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Research Trends in Quality Management over the years 2010-2011

Master Thesis

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ABSTRACT

In current globalized and highly demanding markets, Quality does not constitute any more a competitive advantage for organizations. Instead, Quality represents a basic market entry requirement for organizations indistinguishable from the country or economic sector they belong to.

Being conscious of the importance of Quality for all type of organizations, the purpose of this thesis is to contribute to the identification and better understanding of current trends in academic research on Quality Management. By analyzing a sample of 612 academic papers collected from five international Quality journals and two QMOD international conferences over 2010 and 2011, the author will study and reflect on the current trends of global academic research related to Quality Management.

Literature review was used as research methodology for the thesis. Academic papers were categorized, classified and analyzed in order to identify current research trends on Quality Management.

This work provides a snapshot of the current research trends on Quality Management. It benefits the educational sector, researchers, industry and practitioners by presenting an overview of the current research needs as well as potential future research topics.

As a result of this study, five main trending research topics on Quality Management were identified: management systems standards, total quality management, service quality, customer related processes *after* delivering product/service and excellence models.

China, India, USA, Sweden and UK were identified as the countries that have published the highest number of academic papers in international Quality journals during the studied period. Additionally, it was found a marked predominance of academic research on Quality Management towards the service sector.

These results and the answer to five proposed research questions were discussed and solved in this report.

Keywords: Quality Management, research trends

Table of Content

1. INTRODUCTION

In the current section a brief introduction is given about the thesis topic. The study problem is described and the research purpose and questions are postulated. Finally the limitations are pointed out.

1.1 Background

From the past two decades globalization on markets has opened consumer's eyes to a remarkable range of products and services that seemed unimaginable before the 80's. The reduction of barriers for international trade has resulted in increasingly companies' efforts to improve their manufacturing and/or service operations in order to provide the best offer to every day more demanding markets.

Globalized markets have shown that to be able to enter and remain in this discerning environment, Quality is a key aspect needed to achieve and sustain a competitive advantage. This has made clear that Quality matters indistinguishable from the country or economic sector the organizations worldwide belong to.

Being conscious of the importance of Quality for all type of organizations, this thesis aims to contribute to a better understanding of ongoing trends in academic research related to Quality Management. Research trends will be studied using the academic papers included within the sample of five international Quality journals and papers accepted for the QMOD (Quality Management and Organizational Development) conference over the two years. The author will look for the trends by examining the published articles both in international Quality journals and QMOD conferences papers.

1.2 Problem statement

Quality is an interdisciplinary field that catches the attention from all industries and economic sectors. Therefore, it is worth to be updated with the latest trending topics.

The assumption of the thesis is that if journal papers are published about certain topics, this is highly related to an existing need or interest in getting a broader knowledge about this specific research aspect. The knowledge about the trending topics on Quality Management benefits the educational sector, researchers, industry and practitioners by giving an overview of current research needs as well as potential future research alternatives.

The value of this study represents also a wider understanding of the worldwide Quality research dynamics. It will not only identify the current Quality Management research trends, but additionally it will provide more punctual information such as: Countries with the highest participation on quality research, economic sectors where research efforts have been taken more assiduously, common research topics and economic sectors within the top 5 countries with the highest participation in Quality Management research…

In addition, the last part of the thesis will present an analysis of the found research trends. The analysis will disclose the existence of a potential gap between what has been taught by the academy and the current trends in Quality topics.

1.3 Purpose and research questions

The purpose of this thesis is to contribute to a better understanding of current trends in academic research on Quality Management worldwide. By analyzing a sample of papers from five international Quality journals and International QMOD conference published during 2010 and 2011, the author will study and reflect on the current trends of global academic research related to Quality Management.

For this purpose the following research question (RQ) will be addressed:

RQ1: What are the current worldwide trends on academic research related to Quality Management over 2010-2011?

RQ2: Which countries have published the highest numbers of academic papers in international journals of Quality Management?

RQ3: Which economic sectors have been researched more intensively in academic papers published in international Quality journals over the past two years?

RQ4: What are the main differences or similarities between the findings from international Quality journals and findings from QMOD conference?

RQ5: Is there any gap between the contents included in the sample of Quality textbooks and the content of the Quality trends found in the sample of international Quality journals?

1.4 Limitations

The first limitation of this study emerges from the time scope, since the study only included sources from years 2010 and 2011. The time limitation applies also for the data collected from QMOD conference, where the same years were considered for collecting data.

The second limitation emerges from the study sample. For this study, the author considered only academic papers published in specialized Quality international journals available in LiU electronic library database. Nevertheless, there is a lot of Quality Management research published in other type of journals as general management journals.

There were Quality journals to which it was not possible to have access; because of this there was an exclusion of American Quality journals and Asiatic Quality journals.

Including the research papers from other journals would be valuable in further studies, but unfortunately out of scope for this thesis work. This limitation can to some extent influence the results presented in this thesis.

2. METHODOLOGY

This chapter describes the methodological approach used in this study, i.e. the literature review. Additionally, since the data used in the study was qualitative and merely collected from secondary sources of information; I will describe the qualitative research methodology.

2.1 Literature review

Generally speaking, literature review is the process of studying what has already been written on a particular subject or subjects. Literature review definition is stated in Cooper (1998).

"Literature reviews typically appear as detailed independent works from secondary data or as brief introductions to reports of new primary data. For instance literature reviews can focus on research on outcomes, research methods, theories, applications, or all these. Literature review can attempt to integrate what others have said, to criticize previous scholarly works, to build bridges between related topics areas, to identify the central issues in a field, or all these." (Cooper, 199. p.3)

For the current thesis qualitative secondary data will be collected from five international Quality journals and QMOD Conference. The articles contained in these sources will be analyzed in order to be able to identify current trends in Quality Management.

The literature review I carried out in this thesis differs slightly from the classical approach of literature review (described above).The classic approach discusses extensively the information of published scientific works about a punctual subject. This thesis did not deal with any specific Quality Management topic exclusively throughout the whole document. I did not review a specific subject. Instead, I collected secondary data (academic papers), which I categorized, classified, analyzed to finally be able to identify trending research topics on Quality Management.

2.2 Type of data used

Secondary data, specifically Quality related journal papers were collected from recognized international journals published during 2010 and 2011. The journals considered in the sample were chosen among the available journal subscriptions to LiU electronic library database, and also all of them contained the word "Quality" in its title.

The following international quality journals were analyzed:

- Total Quality Management and Business Excellence
- Total Quality Management (The TQM Journal)
- International Journal of Quality & Reliability Management
- International Journal of Productivity and Quality Management
- International Journal of Quality and Service Sciences

These journals were chosen because all of them are Quality specialized international journals. These journals are well known on quality research for both products and services.

Despite the five quality journals, papers from a European conference on Quality and Service Sciences (QMOD) were analyzed. The time frame was the same as for the journal papers (i.e. 2010 and 2011). The conference has become one of the most known scientific conferences in Europe within the research fields of Quality and Service Management, Organizational Development and related management issues.

The first QMOD Conference was held in Zhengzhou - China, 1997. It was a joined initiative by Århus School of Business (Denmark) and Zhengzhou Institute of Aeronautic (China). For the next three QMOD conferences, Århus School of Business worked together with other international higher educational institutes to organize the conference.

In 2001 Linköping University organized the 4th QMOD conference. From this year Linköping University joined the organizing committee of the conference. In the same way, Lund University joined the organizing committee by the 9th QMOD Conference (2006). The committee is supported by other international higher education institutions from different countries such as Korea, Mexico, France, UK, Italy, Germany, Spain…

Nowadays, LiU and Lund University continue working on the organization of the conference. Each year, the location of the conference changes, as well as the guest university collaborating on organizing the event.

2.3 Sorting the data

For the analysis purpose of this study, in order to sort the paper's information in a systematic way a data base on excel was created.

A sample of 665 journals papers was included within the study.

The data base was built by extracting significant elements from each paper, included title of the article, keywords, country where the research was made, economic sector the study was aiming to (according to economic activity and ownership) and, research methodology.

Since the publications on the conferences and the journals may differ significantly, results were divided into specialized international quality journals' results and QMOD results.

The need to split the articles into these two main groups has two motivations. First, the location of the conference has an impact on the number of articles presented in the conference. Conference's geographical location influences significantly the list of countries that submit papers to a conference. It is being common that authors living in countries located near, or in the country conference itself, usually have the higher numbers of articles submitted to the event. Second, the publications presented on the conferences include often a wider set of research topics. Conferences are more open to research topics, which are first emerging or are at the exploration stage. It is also possible to present at conferences certain studies, which did not lead to expected results e.g. studies where the theoretical assumptions were wrong and not confirmed by the empirical results.

For each of these two main groups (International Quality Journals and QMOD conference), all papers were analyzed according to:

Geographical distribution of the academic paper*:* Determined by the geographical location (country and continent) of the university or academic institution of the academic paper. In case of more than one author from different universities located in different countries, the geographical location of the first author named in the paper was considered. This because, usually the person who does most of the work and writes the paper is generally listed as the first author of a scientific paper.

Research methodology distribution: Papers were classified by the research method (i.e. case study, literature review, research paper, conceptual paper, mathematical modeling, simulation modeling). The former classification for the research methods was structured based on Sachan and Datta (2005) and Scandura and Williams's (2000) classification. This classification is also used by the Emerald journals.

Another research method category for the papers was "Combined research method", which involved more than one research method. In "Combined research methods" academic paper could be either multi-method design or mixed methods designs. Multi-method design is when an academic paper uses more than one method but all of them belonging to quantitative or qualitative research. Mixed method design is when an academic paper includes a mix of both qualitative and quantitative research method. Concepts of multi-method design and mixed methods designs are taken from (Tashakkori and Teddlie, 2003).

Economic sector*:* The economic sector can be analyzed by using two classifications: the first one according to the ownership of the economic sector itself (Public sector, private

sector and social sector) and the second one according to the classification of economic activities in the European Community (NACE, 2008).

- ***Distribution by economic sector ownership****:* The purpose of this classification was to know the economic sector (according to ownership) to which the academic paper focused its research. Economic sector by ownership according to IMF working paper (2009), is divided in: Public, private and social. Since some papers analyzed both public and private organizations, it was pertinent to include the Hybrid classification of Public/Private sector. Formal classification of economic sectors by ownership can be found at Lienert (FMI, 2009).

- ***Distribution by economic sector:*** Based on the classification of economic activities in the European Community (NACE, 2008), papers will be classified considering the main economic sectors that papers were aiming at (e.i Manufacturing, Services, Manufacturing/Services, Health Care, Education, Building and Construction and Others). Health Care and Education will be treated separately from Services since they are large and it would be interesting to see the research trends in these two sectors.
  Even though NACE provides a large and detailed list of economic sectors, the author chose the sectors above looking for a having a good coverage of the main economic sectors, as well as those sectors with focus on Quality Management research.

2.3.1 Keywords

One of the main elements, if not the most important, retrieved from the analyzed articles was the keywords which were contained at the beginning of each article. As mentioned in the previous section, the database was build for collecting information from papers found in each international journal, over the two years of study (2010 and 2011).

As feeding the database during the collecting information's phase, a large list of keywords was built for each of the journals, during each year. The keywords list was increasing with every journal analyzed.

The keywords list became quite extensive to the point that just only after going through the second (out of five) quality journal, the list was around 80 keywords. The reason why the list became so extensive was linked to the frequency of the article's keywords, where some words were hitting the list many times, while others just a few times or simply once within the large list.

Other reasons behind the initially extensive keywords list were as follows:

- Authors naming in different ways the same topic: by mentioning similar keywords which all of them were related to the same concept.
- Authors mentioning up to 6 keywords per article: only few of these keywords were related to the main topic the article was dealing with.

At this point, the keywords database looked unstructured. It was a very long list of individual keywords. Considering this, and seeking to simplify and take only the relevant information to the results phase, keywords were c*lustered according to common concepts*.

By grouping conceptually related keywords, the list decreased substantially, gained structure and became easier to work with. The new grouping strategy for the keywords did not just allow differentiating the main topics related to Quality Management, but also avoided keywords duplication within the same article.

3. THEORETICAL FRAMEWORK

This chapter consists of two parts. In the first part the Quality concepts and history will be described. Here I will explain the theory of quality, quality management and the evolution of the quality movement. These concepts will be explained by giving the reader a general overview about the central topics around which the whole thesis is developed.

In the second part, a literature review will be done taking as reference the eight main Quality textbooks used by teachers and students at different universities in quality courses. A comparative table will be done presenting the most frequently mentioned topics dealt in these books.

3.1 What is Quality?

Quality is a word that everybody uses frequently on a daily basis within their vocabulary. However, even if it is very commonly used word; it has a variety of interpretations and applications depending to the user and the different situations.

Most people who claim to "know" the meaning of the word, say they can tell when a product or service has quality when they "see it".

By breaking down the word quality, it is possible to analyze its linguistic sense. Quality is created from the Latin prefix "quails" which means "such as the thing really is" (Dale et al, 2007). One of the most known generalized and international definitions is the one given by the International Organization for Standardization (ISO), within ISO 9000:2000. The standard states: "Quality is the degree to which a set of inherent characteristics fulfils requirements, i.e. needs or expectations that are stated, generally implied or obligatory".

At this point it is worth to mention the significant contribution made by a group of authors to the quality theory. The legacy of these men has been crucial for building up over the years the quality knowledge we count on nowadays. This group of men is most known as "The Quality Gurus", because they developed a concept and approach to quality within business that made a major and lasting impact. The word "guru" by definition is a good person, a wise person and a teacher. Below, I present definitions of the quality concepts given by some gurus who developed the quality philosophy:

- ✓ Philip B. Crosby (1979): "Quality is conformance to requirements"
- ✓ Joseph M. Juran (1967): "Quality is fitness for use"
- ✓ Edward Deming (1986): "Quality should be aimed at the needs of the customer, present and future"

- ✓ Genichi Taguchi (1986): "The lack of quality is the losses a product imparts to the society from the time the product is shipped"

Considering all the existing quality definitions, some of them broader than others, still there is no such a thing as an official and unique definition for the word quality. But in most quality existing definitions, the common element is that quality *aims to meets customer's expectations or desires*.

3.2 Product Quality dimensions

From the concepts presented above, there is still place for ambiguities when it comes to translating those "quality meanings" into measurable or tangible attributes to be clearly seen on products. With this in mind, David Garvin (1984), developed one of the most recognized sets of *quality dimensions for products*.

The 8 *dimensions of quality* involve the perceptions from managers, operators and customers in respect to quality on products. This because what quality is for a customer may not be exactly the same as what quality is for a manager. Quality perceptions may be different among these groups, and listing product quality dimensions allow sharing the same perception of quality by managers, customers and operators.

Garvin's eight product quality dimensions are:

1. Performance: refers to the efficiency with which a product achieved its intended purpose.

2. Features: constitutes the attributes if a product that supplement the product's basic performance.

3. Reliability: refers to the tendency of a product to perform as it is supposed to over its useful designed life.

4. Conformance: Does the product conform to the specification? Corresponds to the specifications, or numerical dimensions for the product performance such as durability, size, speed, capacity, weight…

5. Durability: means the degree to which a product endures stress without failing.

6. Serviceability: Means how easy a product can be repaired. Is the product relatively easy to maintain and repair? The easiest its reparation is, the more serviceable that product is.

7. Aesthetics: refers to the subjective attributes of the product such as taste, smell, sound, look and feel. The closest the product attributes matches the customer preferences, the highest quality that product will be in terms of aesthetics.

8. Perceived Quality: This dimension depends on customer opinion about the product. The product may possess adequate or even superior dimensions of quality, but still may fall victim to negative customer perceptions.

3.3 Service Quality dimensions

Knowing that services are intangible by nature, quality in services is much more difficult to define than quality in products. The reason of this is because there is a higher customer involvement within the service creation process, which generates wider variations of the final services (Foster, 2004).

The service quality dimensions were postulated by Parasyraman, Zeithamel, and Berry (1984) in order to evaluate the quality in services. They found five dimensions customers use when evaluating service quality:

1. Tangibles: Refers to the physical aspect of the service. Facilities where the service is provided, personnel appearance, equipments…

2. Assurance: It is related to the knowledge of the employees and the way they inspire trust to the customer about the service.

3. Service reliability: Is the service provider delivering what it is expected to? This dimension refers to the capacity of the service provider to perform as expected in a faithful manner.

4. Responsiveness: It is the capacity of the service provides to react if problems occur and be helpful through the service process.

5. Empathy: Is the service provider caring about the customer? This dimension is related to the individualized attention to its needs given by the service provider to the customer.

Once known these product and service quality dimensions, it is easier for each company department to work towards the common goal of getting quality on products/services as expected by clients.

3.4 What is Quality Management?

> *"Quality Management is defined as an integrated approach to achieving and sustaining high quality output, focusing on the maintenance and continuous improvement of processes and defect*

prevention at all levels and in all functions of the organization, in order to meet or exceed customer expectations".(Flynn et al, 1994)

According to Flynn (1994), Quality Management has been a key element in the world class manufacturing approach to achieving and sustaining a competitive advantage. During the early 90's, the current service boom we experience nowadays had not started yet. This explains why most of the efforts on Quality Managements where in its majority aimed towards quality in products. This can be seen in the Quality Management's measurement instrument postulated by Flynn (1994), which was designed considering the world class manufacturing.

The measurement instrument postulated by Flynn (1994) was composed of 14 scales, representing various measures of Quality Management practice dimensions, i.e. (top management support, quality information, process management, product design, workforce management, supplier involvement and customer involvement). These dimensions were also identified by Flynn and constituted during the early 90's a newly develop theoretical framework which was the base of the measurement instrument. It is worth to mention that the seven dimensions were identified taking as focal point products and not services. This can be seen in the existence of the dimension "Product design" and the absence of a "service design" dimension. This particular dimension considered the design weakness to be the greatest source of product failure.

Another definition about Quality Management is the one give by ISO 9001:2005. It defines QM as "Coordinated activities to direct and control an organization with regard to quality." ISO 9000:2005 Classified these activities to manage the organization in matter of quality in the following way:

- *Quality Planning*: Part of Quality Management focused on setting quality objectives and specifying quality necessary operational processes and resources to fulfill the quality objectives
- *Quality control:* Part or Quality Management focused on fulfilling quality requirements.
- *Quality assurance:* Part of Quality Management focused on providing confidence that quality requirements will be fulfilled.
- *Quality Improvement*: Part of Quality Managements focused on increasing the ability to fulfill quality requirements.

The Quality Management (QM) concepts given by Flynn and ISO 9000:2005 are similar in the sense that both of them perceive QM from a holistic point of view. Both think the way to obtain sustainable Quality output is by involving the entire

organization, at all levels. While a difference between them is that Flynn's theoretical framework was designed and centered exclusively towards Quality in products, while ISO 9000:2005 was broader and focused in both product and services.

3.5 History of Quality Management

Quality Management has evolved over time. Based on Bergman and Klefsjo (2010), the most relevant echelons during this progress will be depicted..

- The Prehistory: Here the quality lied on *specialization* of the work. Great craftsmanship was the way to get products/services of high quality.

- The industrial revolution:

    - *Assembly*: By trying to solve problems in assembly, specifically problems related to the high variation among the different parts to be assembled, Honoré le blanc, developed a system for manufacturing muskets. The system was to produce muskets to a standard pattern using interchangeable parts and assembling them. This is how the Musket assembly line was born. This system was later adopted in US and succeeded there thanks to the *setting of tolerances*. If tolerances are defined and the component parts are manufactured according to these settings, all the component parts can be easily assembled.

    - *Taylorism*: Federick Taylor (1911) separated planning function from the execution function. Managers and engineers were in charge of the planning function, while operations were assigned the execution function. *Operation was separated from inspection*. Job was segmented into specific tasks, there was a focus on increasing efficiency and *quality assurance relied on inspectors*. Defects were present but removed by inspection.

- Walter Shewhart: He applied a statistical perspective to the production process. He suggested the *control chart* as a tool for handling variations. Shewhart pointed out how to maintain the data and draw conclusions from it, so the variation in the production process will be under control and supervised.

- Edwards Deming (Late 40's) and Joseph Juran (mid-50's). Both of them emphasized the importance of top management support on continuous quality improvements. Deming stated that quality cannot be achieved by depending on inspection and highlighted the statistical process control. Juran highlighted the importance of working continuously on quality improvements. The big difference

among these two quality gurus was that Deming ignored the cost of quality, while Juran claimed that reducing these costs is vital for any business.

- Japan after the Second World War (1950-1985): After the Second World War Japan started to rebuild its industries, helped by the innovative ideas of Deming and Juran.

    - *Kaoru Ishikawa*: believed in the utility of statistical methods to solve problems. Ishikawa designed "The seven quality control tools". He suggested the use of "The seven quality control tools" during Quality control circles. Ishikawa aimed to involve all the company (operators, top managers, engineers, administration staff…) within the quality improvement process.

    - *Taiichi Ohno*: (1950) He was the developer of the Toyota production system (TPS). He stressed the importance of reducing waste and unnecessary work. He created the Kanban method and the Just in time concept. These production techniques are the cornerstones for lean production as we know it today.

- The western quality revolution During the 80's USA started the awakening process for improving the quality on its products. This as a reaction to the international competence and the progressive and superior quality inherent to Japanese products. After 3 decades that Deming had helped Japan to improve the quality and its industry, USA finally adopted Deming's quality teachings.

    - *Six Sigma* began in 1986 as a statistically-based method to reduce variation in electronic manufacturing processes in Motorola Inc – USA. This business management strategy aimed to improve the quality of process outputs by locating and eliminating the causes of defects and decreasing the statistical dispersion in not just manufacturing, services and business processes.

    - *Quality Awards:* In 1987, as a way to incentive the quality initiatives among American organizations, USA founded the "Malcom Baldridge National Quality Award". A couple of years later in Europe, (1992) the European Foundation for Quality Management (EFQM) established the European Quality Award. Nowadays this award is known as EFQM Excellence Award. It is worth to mention that these are not the only Quality awards. Awards have been established within different countries worldwide (e.g. Utmärkelsen Svensk Kvalitet given by SIQ in Sweden since 1992).

    - *Lean Production:* in 1985 was the given name to a production practice based on the Toyota Production System and the teachings giving by Taiichi

Ohno (Womack, Jones and Roos, 1991). Lean was focused on preserving value with less work. Lean production has evolved in Lean thinking and Lean six sigma.

- *TQM total Quality Management* was first coined as a term on 1985 by the Naval air Systems Command to describe its Japanese style management approach to quality improvement. TQM is perceived as a holistic concept of values, methodologies and tools that are combined to achieve higher customer satisfaction with less resource consumption.

- *Quality Management Systems:* During 1987, in Europe, the first version on ISO9000:1987 was published. This represented the beginning of the Quality Management systems we currently know.

Figure 1, shows the evolution of quality practices in history. One of the most visible and curious aspects was the change through the years of human involvement on quality. Quality has evolved from being a responsibility of a single person to be a shared responsibility where all people in the organization are involved. This change also implied a shift from quality relying on inspection to remove the defects from the line, to a conception of quality as a holistic continual improvement process, minimizing waste at its maximum, and eliminating the source of defects.

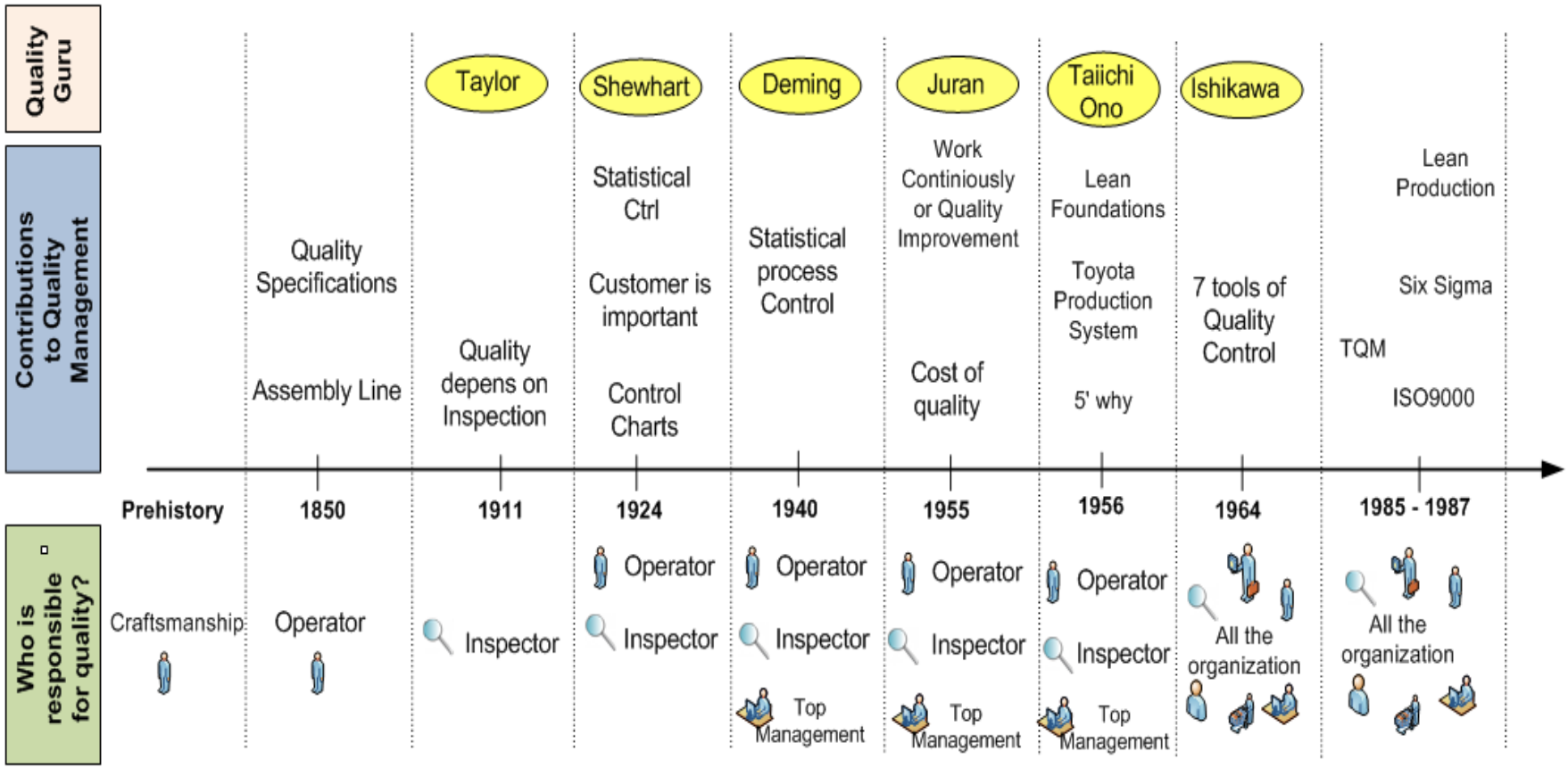

Figure 1. Evolution of the quality movement in history (Adapted from Bergman and Klefsjo (2010), Summers(2005))

3.6 Drivers of research

3.6.1 Research Concept

The word Research has its origins in the middle French recerche, from *recercher* to go about seeking, from old French *recerchier*, from re- + cerchier, *sercher* to search (Merriam-Webster's, 2005).

Research is defined as "the systematic investigation into and study of materials, sources, etc., in order to establish facts and reach new conclusions" (Thompson, 1996). Other definition is given by Creswell (2008), "Research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue".

3.6.2 R&D Concept

The United Nations Educational, Scientific and Cultural Organization – UNESCO (1978) defined R&D as a creative work addressed on a systematic basis which objective is to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to create new applications.

UNESCO also points out that R&D covers the following three activities:

- *Fundamental or basic research:* It is the experimental or theoretical work aiming to acquire new knowledge of the underlying foundations of phenomena, without specific applications in mind. Basic research is a type of research inside scientific knowledge which lacks of punctual and immediate commercial objectives.

- *Applied research:* Deals with the original investigation which purpose is to acquire new knowledge. It is addressed primarily towards a specific practical aim or objective. Transnational research is aimed at gaining the knowledge or understanding to meet a specific, recognized need, or solve a specific problem

- *Experimental development*: It is a work based on existing knowledge gained from research or practical experience. This study is conducted to produce innovations (e.g. new materials, products and devices, to installing new processes, systems and services, and to improving substantially those already produced or installed).

As seen in the study sample in this thesis, for Quality Management, the most frequent type of R&D used is *applied research.* This is mainly because applied research is focused in attending specific problems/needs in real life organizations. This type of Research

involves the application of different methodologies to solve problems or improve organizations (e.g. Implementation of ISO 9001, Six sigma, lean…)

Looking for measuring R&D efforts in different countries or even in minor scales measuring R&D within companies, the concept *R&D intensity* emerges. The definition for R&D intensity can be found at (OECD, 2011) "R&D intensity (R&D expenditure as a percentage of GDP) is used as an indicator of an economy's relative degree of investment in generating new knowledge." Several countries have adopted "targets" for this indicator to help focus policy decisions and public funding.

For purposes of the present study and looking for terminology unification along the document, both Research and Research and Development (R&D), will be addressed as research. This, due to R&D has a more specific description within a broader concept which is Research.

3.6.3 Research drivers

This section introduces some of the more representative factors that urge on research or R&D.

High Market entry or High level of competition: Cullman et al (2009), as well as Acs and Audretsch (1990) and Geroski (1991) stated that high market entry rates increase the incentives to innovate due to strong competition, and thereby, the overall level of research of a country. In other words, if a country has high governmental regulation, competition will be reduced by raising barriers to entry to this country. Hence, it will reduce not just the competitive pressure, but the incentives to innovate or research efficiently.

High levels of competition increase the incentives to allocate wisely limited resources as a way to stay alive in the market (Boone, 2008). In this order of ideas, high market entry rates and the competitive environment it generates for national industries are strongly linked to higher levels of research and innovation within the country. In other words, high market entry drives Research.

Technological specialization Another driver can be found in Matieu and Van Pottelsberghe (2008). Here, they mentioned that technological specialization and not a country-specific environment particularly favorable to research, is what influences significantly the research intensity.

Funding Sources*:* Usually research funding comes from government, corporations or foundations. These entities allocate the funding resources for scientific research. This Research is carried out mainly by universities or specialized government agencies.

Public Policies: According the European Commission (2009), among the most common public policies for supporting R&D efforts, the following can be found

Research subsidies*:* The government can stimulate research with direct measures, either through fiscal incentives or by means of direct financial support.

Fiscal incentives for Research: Fiscal (Tax) incentives are a tool to provide assistance to a large variety of economic sectors when it comes to research (R&D). Tax incentives encourage on a bigger extent the long term investments for R&D.

- Product market regulation and other legal frameworks:
- Direct local public aid
- Direct public aid from other sources

Other influential factors that trigger research or R&D are the ones described by Cincera, Cozza and Tübke (2010, Page 10). These factors were originally taken from a monitoring industrial research study, which is based on an EU annual survey on investments on R&D. The influential factors are as follows:

- *Market pull*: It is when the stimulus for innovation or research comes from the unsatisfied needs of society or a particular section of the market (OU, 2010).
- *Improving corporate productivity*
- *Exploiting technological opportunities (technology push)*: In this case the innovation or the research starts first with an idea or a discovery. This idea is pushed to the market .Here the starting point is basic scientific research or applied research and development (R&D) in organizations. (OU,2010)
- *Local and Global competition*
- *Product market regulation and other legal frameworks*

From this section it is relevant to stand out the importance of *Market pull* as a research driver when it comes to Quality Management. Specific organizations or entire industries frequently present some recurrent problems to be solved (e.g. Obstacles while implementing lean in health care sector, needs for finding accurate ways to measure quality in services…). These are a few examples of problems or unsolved needs that face real life organizations. These problems have an urgency to be solved by the organizations or industries that in some cases turn to academic institutes looking for collaboration to solve these problems. In other cases, the initiative of solving the

problems comes directly from the academy itself that after observing and studying the industry identify unattended needs or problems to be solved.

In this order of ideas it is possible to state that *market pull* as a driver for doing research, support the assumption that current research trends on Quality Management reflect the needs or unsolved problems that industries and organizations around the world are currently facing.

3.6.4 Forces driving Quality research

Apart from the former authors, ASQ (American Society for Quality), found that there is a set on forces that are shaping the future of Quality (ASQ, 2011). For the ASQ, quality has been behaving dynamically reacting to the forces of change. Quality is not today what it was twenty years ago, or even five years ago. Being this the reason why ASQ carries out the studies about the future in Quality every three years since 1996. In these studies, both the forces of change and the quality trending topics, usually vary from year to year. For the year 2011, some of those forces or drivers acting on current/new quality trends were as follows:

- *Global Responsibility*: It is the awareness of the need of becoming more socially responsible. It is being conscious of the global impact of the local decisions taken inside organizations. The global responsibility includes fair operating practices, consumer interests, environment, labor practices and other contributions to society. An example of this Global responsibility can be seen in ISO 26000.

- *Consumer Awareness*: Means that consumers now own the knowledge (thanks to internet) to make purchasing decisions more aligned to their preferences. Now customer's purchasing decision is not constrained to be made only locally (geographically), he can find what he wants in other geographical markets thanks to the social media and its accessibility to instant information. Consumer awareness is also reflected in new flexible manufacturing technologies and greater flexibility in organizations to create products and services to match customers.

- *An Aging Population*: The increasing life expectancy challenge world resources and place importance on the cost of providing healthcare to a larger percentage of the world's population.

- *21st-Century Quality*: Quality in the last century was defined by control and improvement, and that control and improvement according to ASQ will not be

sufficient for the 21st century. For ASQ, change and transformation are the emerging tools of Quality. Also, "near perfect product/service quality" is considered will be a minimum for being competitive in the future.

- *Innovation:* It is the ability of a company to anticipate customer needs, expressed or unexpressed, known or unknown, and bring products/services to the market place that delight customers. Innovation is the fuel of growth in today´s changing world.

3.7 Quality research future trends

When discussing about Quality topic trends that have potential to be researched in the next years, ASQ outstands as one of the main Quality institutes that sets the bar when it comes to predict those quality topics that will be trending worldwide for the next years. This according to how the world has been evolving in terms of Quality.

ASQ acts here as point of reference for analyzing and forecasting current and future Quality trending topics. This due to its long tradition while working in providing quality services consultancy and research to companies worldwide. Based on the former, this section will deal with the future of quality study presented by ASQ within its 2011 Future Quality study, which constitutes the one of the few serious sources about Quality trending topics.

3.7.1 What is ASQ?

ASQ is a global community providing the best quality resources (e.g. publications, training, certifications) and experts in Quality area, organizations and industries concerning to Quality (ASQ, 2011). ASQ is also considered as the global knowledge network that links the Quality ideas, tools, and experts.

3.7.2 ASQ Future of Quality 2011

Aiming for predicting the next trending Quality topics, ASQ developed a study that included 140 professionals, representing 33 countries distributed among all five continents. The study contained information from all major sectors of global economy. It is worth to mention that this study is not the first one carried out by the institution on future of quality. ASQ has conducted six "Future of Quality Studies" – in 1996, 1999, 2002, 2005, 2008 and its last one was in 2011.

From this report it is possible to extract trending Quality topics from the comments made by the authors about the future of Quality. These comments were as follows:

Excellence will be the market entry point, not just an ambition, or at aim that has the probability of not being obtained. Products and services must be delivered without errors and always exceeding customer needs. Non-value-added activities will be permanently eliminated.

Quality useful to society Far beyond filling a market gap or satisfying a customer need, the quality organization will be useful to society. Quality should shape society.

Quality beyond quality systems: In terms of methodology, quality leans to quality systems, but organizations need to have a holistic perspective of quality, one far beyond of the product or services.

Innovation is a daily imperative, is mandatory for obtaining betterment. But this time, there is a lower concern that quality goes against innovation. In fact, innovation and quality complement one another very well. Innovation tools need to be included into the quality toolkit.

Sustainability programs in quality: For years, organizations have been doing significant efforts on waste reduction. Nowadays, besides this, it will be highly important that organizations create and implement sustainability programs.

Customer awareness: Thanks to globalization marketplace is changing rapidly. Clients are becoming highly aware of their options; are learning more quickly of positive and negative attributes of products, services; and are expecting more responsive offerings.

Global responsibility: Quality decision nowadays and in the future will be taken while considering the environmental sustainability and the social responsibility; these two making up the global responsibility quality concept. Quality decisions have consequences on consumers, communities, employees and environment.

Enterprise excellence and sustained competitive advantage: according to ASQ, nowadays counting with quality in products/services does not constitute a competitive advantage for a company; but what it does is having Quality Management to the entire organization (e.g. Baldrige Performance Excellence Program, EFQM Excellence Model, or Global Performance Excellence Award).

From product/service centric quality to experience centric quality: Since quality in products and services are not longer competitive advantage but a minimum market entry requirement, companies are starting to offer experience quality (Experience Management). This means that companies manages every aspect of the customer experience to deliver quality and not just quality on the end product/service.

Waste reduction: Triggered by the worldwide financial crisis, organizations are using more often tools such as lean and Six Sigma to systematically root out waste.

New roles for the quality leader: Nowadays the ideal quality leader not just must count with knowledge on statistics, defect prevention, process control, but also with soft skills and some finance knowledge. This since quality leadership is no longer limited to a quality department, but the whole organization.

4. RESULTS

In this chapter, results will be presented alongside the analysis. In some sections the author of this thesis will be answering the research questions posed at the beginning of this study.

4.1 International Quality journals

A total of 5 quality specialized international journals were analyzed according to the information gathered in its published papers during 2010 and 2011. The information presented in this section will be divided into Geographical distribution, Main economic sector distribution, Distribution by economic sector ownership and Research methodology distribution

4.1.2 Distribution of journal's research papers by geographical area

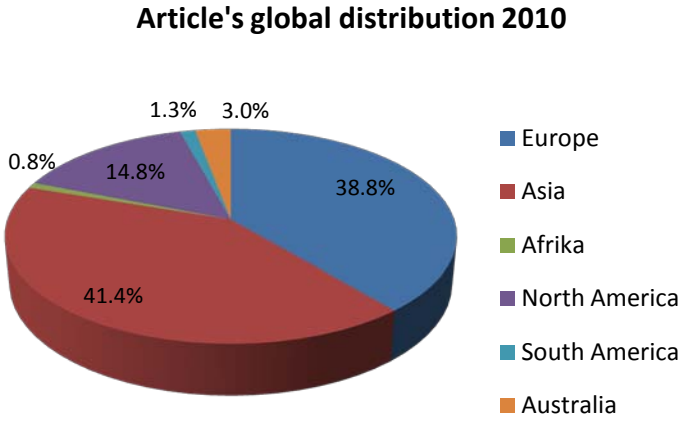

Figure 2. Paper distribution by continent (2010)

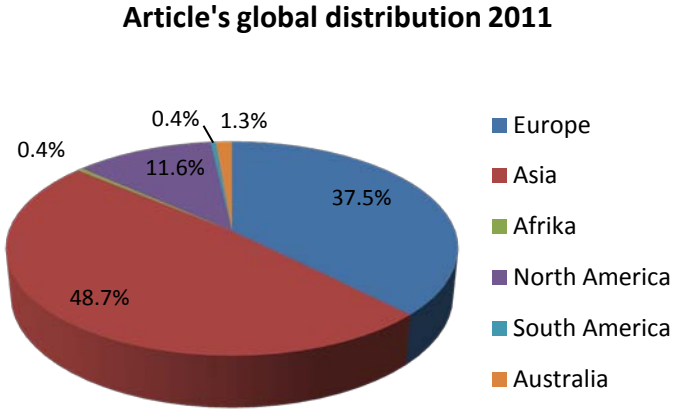

Figure 3. Paper distribution by continent (2011)

Distribution of research papers by continent is shown in Fig. 2 and 3, which indicate that Asia has been leading as the continent with the largest participation on international quality journals over the past two years. Asia shows an increment of 17.6% in the participations of Asian institutions on academic quality papers from 2010 to 2011.

The first place of Asia is followed closely by Europe, where in contrast to Asiatic increment; Europe has a reduction in the participation of European Institutions of 3.3%.

North America on the third place and with a much lower participation, also presented a fall of 21.6% from previous year participation. Australia, South America and Africa due to its low numbers of published papers, they did not represent a significant portion of the distribution cake.

4.1.3 Distribution of journal's research papers by country

This section will answer the following research question:

RQ2: *Which countries have published the highest numbers of academic papers in international journals of Quality Management?*

In international quality journals, 461 articles were published from 48 different countries during the two years of study. 237 papers were published in 2010 and 224 papers in 2011. Figures 4 and 5 show the distributions by countries.

In figure 4, the top 10 countries that contributed with most papers on quality related topics were: China, USA, India, UK, Sweden, Spain, Greece, Malaysia, Italy and Iran. With 36 articles (15%), China was the country that published the highest number of articles in quality journals, followed by 29 articles from USA (12%), 26 from India (11%). Iran is in 10th place within the top 10 countries with the strongest participation on international quality journals during 2010.

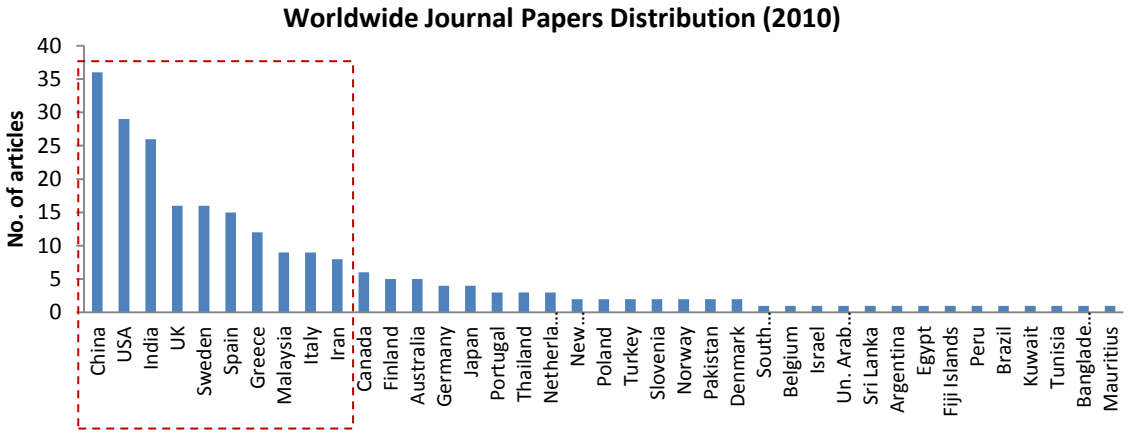

Figure 4. International paper's distribution by country (2010)

In 2011, the highest places of the country distribution ranking list (China, USA, and India) did not show significant variations. In 2011, India occupies the first place with 39 published papers that represented 17% of the total sample size, China with 31 papers (13%) and USA with 22 papers (10%). Greece who during 2010 occupied the 7Th place in the ranking list, dropped to the 23rd place in 2011. This abrupt fall has a potential explanation due to the economic Greek crisis that started by the end of 2009.

At this point of the study, it is possible to state that during both years it was clear that China, India, USA, Sweden and UK were the ***top five countries*** that contributed the most with submitting papers to international Quality journals. A deeper study these countries will be made further in section "4.1.7 Top five countries and its Economic sectors trends".

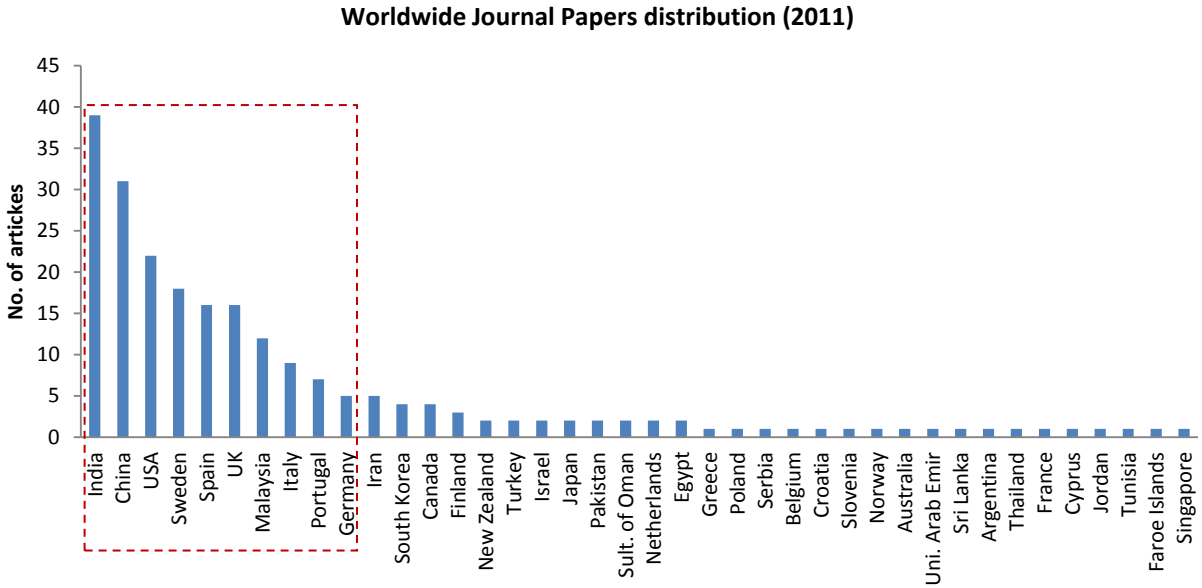

Figure 5. International paper's distribution by country (2011)

During both years the participation of North American continent in quality international journals oscillated within 14.8% and 11.6% compared with the rest of continents. That percentage is mainly because of the contribution of academic research papers submitted by authors in USA and Canada.

From table 2, it is possible to see that North American continent is made up by 23 countries, from which the same two countries (USA and Canada) along 2010 and 2011 submitted papers. This meant that only 8.6% of countries out of the total of 23 countries that make up North America participated in the study sample, showing a low participation of North American countries in the total participation of the continent.

The low percentages may have its explanation in the fact that North America only has 2 developed countries versus 21 developing countries. From here it is possible to state that Quality academic research efforts in North America have not been distributed

homogeneously among all its countries, but concentrated in just two of them, USA and Canada, which are the highest developed economies of the continent.

For Europe, 14 and 17 out of 44 countries that compose the whole continent, submitted quality related academic articles during 2010 and 2011 respectively. Those 14 and 17 European countries constituted the 31.8% and 38.6% of the total European countries within the continent. About Asia, the continent is set up by 48 countries, from which 16 and 18 countries participated by submitting papers to international quality journals. This represented a participation of 33.3% and 37.5% (during 2010 and 2011) of the total number of Asiatic countries.

In Table 1, also indicates that even North America occupies the third place in paper distribution by continent, it does not have a high position in the ranking when it comes it to country participation per continent. North America is in fifth place after Asia, Europe, Australia and South America, which shows that in these continents in contrast to North America, quality research is not monopolized by a minority of countries but many of their countries are involved in it.

It is worth to mention that the percentage of countries participation within each continent does not mean that the weighted participation of each country is the same. This percentage simply gives information about the number of countries participating within each continent in international quality journals.

Continents	Paper distribution by continents		Total No. of countries per continent	Country participation per continent			
	2010	2011		C.P * 2010	2010	C.P * 2011	2011
Asia	41.4%	48.4%	48	16	33.3%	18	37.5%
Europe	38.8%	37.3%	44	14	31.8%	17	38.6%
Australia	3.0%	1.3%	14	7	50.0%	3	21.0%
North America	14.8%	11.6%	23	2	8.6%	2	8.6%
South America	1.3%	0.4%	12	3	25.0%	1	8.3%
Africa	0.8%	0.4%	56	2	3.5%	1	1.7%
Antarctica	0.0%	0%	4	0	0.0%	0	0.0%

C.P*: No. of Countries participating within a continent, during a specific year.

Table 1. Country participation per continent in International Quality Journals

4.1.4 Distribution of journal's research papers by research methodology distribution

By far combined methods were the main methodology used by authors with a 63.3% (2010) and 69.2 % (2011). Combined methods research involves the use of more than one method, usually a combination of qualitative and quantitative methods. In second place, case study with 18.1% (2010) and 14.7% (2011). Literature review, conceptual method, mathematical modeling have weak participation on the distribution, nevertheless, simulation modeling is the research method with the lowest application by the authors.

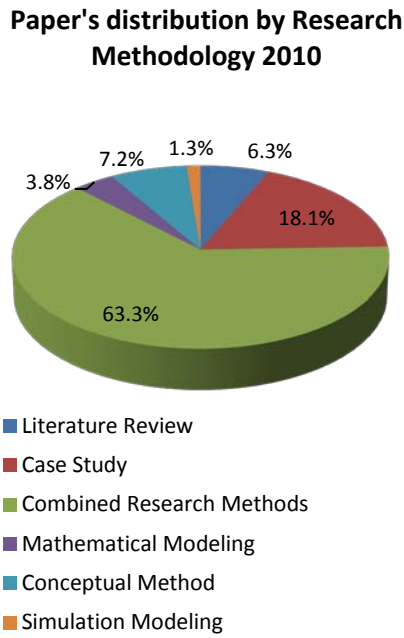

Figure 6. Paper distribution by method (2010)

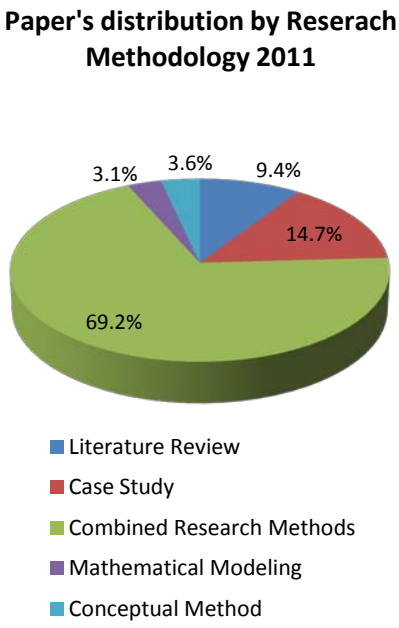

Figure 7. Paper distribution by method (2011)

4.1.5 Distribution of journal's research papers by economic sector (according to ownership)

As seen on figures 8 and 9, during 2010 and 2011, 63.6% and 54.5% of the published papers were involved in research related to companies from the private sector. 25.4% and 37.5% of the papers took part in organizations belonging to both public and private sectors.

The smallest participation of the papers was from public and social sectors. Regarding the public sector, 9.7% of the quality papers in 2010 and 7.6% in 2011 were carried out within state or public institutions. Regarding the social sector, 1.3% (2010) and 0.4% (2011) of the quality papers corresponded to studies performed within this sector.

During the two years, it is quite evident the strong influence of research to be carried out within the private sector, as well as the combination of public and private sector in the same research papers.

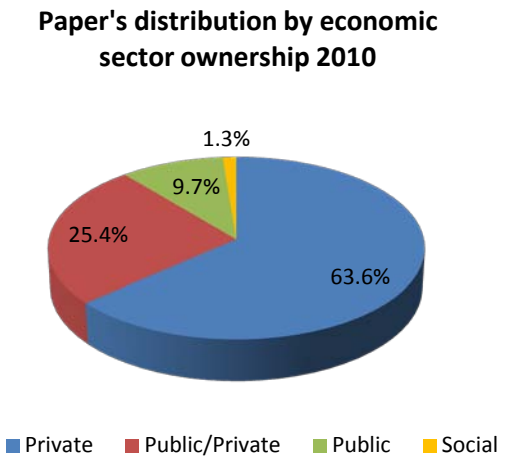

Figure 8. Paper distribution by Economic sector ownership 2010

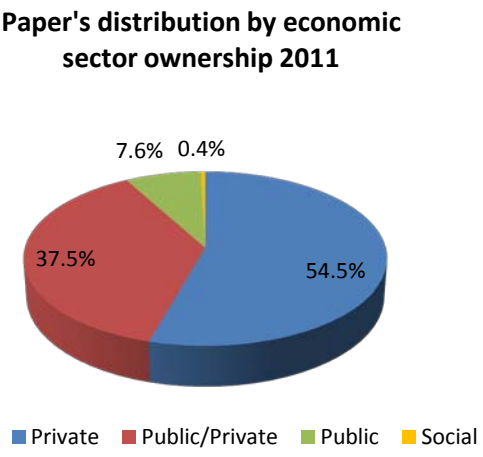

Figure 9. Paper distribution by Economic sector ownership (2011)

4.1.6 Distribution of journal's research papers by main economic sectors

This subsection will answer the following research question:

RQ3: *Which economic sectors have been researched more intensively in academic papers published in international Quality journals over the past two years?*

In this section papers will be divided into Manufacturing, Services, Building and Construction, Education, Manufacturing/Services, Health Care and others.

As seen in figures 10 and 11, manufacturing sector occupies the first place in international quality papers during 2010 (38.8%) and the second place in 2011 with 33.5%.

About service sector it is worth to mention that analyzing economic sectors in a more detailed level, percentages from education and health care sectors (which are services as well) are being considered part of service sector data. In this order of ideas, it is possible to state that research in service sector was found in 26.6% of articles in international Quality journals during 2010 and 47.8% during 2011, when it occupied the first place.

There was found a sharp rise in the service sector of 79.6% from 2010 to 2011, versus a decrease of 13,6% in manufacturing sector during the same period of time.

On the third place, “manufacturing /services” constituted a category for those academic papers that involved both service and manufacturing industries within its researchers. Paper that combined manufacturing/services sector within its research went from 30% (2010) to 17.4% (2011), which signified a drop of 42% for this mixed sector

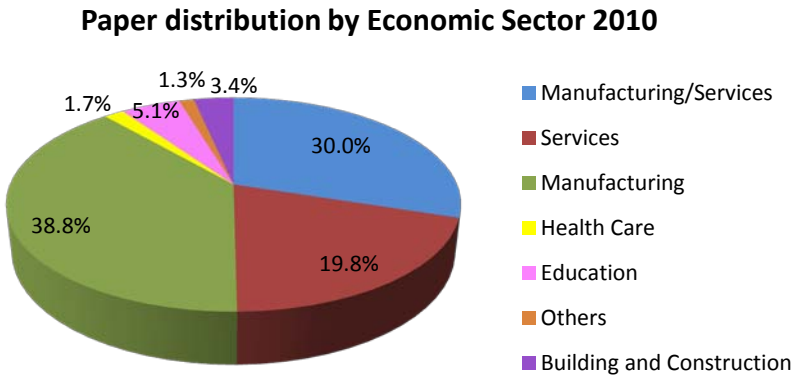

Figure 10. International Journal distribution by economic sector (2010)

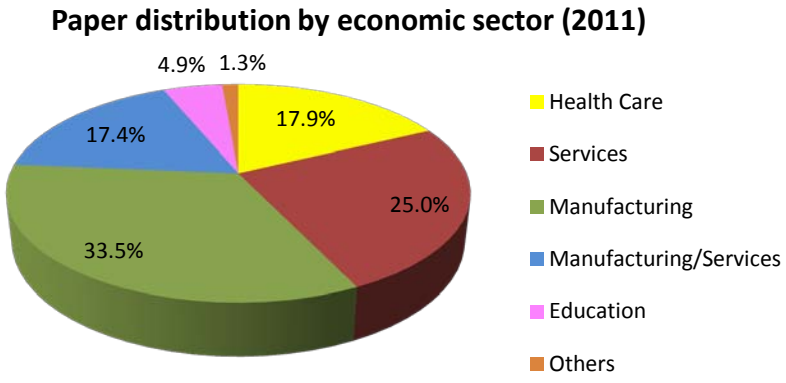

Figure 11. International Journal distribution by economic sector (2011)

An interesting finding was a sharp rise of 952% in academic Quality papers related to health care sector. This sector went from having a 1.7% paper related to health care in 2010 to 17.95% in 2011. The percentage of growth of health care related papers may signify a potential trend of Quality researchers towards Quality in this particular sector.

In contrast to the surprising findings on health care sector, education sector did not represent a significant variation. 5.1% of papers were related to education in 2010 and 4.9% in 2011. This meant a decreasing in just 3.9% between the two years.

4.1.7 Top five countries and its economic sectors trends

From precedent subsections "4.1.3 Distribution of journal's research papers by country", it was clear that China, India, USA, Sweden and UK were the top five countries that contributed the most with submitting papers to quality journals.

Table 2, presents detailed information of the research carried in top 5 countries and its participation for each economic sector. For methodological purposes, percentages were given in a detailed level (within the country) and in more general level (between countries). In a detailed level, W.C (within the country) means the percentage of papers researching a specific sector in a country, with respect to the sum of papers published by that country in all the economic sectors. In a more general level, B.C (between countries) means the percentage of papers doing research at a specific sector in a country, with respect to the total number of papers doing research in the same economic sector in all the top 5 countries.

According to a W.C percentages shows that China is presenting a trend towards services. Services sector in China accounts for a 40% (including education and health care) versus a 30% belonging to manufacturing sectors. The domination of the service related research in academic quality papers was unexpected due to China has been known throughout the years by its marked participation on manufacturing worldwide and by having increasing its manufacturing capacity significantly in the last 10 years.

Main Economic Sectors studied in International Journals for Top 5 Countries												
Sector	Total of papers		*China*		*India*		*USA*		*Sweden*		*UK*	
			No.	%	No.	%	No.	%	No.	%	No.	%
Manufacturing	101	W.C	20	30%	42	66%	20	39%	11	32%	8	25%
		B.C		20%		42%		20%		11%		8%
Health Care	16	W.C	2	3%	0	0%	7	14%	6	18%	1	3%
		B.C		13%		0%		44%		38%		6%
Services	48	W.C	24	36%	7	11%	8	16%	5	15%	4	13%
		B.C		50%		15%		17%		10%		8%
Manufacturing/ Services	63	W.C	18	27%	10	15%	11	22%	8	24%	16	50%
		B.C		29%		16%		17%		13%		25%
Education	12	W.C	1	1%	5	8%	3	6%	1	3%	2	6%
		B.C		8%		42%		25%		8%		17%
Building and Construction	8	W.C	2	3%	0	0%	2	4%	3	9%	1	3%
		B.C		25%		0%		25%		38%		13%
	248		67		64		51		34		32	

W.C : Within countries

B.C: Between top 5 countries

Table 2. Main economic sectors in top 5 countries

Some explanation for the trend in service studies (not just for China, but any other country which core competition lies on the manufacturing sector) might be that a key factor for manufacturing depends on the services sector, due to manufacturing performance is affected critically on the service inputs, finance, transportation, telecommunications… Other possible explanation for this could be that in the late years it has been an extreme growth of the service sector.

In the case of India, W.C analysis showed that manufacturing sector exceed significantly service sector with a 66% versus a 19%. Academic studies on health care and building sectors were nonexistent. Predominance of manufacturing over service sector was another surprise in this study; this considering the well known tradition of Indian in services which started during the 90's and has been growing at a fast speed. India economy is worldwide known because it excels mainly in information technology and business process outsourcing, being this reflected in the fact that services has the largest share of 2011 GDP with a 55.6% versus a 26.5% for manufacturing. A potential reason for the predominance of manufacturing over service sector in India could be that papers on Indian service management are been published in other journals different from Quality related journals

Current Indian trends towards manufacturing may be due to the efforts made by India during the last years to resurge it economy through manufacturing. Because of this, it could be timely for India to make research related to quality in manufacturing so organizations could learn from this and at the same time be imbibed with world-class practices in Quality Management.

In the case of USA, W.C percentages reflected that researches having place in manufacturing sector (39%) and service sector (34%) have been distributed almost on relatively close. Even though, USA has been considered through the years as one of the largest manufacturer countries in the world, the studied sample showed a homogeneous interest in research not solely for manufacturing sector, but both, manufacturing and services.

In the case of Sweden, W.C participation showed a possible trend towards research in service sector with a 36% versus a 32% in manufacturing.

Comparing the countries participation between each other, B.C showed that Sweden was the country out of the Top 5 countries with the highest number of papers in health care sector (18%) and Construction (9%). This high focus on health care sector may be probably explained by the social phenomenon named "Ageing of Europe", where Sweden is one the European countries (along Germany, Denmark and Italy) with the highest percentage of the population over than 65 in Europe. For this reason Sweden may need to focus on the quality and betterment of its health care services, in order to supply the demands its large proportion of ageing society.

B.C percentages also showed that among all the top 5 countries, India (42%) was the country with the highest percentage of research taking place in exclusively manufacturing sector.

Even though education and construction were the sectors with the lowest number of papers, B.C percentages reflected that in education sector, India had the biggest participation among the top 5 countries followed by USA. For building and construction, Sweden leads the research but it is closely followed by USA and China.

From other perspective, now the top five countries will be considered as a whole group and not individually as they were already analyzed back in table 2. In this order of ideas, from figure 12, it became evident that Top 5 countries submitted most of its academic quality studies towards manufacturing sector organizations (41%) followed closely by service sector (31%). This predominance of manufacturing sector was a replica of the findings obtained from the total average sample of 55 countries during 2010-2011, where manufacturing sector occupied as well the first place in international quality papers during both years 2010 (38.8%) and 2011(33.5%).

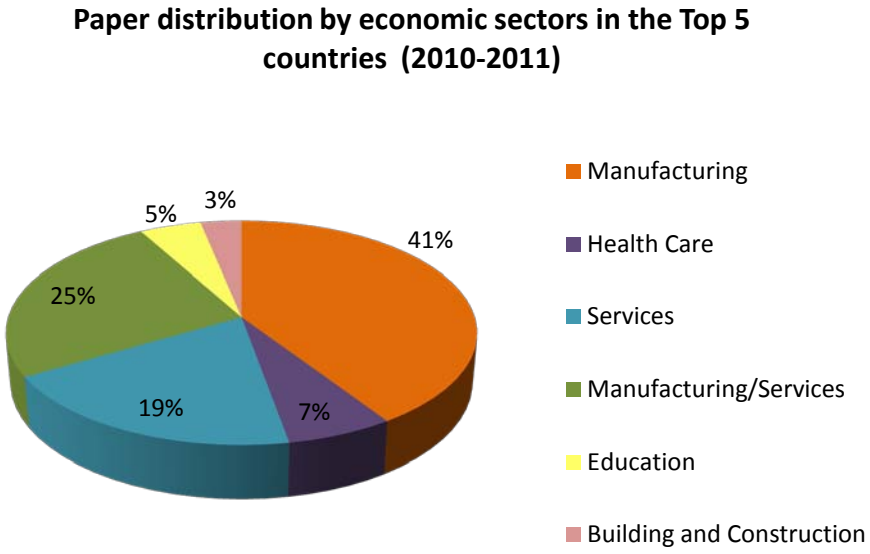

Figure 12. Paper distribution by economic sectors in the Top 5 countries

It is worth to mention that the unexpected trends of China going towards service and India going towards manufacturing sector may be an indication of changing interests of these two countries in researching other sectors different from their main core competitive economic sectors. This phenomenon may have its explanation in the fact that China and India are researching and investing more in those sectors that complement their main core competence sectors. In this way, China and India are looking for a more sustainable and

inclusive economic growth, at the same time that they experience in diversifying its economy to get a perfect balance of manufacturing and services.

To find a possible relation between the top 5 countries and the research in a specific sector of the economy, a chi- square test was executed. The test used as primary data the number of papers corresponding to each of the sectors of the economy studied.

Unfortunately, the chi square test did not give appropriate results, since just two out of its three main assumptions for performing the test were satisfied. This test was not appropriate for our case since there were some countries where the frequency of papers carrying out research within a specific economic sector was 0.

4.1.7 Top ten prioritized keywords

After grouping the common related keywords, from a total of 49 keyword groups, there was selected the top 10 groups that represented the main trending topics in which the current academic research in quality is being focused. The top 10 selection was made by listing the keyword groups in order of frequency or number of hits in the database (from highest to lowest). This process of finding the top 10 keyword groups was made for each year separately, but for methodological purposes and simplicity of this document the cumulated result from these two tables will be condensed in table 3.

Frequency of the keywords in table 3 indicates the most common keywords used in international specialized quality papers during 2010 and 2011. The table allows having a detailed and discriminated outlook of the trending topics during each year.

It was found that trending topics during 2010 and 2011 do not vary widely in terms of keywords; mainly what it does change is the keywords position in the top 10 ranking list.

4.2 Description of the 5 trending topics found in international Quality journals

This section will answer the following research question:

RQ1*: What are the current worldwide trends on academic research related to Quality Management over 2010-2011?*

From table 3 it is possible to see the top 10 trending topics on Quality Management from a sample of international specialized journals, during 2010-2011. The same table highlights the top 5 trending topics (keywords grouped inside of the red dashed line). The top 5 list is constituted by the five most important and popular topics within the 461 papers that constituted the study sample.

Keywords Prioritized List (2010-2011)	2010	2011	Cumulated frequency	Top 10
Management Systems Standards/Standards QMS/Systems Integration/ISO 9001/Quality certificates /Other quality standards/Quality Assurance/Quality Assurance/Internal Auditing	33	34	67	1
Total Quality Management (TQM)	36	29	65	2
Service Quality/ Gaps Model/SERVQUAL/DINESERV/Service Quality Measurement/SERVPERF (Measure service quality)/E-S-QUAL (Measurement tool for e-service quality)/e-service quality/e-SERQUAL/Internal service quality/ Service dominant logic/Servitization	25	30	55	3
Customer related processes AFTER delivering service or product: customer feedback/Customer Satisfaction/Customer Experience/Customer Loyalty/European Customer Satisfaction Index (ECSI)/Complaints management/Service Recovery/After sales service	28	25	53	4
Quality Models/EFQM (Model Excellence)/European Business Excellence Model (EBEM)/Baldrige Criteria for Performance Excellence (BCPE)/Quality Awards/Self-assessment/Business excellence	16	24	40	5
Customer related processes WHILE delivering service or product: Customer needs/customer focus/Customer service Management/Customer relationship management-CRM /Customer service/Customer retention/acquisition//Branding/Moment of truth	25	13	38	6
Soft issues/ Leadership/Quality values orientation/Appreciative leadership/Intangible resources/Management of intangibles/Organizational culture/Teamwork/Team Effectiveness model/Improvement teams/Quality Circles	16	22	38	6
Six Sigma/DMAIC/ DFSS (Design for six sigma)	19	18	37	7
Continuous improvement /PDCA Cycle/ Deming's chain reaction model	17	16	33	8
Product development/QFD (Quality function deployment)/RDM(Robust design method)/Demand Compliant Design (DeCoDe) a method for product development / fuzzy QFD/Concurrent engineering	16	14	30	9
Employee related quality issues : Human resource management/ Employee-driven/ Sustainable Health/ Workers / Co-worker Involvement/co-worker health/Work environment/SA8000 standard for decent working conditions /Job satisfaction/employee satisfaction/OHSAS 18001/workers perception/Internal customer satisfaction/Employee productivity/	14	14	28	10
Reliability management/ Human reliability/Human mistakes/Failure Mode and Effect Analysis (FMEA)/Human Error/Product reliability/Service Reliability/analysis of potential failures	15	13	28	10

Table 3. Consolidation of top 10 more frequent keywords over 2010 and 2011

Top 5 trending topics and participation percentages were: Management Systems Standards (14.5%), Total Quality Management (14%), Service Quality (11.9%), customer related processes after delivering product or service (11.4%) and Quality Models (8.6%).

It is worth to mention that the keywords were distributed widely within 49 sets of keyword groups. This significant number of keyword groups made impossible to see large percentages of participation in the top 5 each keyword groups.

Generally speaking, the top 5 quality topics found in the studied sample show trends essentially towards TQM and management systems standards.

About the other positions of the top 10 rank, It can be said that "Soft issues" (6^{th} place with 8.2%) and "Employee related issues" (10^{th} place with 6.0%) represent the interest in the human aspects regarding to Quality. These two keyword groups refer to topics such as: Leadership, organizational culture, improvement teams, teamwork, co-worker involvement, 9employee satisfaction, OHSAS18001, work environment, internal customer satisfaction, and so forth. The fact that soft issues and human aspects- related keywords are placed within the Top 10 list represents the critical role that the employees and soft issues play in the success or failure of the implementation of management systems standards, Quality models and continuous improvement.

4.2.1 Management Systems Standards

Management Systems Standards constituted the most popular group of keywords in the studied sample. The content of the research papers related to Management Systems Standards included ISO family management standards excluding OHSAS 18001 and ISO 14001. This exclusion was made since the latter two standards were considered individually within other keywords groups with other topics more closely related (i.e. employee issues and corporate environmental management/EMAS/Environmental labeling).

ISO 9001 and systems integration have been mentioned in a large scale throughout the papers, while other certifications such as OHSAS 18001 and ISO 14001 did not show the same popularity.

The high trend towards Management systems standards may have its explanation in the popularity of ISO 9000 related practices. ISO 9000 is the most popular standard management system in the world. More than one million of organizations worldwide have a certified quality systems based on the ISO 9000 series of quality standards. The standard is generic, it can be used by manufacturing and service organizations around the world, and therefore it is applicable independently from the size and economic sector of the organization.

Finally, it has been noticed that organizations without an ISO 9001 certificate find it difficult to do business in the marketplace, which motivates SMEs to implement this QMS.

The papers related to Management Systems Standards dealt with topics such as:

- Impact of implementing Quality Management Systems (QMS) on employee's satisfaction
- Critical issues to consider for implementing effectively an integrated management system (IMS).
- Benefits from implementing IMS
- Motivations of organizations for implementing ISO 9000 standards.
- Motives and impacts of Quality certifications in specific sectors (e.g. hospitality industry)
- ISO 9001 Implementation stories in specific sectors (e.g. education, manufacturing)

4.2.2 Total Quality Management

This keyword group is in second place of popularity. One of the reasons why TQM is present in so many articles could be that many quality aspects in academic papers can be addressed or classified under the name "TQM". This because TQM concept is quite diffuse, hence there is a lack of consistent definition about it.

For a TQM practitioner in order to comply with the TQM's values or cornerstones, it is necessary to apply certain methodologies and tools (e.g. Cause-and-effect diagram, Pareto chart, statistical process control, matrix diagrams…). Therefore and according to Bergman and Klefjö (2010), these values, methodologies and tools constitute a whole which can be described as a management system. Therefore, the perception of TQM as a management system might be a possible secondary reason for a high interest in researching towards TQM. This possible reason gets more acceptable by considering the high interest and rapid growth of other Quality Management Systems in Europe (e.g. ISO 9000).

The papers related to TQM dealt with topics such as:

- Implementation of TQM in specific industries (e.g. healthcare)
- Obstacles to TQM implementation
- Analysis of TQM effects on productivity and customer satisfaction
- Impact of TQM on corporate culture
- TQM success factors in manufacturing and service industries

4.2.3 Service Quality

Other trend in academic quality papers was the keyword group related to "Service Quality". This keyword group included keywords such as Gap model, internal service

Quality, Service dominant logic and some methodologies for Service Quality Measurement (e.g. SERVQUAL, SERVPERF, e-SERVQUAL, DINERSERV…).

"Service quality" occupies the third place in the top 5 ranking. A reason for this seems to be the growing interest of the economy towards the service sector. This is also known as the shift the economy has been experienced from manufacturing to services industrialized economies. The punctual shift towards services or the growing interest in the service sector became evident on the past section "4.1.6 Distribution of journal's research papers by main economic sectors". There it was clear that the majority of the academic quality papers in the study sample were aiming towards research in the service sector (including health care and education). Additionally, in this section it was possible to see that quality papers aiming to service sector had a sharp rise of 77.8% from 2010 to 2011, versus a decrease of 13,6% in Manufacturing sector.

Talking about the shift of the economy from manufacturing to service industrialized economies, there are two closely related and pioneer concepts: *Service dominant logic* and *Good dominant logic* postulated by Vargo and Lusch (2004). Good Dominant logic (G-D) which ultimate economic goal is to produce and sell objects or tangibles goes opposite to Service dominant logic (S-D) where economy is based in people trading for benefits, services, knowledge or certain skills.

Vargo and Lusch postulated a change in focus in the economy dynamic from tangible centered (Manufacturing) towards intangibles centered (Services). They mention that in the new service environment, service provisions rather than goods will be the core of the economy exchange. Hence, intangibles such as skills, information and knowledge get more valuable. Customer also acquires a new interpretation with this new mindset. Customer roles changes from being a recipient of final goods in G-D logic, to act as a co-producer of the service in S-D logic.

In this thesis a significant number of papers were related to measurement of Quality in different types of services. In these papers the most common used service Quality framework was SERVQUAL, which assesses the quality of a service based on the perceptions of the customer (Customer's perceived Quality-Customer Expectation). Due to the economy shift from manufacturing based towards services, it became greatly important to evaluate customer's perception about the service, hence the significant number of research papers focused on service quality measurement.

The papers related to Service Quality dealt with topics such as:

- Assessment of a quality in specific services (e.g. hospitality industry)
- Relation and impact of employee related issue in Service Quality Management.

- Relation between the service environment and the customer's service experience
- Service improvements generated by customer ideas
- Measurement of service quality in different service sectors (e.g. banking sector, e-commerce, health care, hospitality, public services, education…)
- Evaluation of SERVQUAL across various cultural and economic environments.
- Evaluation of customer perceptions about the service quality

4.2.4 Customer related processes AFTER delivering services or products

For methodological purposes and looking for having a more concept related keyword groups, customer related processes were divided into Customer related process "*Before*", "*While*" and "*After*" delivering its product/service. As the keyword group name itself explains, each of these three groups contains different set of topics regarding to activities/processes concerning to customer along different points in time (Before, while and after delivering a product or service).

"Customer related processes *before* delivering services or products" deals with topics such as customer involvement, customer-driven, attractive Quality (Kano model), value co creation, and attractive Quality creation.

"Customer related processes *while* delivering services or products" includes keywords such as: Moment of truth, customer relationship management CRM, customer retention, customer acquisition, customer service.

"Customer related processes *after* delivering services or products" contains topics such as: customer feedback, customer satisfaction, customer loyalty, service recovery, complaint management, after sales service. This group represents a high interest for the researchers because it is a source of highly valuable information for improving services/products or developing new products/services. The measurement of customer satisfaction is one of the requirements of ISO 9001 standard and thus practiced by many organizations.

Also this keyword group may be appealing for doing research because topics such as "service recovery and after sales service" are known for being important aspects when it comes to customer retention. This is evidenced in the service recovery paradox, (Gronroos, 1990), that states that customer retention is possible by providing a satisfactory after sale experience. In addition to this, Chikan and Demeter (1997) highlighted the importance of after sales service, by recognizing it as one of the most important sources of competitive advantage for durable goods manufacturers.

Finally, it can be said that the fact that two out of three customer-related-processes keyword groups appeared within the top 10 list of keywords, "customer related processes after delivering product/service" (4th place with 11.4%) and "customer related processes while delivering product/services" (6th place with 8.2%), reflect the realization from

organization's point of view that the customer is the most important aspect of the Quality Management, hence customer related processes are critical when achieving quality.

The papers related to Customer related processes *after* delivering services or products dealt with topics such as:

- Service/product improvements generated by customer feedback in different economic sectors.
- The impact of post-sale factors on customer satisfaction
- Dissatisfaction feedback and new product development
- Relation of customer satisfaction on customer loyalty for specific industries (e.g. communication sector, food sector).
- Customer satisfaction reports and identification of quality attributes
- Relation of European Customer Satisfaction Index (ECSI) and product development

4.2.5 Quality models , Excellence models and Awards

8.6% of papers from our sample were referring to this keyword group, placing it in the 5th place of the top 10 list. This keyword group involved topics like EFQM-Excellence model, EEBEM- European business excellence model, Baldrige criteria model, Quality Awards…).

"Quality models" belong to the top 5 because EFQM as a framework for assessing business excellence also aims to provide a stimulus to organizations to develop quality, which represent an appealing way to many organizations in their way towards the excellence. In addition to this, EFQM is a popular keyword because over the years it has being positioned as the most widely used organizational framework in Europe and it has become the basis for the majority of national and regional Quality Awards.

Excellence models constitute a quite popular Quality topic since they help organizations to assess their improvement efforts, monitoring their overall performance management system, and locate opportunities for improvement. Excellence models offer good support for organizations since they guide companies in their process of attaining performance excellence.

But when it comes to "Excellence" although EFQM is the most popular model used in Europe, it is not the only excellence model. The Baldrige performance excellence program or Baldrige criteria, is another option of business excellence framework.

The papers related to Quality Models and Awards dealt with topics such as

- Motivations of organizations for implementing EFQM Model and the obstacles detected during its implementation.

- Relation between Quality Awards and performance
- Relation between EFQM excellence model and statistical data analysis techniques.
- Difficulties in the implementation of EFQM
- Impact of EFQM on organizational excellence
- EFQM model as facilitator to integrate quality and environmental management systems.

Observation: As mentioned before, Customer related processes were divided into three different keyword groups according to the customer involvement: Customer related processes before, during and after delivering a product or service. These three groups represent 3 grades of customer involvement being "During and After" the most common used practices of involving customers. The observation here is that if we have considered the three keyword groups as one single group "Customer related processes" it will be located in the first position of the top five trending topics with a frequency of 118. This would have shown the importance that companies and researchers allocate to practices that involve customers in the value added process. Involving customers from the early stages of new product/service development process, until the last stages (after providing the products/services).

4.3 Distribution of top 10 keywords within the top 5 countries

Table 4, shows the participation of the Top 5 leader countries (China, India, USA, Sweden and UK) in the Top 10 trending keywords groups (2010-211) obtained previously in Table 3.

According to table 4, China participated in the in all the Top 10 keyword groups. China was the country that showed most interest out of the top 5 countries by submitting the highest numbers of papers related to topics such as "Customer related processes WHILE delivering service or product", where China contributed with a 58% out of the total number of times those keywords where mentioned in the total sample during 2010 and 2011.

China was the strongest contributor out of the five main countries, in topics related to Six Sigma (54%), Service Quality (29%), Employee issues (29%) and Customer related processes AFTER delivering service or product (28%).

India produced the majority of papers out of the 5 main countries, related to Reliability management (43%) and Product development (23%), which may show a consistency with the trend in this country towards academic research in manufacturing sector. USA was the country with the strongest interest towards soft issues with 21%. Sweden did not have a

main contribution within any of the Top 10 trending keywords, while UK had the highest participation in “Quality Models & Awards”.

There were some trending topics that were not considered within the Top 10 general list, but in spite of this, they were top 5 trending topics inside of each country. For the case of China one of the trending topics excluded in the Top 10 general list was “Customer related processes BEFORE delivering services or products”.

Top 10	Top ten key words used in international journals (2010-2011)	2010 - 2011	China		India		USA		Sweden		UK	
			Frq.	*%	Frq.	*%	Frq.	*%	Frq.	*%	Frq.	*%
1	Management Systems Standards/Standards QMS/Systems Integration/ISO 9001/Quality certificates (ISO, European standards, other quality standards)/Quality Assurance/Quality Assurance/Internal Auditing	67	7	10%	7	10%	3	4%	4	6%	2	3%
2	Total Quality Management (TQM)	65	11	17%	11	17%	8	12%	3	5%	6	9%
3	Service Quality/ Gaps Model/SERVQUAL//DINESERV/Service quality measurement/SERVPERF (Measure service quality)/E-S-QUAL (Measurement tool for e-service quality)/e-service quality/e-SERQUAL/Internal service quality	55	16	29%	5	9%	3	5%	5	9%	3	5%
4	Customer related processes AFTER delivering service or product: customer feedback/Customer Satisfaction/Customer Experience/Customer Loyalty//European Customer Satisfaction Index /(ECSI)/Complaints management/Service Recovery/After sales service	53	15	28%	5	9%	2	4%	6	11%	2	4%
5	Quality Models/EFQM (Model Excellence)/European Business Excellence Model (EBEM)/Baldrige Criteria for Performance Excellence (BCPE)/Quality Awards/Self-assessment/Business excellence	40	2	5%	4	10%	2	5%	2	5%	5	13%
6	Customer related processes WHILE delivering service or product: Customer needs/customer focus/Customer service Management/Customer relationship management-CRM /Customer service/Customer retention/acquisition//Branding/Moment of truth	38	22	58%	2	5%	3	8%	5	13%	3	8%
6	Soft issues, Leadership; Quality values orientation/Appreciative leadership/Intangible resources/Management of intangibles/Organizational culture/Teamwork/Team Effectiveness model/Improvement teams/Quality Circles	38	7	18%	2	5%	8	21%	2	5%	4	11%
7	Six Sigma; DMAIC; DFSS (Design for six sigma)	37	20	54%	7	19%	5	14%	3	8%	3	8%
8	Continuous improvement /PDCA Cycle/ Deming's chain reaction model	33	5	15%	5	15%	4	12%	5	15%	4	12%
9	Product development/QFD (Quality function deployment)/RDM(Robust design method)/Demand Compliant Design (DeCoDe) a method for product development / fuzzy QFD/Concurrent engineering	30	3	10%	7	23%	1	3%	3	10%	2	7%
10	Employee issues: Human resource management/ Employee-driven/ Sustainable Health/Co-worker Involvement/co-worker health/Work environment/SA8000 standard for decent working conditions /Job satisfaction/employee satisfaction/OHSAS 18001/workers perception/Internal customer satisfacción/Employee productivity/	28	8	29%	2	7%	4	14%	2	7%	3	11%
10	Reliability management/ Human reliability/Human mistakes/Failure Mode and Effect Analysis (FMEA)/Human Error/Product reliability/Service Reliability/analysis of potential failures	28	1	4%	12	43%	4	14%	0	0%	2	7%

*%: Percentage of a country's participation in the worldwide total frequency of a keyword group during 2010-2011

Table 4. Participation of Top 5 Countries and the Top 10 key words found in 2010-2011

In India, there was also a trend towards “Statistical process control”. USA and Sweden shared a high interests towards keywords related to Lean Production.

4.4 QMOD Conference during 2010 and 2011

QMOD conference treats topics within the research fields of Quality, Service, organizational development and related research areas. In 2010, QMOD conference was held in Cottbus (Germany) where 68 academic papers were accepted. In 2011, the conference location was San Sebastian (Spain) and it counted with 136 accepted papers, showing a considerable growth of 100% from the previous year.

The information presented in this section will be divided into geographical distribution, main economic sector distribution, distribution by economic sector ownership and research methodology distribution, in the same way as information from papers in the sample of international quality journals was presented.

4.4.1 Distribution of Journal’s research papers by continent

Figures 13 and 14 indicate that Europe along the two years has been the leader continent with the largest participation of academic papers in 2010 and 2011 QMOD conferences. Even though Europe is the leading continent, it shown a slight decrease of 10% from 2010 to 2011.

In second place and distantly from the first place, Asia is going from a 10.3% in 2010 to 16.9% in 2011, showing a significant increment of 64% in the conference participation.

Australia and North America have had the lowest participation in QMOD conferences during the past two years. South America and Africa have not participated in this conference.

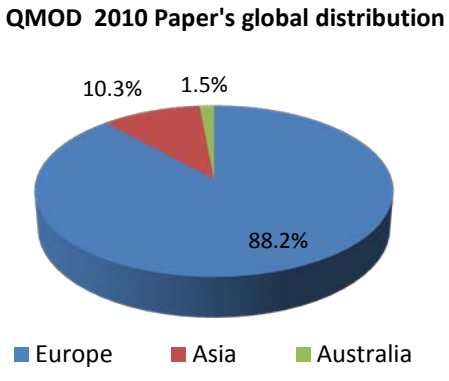

Figure 13. Paper distribution by continent (2010)

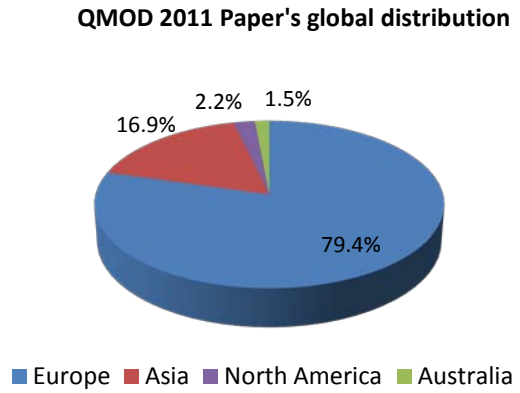

Figure 14. Paper distribution by continent (2011)

It is known that the location of a conference is a critical factor when it comes to the number of submitted academic papers to a specific conference. This explains why Europe has been along the last two years the leader continent with the largest participation of academic papers presented during QMOD conferences.

In spite of knowing the strong relation between conference location and the countries participating on the conference, an analysis of papers by country will be made.

4.4.2 Distribution of QMOD papers by country

QMOD Conference contained 204 papers that were published from 34 different countries during the two years of study. Due to the smaller number of papers and countries participating in the conference compared with the numbers found while analyzing the sample of international quality journals, only the top three countries will be analyzed. Figure 13, Shows the country distribution and the tops 3 countries that participated with the highest number of papers in QMOD 2010. These countries were: Sweden, Germany and Lithuania.

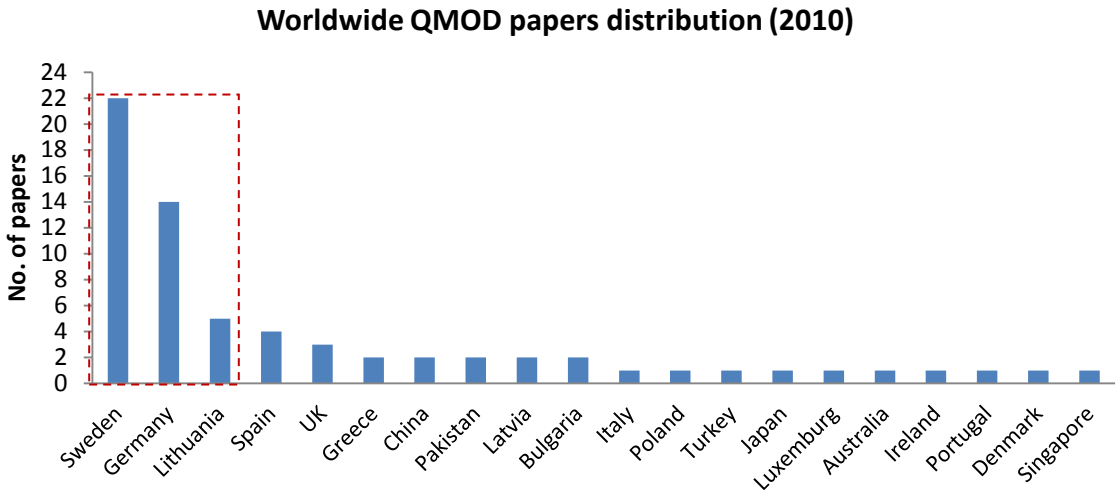

Figure 13. QMOD 2010 paper's distribution by country

As seen in figure 13, during QMOD 2010, the first places were occupied by Sweden, Germany and Lithuania. In QMOD2011, Sweden, Spain and Germany had the top 3 the highest places of the country distribution ranking list. Here is possible to see that within most active countries in the QMOD conference ranking, the host country is always placed within the top three countries.

About significant variations, Spain showed a pronounced growth of 425% going from the 4th place in 2010 with only 4 accepted papers to 2nd place in 2011 with 21 papers,

which reflects once again the influence of location when it comes to participation of countries and submission of papers to an international conference.

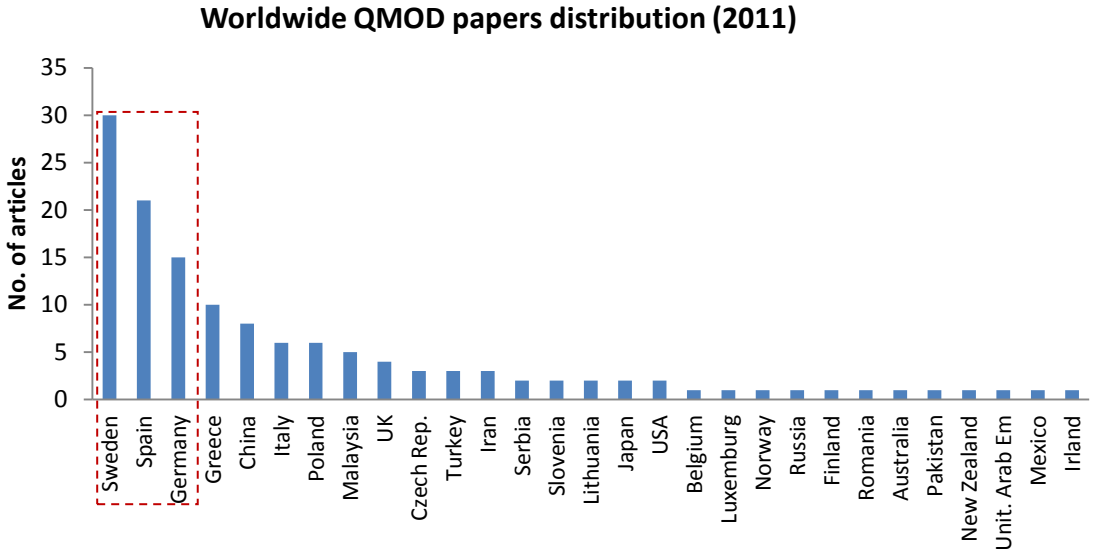

Figure 14. QMOD 2011 paper's distribution by country

By simply looking at the fugures13 and 14, it is clear the outstanding predominance of Sweden over the rest of the countries. The reason for this is that two Swedish universities (Linköping University and Lund University) are the head members of QMOD'S organizing committee. Hence, the participation of these two Swedish universities motivates and incentives researches from all over Sweden to submit papers to this conference.

The location of the past two conferences have been Germany and Spain, which lead us to think that the participant countries that submitted papers to QMOD conferences have been influenced by the location of the QMOD conference itself for each year.

The former could explain the reason why QMOD conference has generated a higher interest, hence more followers, from European Countries in the past two years where the Conference has been hosted in European Countries.

4.4.3 Distribution of QMOD conference papers by research methodology

Combined Research Methods has been the preferred research methodology used by authors in QMOD conferences with a 57.4% (2010) and 67.6 % (2011). As it was already mentioned, combined research methods entail the use of more than one research method through either multi-method design or mixed methods designs. In the QMOD conference, "Combined research methods" included combinations such as: Structured interviews and observation, survey and literature review, experiments (studies that have characteristics of experimental design) and conceptual method, focus group interviews and survey, case study and questionnaire, literature review and conceptual method…

Literature review was the second more used research method in the sample, 14.7% (2010) and 16.2% (2011). In the third place, case study had a participation of 8.8% in 2010 and 11.8% in 2011. Among the research methods less used were conceptual paper, simulation modeling and mathematical modeling.

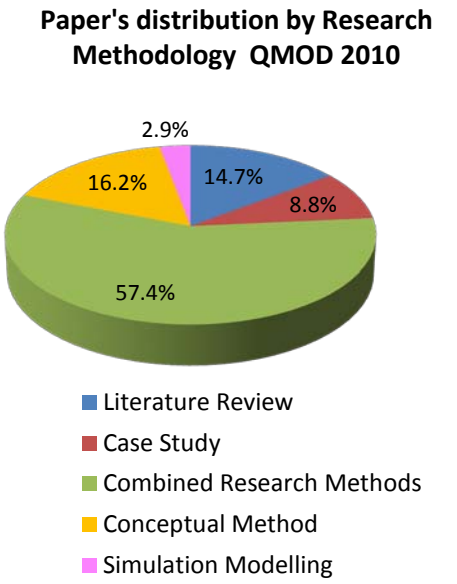

Figure 15. Paper distribution by method (2010)

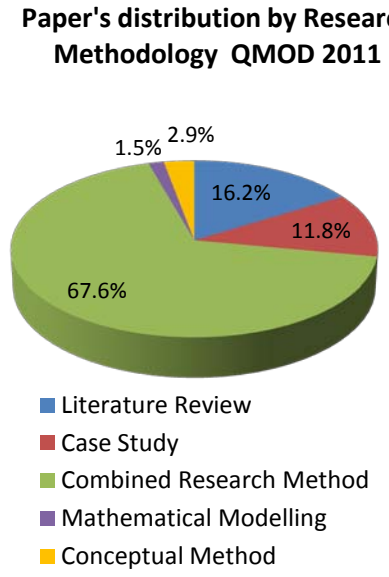

Figure 16. Paper distribution by method (2011)

4.4.4 Distribution of QMOD research papers by economic Sector (according to ownership)

During 2010 and 2011 there was a predominance of the private sector. 55.9% and 61% of the accepted papers in QMOD conference in 2010 and 2011 were involved in research related to companies from the private sector.

In the second place was the academic studies carried out in both public and private sector. This mixed public/private sector had a participation of 35.3% (2010) and 21.3% (2011).

Public sectors have had the lowest participation, going from 8.8% in 2010 to 17.6% in 2011. Social sector was not included in the sample of QMOD conference during the years 2010 and 2011.

In QMOD conference, as well as on the international Quality journal study sample, over 2010 and 2011 it was clear the predominance of the academic research implemented towards within the “Private sector” in first place and the “Mixed of public and private sectors”.

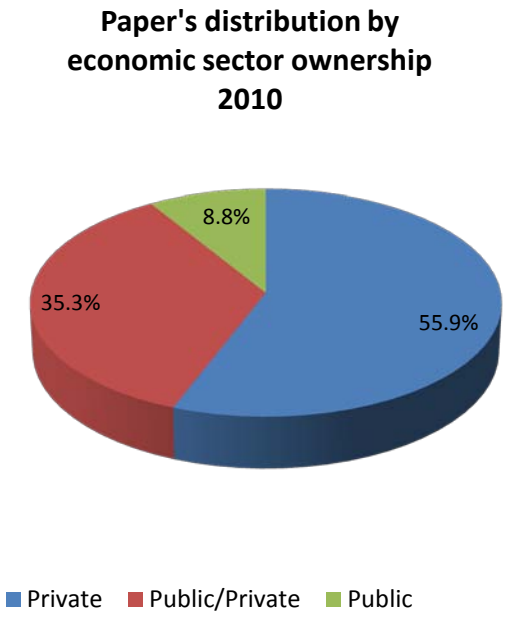

Figure 17. Paper distribution by Economic sector ownership 2010

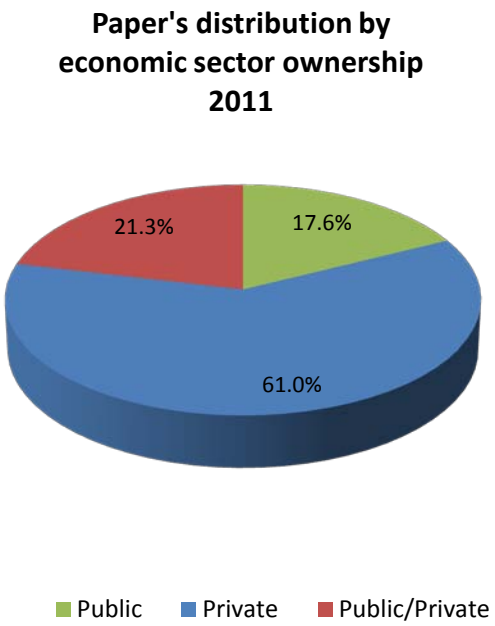

Figure 18. Paper distribution by Economic sector ownership (2011)

4.4.5 Distribution of QMOD research papers by main economic sectors

As seen in figures 19 and 20, service sector had the first place as the economic sector that most of academic papers were aiming at within QMOD conference. Service sector had a participation of 38.2% during 2010 and 60.3% during 2011, showing a growth of 57.8% from one year to the other. Here is relevant to remember that "Service sector" per se includes sectors such as health care and education.

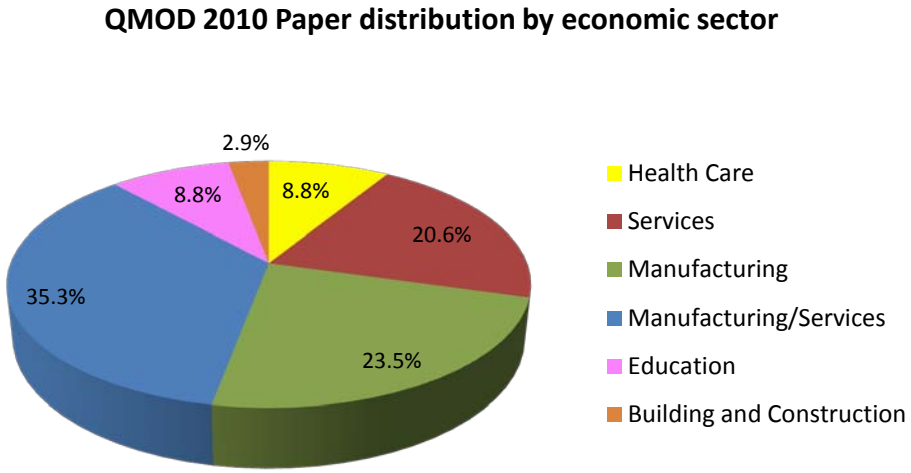

Figure 19. QMOD 2010 Paper distribution by economic sector

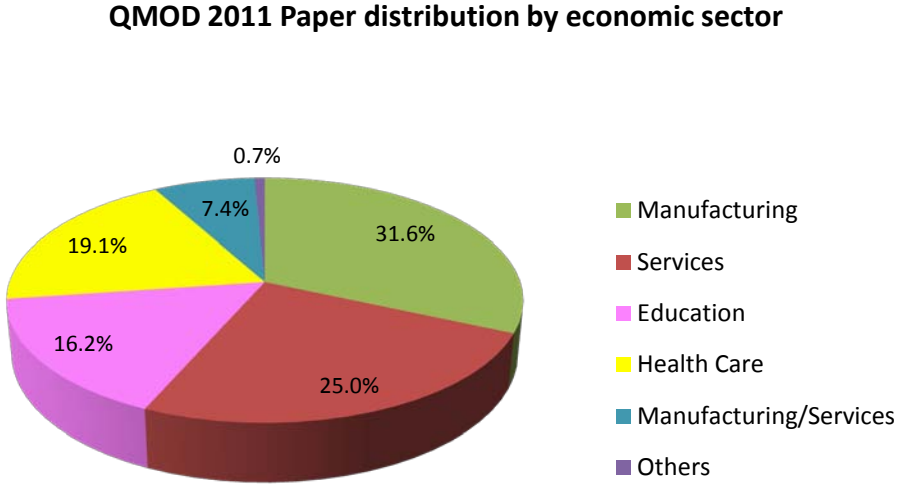

Figure 20. QMOD 2011 Paper distribution by economic sector

The second place was occupied by manufacturing Sector. This sector went from a participation of 20.6% to 25% during 2010 and 2011, experiencing a growth of 21.3% from one year to the other.

In the third place, the combined sector of "Manufacturing/services" went from having a participation of 35.3% (2010) to 7.4% (2011). This sector experienced a significant drop of 79% between the two years.

Health care sector remained as an interesting economic sector for researchers, and occupied the fourth place. In 2010 the 8.8% of the total number of papers in QMOD belonged to studies related to health care, while in 2011, 19.1% of QMOD papers focused on this sector. The former represented an increment of 117% for this sector. This sharp rise may represent a potential trend in the interest of researchers in Quality focused on health care sector.

Education sector also experienced a significant variation from one year to the other. In QMOD 2010, 8.8% of papers were carrying out studied in educational sector. In 2011, education increased to a 16.2%. This meant education sector had a rise of 84% between the two years.

4.4.6 Top 5 prioritized keywords for QMOD conference.

Due to the relatively small size of QMOD's sample compared with the international journal sample, from a total of 45 keyword groups, only the top 5 keywords groups were chosen to represent the main trending topics in QMOD Conferences. The top 5 selection was made by listing the keyword groups in order of frequency or number of hits in the database (from highest to lowest).

Keyword Prioritized list (2010-2011)	2010	2011	Cumulative Frequencies	Top 5
Service Quality/ Gaps Model/SERVQUAL/DINESERV/Service quality measurement/SERVPERF (Measure service quality)/E-S-QUAL /e-service quality/e-SERQUAL/Internal service quality	13	23	36	1
Customer related processes AFTER delivering a service or product: customer feedback/Customer Satisfaction/Customer Experience/Customer Loyalty/European Customer Satisfaction Index /(ECSI)/Complaints management/Service Recovery/After sales service	6	17	23	2
Quality Models/EFQM (Model Excellence)/European Business Excellence Model (EBEM)/Baldrige Criteria for Performance Excellence (BCPE)/Quality Awards/Self-assessment/Business excellence	9	14	23	2
Innovation/CAF (Common assessment framework- innovation for European public sector)	6	15	21	3
Management Systems Standards/ Quality Management Systems/Systems Integration/IMS/Management Systems Standards/ISO 9000 /Quality certificates /Quality Assurance/Internal Auditing	6	14	20	4
Employee Issues: Human resource management/Employee-driven/Sustainable Health for Workers / Co-worker Involvement/co-worker health/Work environment/SA8000 standard for decent working conditions /Job satisfaction/employee satisfaction/OHSAS 18001/workers perception/Internal customer satisfaction/Employee productivity/	0	19	19	5
Total Quality Management (TQM)	7	12	19	5

Table 5. Consolidation of top 5 most frequent keywords during 2010-2011 combined table for the QMOD conference papers

Table 5 indicates the most common keywords used in accepted papers for QMOD conferences (2010 and 2011). It also presents a cumulative list of the top 5 most trending quality topics for QMOD conferences.

The cumulative trending topics in table 5, show the top 5 trending topics from the study sample of 204 accepted papers at QMOD conference 2010 and 2011. The top 5 trending quality topics were as follow: Service Quality (17.6%), Customer related processes AFTER delivering products or services (11.3%), Quality Models (11.3%), Innovation (10.3%), Standard management systems (9.8%), Employee Issues (9.3%) and Total Quality Management (9.3%).

"Service Quality "was the most popular keyword group in QMOD Conference over the past two years. The fact that service Quality is placed at the first position in the Top 5 ranking is not a surprise due to the high interest of researchers in performing academic studies within organizations belonging to the Service Sector of the economy as it was shown in previous section 4.4.5 Distribution of QMOD's research papers by main economic sectors.

As it was stated before, this trend towards research in service Quality may be because economy has been experiencing a shift from predominance in manufacturing to services industrialized economies

4.5 Relevant Quality Management textbooks and main common topics addressed

This section will identify the main topics addressed by the most commonly used textbooks within Quality courses at different universities written in English. This analysis will allow to investigate the potential existence of gap between the keywords or current research interest from the QM international journals sample (on the results chapter), and the Quality Management topics that are currently on textbooks and are been taught to students. The information collected will be presented using a comparative table.

The books considered were:

- **Book 1 (B1)**:"Quality from customer needs to customer satisfaction", Bo Bergman and Bengt Klefsjo. Studentlitteratur. Third edition.2010
- **Book 2 (B2): "**Quality Management. Creating and sustaining organizational effectiveness" Donna C.S Summers, Pearson international edition. Second edition. 2005

- **Book 3 (B3):** "Managing quality and integrative approach", Thomas Foster, Pearson education International Edition,2004.
- **Book 4 (B4):** "Quality", John Beckford, Routledge, Second Edition. 2002.
- **Book 5 (B5):** "Managing Quality", Barrie G. Dale, Ton van der Wiele and Jos van Iwaarden, Blackwell publishing, fifth edition, 2007
- **Book 6 (B6):** "The management and Control of Quality ", James R. Evans, William M. Lindsay, Thomson south-western publishing, Sixth Edition, 2005.

According to the hits of each topic per book, table 6 reflects the most common topics in quality textbooks. Most common topics (with the highest scores 6 and 5) are in color dark and light green. The least common topics are in dark and light blue (with 1 and 2 hits respectively).

It is possible to observe that among the most common topics among the textbook sample were as follows: Definition of Quality, Total Quality Management, Lean Production/Lean Philosophy, Six sigma, Learning organization, Quality Management Systems, Quality awards and self assessment/Quality models, Benefits of Quality, Costs of poor Quality, Customer focused Product and Service development, Process Management, Evolution of the quality movement, Management Standard Systems (QMS), Quality Service, External Customer Satisfaction, Product Development (QFD), Statistical Process Control, The 7 Quality tools, Leadership, Supplier partnership.

The topics with less popularity in the studied sample were: Critical system Thinking and Quality, Sustainable development, Organization cybernetics and quality and Kano Model.

Even though "External customer satisfaction/ Measurement of external customer satisfaction" was very common, one of its derivate topics for the service sector "Service Quality Measurement Models" did not have the same frequency. Books dealing with "External customer satisfaction/Measurement of external customer satisfaction" covered aspects such as satisfaction surveys, Likert scales and analysis of customer feedback. While, the few books containing "Service Quality Measurement Models" dealt with specific service models, being SERVQUAL the most common. A possible reason for this could be that books containing "Service Quality measurement models" have a more equal emphasis on the manufacturing and service sectors.

In the same way, "Kano Model" had an unexpected low popularity among the sample. Kano Model is known for being a theory of Product/Service Development and customer satisfaction (mostly used for Service development). The low participation of "Kano Model" contrasted the high popularity of "Customer focused product and service development" and

"External customer satisfaction/ measurement external satisfaction". Once again, a possible explanation for this might be that the sample of quality books was mainly focused towards quality in products and not in services.

QUALITY MANAGEMENT TOPICS	B1	B2	B3	B4	B5	B6	Score
Definition of Quality	1	1	1	1	1	1	6
TQM	1	1	1	1	1	1	6
Lean production /Lean Philosophy	1	1	1	1	1	1	6
Six Sigma	1	1	1	1	1	1	6
Benefits of quality	1	1	1	1	1	1	6
Cost of poor quality	1	1	1	1	1	1	6
Evolution of quality movement	1	1	1	1	1	1	6
Customer focused product and service development	1	1	1	1	1	1	6
Quality Function Deployment	1	1	1		1	1	5
Reliability, FMEA, VMEA	1		1		1	1	4
Design of experiments	1		1		1	1	4
Robust design	1				1	1	3
Process Management	1	1	1	1	1	1	6
Statistical Process Control	1	1	1		1	1	5
The 7 improvement tools or the 7 Quality control tools	1	1	1		1	1	5
Supplier Partnership	1		1	1	1	1	5
External customer satisfaction , measurement external satisfaction	1	1	1		1	1	5
Service Quality Measurement Models: SERVQUAL & SERVPERF	1		1		1		3
Kano model	1					1	2
Kansei engineering	1	1				1	3
Gap model or 5 gaps model	1		1		1	1	4
Internal customer satisfaction/ measurement internal satisfaction	1	1			1	1	4
Leadership/Strategic planning	1	1		1	1	1	5
Learning organizations	1	1	1	1	1	1	6
Quality Management systems	1	1	1	1	1	1	6
Quality awards and self assessment/Quality models	1	1	1	1	1	1	6
Sustainable development	1						1
Quality in health care	1	1	1			1	4
Benchmarking		1	1	1	1		4
Organization cybernetics and Quality				1			1
Critical system Thinking and Quality				1			1

Table 6. Most common topics on quality textbook sample

It is worth to mention that in the sample of textbooks, it were found a very few non common topics which was reflected in the fact that on table 1, there were not too many topics in colors dark and light blue. It seems that there exists a common picture of the issues, which are part of the Quality Management paradigm.

The sampled textbooks provide general description and knowledge about quality field as a whole. The books aim to give the readers complete and fundamental quality knowledge to put in practice or to become quality practitioners.

5. DISCUSSION

5.1 Comparison of results from international Quality journals versus QMOD conference

This section aims at answering the following research question:

RQ4: *What are the main differences or similarities between the findings from international Quality journals and findings from QMOD conference?*

Regarding the economic sector distribution, there were found two similarities in QMOD conference and the international Quality journals sample. Firstly, for both QMOD and international Quality journals, **service sector was the predominant economic sector** researched on the papers. And secondly, there has been a **sharply augmentation of interest for Quality research within health care sector** specifically.

Other similarity concerns the economic sector (by ownership) where Quality research papers were developed. This thesis found evidence that majority of Quality research (both in International journals and QMOD conference) is been carried out within organizations belonging to the private sector.

Comparing the top 5 trending keyword groups in QMOD conferences (Table 6) and versus the top 5 trending keywords groups in the international Quality journals (Table 4), the trending topics of the two groups are quite similar in its contents. These trending topics may not be ranked in the same position of importance in both ranking lists, but generally speaking the topics are the same.

Top 5	QMOD Keyword prioritized group list (2010-2011)	Top 5	International Quality journals keyword group list (2010-2011)
1	Service Quality	1	Management Systems Standards
2	Customer related processes AFTER delivering a service or product	2	Total Quality Management (TQM)
2	Quality Models, EFQM Excellence Models, awards	3	Service Quality
3	Innovation	4	Customer related processes AFTER delivering a service or product
4	Management Systems Standards	5	Quality Models, EFQM Excellence Models, awards
5	Employee Issues		
5	Total Quality Management (TQM)		

Table 7. Top 5 most frequent keywords in QMOD conference and International quality journals.

An example of the former statement can be appreciated in table 7 below, where "Service quality" was located in the first place of importance for QMOD conference, while for international Quality journals, "Service Quality" appeared on the third position in the ranking. In the same way, "Management System Standards" which occupied the first position for international quality journals, then on the QMOD analysis it was placed on 4th place of importance.

This difference regarding the position in the ranking of the main trading topics for international Quality journal and QMOD conference might be explained due to the predominant countries participating in each of these two samples.

International Quality journal sample has the highest participation from China, India, USA; while QMOD conference is mostly followed by European countries.

International Quality journals sample has "Management system standards" as its first position mainly because China, the world's second-largest economy, is the country with the greatest increment in ISO 9001 certifications in the world (ISO, 2010). Many papers on Quality management systems are published by Chinese authors.

QMOD Conference has "Service Quality" in first position possibly due to Sweden's impact in leading the conference with the largest number of accepted papers. Statistics shows that Sweden's largest portion of GDP by sector accounts for the service sector (71.3%). This could explain the importance that Sweden allocates in doing research in the service sector, hence in "Service Quality".

Other evidence of the European predominance in QMOD conference was that "Quality Models, EFQM Excellence Models, awards" occupied the third place in the ranking. This might be because of the great popularity that EFQM framework has among European countries.

To summarize, the top trending topics in QMOD conference and the top trending topics in the studied sample of international Quality journals were the same but in different position.

5.2 Gaps between literature and the results obtained from International Quality journals

This section will answer the following research question:

RQ5*: Is there any gap between the contents included in the sample of Quality textbooks and the content of the Quality trends found in the sample of international Quality journals?*

After analyzing the trends in the sample of international Quality journals, a big question raised: Was there something missing, a gap, between what is contained in quality books and the most trending topics in Quality Management research?

The answer to this question is yes and no.

No, because on a ***general level analysis,*** there were found clear similarities in terms of contents covered between the textbooks and the papers from international Quality journals.

As in the most common topics on the studied sample of textbooks, the trending topics from international papers showed coincident high interest towards the following topics: Total Quality Management, Management Systems Standards, Quality models/Excellence models/Awards, Six Sigma, product development (QFD), customer satisfaction and service quality. On a general level, the comparison between the two of them evidenced that the majority of current trending topics are being included within quality textbooks.

On a ***more in detail analysis***, it is possible to state that: Yes, there were found some differences, as follows:

"Service Quality" was one of the top 5 keyword groups in the international Quality journals papers, where the majority of articles made emphasis on studies concerning to assessment and measurement of service quality. Keywords such as SERVQUAL were mentioned intensively in many articles. On the contrary, textbooks barely mention SERVQUAL, and the few ones that mentioned it, did not explain in a deep way this service quality framework.

In the same way, textbooks do not explain general concepts about other service quality measurement models such as SERVPERF, e-SERVQUAL, DINERSERV, which were found in international Quality journal papers.

A possible reason for the absence of "Service Quality measurement models" within the content of textbooks might be that these textbooks did not have an equal emphasis on the manufacturing and service sectors. They were focused in its majority towards Quality in manufacturing sectors. Complementary to this, international Quality journal papers showed a sharp rise towards research in service sector compared with manufacturing sector. In spite of this shift of the economy towards service sector that started occurring some years ago, sampled textbooks are left behind this trend. This because the majority of textbooks focused their content on Quality for manufactured goods.

Another difference found in a more detailed analysis was the absence in textbooks of certain topics related to the "Customer process *After* delivering a product or service" such

as Service recovery and after sales service. Although, textbooks cover other keywords belonging to this groups such as: Customer experience, customer loyalty, European customer satisfaction index, customer feedback, textbooks fell short in covering "service recovery" and "after sales service".

5.3 Comparison of results obtained from international Quality journals versus ASQ future study perspective

After analyzing the Quality trending topics found in international quality journals papers versus the study made by ASQ in 2011 with regard to future trending Quality topics, there were found differences and similarities between the two of them.

"Business excellence/Organizational excellence" is one of the similarities found. Both, ASQ and the results from this thesis considered it as a popular trending topic. Both consider that Quality in final products or services is not enough, what it is necessary is to Quality Management further to the whole company processes and here is where Excellence Models come into play. EFQM-Excellence model emerged in this study as very common keyword when it comes to self assessment in an organization's way to excellence. EFQM-Excellence model is nowadays the most widely used organizational framework in Europe and it has become the basis for the majority of national and regional Quality Awards.

Another similarity is related to "Waste reduction". ASQ stated that companies are increasingly focusing in waste minimizing tools (e.g. lean and six sigma). In our results, "Six sigma/DMAIC/Design for six sigma" is placed in 7th place within the top 10 trending Quality topics in international journal. Even though, this keyword group is not within the top 5 trending topics, it did have a relevant participation because it is placed in the top10 list.

With regard to the differences, ASQ postulated as trending topic the "Global responsibility". For ASQ quality decisions should consider environmental sustainability and social responsibility. This study did not found Global responsibility, also known as, Sustainable development, to be part of trending quality topics in international Quality journals papers (Top 10 list). In our study, Sustainable development has not the same popularity as ASQ predicts, on the contrary, it was placed as 24th in a very low frequency position.

The second difference is quite similar to the one described above. ASQ stressed a high importance to the social aspect of Quality; ASQ depicted it as a Quality useful to society. Corporate social responsibility or the social performance of a company was not placed within the top 10 trending Quality topics for the studied sample of international Quality journals.

The third difference is regarding “Innovation”. In spite of knowing the high importance of this keyword, “Innovation” was not a top 10 trending keyword in international Quality journals papers. It was placed in the 15th place.

Regarding to “Quality beyond Quality systems” ASQ stated that quality usually leans to quality systems, but the ideal would be that organizations have a holistic perspective of Quality. In contrast, this thesis showed that Standard Management Systems (including ISO 9000) constituted the most common keyword within the top 10 list. The predominance of Standard management systems popularity in international Quality journals indicates that Quality systems are still in focus.

Another difference is related to “Experience management”. ASQ considers there will be a shift from product/service centric Quality to *experience centric Quality* and organizations are starting to offer Quality experience and not just a final product or service. Even though “Service Quality” was one of the top 5 trending topics found in this thesis, and it is closely related to “Experience management”, there were few papers related to this punctual topic. Experience management did not have significant participation in the study sample.

Finally, ASQ predicts *New roles for the Quality leader*. By this ASQ meant that since Quality is no longer limited to one department but the entire company, Quality leaders must count on some extra skills, (beside the one required for its specific job position), such as: soft skills and financial knowledge. This prediction has not been anticipated yet by the international researchers on Quality, since there were only two published papers in international Quality journals related to the keyword group “Quality professionals/Quality department”.

6. CONCLUSIONS

6.1 Answers to research questions

The purpose of this thesis was to contribute to a better understanding of research trends on Quality management worldwide during 2010 and 2011. In order to achieve this purpose, five research questions were postulated and answered in this study.

RQ1: What are the current worldwide trends on academic research related to Quality Management over 2010-2011? The most popular research topics on Quality Management were: management systems standards, TQM, service quality, customer related processes *after* delivering product/service and excellence Models/awards.

Management systems standards constituted the most popular group of keywords in the studied sample. This showed that the old popularity of Management systems standards (Specially ISO 9001 and systems integration), still keeps its high attraction in the eyes of Quality researchers due to the notorious number of academic articles containing this keyword. ISO 9001 continues being adopted globally by thousands of organizations, hence, the interest generated in practioners, industries and organizations.

TQM is in second place of popularity. One of the reasons why TQM is present in so many articles could be that many quality aspects in academic papers can be addressed or classified under the name "TQM". TQM concept is quite diffuse; hence there is a lack of consistent definition about it. Additionally, an alternative reason for TQM's popularity could be the perception of TQM as a management system.

In third place, "Service quality". A growing interest of the economy towards the service sector may be behind the high interest of researchers towards this topic. This is also known as the shift the economy has been experienced from manufacturing to services economies.

In fourth position, "Customer related processes AFTER delivering services or products". This keyword group contains topics such as: customer feedback, customer satisfaction, customer loyalty, service recovery, complaint management, after sales service. This group represents a high interest for the researchers because it is a source of highly valuable information for improving services/products or developing new products/services. The measurement of customer satisfaction is one of the requirements of ISO 9001 standard and thus practiced by many organizations.

Quality Models/Excellence Models and Awards are placed in fifth position. The popularity of this keyword group is because EFQM is the most widely used organizational framework in Europe. Also EFQM became the basis for the majority of national and regional Quality Awards in Europe. Excellence models are quite popular since they help

organizations to assess their improvement efforts, monitoring their overall performance management system, and locate opportunities for improvement.

RQ2: Which countries have published the highest numbers of academic papers in international journals on Quality Management? China, India, USA, Sweden and UK are the countries that have published the highest number of academic papers in international Quality journals (2010-2011).

RQ3: Which economic sectors have been researched more intensively in academic papers published in international Quality journals over the past two years? There is a marked predominance of academic research towards Service sectors. This is evidenced not only in the general sample of international Quality journals papers, but also within the Top five leading countries in quality academic research.

The world has been experiencing a shift from manufacturing based economy towards service based economy over the last years. This economical phenomenon was greatly evidenced in this thesis, where worldwide Quality trending topics (not just from international Quality journals, but from QMOD conferences), indicated that the majority of the academic research has been taking place within and for the service sector of the economy.

Complementary to the predominance of Service sector in research, is the fact that one of the most popular trending topics over the past two years has been "Service Quality". The high interest of researchers towards the keyword group "Service Quality", (which includes keywords such as Service Quality measurement and internal service quality), reflects once more the change of focus of interest and the rapid growing interest towards the service sector of the economy.

A potential trend for the future of Quality research in services could be research within the Health Care sector specifically. Data gathered during this thesis evidenced a sharply increment of interest for Quality research within this specific service economic sector. Complementary to this, it was found that Quality in health care is a topic that has been tackled, although not in depth, some of textbooks analyzed.

Contrary to the increasing interest that Health care has been generated in the Quality research community, it is worthy to mention that Education and Building /construction sectors did not show in this thesis the marked high trend I was expecting to find.

RQ4: What are the main differences or similarities between the findings from international Quality journals and findings from QMOD conference?

Similar aspects between the two samples:

- ✓ For both QMOD and international Quality journals, **s**ervice sector was the predominant economic sector where most of the researches took place.
- ✓ For both samples, there was a sharply augmentation of interest for Quality research within health care sector specifically.
- ✓ Regarding the economic sector (by ownership), the majority of quality research was carried out within organizations belonging to the private sector.
- ✓ Regarding trending topics, both samples had the same content of trending keywords as Quality topics. The only marked variation was the position of the topics within the rank.

Contrasts or differences between the two samples:

- There was a difference regarding the position in the ranking of the main trading research topics for both samples. This might be explained due to the predominant countries participating in each of these two samples. For international Quality journals sample "Management system standards" was the most popular research trend. This because China, the world's second-largest economy, is the country with the greatest increment in ISO 9001 certifications in the world.

- QMOD Conference had "Service Quality" as its most important trending topic. This might be result of Sweden's impact as organizing member of the conference with the largest number of accepted papers among all the countries. Additionally, since Sweden's largest portion of GDP corresponds to the service sector (71.3%), it could explain the importance that Sweden allocates in doing research in the service sector, hence in "Service Quality".

- Other evidence of the European predominance in QMOD conference was that "Quality Models, EFQM Excellence Models, awards" occupied the third place in the ranking. This might be because of the great popularity that EFQM framework has among European countries.

RQ5: Is there any gap between the contents included in the sample of Quality textbooks and the content of the Quality trends found in the sample of international Quality journals?

Even though there were found clear similarities in terms of contents covered between the textbooks and the papers from international Quality journals, there is a slightly gap.

Quality textbooks used in Quality courses are falling behind about Quality service related topics. An example of this is that topics such as Service Quality measurement models (SERVQUAL, SERVPERF) have not being included in the majority of textbooks. Knowing that it is really impossible to change constantly the editions of books to keep them updated with the lasts studies related to quality, it is very important that textbooks do not

overlook Quality in services, and provide an equal emphasis Quality for both, manufacturing and service sectors.

Another difference found in a more detailed analysis was the absence in textbooks of certain topics related to the "Customer process *After* delivering a product or service" such as *Service recovery* and *after sales service*. Although, textbooks cover other keywords belonging to this groups such as: Customer experience, customer loyalty, European customer satisfaction index, customer feedback, textbooks fell short in covering "service recovery" and "after sales service".

Additionally to the five research questions, a comparison made between the top 10 Quality trending topics in international Quality journals and ASQ´s study found some similarities and differences between the two groups. Among the similarities, both allocated a high importance to Quality topics such as Business Excellence/Organizational Excellence and waste reduction.

With regard to the differences, ASQ predicted a trend towards having Quality beyond Quality systems. In contrast, this thesis showed that the predominance of standard management systems worldwide is not gone. Quality systems are still in focus. Other difference was regarding "Experience management". Although, Service Quality was one of the top 5 trending topics found in this thesis, Experience management did not have significant participation in the study sample.

6.2 Further work

If researchers intend to deepen its knowledge regarding to current Quality Management research trends and count with a broader global study sample, there is a sample limitation that could be further considered. As discussed in section 1.4 Limitations, there are some limitations regarding the international journals considered for this study. In this thesis, only specialized Quality journals, available at LiU electronic library database were included. Nevertheless, for further studies it would be possible to include more journals from USA and other Asian countries, such as: ASQ Quality Management Journal, Asian Journal on Quality, among others.

A possible further research could emerge from studying one out of the top 5 Quality trending keywords found in this thesis and analyzing it throughout the time. It would be interesting to see how the chosen Quality Management trending topic has evolved in time and to identify within that topic its most significant subtopics researched.

Additionally and based on the found high trend in Quality management research towards the service sector, a potential future study could be the analysis of research trends using exclusively International service management journals.

APPENDIX

List of Keyword groups

No	Keyword groups
1	Management Systems Standards/Standards QMS/Systems Integration/ISO 9001/Quality certificates /Other quality standards/Quality Assurance/Quality Assurance/Internal Auditing
2	Total Quality Management (TQM)
3	Service Quality/ Gaps Model/SERVQUAL/DINESERV/Service Quality Measurement/SERVPERF (Measure service quality)/E-S-QUAL (Measurement tool for e-service quality)/e-service quality/e-SERQUAL/Internal service quality/Service dominant logic/Servitization
4	Customer related processes AFTER delivering service or product: customer feedback/Customer Satisfaction/Customer Experience/Customer Loyalty/European Customer Satisfaction Index (ECSI)/Complaints management/Service Recovery/After sales service
5	Quality Models/EFQM (Model Excellence)/European Business Excellence Model (EBEM)/Baldrige Criteria for Performance Excellence (BCPE)/Quality Awards/Self-assessment/Business excellence
6	Customer related processes WHILE delivering service or product: Customer needs/customer focus/Customer service Management/Customer relationship management-CRM /Customer service/Customer retention/acquisition//Branding/Moment of truth
7	Soft issues/ Leadership/Quality values orientation/Appreciative leadership/Intangible resources/Management of intangibles/Organizational culture/Teamwork/Team Effectiveness model/Improvement teams/Quality Circles
8	Six Sigma/DMAIC/ DFSS (Design for six sigma)
9	Continuous improvement /PDCA Cycle/ Deming's chain reaction model
10	Product development/QFD (Quality function deployment)/RDM(Robust design method)/Demand Compliant Design (DeCoDe) a method for product development / fuzzy QFD/Concurrent engineering
11	Employee related quality issues : Human resource management/ Employee-driven/ Sustainable Health/ Workers / Co-worker Involvement/co-worker health/Work environment/SA8000 standard for decent working conditions /Job satisfaction/employee satisfaction/OHSAS 18001/workers perception/Internal customer satisfaction/Employee productivity/
12	Reliability management/ Human reliability/Human mistakes/Failure Mode and Effect Analysis (FMEA)/Human Error/Product reliability/Service Reliability/analysis of potential failures

13	Customer related processes BEFORE delivering service or product: Customer involvement/Customer-driven/Attractive Quality (Kano Model)/Value creation /Value for customer/Attractive Quality Creation
14	Performance measurement/Balanced scorecard/system performance
15	Knowledge management (KM)/Organizational learning/Organizational competence
16	Innovation/CAF(Common assessment framework- innovation for European public sector)
17	Lean production/Visual planning /Visual management/Value stream mapping (VSM)/5's/Toyota Production System
18	Quality costs/Cost of Quality implementation/ Cost of Quality models (PAF model, ABC model, process cost model and opportunity model)/Quality costing/ Financial plus Quality Management (FPQM)/ Return on Quality/Quality Investment
19	Statistical process control/EWMA control charts/Non-normal data/Random process shift/Measurement system analysis/Statistical Quality Control (SQC)
20	Quality Tools and techniques
21	Maintenance/Total productive maintenance (TPM)
22	Process management/Process audit/Process Optimization/Process improvement/Process view/Value added processes/Process Quality Management
23	Corporate environmental management/ISO 14001/EMAS/Environmental labeling ISO 14024:1999/Environmental performance management
24	Inter-organizational Network/Networks participation/Supply chain Networks
25	Stakeholder management/Stakeholder analysis/Stakeholder requirements/Stakeholder oriented management
26	Benchmarking
27	Sustainable Development/Sustainability/Organizational self-sustainability
28	Lean Six Sigma (LSS)
29	Supplier/Beneficial relations between suppliers/Quality Logistics processes/Supplier selection factors
30	Change management/Organizational Change/Strategic change management
31	Information and system Quality/Generation and dissemination of information
32	Corporate social responsibility (CSR), Product liability, Service Liability

33	Quality Profiles/Global Quality Management/Quality future/Quality movement
34	Kansei Engineering /Emotional Design/Emotional Quality
35	Quality Professionals/Quality Department
36	Design Quality
37	Agile Manufacturing
38	Risk analysis /Risk management
39	Project Management and Quality
40	EBM (Evidence Based Management)
41	Software Quality models
42	Business process re-engineering (BPR)
43	Conformance Quality
44	Recession recovery strategies/Harm crisis/Crisis management

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Claudia Juliana Alayón G.

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