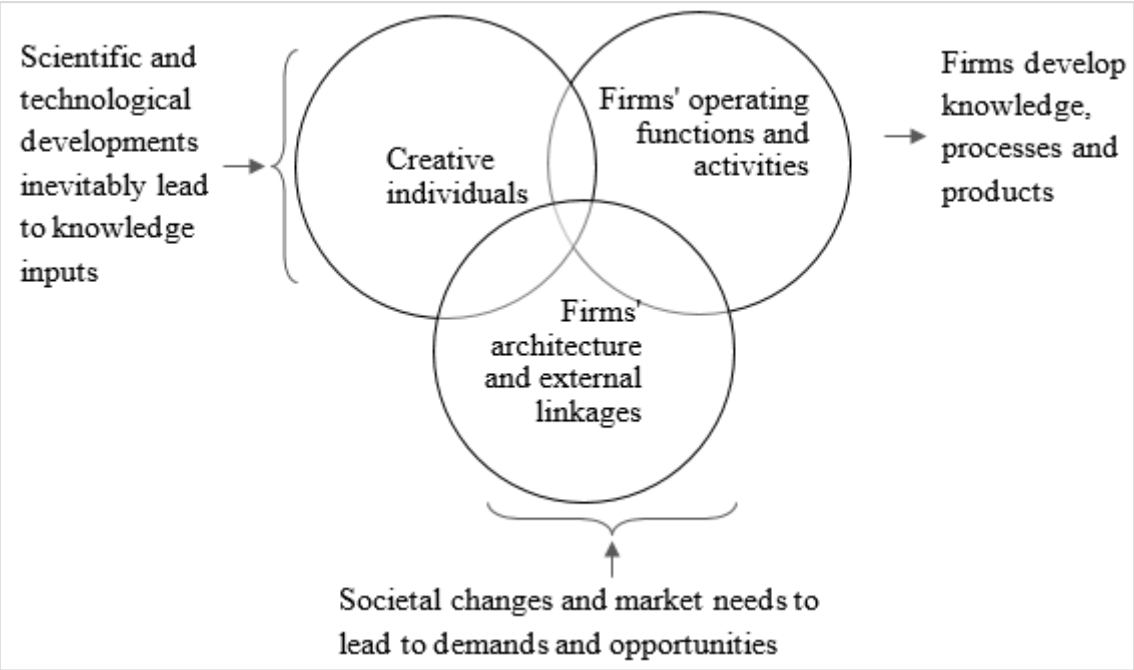

Figure 17 - Overview of the innovation process. Source: Trott, P. 2012. **Innovation Management and New Product Development**, Pearson Education Limited, Edinburgh Gate

Definition and meaning of innovation

The abilities to see connections and both to identify and use opportunities is what drives innovation (Bessant *et al.*, 2009). It can be related with the creation of new markets but it can also be about finding new ways of expanding the existing ones. Moreover, innovation finds no borders, it can be achieve in products and services, in all sectors of the economy, being itself a very broad concept with multiple definitions (Trott, 2012). For instance, Myers and Marquis (1969), cited by Trott (2012), define innovation has a total process of many other sub processes, such as the idea conception, the invention of a products and the development of a new market, all together (Trott, 2012).

In the Oslo Manual (third edition, 2005), OECD defines innovation as "*the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations* (Oslo Manual, OECD, 2005:46)".

There are five key characteristics of innovation which are relevant to have in attention: the degree of novelty; platforms and families of innovations; discontinuous innovation; level of innovation; and timing (Bessant *et al.*, 2009).

Degree of novelty

When we speak about innovation, we may be speaking about incremental innovation or radical innovation. While incremental innovation represents minor changes and is usual related with improvement of processes/products/services, radical innovations change the way we think about things and use them. In addition, the degree of novelty is something that is perceived by the beholder and not something that companies are able of stipulating.

Sometimes, innovation is synonym of discontinuous shift, however, most of times, it is about incremental improvements (Bessant *et al.*, 2009). Improvement regarding product/service is the most common type of innovation. Although not being disruptive, incremental innovation is also desirable for organizations because it can mean greater efficiency by focus on optimization of processes. In recent years, continuous improvement has been given more attention, much of that attention arising due to the total quality management movement, which has been given Japanese manufacturers, since the late twentieth century, the ability to improve quality and also productivity through incremental innovation (Bessant *et al.*, 2009).

Moreover, the learning curve effect, which states that productivity increases with the increase of the scale of production, also presume that companies gain from learning and continuous incremental improving, accompanied by new products and processes (Bessant *et al.*, 2009).

Platform innovation

Regarding a continuous incremental innovation approach, innovation can benefit from a concept of platforms, which is a way of leaving space around an innovation, and then creating a basis from which the innovation can be expanded (Bessant *et al.*, 2009). Through the production of a set of products or services of the same family, that use common processes, companies can improve performance and recover initial investments in R&D.

Discontinuous innovation

Innovation in most of the cases is about improvement and mostly happens within a specific set of rules, which are clear for all of the players involved. Whenever the rules change, organizations have room for trying new things, creating new opportunities and obfuscate competition. Discontinuity can lead firms to change the rules of the game and rethink the industry (Bessant *et al.*, 2009). The challenge of dealing with this type of innovation is that

usually the new players are the ones whom take the greater advantage of it because old players have to forget the old way of doing things and learn the new way.

Bessant *et al* (2009) points eleven sources of discontinuity: new market emerges; new technology emerges; new political rules emerge; running out of road; sea change in market sentiment or behaviour; deregulation/shifts in regulatory regime; fractures along fault lines; unthinkable events; business model innovation; shifts in techno-economic paradigm; and architectural innovation. In order to take advantage of discontinuous conditions, firms need to understand that different approaches will be needed in order to deal with innovation (Bessant *et al.*, 2009).

Component/architecture innovation and the importance of knowledge

There are innovations that are about changes in components whereas there are innovations that are able to promote changes in the whole system. Looking at innovation at the level of components is another perspective to bear in mind.

In this kind of approach to innovation, knowledge plays an important role, as it is essential to create new possibilities (Bessant *et al.*, 2009). Organizations may already be in possession of the specific knowledge that can lead them into innovation or they may need to search it. However, there is a high level of uncertainty since it is not possible to be sure that the knowledge searched will help reaching innovation.

The innovation life cycle (different emphasis over time)

Opportunities for innovation are not steady over time and depend on the maturity stage of the organizations. For instance, in new industries there is more room for R&D, experimentation and failure in order to reach a new product or service. On the other hand, regarding more mature industries, the focus will be essentially on process or position innovation, as the goal will be to deliver products and services in a cheaper way (Bessant *et al.*, 2009).

Types and models of innovation

OECD identifies four generic types of innovation: product innovations; process innovations; marketing innovations; and organisational innovations (Oslo Manual, OECD, 2005).

OECD's Innovation Definitions	
Product Innovation	A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics.
Process Innovation	A new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.
Marketing Innovation	A new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
Organisational Innovation	A new organisational method in business practices, workplace organisation or external relations.

Table 11 - OECD Innovation Strategy: Defining Innovation. Source: https://www.oecd.org/site/innovationstrategy/defininginnovation.htm

Also, according with Trott (2012) seven types of innovation can be distinguished:

1) Product innovation;
2) Process innovation;
3) Organisational innovation;
4) Management innovation;
5) Production innovation;
6) Commercial/marketing innovation; and
7) Service innovation.

Traditionally, there were two schools of thought regarding innovation: (1) the social deterministic school, for whom innovations were the result of external social factors and influences; and (2) the individualistic school, for whom innovations were instead the result of unique individual talents (talents which cannot be learnt). More recently, innovation literature has tended to be divided between the market-based view and the resource-based view. The first view believes that innovation depends on market conditions while the second one believes that the firms' resources, skills and capabilities are the key issues in order to innovate. Moreover, seven models of innovation can be referred:

1) Serendipity;
2) Linear models;

3) Simultaneous coupling model;
4) Architectural innovation;
5) Interactive model;
6) Innovation life cycle and dominant designs; and
7) Open innovation and the need to share and exchange knowledge (network models).

2.2.2. Innovative Organization

All organisations need both stability and creativity, creating this a tension withn the management (Trott, 2012). This tension represents the dilemma of innovation management. Firms need stability and routines in order to function and execute their activities. On the other hand, they also need to remain competitive and so they need to create new products and have new ideas. The management of the innovation process includes exploring new ideas and trying to develop creativity and, because of that, managing uncertainty is an important feature of managing the innovation process (Trott, 2012). The following table summarizes organizational characteristics that facilitate the innovation process (Trott, 2012).

Organisational requirement	Characterised by
1. Growth orientation	A commitment to long-term growth rather than sort-term profit.
2. Organisational heritage and innovation experience	Widespread recognition of the value of innovation.
3. Vigilance and external links	The ability of the organisation to be aware of its threats and opportunities.
4. Commitment to technology and R&D intensity	The willingness to invest in the long-term development of technology.
5. Acceptance of risks	The willingness to include risky opportunities in a balanced portfolio.
6. Cross-functional cooperation and coordination within organizational structure	Mutual respect among individuals and a willingness to work together across functions.
7. Receptivity	The ability to be aware of, to identify and to take effective advantage of externally developed technology.

8. Space for creativity	An ability to manage the innovation dilemma and provide room for creativity.
9. Strategy towards innovation	Strategic planning and selection of technologies and markets.
10. Coordination of a diverse range of skills	Developing a marketable product requires combining a wide range of specialized knowledge.

Table 12 - Summary of the organisational characteristics that facilitate the innovative process. Source: Trott, P. 2012. ***Innovation Management and New Product Development***, Pearson Education Limited, Edinburgh Gate

Innovation plays an important role within the organizations and is an important process in order to survive in a competitive environment because without it the firm stays the same while the competitors take over (Davila *et al.*, 2013). Bessant *et al.* (2009) point the increasing relevance that the ability to create novelty in products and services has regarding developing competitive advantage, being that nowadays not only favoured by size or assets.

That is a reason for the importance of innovation for companies. Whether the organization is putting a new product on the market or developing a new process no other company has, or offering a better service, it has always a competitive advantage regarding its competitors. However, if companies want to keep the competitive advantage they have achieved through innovation, they cannot stop doing it; the organization must be able to go further, so that it is not left behind as competitors converge efforts into innovation (Bessant *et al.*, 2009). The following table identifies some specific mechanisms that organizations can use in order to obtain strategic advantage through innovation (Bessant *et al.*, 2009).

Strategic advantages through innovation	
Mechanism	**Strategic advantage**
Novelty in product or service offering	Offering something no one else can
Novelty in process	Offering it in ways others cannot match – faster, lower cost, more customized
Complexity	Offering something which others find it difficult to master
Legal protection of intellectual property	Offering something others cannot do unless they pay a licence or other fee

Add/extend range of competitive factors	Move basis of competition, e. g. from price of product to price and quality, or price, quality, choice
Timing	First-mover advantage – being first can be worth significant market share in new product fields Fast-follower advantage – sometimes being first means you encounter many unexpected teething problems, and it makes better sense to watch someone else make the early mistakes and move fast into a follow-up product
Robust platform design	Offering something which provides the platform on which other variations and generations can be built
Rewriting the rules	Offering something which represents a completely new product or process concept – a different way of doing things – and makes the old ones redundant
Reconfiguring the parts of the process	Rethinking the way in which bits of the system work together, e. g. building more effective networks, outsourcing and coordination of a virtual company
Transferring across different application contexts	Recombining established elements for different markets
Others?	Innovation is all about finding new ways to do things and to obtain strategic advantage, so there will be room for new ways of gaining and retaining advantage

Table 13 – Strategic advantages through innovation. Source: Davila, T., Epstein, M. J., Shelton, R. D. 2013. ***Making innovation work: how to manage it, measure it, and profit from it***. New Jersey: Pearson Educated Inc.

Furthermore, as Davila *et al.* (2013) state, innovation consequences are: increase revenue, strengthen bottom line, improve customer relationships, motivate employees, improve partnerships and create competitive advantage.

Both teamwork and the combination of different disciplines and perspectives are becoming more important to innovation (Bessant *et al.*, 2009). In the modern economy of knowledge, people are in fact a very important asset and management needs to understand which type of organization it should promote so that creativity and innovation can happen. Eliminating, for instance, bureaucracy and other unhelpful structures that tend to prevent communication and

creative ideas from happen, is not necessarily the right and only way to manage this question (Bessant *et al.*, 2009). In fact, organizations may benefit from a little order and structure. Bessant *et al.*, (2009) identify some components of an innovative organization. By combining those components, it is possible to create or maintain an environment where innovation happens.

Components of the innovative organization	
Component	**Key feature**
Shared vision, leadership and the will to innovate	Cleary articulated and shared sense of purpose Stretching strategic intent 'Top management commitment'
Appropriate structure	Organization design which enables creativity, learning and interaction. Not always a loose 'skunk works' model; key issue is finding appropriate balance between 'organic and mechanistic' options for particular contingencies
Key individuals	Promoters, champions, gatekeepers and other roles which energize or facilitate innovation
Effective team working	Appropriate use of teams (at local, cross-functional and inter-organizational level) to solve problems, requires investment in team selection and building
High-involvement innovation	Participation in organization-wide continuous improvement activity
Creative climate	Positive approach to creative ideas, supported by relevant motivation systems
External focus	Internal and external customer orientation Extensive networking

Table 14 - Components of the innovative organization. Source: Davila, T., Epstein, M. J., Shelton, R. D. 2013. ***Making innovation work: how to manage it, measure it, and profit from it***. New Jersey: Pearson Educated Inc.

Organizational culture evolves and should keep up with the company itself through the development of new systems, processes, symbols and values (Davila *et al.*, 2013).

Innovation leadership

So that it happens, innovation will need the support of the management (Davila *et al.*, 2013). As Davila *et al.* (2013) mention, the leadership role regarding innovation should include the following tasks:

- Providing a long-term view for innovation via the innovation strategy and portfolio;
- Sensitizing key leaders and managers to the dynamics of innovation;
- Nurturing key creation projects;
- Managing relationships with external partners;
- Assessing innovation implications of corporate, strategic initiatives;
- Providing an expert opinion and crucial judgment;
- Managing the balance between business and technology innovation, such as organizational dynamics, portfolio, resources, and processes.

Innovation measurement

Although not being widely discussed, measurement is fundamental and critical so that firms are able of succeeding with innovation (Davila *et al.*, 2013). The reason for its importance is that what it is measured can get done. When looking at innovative performance, firms should link strategy and innovation measurement (Davila *et al.*, 2013).

A measurement system should have three functions: to plan; to monitor; and to learn (Davila *et al.*, 2013). Regarding planning, it includes both defining and communicating a strategy and it is about making it easier to understand what is important and in which ways every day activities help the firm increasing its value and pursuing its mission (Davila *et al.*, 2013). The company benefits from doing this because it makes people reaching an agreement regarding strategy by allowing discussion, it favours communication and it makes it possible to follow the evolution of the company. Monitor is an important activity in order to understand if everything is going as planned and also if any intervention or change is necessary. Finally, the learn task is about identify new opportunities and take advantage of them.

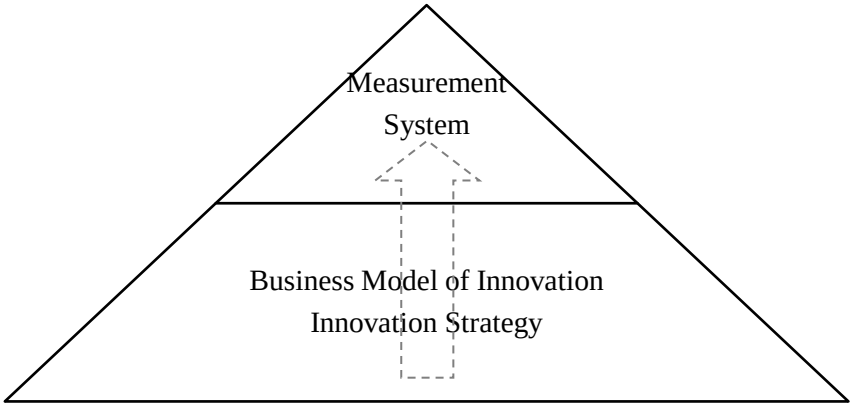

Figure 18 – Business model and measurement system. Source: Davila, T., Epstein, M. J., Shelton, R. D. 2013. ***Making innovation work: how to manage it, measure it, and profit from it***. New Jersey: Pearson Educated Inc.

2.3. Quality and Innovation Relationship

The literature regarding the relationship between quality and innovation does not provide one general and clear answer to the subject. While some of the studies seem to suggest that there is a negative relationship between TQM and innovation, others suggest that the relationship is positive (Fallahnejad *et al.*, 2015). When looking at the positive connection, studies focus on management leadership, customer orientation and constant development to support that connection (Fallahnejad *et al.*, 2015). The leadership can favour the discussion of innovative ideas, customer orientation can benefit innovation by being constantly aware of customer's needs and continuous improvement is useful in order to reach innovation. On the other hand, standardization is referred as a blocker of creativity, leading to a negative connection between the two concepts (Fallahnejad *et al.*, 2015).

In addition to the existence of conflicting theoretical arguments regarding the theme, Abbas and Yahiya (2014) point the importance of addressing the relationship between TQM and innovation performance due to the growing attention that the topics have been given, being quality the basic criteria that firms should achieve and innovation the criteria which can make the difference concerning winning over competition. The authors consider that the question which arises from the stated previously within the companies is whether they should continue implementing TQM when they want to reach higher innovative performance (Abbas, A. Yahiya, A., 2014). Although innovation may be an important way in order to increase both profits and market share, innovative products and services will not thrive if they do not meet acceptable quality standards, being this a reason for quality and innovation to be related. Given the fact that both concepts, innovation and TQM, are multidimensional, the opinions regarding

the relationship varies between positive linkage and negative correlation (Abbas, A. Yahiya, A., 2014).

One of the issues concerning this relationship is that the two concepts, quality and innovation, have traditionally been understood as competing goals instead of complementary, impliying various tradeoffs (Leavengood *et al.*, 2014). For instance, some authors argue that while quality focus on improving and on trying to satisfy existing clients, innovation focus is to achieve new clients through breakthrough products. Recent studies mostly indicate that Total Quality Management has a positive impact on quality and innovation performance (Leavengood *et al.*, 2014). Results are often framed in terms of the following dualities (Leavengood *et al.*, 2014):

1) Firms that use a mixture of hard[1] and soft[2] tools will outperform firms that use primarily hard tools;
2) Firms that have implemented TQM companywide will outperform firms that have implemented TQM more narrowly; and
3) Firms for which the focus is both internal[3] and external[4] will outperform firms with primarily an internal focus.

Kim *et al.* (2012) refer that empirical studies' findings support the idea that QM practices can offer employees opportunities to apply QM principles and practices in the innovation process. According with those empirical studies, QM practices can then be seen has beneficial for the innovative process.

2.3.1. Quality as an encouraging platform for innovation

According with the empirical study conducted by Perdomo-Ortiz *et al.* (2006), TQM and business innovation capability (BIC) are connected. The study goes even further by identifying which dimensions of TQM better explain the generation of BIC. The authors propose two theoretical arguments in order to analyse the TQM and BIC relationship. The first argument is that TQM practices create a fertile platform for the innovation generation given its three principles: consumer orientation; continual improvement; and teamwork. That first principle

[1] Hard tools - continuous improvement and innovation, information and performance measurement, process management, strategic planning, process control, and product and service design (Kim *et al.*, 2012).
[2] Soft tools - customer focus and satisfaction, people training, top management commitment, teamwork, employee involvement, and supplier management (Kim *et al.*, 2012).
[3] Internal focus – emphasises process improvement (Kim *et al.*, 2012).
[4] External focus – emphasises costumer focus (Kim *et al.*, 2012).

promotes innovation through learning and taking ideas from the market, which will lead to trying to make new products and services in order to reach unsatisfied demand (Perdomo-Ortiz *et al.*, 2006). Moreover, regarding the continual improvement, it increases innovation through the practices that promote critical thinking (Perdomo-Ortiz *et al*., 2006). Teamwork is relevant since it incentives both communication and information flows, which are essential in innovation projects. Secondarily, the determinants of innovation are the other theoretical argument to mention because TQM has impact in many of them, and they become channels that spread quality influence on innovation (Perdomo-Ortiz, et al., 2006). Having in mind that TQM is related with the commitment to the goal set by the firm and that nowadays the goal for innovation is essential in order for the organizations' survival, TQM practices should be align in order to achieve that goal. That allocation of the goal is a key element in order to reach innovation results (Perdomo-Ortiz, et al., 2006). Additionally, intangible resources which are determinants of innovation such as management of human resources, organizational resources, commercial resources and management knowledge as a source of innovative ideas are connect with TQM practices such as teamwork, leadership and focus on the customer, for instance (Perdomo-Ortiz, et al., 2006). Innovative results are also influenced by the strategic orientation of the firm. Quality programs in order to be successful must also be align with corporate and competitive strategies, and so we can say that innovation is positively affected by TQM practices (Perdomo-Ortiz, et al., 2006).

On the other hand, and still regarding the fertile platform, the authors also present arguments which reject that view. For instance, they state that since quality and innovation have competitive priorities, the management and performance in order to reach those goals will also be conflicting (Perdomo-Ortiz, et al., 2006). The focus on the previously mentioned principles may also be harmful for innovative performance since quality management characteristics such as the need to control the processes make it difficult to adopt novelty (Perdomo-Ortiz, et al., 2006).

The empirical study conducted by Martínez-Costa and Martínez-Lorente (2008) among Spanish companies provides evidence on a positive link between TQM and innovation, being TQM a good platform for innovation to arise., through the offering of more benefits than any barriers it can create regarding innovation's development (Martínez-Costa and Martínez.Lorente, 2008). Additionally, the two concepts together also enhance the performance of the company. However, the authors state that in order for the firms to take the most advantage from TQM as

an innovation facilitator they must first ensure that TQM is widely and correctly implemented throughout the company, TQM itself must be successfully accomplished.

According with Fallahnejad *et al.* (2015) and their study, which explores the conceptual model in figure 19, despite the fact that TQM contribution is higher for quality performance, it also contributes in a significant matter to innovation performance. Moreover, there is it is important to refer that there is a positive relation between the two types of performance, quality performance and innovation performance (Fallahnejad *et al.*, 2015). As so, innovation performance can be seen as an outcome of quality performance (Fallahnejad *et al.*, 2015).

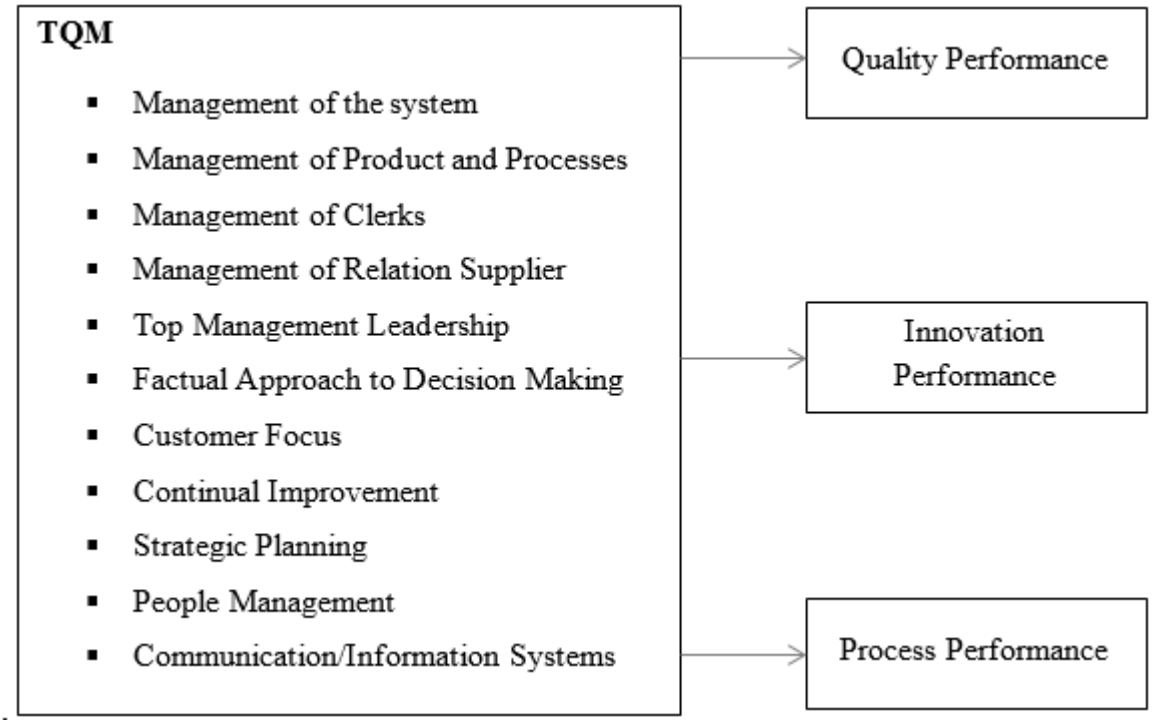

Figure 19 – Conceptual model. Source: Fallahnejad, M., Shamsaddini Lori, E. (2015) A framework for connection between Total Quality Management and innovation processes, ***Cumhuriyet University Faculty of Science, Science Journal (CSJ)***, Vol. 36, No: 3 Special Issue (2015), p. 1515 – 1524

Honarpour *et al.* (2012) studied both TQM and Knowledge Management as factors that affect innovation through research on the relationship between those two concepts and also between them and innovation. The TQM and KM relationship can be understood under two different perspectives; one of them determines KM as a TQM enabler while the other sees TQM as a supporter of KM. The authors focused their research on understanding if TQM has a positive relationship with innovation, if KM has a positive relationship with innovation and if there is a reciprocal relationship between TQM and KM and the results of their research suggested that all the hypotheses are true.

2.3.2. Quality dimensions' impact on innovative performance

Fernandes *et al.* (2014) research focused on understanding which was the impact of specific TQM dimensions (leadership, costumer focus, involvement and development of people, management by processes, continuous improvement, relations with suppliers, measuring results and product design) on specific innovation outputs such as research, development and technological innovation, product innovation, process innovation, organizational innovation, management innovation and marketing innovation. Through an empirical research they found that all TQM's dimensions, except involvement and development of people have impact on the innovation performance of organizations, however that impact is positive on some innovation outputs and negative on others. Leadership has a positive impact on both organizational and management innovation. Customer focus has a positive impact on product innovation, but a negative one on innovation of management, as it seems to relate with short-term management, where innovation is not a priority (Fernandes *et al*., 2014). Process management affects negatively two innovation outputs, R&D and technological innovation and marketing innovation, being this justified by the fact that this TQM dimension makes it difficult to create and maintain and R&D department (Fernandes *et al*., 2014). Continuous improvement has a positive impact on all the six innovation outputs on the scope of the study. Relations with suppliers influences negatively product and process innovation, while results measurement additionally influences negatively organizational innovation. Fernandes *et al.* (2014) provide an explanation for these results, arguing that regarding relations with suppliers, it restricts changes in product and process and, given that, "isolated" innovation may be discouraged. Regarding the last TQM dimension analyzed, product design, only management innovation is not affected by it; all the other five innovations' outputs are positively influenced by this TQM dimension.

Gomes *et al.* (2014) studied the particular effect that resources developed through TQM's implementation may have on strategic product innovation, under a resource-based theory approach. The research provided evidence on design quality being an important capability in order to develop product innovation, for which the authors give two explanations.

> *"first, product design capability could be an important foundational element for product innovation, ensuring faster and more effective translation of new ideas into product features that customers value, and into technical specifications for new products; secondly, the deployment of*

> *product design routines in the context of innovation could be embedded with idiosyncratic elements that increase the level of firm-specificity and inimitability conferring a technological or market advantage to the firm's new products.* (Gomes *et al*., 2014:1326)"

In addition, the research suggested the TQM culture is directly relevant for process improvement and product design capabilities, which will then be important influences for product innovation, having then TQM culture indirect influence on this type of innovation. Those findings provide implications for both management and government policies, as managers should invest in TQM resources to promote strategic product innovation and government policies in less advantaged regions should support TQM in order to achieve innovation.

Abrunhosa and Sá (2008) consider that, in order to fully understand the relationship between TQM and innovation, it is important to study the theme within a single industry, since both TQM and innovation represent cumulative processes, and specifically innovation depends on various factors and because of that, it is easier to understand in the context of a single industry. The authors' research focused specifically on the effects that "soft" TQM practices (autonomy, communication, consultation, flexibility and supportive people management) have on technological innovation developed in the Portuguese footwear industry because this is a mature industry in the country, being innovation very important in order to gain competitive advantage. The obtained results reveal fragilities first of all in terms of quality management practices' implementation itself, being TQM initiatives still scarce, specifically regarding "soft" practices. For instance, there are little training in quality, the practices are informal, and quality is related mostly with errors detection. In addition, Portuguese firms in the research scope were also not very innovative. Regarding "soft" quality management practices and innovation relationship, the authors were able to conclude that, from all the previously referred practices, communication, teamwork and supportive people management were the practices that contribute positively for the stated relationship. However, the authors highlight that based on the fieldwork conducted with the firms in the footwear industry that they believe that the level of TQM implementation influences the innovation process higher levels of the first will increase innovation. In fact, TQM principles can be important enablers of innovations' implementation.

Schniederjans and Schniederjans (2015) presented a research which divides the quality into social and technical quality management, combining the two quality concepts with innovation, taking into account contingency factors such as organization size, task and managerial ethics.

While social quality management practices are social/behavioural practices, technical quality management relates to mechanical methods. For instance, quality training, cross-functional cooperation and long-term supply chain relationships are practices which are included in the first dimension. On the other hand, just-in-time and design for manufacturability are practices which are included in the second dimension, focusing on controlling processes and products making sure established requirement are fulfilled (Schniederjans and Schniederjans, 2015).

According with the authors most studies fail to understand the potential contingency factors, being this a reason why the literature is not conclusive regarding whether there is a positive or negative linkage between quality and innovation. Schniederjans and Schniederjans (2015) developed their research assuming the structural contingency theory that states the firm must align its contingencies with external and internal environment factors. Organization size, organizational task and managerial ethical evaluation are the factors that may influence a positive or negative relationship between quality and innovation. The first concept relates with organization dimension in terms of number of employees. Organizational task refers to task uncertainty and interdependence, being the first related to lack of information and the second individuals' perception regarding their tasks dependence. The last concept, managerial ethical evaluation, depends on teleological evaluation, which depends on perceiving consequences of different alternative for stakeholders, and on deontological evaluation, which is the process of comparing alternatives regarding perceived moral obligations (Schniederjans and Schniederjans, 2015). Managers should understand which contingencies they are facing concerning the mentioned dimensions (organizational size, organizational task and managerial ethical evaluation) so that they are able of using the best processes and practices given the situation and consequently improve innovation performance.

Schniederjans and Schniederjans (2015) state that social quality management can improve product innovation through (1) quality training, which improves teamwork, decreasing errors and increasing job satisfaction, (2) cross-functional cooperation, which improves communication and thus creative thinking, and (3) long-term supplier relationships, which leads to greater transparency in information sharing, diminishing product development time and allowing them more time to be spent on developing product innovation. In addition, it can also positively influence process innovation through quality training, cross-functional cooperation and long-term supply relationships. Moreover, administrative innovation may also benefit from social quality management, once again, through quality training, cross functional cooperation

and long-term supply relationships, which allow the development of teamwork, creative thinking, ideas sharing and focus on strategic technology development.

The authors based their empiric research in the previous assumptions through a study within the manufacturing industry, reaching the conclusion that social quality management practices have a positive relationship with innovation. On the other hand, the results did not provide the same evidence regarding technical quality management. However, they were able to conclude that technical and social quality management practices do have a reciprocal relationship and so, innovation can benefit indirectly from technical quality management practices. In respect of the contingencies in the scope of the research, organization size, task and managerial ethics evaluation, the results supported that organizational size and managerial ethical evaluation moderate the positive relationship between technical quality management practices and innovation while organizational size, task and managerial ethical evaluation do not moderate the previously referred relationship neither organizational task do so regarding technical quality management practices.

Recently, Raja and Wei (2015) made an extensive literature review focused on the relationship between quality and innovation performance in different industries, reaching both positive and negative findings regarding that relationship. Regarding arguments which lead to believe that a positive relationship between quality and innovation exists, six findings are mentioned related with autonomy, information sharing, cross-functional teams, leadership, continuous improvement and customer focus. First, whenever employees are given autonomy to follow their own judgement, organizations take benefit from it because it develops creativity and innovation potential. Alternatively, information sharing contributes for the generation of new ideas, leading consequently to the development of new products and services. Cross-functional teams are also important tools in order to develop creativity and innovation potential. Leadership which focus on innovation and rewards the development of new ways of delivering products and services is also another aspect which brings quality and innovation closer. Additionally, a continuous improvement mentality will support incremental innovations. Finally, customer focus and the importance of fulfilling or even exceeding customer needs will develop a necessity to innovate and to offer new products or services that can fully satisfy the customer.

In contrast, they summarize four findings which support a negative relation between quality and innovation. Those negative findings are related with customer focus, continuous

improvement, quality controls and teamwork. Concerning customer focus, it can be argued that too much attention to fulfil customers' needs can make firms to miss opportunities by being too focused only on customers' demand. Consequently, new products and services are not developed because opportunities besides the ones that customers' demand provides are not seen. Continuous improvement can be harmful for radical innovation, paying too much attention to the improvement of existing processes, products and services. Moreover, quality controls, by focus on efficiency, also affect negatively radical innovation. Finally, teamwork can damage individual creativity, which leads to a decline of individual innovative performance. Additionally, the authors point that positive results will only happen if management is able of selecting the best TQM practices according with internal and external environmental conditions (Raja *et al*., 2015).

Feng *et al.* (2016) through an empirical research of Chinese companies conclude that quality management infrastructure (top management commitment, employee involvement and customer focus) and core (continuous improvement, process flow management and supplier relationships) practices influences positively innovation performance.

> "*Given that QM infrastructure practices prioritize key practices, such as top management commitment, customer focus, and employee involvement, which would help to cultivate a pro-innovation working environment, innovations are thus more likely to occur. This is because, working under such condition, individuals are motivated and gain the desire to innovate their working methods. This also enhances their recognition for innovation and mobilizes firms' innovation performance. Moreover, continuous improvement also encourages creative minds and learning, and is beneficial in that it allows repeated processes to gain opportunities for improvement on an incremental basis. All of these will have effect on innovation performance* (Feng *et. al*, 2016:300)".

Contingencies such as market environment were also under the scope of the study and the results suggested that in an highly uncertain market, mature quality management infrastructure practices contributes for enhanced product innovation performance. Regarding core practices, innovation performance benefits more from it in the cases where the market is stable and as turbulence rises core practices' benefits for innovation decrease.

A table which summarizes all the previous provided arguments regarding quality and innovation relationship is provided bellow.

Quality and innovation relationship - Literature review summary			
Authors	**Year**	**Study/Research focus**	**Conclusions**
Martínez-Costa, M., Martínez-Lorente, A.	2008	The empirical study conducted among Spanish companies in order to understand the relationship between quality and innovation.	The study provides evidence on a positive link between TQM and innovation, being TQM a good platform for innovation to arise. Additionally, the two concepts together also enhance the performance of the company.
Abrunhosa, A., Sá, P. M.	2009	The authors' research focused on the effects that "soft" TQM practices have on technological innovation developed in the Portuguese footwear industry.	Communication, teamwork and supportive people management practices contribute positively for the relationship between quality and innovation.
Kim, D., Kumar, V., Kumar, U.	2012	The study focus on the relationship between quality management practices and five types of innovation - radical product, radical process, incremental product, incremental process and administrative innovation.	Establishing and improving QM practices is positively related with both innovative products and processes, both in existing and new markets. The value of one QM practice is linked with other QM practices, so it may be valuable to use more than one.
Honarpour, A., Jusoh, A., Nor, K. M.	2012	Research on the relationship between TQM and Knowledge Management and also between each of those concepts and innovation.	The results suggested that TQM has a positive relationship with innovation, as well as KM has, and in addition there is a reciprocal relationship between TQM and KM.

Abbas, A., Yahiya, A.	2014	The research addressed the elationship between TQM and performance and TQM and innovation.	Customer focus and process management are important practices in the relationship between TQM and innovation.
Fernandes, A., Lourenço, L., Silva, M.	2014	The research focused on understanding which was the impact of leadership, costumer focus, involvement and development of people, management by processes, continuous improvement, relations with suppliers, measuring results and product design on innovation outputs such as research, development and technological innovation, product innovation, process innovation, organizational innovation, management innovation and marketing innovation.	All TQM's dimensions, except involvement and development of people have impact on the innovation performance of organizations, however that impact on is positive on some innovation outputs and negative on others.
Gomes, P., Lages, L., Pereira, Z., Silva, G.	2014	Research on the effect that resources developed through TQM's implementation may have on strategic product innovation, under a resource-based theory approach.	Results provide evidence that design quality is an important capability in order to develop product innovation. In addition, TQM culture is directly relevant for process improvement and product design capabilities.
Leavengood, S., Anderson, T., Daim, T.	2014	The study focus on the linkage between quality management and innovation.	Quality-oriented firms choose not to pursue innovation, focus on meeting present needs. In order to achieve both quality

			and innovation management should change how innovation is understood and adapt the organization culture.
Schniederjans, D., Schniederjans, M.	2015	The research divides quality into social and technical quality management, combining the two quality concepts with innovation, taking into account contingency factors such as organization size, task and managerial ethics.	Social quality management can improve product and administrative innovation through quality training and long-term supplier relationships. In addition, technical and social quality management practices have a reciprocal relationship and so, innovation can benefit indirectly from technical quality management practices.
Feng, X., Xiang, X., Zhang, Q.	2016	Empirical research of Chinese companies on how quality management infrastructure and core practices influences innovation performance.	Results suggest that both quality management infrastructure and core practices influence positively innovation performance.

Table 15 - Quality and innovation relationship - Literature review summary. Source. Own elaboration.

3. Empirical Research

3.1. Methodology

The empirical research in the dissertation was conducted using a survey. Couper *et al.* (2004) propose a process perspective of a survey that was taking into account in order to conduct a consistent survey and is represented in figure 20 bellow.

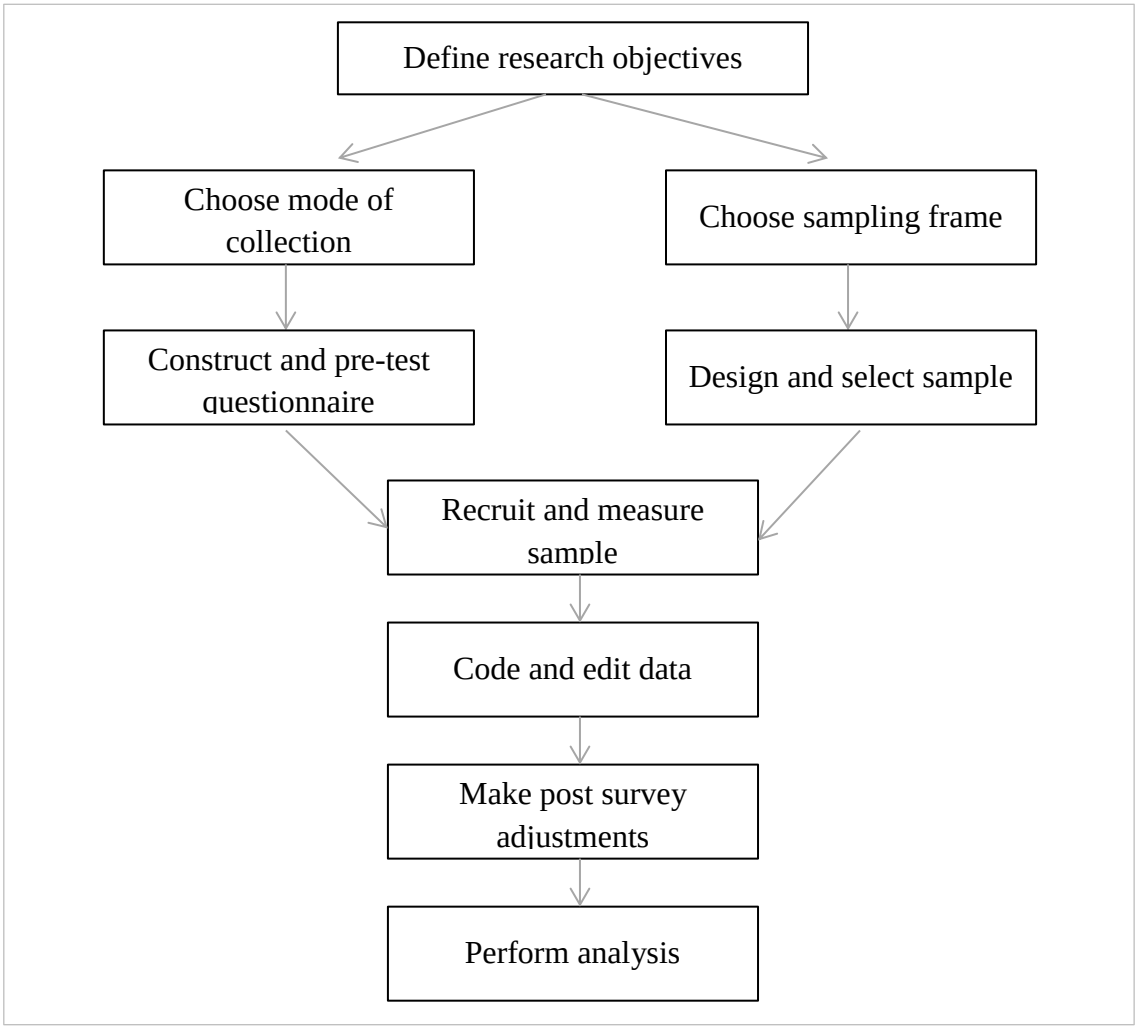

Figure 20 – A survey from a process perspective. Source: Couper, M. P., Fowler, Jr., F. J., Groves, R. M., Lepkowski, J. M., Singer, E., Tourangean, R. 2004. ***Survey methodology***. New Jersey: John Wiley & Sons, Inc.

Defining the research objectives is the first step, being then followed by decisions related generically with collection mode, questionnaire construction, sample and adjustments. The methodology was structured so that it was able to meet the steps provided in the process

described in figure 20. The research objectives, type of questionnaire, the way it was constructed, the population and sample definition and all the methodology justifications will then be explain in the following points.

Research Objectives

The objective of the survey is to understand empirically which the contribution of TQM practices for innovation is. In order to do so, it is important to understand the perceptions of firms regarding the contribution of TQM practices they use for their innovative processes.

Having in mind all the characteristics of quality management presented in the literature review as well as specifically the research framework of Fallahnejad *et al.* (2015) presented in figure 19, the following framework representation in figure 21 was constructed, going further in the specification of the practices and focusing only on their relationship with innovation. The research focused, as mentioned, in gathering the perceptions of firms regarding null, positive or negative effects of TQM practices in their innovative processes.

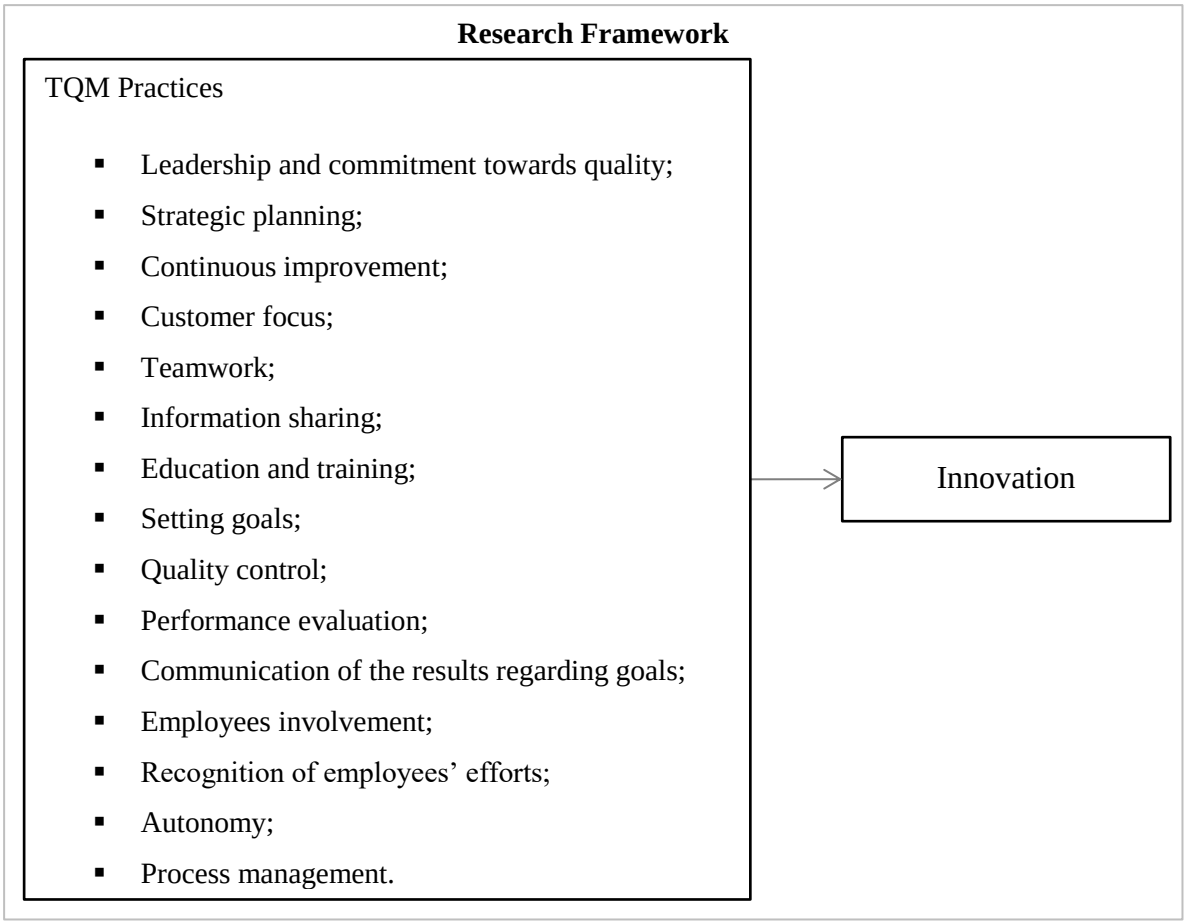

Figure 21 - Research framework. Source: Own elaboration.

The questionnaire

The mode of collection is through a questionnaire, which objective is gathering data and providing an empirical view of the theme, bearing in mind the research objective. The research was developed using a self-completion questionnaire, which was distributed online, through e-mail. As the name suggests, in this type of questionnaire the respondents answer the questions themselves. Self-completion questionnaire has advantages related mostly with convenience and time and costs limitations. For instance, Bryman (2012) refers advantages such as being cheaper to administer, being quicker too, the absence of interviewer effects, the inexistence of interviewer variability and convenience for respondents. Those were reasons that help selecting specifically this type of questionnaire.

Regarding the structure of the questionnaire, most of self-completion questionnaires are mainly composed by closed questions, have clear design in order to minimize omitting a question and are short (Bryman, 2012). Concerning specifically the advantages of closed questions, Bryman (2012) refers five. First, it is easier to process the answers when compared with open questions, being less time consuming in what concerns coding and editing data. Thus, it is also easier to compare answers. The availability of answers in a closed question (multiple choices, for example) may help clarifying the meaning of the question, minimizing non-response errors. Moreover, they are easier and quicker to complete than open questions. Finally, this type of question reduces the variability in recording the answers.

There were some advices regarding questions' design specified by Bryman (2012) which were also taken into account when developing the questionnaire. Long questions, questions which ask two different things, very general questions, leading questions and questions that include negatives and technical terms should be avoid. Concerning response rate, Bryman (2012) provides some steps in order to improve it. Some of those advices were taken into account when developing the questionnaire of this research. For instance, it is important to make clear the relevance of the questionnaire and the research. Individuals who do not respond should be reminded of do so. Questionnaires, which are shorter, are likely to have greater response rates. Clear instructs and few open questions can also be important to increase that rate.

All the previously mentioned advantages and advices lead to the creation of a short questionnaire, mainly composed by closed questions.

Population and sampling

A population is a group of elements with similar characteristics among them (Andrade *et al.*, 2008). The identification of the target population, which is composed by all the elements whose information is relevant for the research, is essential (Andrade *et al.*, 2008).

The target population of the research is composed by firms, located in Lisbon, which are certified by ISO 9001 (Quality Management Systems). According with the database of certified companies IPAC (Instituto Português de Acreditação), there are currently 1337 firms located in Lisbon, from different industries, which are certified with ISO 9001.

In the process of constructing a sample, the identification of the target population is followed by two other equally important steps – selection mode of the sample and sample dimension (Andrade *et al.*, 2008). A sample is a sub-group of the population (Andrade *et al.*, 2008). The sampling methods can be divided in two general groups: random sampling methods and determined sampling methods (Andrade *et al.*, 2008). The existing methods which belong in the first group, random sampling methods, have advantages such as the possibility of demonstrating the representability of the sample, the measurement of the uncertainty level and the identification of bias (Andrade *et al.*, 2008). Despite the mentioned advantages of a random sampling method, that type of method is costly and time consuming and did not meet the time and costs limitations of this specific research. In this research, the sampling method used is included in the determined sampling methods group and is a sample by convenience. In this method, the sample is selected taking into account the availability of the elements of the target population (Andrade *et al.*, 2008).

> "*Given the difficulty and the high costs of the realization of a process of random sampling, in many situations the convenience sampling becomes particularly attractive and, although we cannot speak in representability, it is often possible to avoid systemic bias* (Andrade *et al.*, 2008:39)".

Having the list of the 1337 firms by which the population was composed, I selected the ones which I believed were more likely to respond.

3.2. Results

There were sent 248 questionnaires (Appendix 1) through e-mail, for 248 firms with ISO 9001 quality management certification, and there were received 28 responses, meaning this a rate of response of around 11%. The e-mails were sent for the e-mail made available in the firms' website; most of times it was a general e-mail, but sometimes it was possible to send the e-mail for the quality department directly. In the cases were it was only given access to the general e-mail, it was especially asked that the questionnaire was re-directed and answered for someone in the quality department.

Sample Characterization

As already mentioned, twenty-eight answers were obtained through the questionnaire (Appendix 1). Mostly the responses came from medium size companies (figure 22) of "Other service activities" and "Consulting, scientific, technical and similar activities", followed closed by "Transforming industries" and "Wholesale and retail trade; repair of motor vehicles and motorcycles" (figure 23), which predominantly obtained ISO 9001 certification ten or more years ago (figure 24).

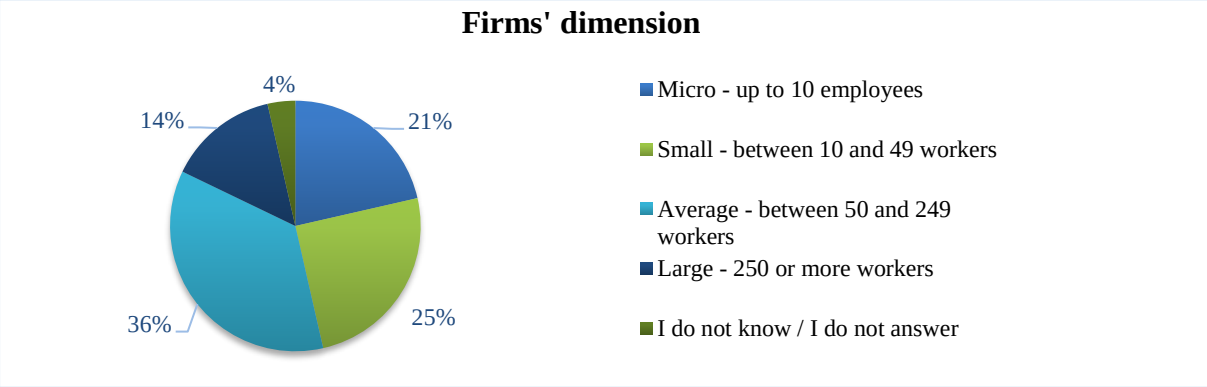

Figure 22 - Firms' dimension. Source: Own elaboration.

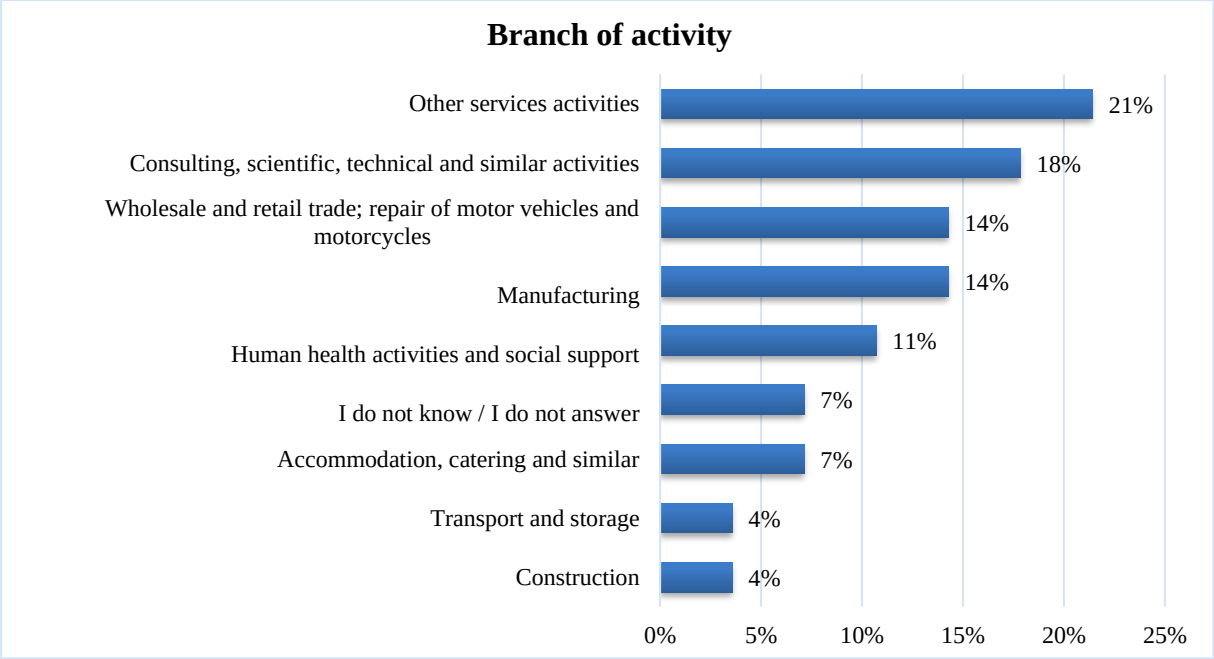

Figure 23 - Branch of activity. Source: Own elaboration.

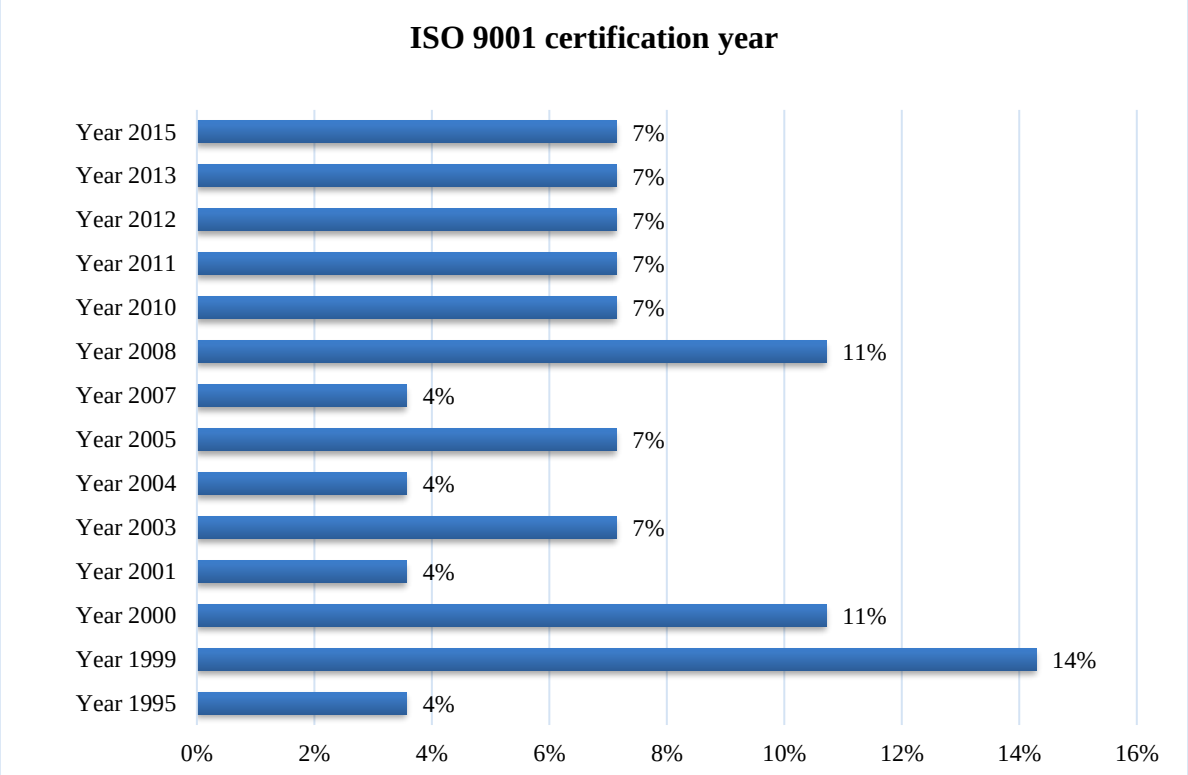

Figure 24 - ISO 9001 certification year. Source: Own elaboration.

Analysis of the Responses

From 15 quality management practices, the firms were asked to select in the maximum 3 of them which they considered to be especially important for the firm's success.

The top 3 activities mentioned by respondents as the practices they considered especially important for the company's success were continuous improvement, leadership and quality commitment and customer focus, having these practices received 20%, 18% and 17% of responses, respectively, as can be observed in the graph bellow. From the other 12 practices, strategic planning (7%), establishment of objectives (6%), teamwork (6%), process management (5%), involvement of all workers (5%), quality control (5%), communication of results achieved in relation to established objectives (4%), performance evaluation (4%), education and training (4%), and recognition of the commitment of workers (1%) were also practices selected by the respondents. This leaves behind two practices that were not mentioned, such as, autonomy and employee involvement.

Figure 25 - Quality management practices especially important for firm's success. Source: Own elaboration.

From the 28 respondents, 14% develop innovation activities (figure 26), such as development of new products and services and process innovation, which all of the innovative firms believe to be important or very important. As so, the three types of innovation more commonly developed among respondents are process innovation, service innovation and product innovation, mostly incremental innovation regarding novelty degree.

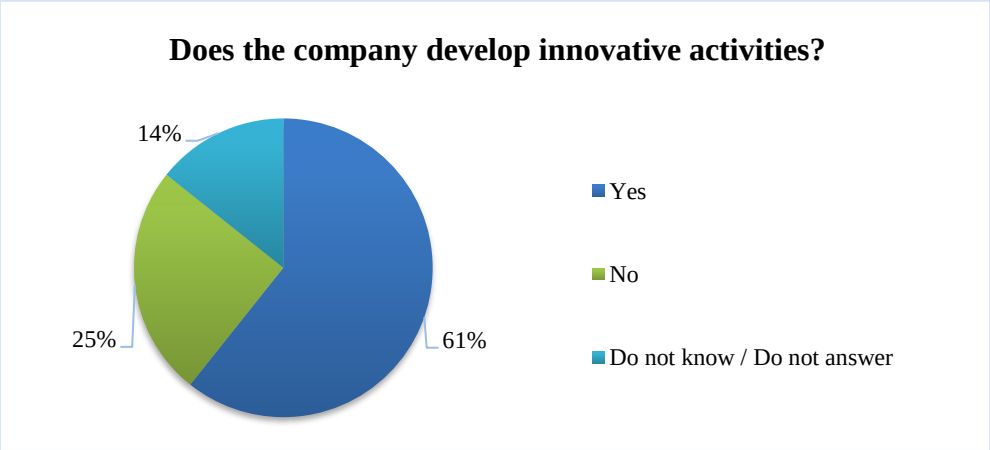

Figure 26 - Does the company develop innovative activities? Source: Own elaboration.

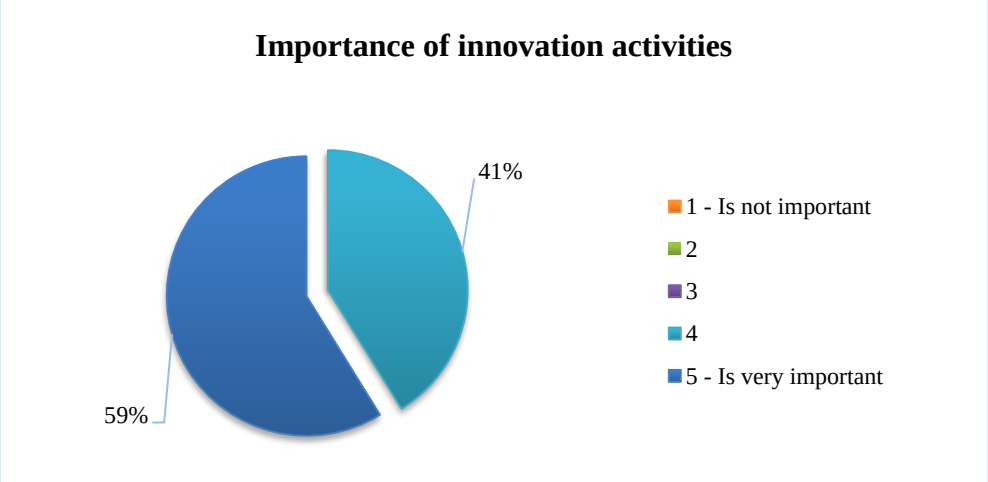

Figure 27 - Importance of innovation activities for the firm. Source: Own elaboration.

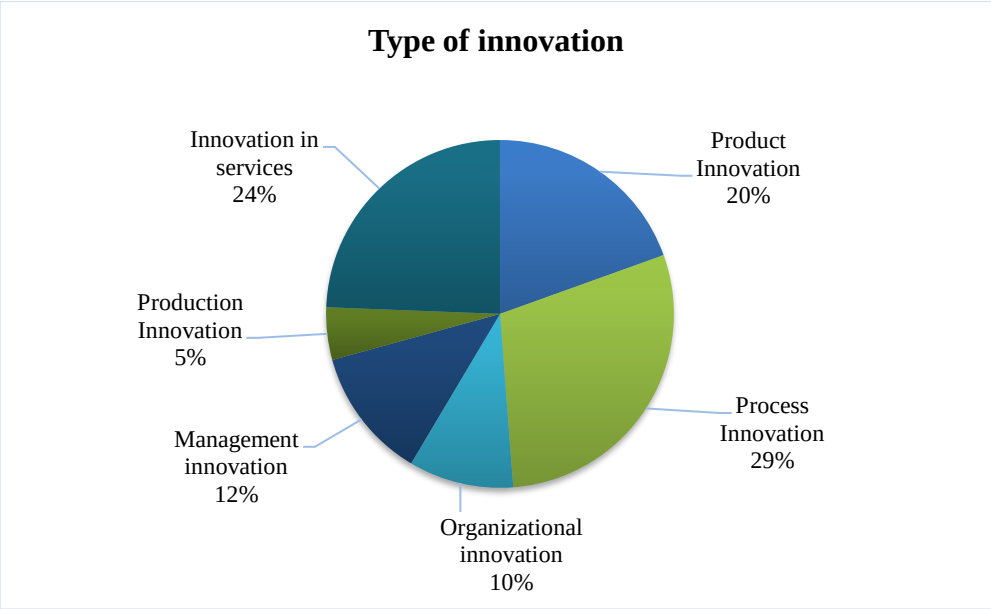

Figure 28 - Type of innovation. Source: Own elaboration.

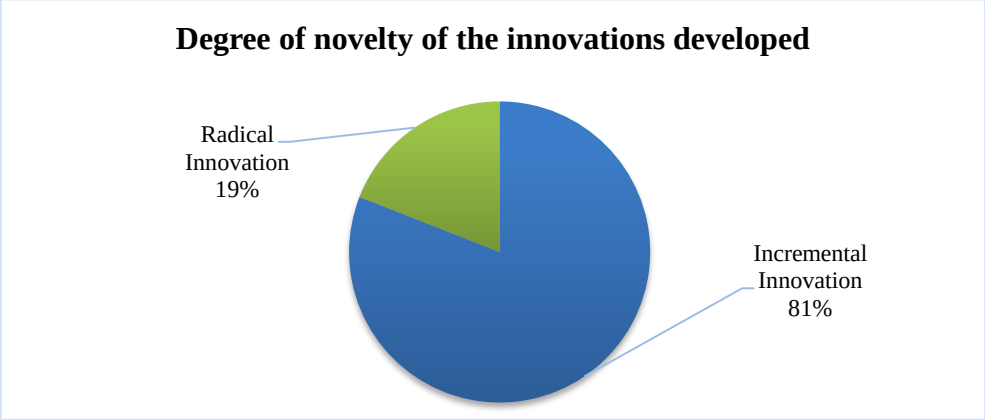

Figure 29 - Degree of novelty of the innovations developed. Source: Own elaboration.

The 17 firms that developed innovative processes where asked to selected a maximum of three practices, from the 15 available, that they believed had a positive impact on their innovative performance. The top 3 of practices that companies believe to have a positive impact on innovative performance are similar to the ones referred on the top 3 of quality practices they believe were especially important for the firm's success, presented on figure 25. Continuous improvement (17% of responses), leadership and quality commitment (14% of responses) and customer focus (11% of responses), as can be observed in figure 30. The other practices selected are also similar to the ones in the already referred figure 25, being the difference that the two

practices that were not referred here are autonomy, that was not previously selected too, and performance evaluation, which had been chosen before.

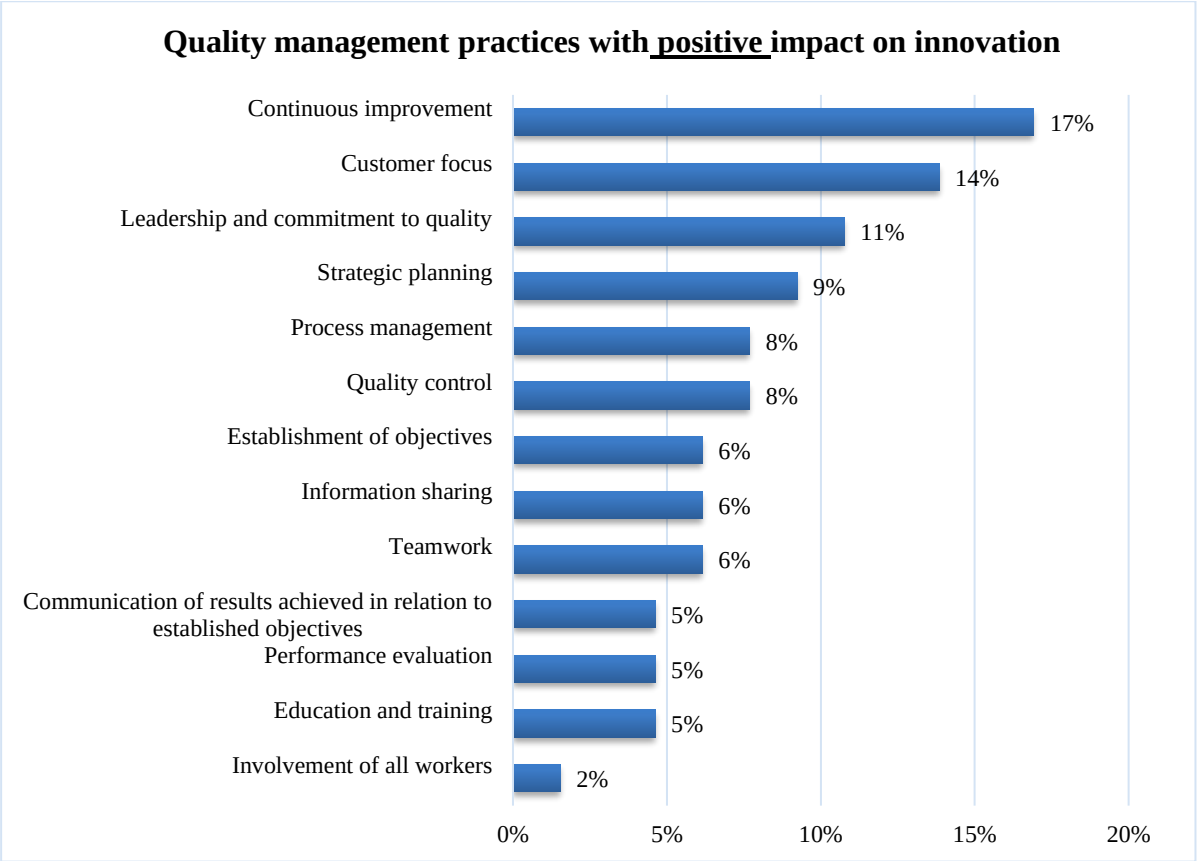

Figure 30 - Quality practices with positive impact on innovation. Source: Own elaboration.

On the other hand, when identifying the practices that are perceived has having negative impact, "none" was the most common response, with 49% of responses. Autonomy was the following practice identified as negative to the innovative processes (15%), but before that, 20% answered "Do not know/ Do not answer". Quality control, process management and performance evaluation were the only other practices that firms perceived as negative.

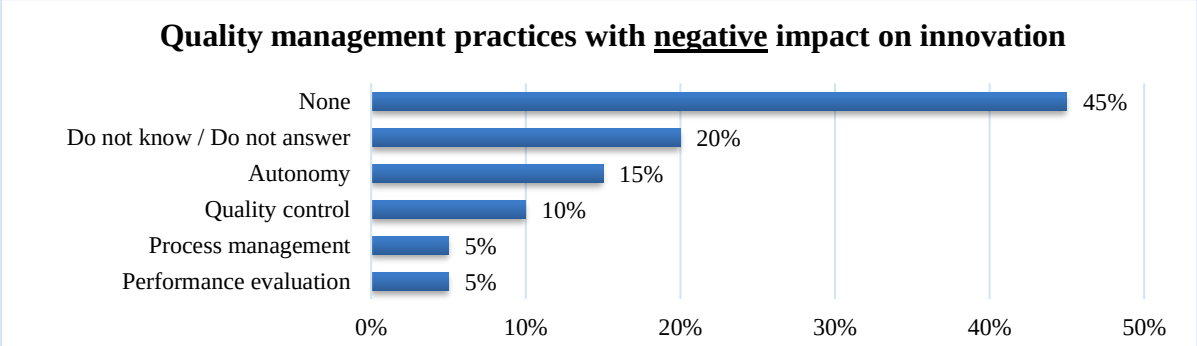

Figure 31 - Quality management practices with negative impact on innovation. Source: Own elaboration.

4. Conclusion

The objective of this dissertation was to analyse the relationship between quality management practices and innovation, and understand the contribution that those practices can have regarding innovation.

Through the conducted literature review, it was possible to understand that there is not a clear answer as whether quality management provides a positive impact on innovative performance or a negative one, but all of the studies suggest that there is in fact a relationship, even though that relationship is not the same in all of the views. Social quality management practices are the type of practices that are more commonly pointed as beneficial for the innovative processes. However, a generic recipe that management can apply so that it can take advantage of quality management practices as a vehicle for innovation does not exist. The benefits that may arise will depend on the level of Total Quality Management implementation and also on the industry specifications, as for instance Abrunhosa and Sá (2009) referred and was pointed on the literature review.

The results obtained through the questionnaire distributed by companies with ISO 9001 certification suggested that firms also perceive social quality management practices as especially relevant regarding both performance in general and specifically regarding positive effects on innovative performance, mentioning practices such as continuous improvement, leadership, commitment with quality and customer focus. It is similar to findings in studies focused in the literature review, such as practices Schniederjans and Schniederjans (2015) for instance, which research suggested that social quality practices are important for product and administrative innovation.

Although limitations such as low rate of response and impossibility of data extrapolation, the results are helpful in the way they show firms' perception on quality management practices' importance in order to innovate, suggesting also that firms may be aware that rather than competing, quality and innovation can be achieved together. Future research should focus more specifically in single industries as to determine specific impacts of quality management on specific types of innovation, so that management can use that information and take more benefit from quality practices.

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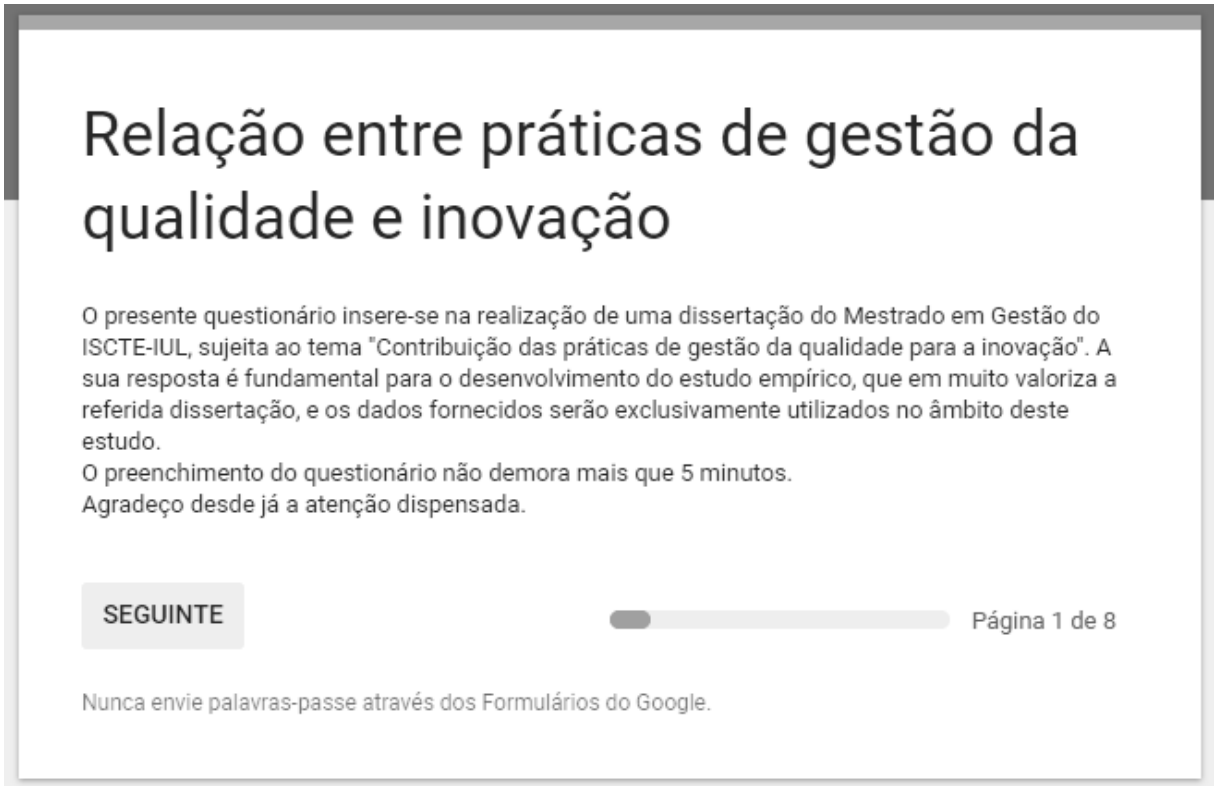
Appendices

Appendix 1 - Questionnaire



Relação entre práticas de gestão da qualidade e inovação

O presente questionário insere-se na realização de uma dissertação do Mestrado em Gestão do ISCTE-IUL, sujeita ao tema "Contribuição das práticas de gestão da qualidade para a inovação". A sua resposta é fundamental para o desenvolvimento do estudo empírico, que em muito valoriza a referida dissertação, e os dados fornecidos serão exclusivamente utilizados no âmbito deste estudo.
O preenchimento do questionário não demora mais que 5 minutos.
Agradeço desde já a atenção dispensada.

SEGUINTE

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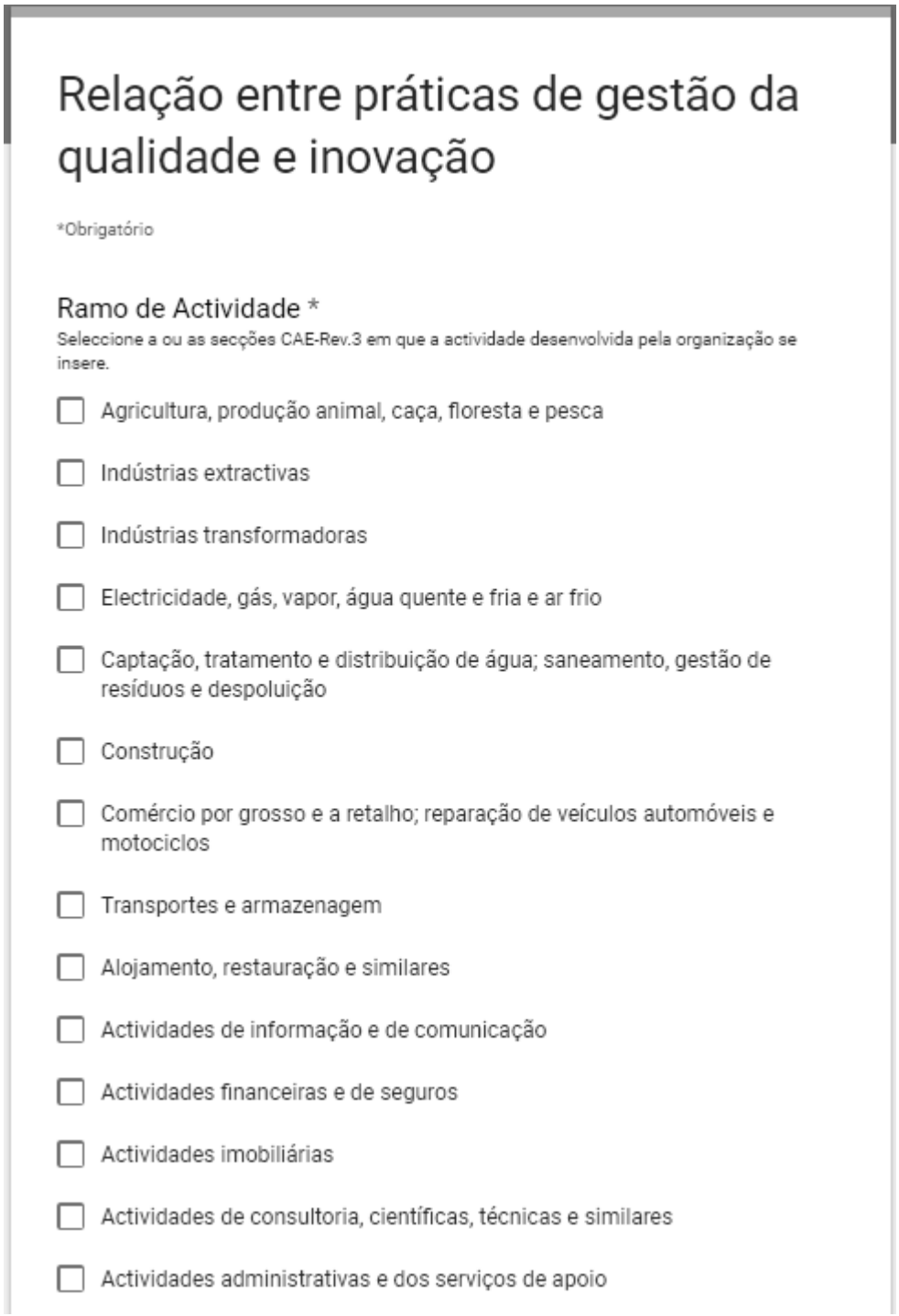


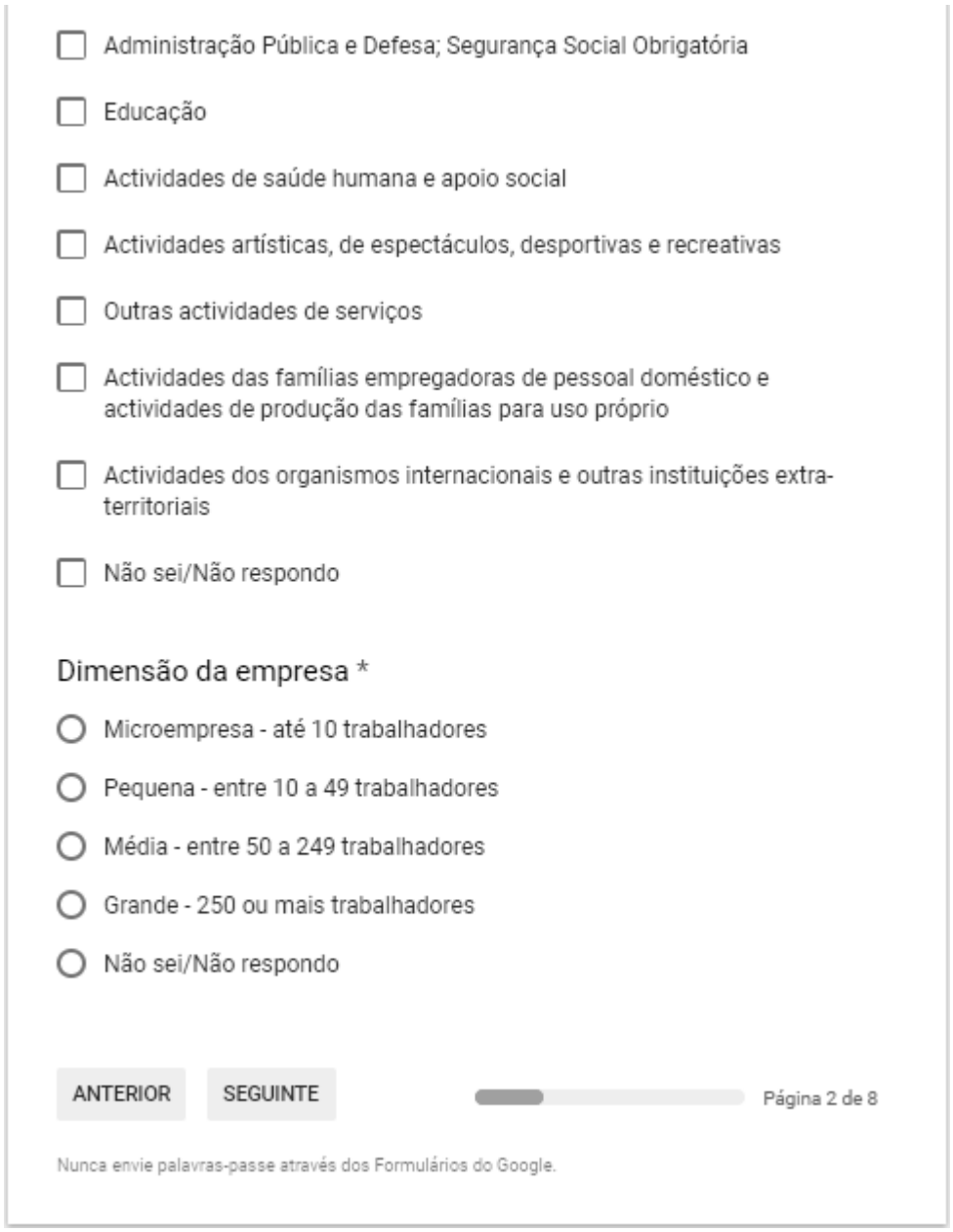
Relação entre práticas de gestão da qualidade e inovação

*Obrigatório

Ramo de Actividade *

Seleccione a ou as secções CAE-Rev.3 em que a actividade desenvolvida pela organização se insere.

- [ ] Agricultura, produção animal, caça, floresta e pesca
- [ ] Indústrias extractivas
- [ ] Indústrias transformadoras
- [ ] Electricidade, gás, vapor, água quente e fria e ar frio
- [ ] Captação, tratamento e distribuição de água; saneamento, gestão de resíduos e despoluição
- [ ] Construção
- [ ] Comércio por grosso e a retalho; reparação de veículos automóveis e motociclos
- [ ] Transportes e armazenagem
- [ ] Alojamento, restauração e similares
- [ ] Actividades de informação e de comunicação
- [ ] Actividades financeiras e de seguros
- [ ] Actividades imobiliárias
- [ ] Actividades de consultoria, científicas, técnicas e similares
- [ ] Actividades administrativas e dos serviços de apoio



- [ ] Administração Pública e Defesa; Segurança Social Obrigatória
- [ ] Educação
- [ ] Actividades de saúde humana e apoio social
- [ ] Actividades artísticas, de espectáculos, desportivas e recreativas
- [ ] Outras actividades de serviços
- [ ] Actividades das famílias empregadoras de pessoal doméstico e actividades de produção das famílias para uso próprio
- [ ] Actividades dos organismos internacionais e outras instituições extra-territoriais
- [ ] Não sei/Não respondo

Dimensão da empresa *

- ○ Microempresa - até 10 trabalhadores
- ○ Pequena - entre 10 a 49 trabalhadores
- ○ Média - entre 50 a 249 trabalhadores
- ○ Grande - 250 ou mais trabalhadores
- ○ Não sei/Não respondo

ANTERIOR SEGUINTE Página 2 de 8

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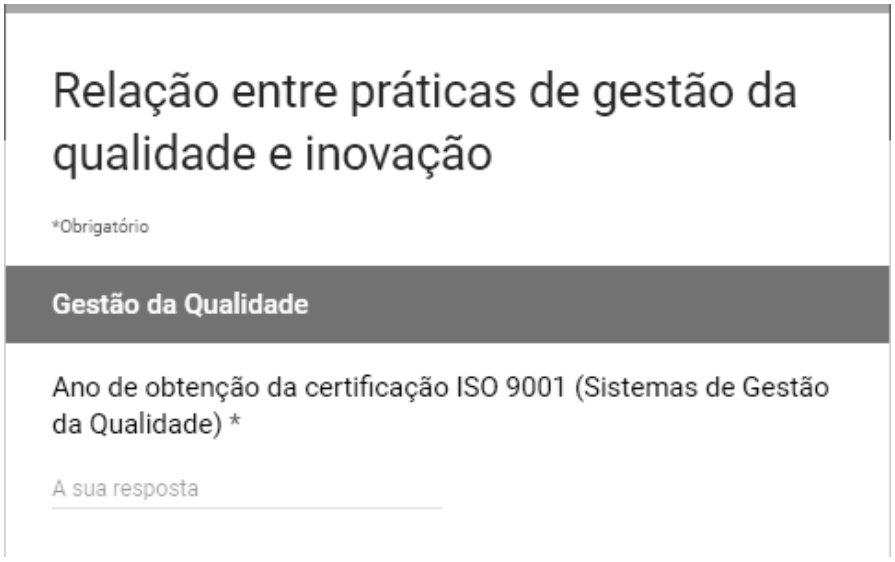


Relação entre práticas de gestão da qualidade e inovação

*Obrigatório

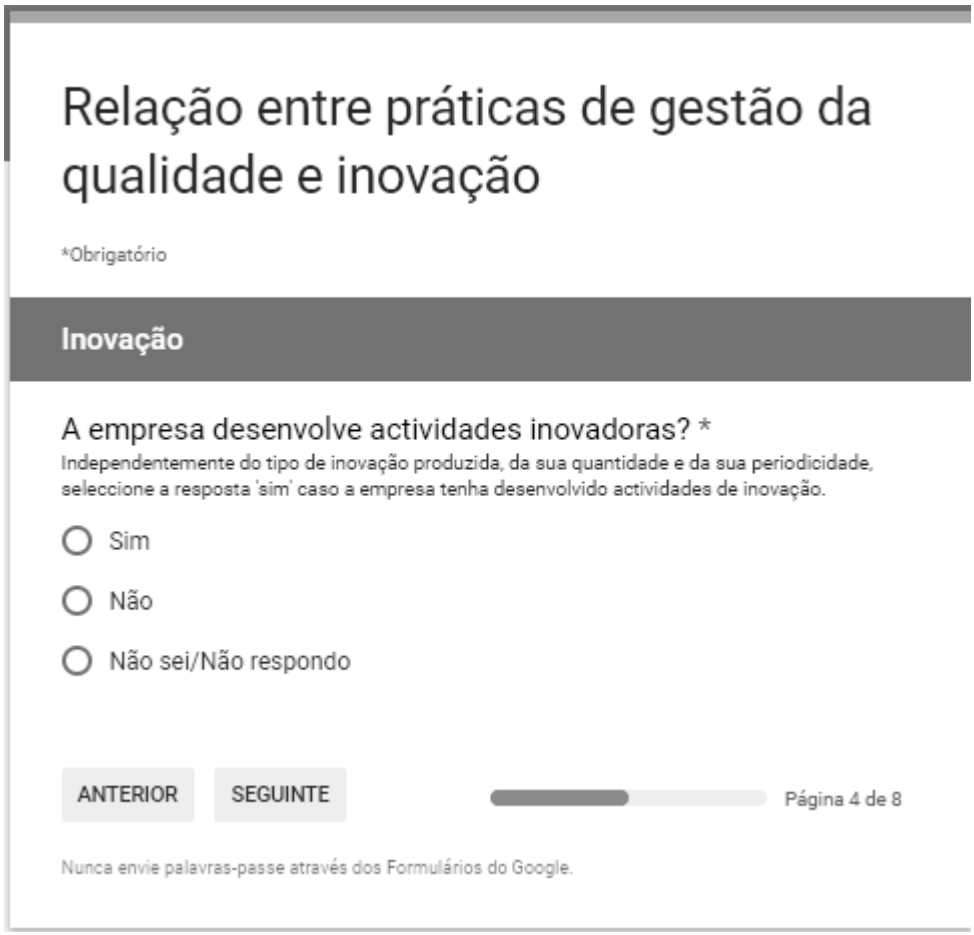
Gestão da Qualidade

Ano de obtenção da certificação ISO 9001 (Sistemas de Gestão da Qualidade) *

A sua resposta

Das seguintes práticas de gestão da qualidade seleccione no máximo três que a empresa utiliza e considera particularmente importantes para o seu sucesso. *

- [ ] Liderança e compromisso com a qualidade
- [ ] Planeamento estratégico
- [ ] Melhoria continua
- [ ] Foco no cliente
- [ ] Trabalho em equipa
- [ ] Partilha de informação
- [ ] Educação e formação
- [ ] Estabelecimento de objectivos
- [ ] Controlo da qualidade
- [ ] Avaliação do desempenho
- [ ] Comunicação dos resultados alcançados relativamente a objectivos estabelecidos
- [ ] Envolvimento de todos os trabalhadores
- [ ] Reconhecimento do empenho dos trabalhadores
- [ ] Autonomia
- [ ] Gestão de processos
- [ ] Não sei/Não respondo
- [ ] Nenhuma
- [ ] Não sei/Não respondo
- [ ] Outra: _____



Relação entre práticas de gestão da qualidade e inovação

*Obrigatório

Inovação

A empresa desenvolve actividades inovadoras? *

Independentemente do tipo de inovação produzida, da sua quantidade e da sua periodicidade, seleccione a resposta 'sim' caso a empresa tenha desenvolvido actividades de inovação.

- Sim
- Não
- Não sei/Não respondo

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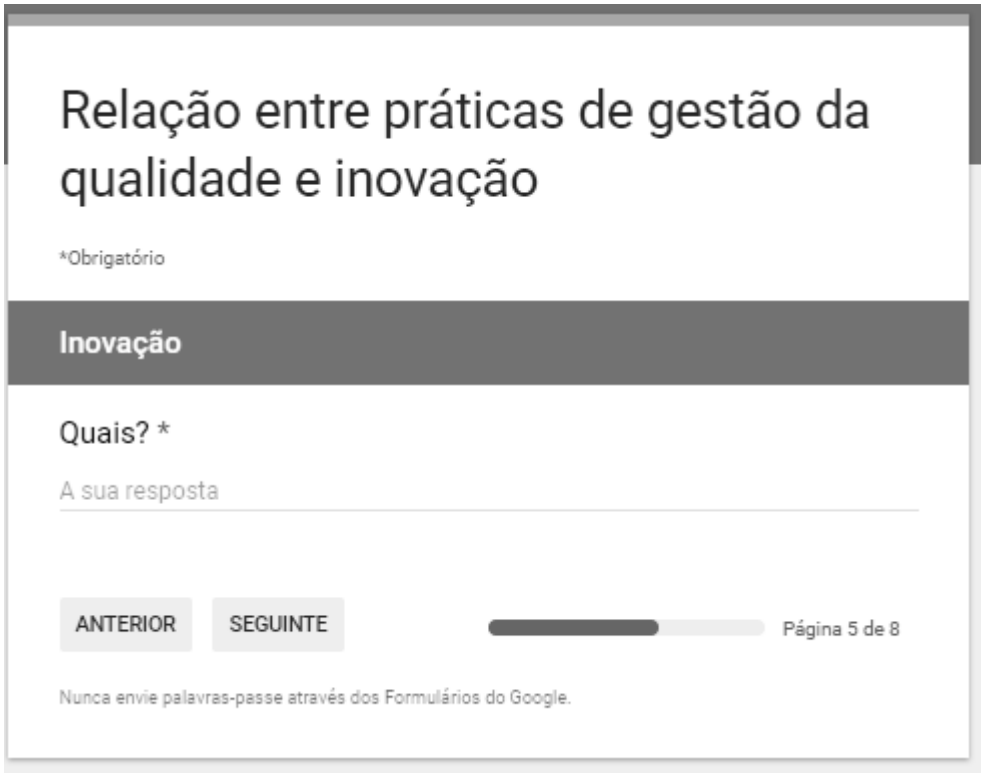

Relação entre práticas de gestão da qualidade e inovação

*Obrigatório

Inovação

Quais? *

A sua resposta

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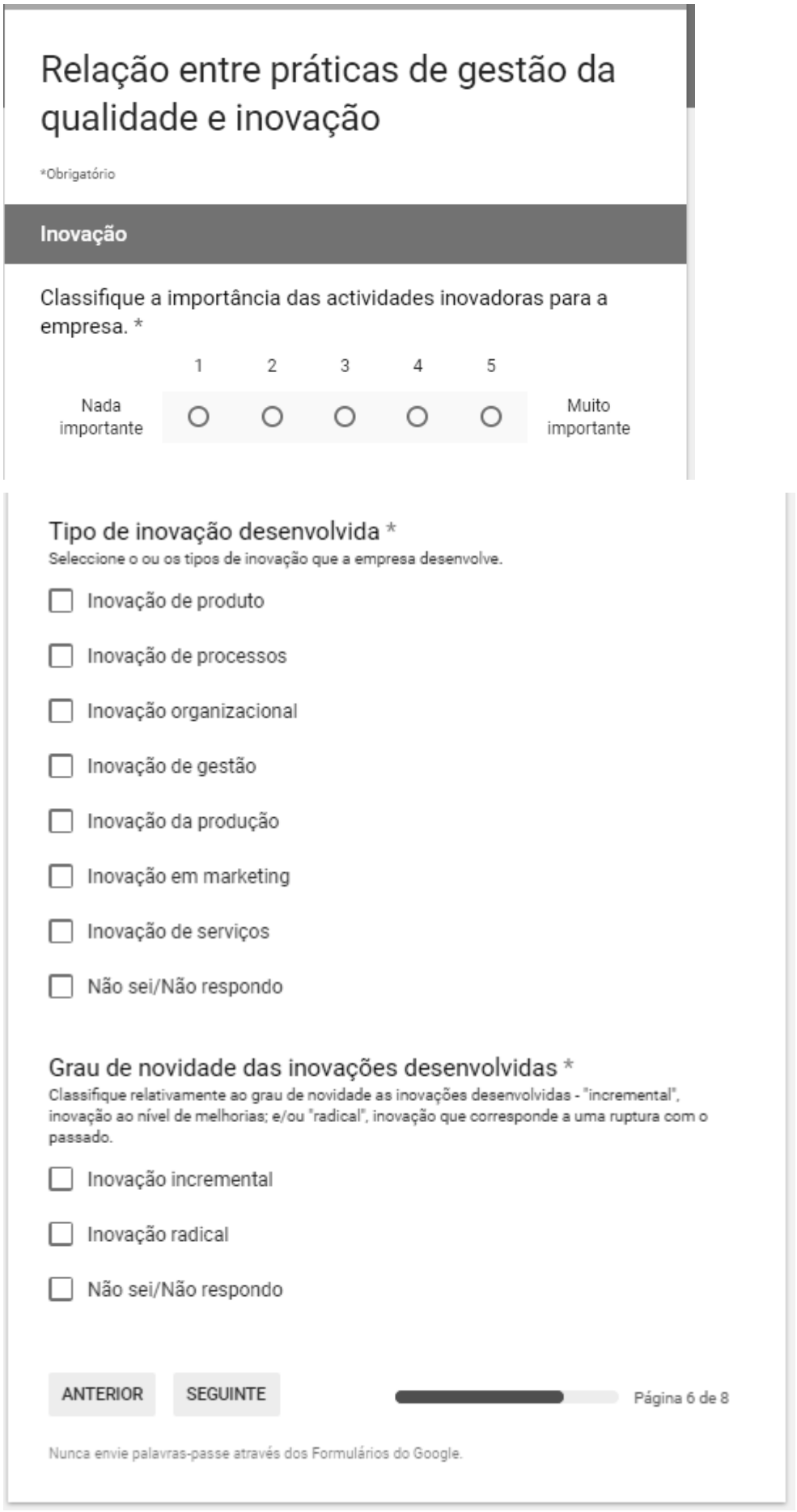

Relação entre práticas de gestão da qualidade e inovação

*Obrigatório

Inovação

Classifique a importância das actividades inovadoras para a empresa. *

	1	2	3	4	5	
Nada importante	○	○	○	○	○	Muito importante

Tipo de inovação desenvolvida *

Seleccione o ou os tipos de inovação que a empresa desenvolve.

- ☐ Inovação de produto
- ☐ Inovação de processos
- ☐ Inovação organizacional
- ☐ Inovação de gestão
- ☐ Inovação da produção
- ☐ Inovação em marketing
- ☐ Inovação de serviços
- ☐ Não sei/Não respondo

Grau de novidade das inovações desenvolvidas *

Classifique relativamente ao grau de novidade as inovações desenvolvidas - "incremental", inovação ao nível de melhorias; e/ou "radical", inovação que corresponde a uma ruptura com o passado.

- ☐ Inovação incremental
- ☐ Inovação radical
- ☐ Não sei/Não respondo

ANTERIOR SEGUINTE Página 6 de 8

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Relação entre práticas de gestão da qualidade e inovação

Das seguintes práticas de gestão da qualidade seleccione aquelas que a empresa utiliza e contribuem positivamente para o processo de inovação. *

- [ ] Liderança e compromisso com a qualidade
- [ ] Planeamento estratégico
- [ ] Melhoria continua
- [ ] Foco no cliente
- [ ] Trabalho em equipa
- [ ] Partilha de informação
- [ ] Educação e formação
- [ ] Estabelecimento de objectivos
- [ ] Controlo da qualidade
- [ ] Avaliação do desempenho
- [ ] Comunicação dos resultados alcançados relativamente a objectivos estabelecidos
- [ ] Envolvimento de todos os trabalhadores
- [ ] Reconhecimento do empenho dos trabalhadores
- [ ] Autonomia
- [ ] Gestão de processos
- [ ] Nenhuma
- [ ] Não sei/Não respondo
- [ ] Outra:

Das seguintes práticas de gestão da qualidade seleccione aquelas que a empresa utiliza e contribuem negativamente para o processo de inovação. *

- [ ] Liderança e compromisso com a qualidade
- [ ] Planeamento estratégico
- [ ] Melhoria continua
- [ ] Foco no cliente
- [ ] Trabalho em equipa
- [ ] Partilha de informação
- [ ] Educação e formação
- [ ] Estabelecimento de objectivos
- [ ] Controlo da qualidade
- [ ] Avaliação do desempenho
- [ ] Comunicação dos resultados alcançados relativamente a objectivos estabelecidos
- [ ] Envolvimento de todos os trabalhadores
- [ ] Reconhecimento do empenho dos trabalhadores
- [ ] Autonomia
- [ ] Gestão de processos
- [ ] Nenhuma
- [ ] Não sei/Não respondo
- [ ] Outra: _____

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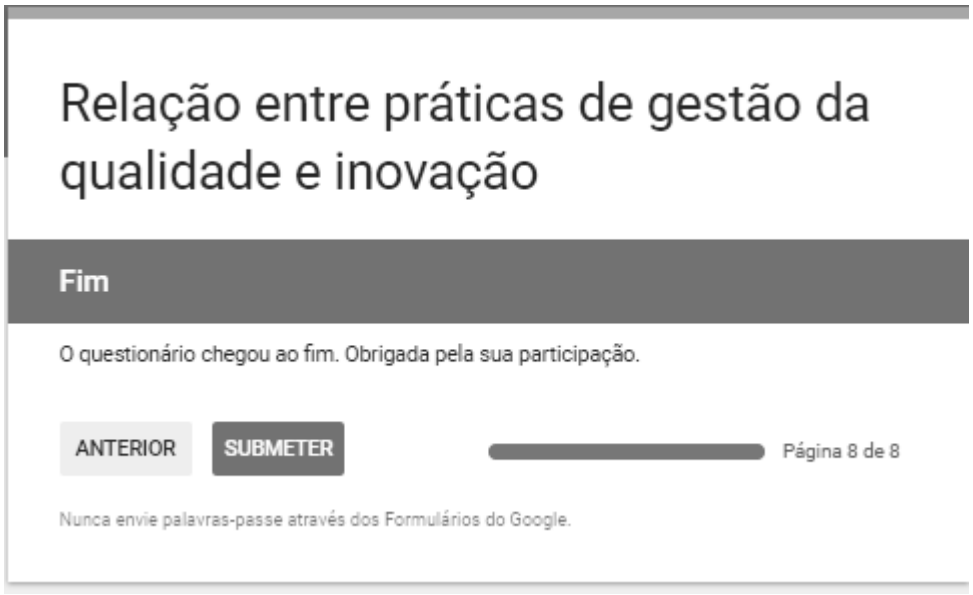
Relação entre práticas de gestão da qualidade e inovação
Fim
O questionário chegou ao fim. Obrigada pela sua participação.
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Página 8 de 8
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