THE EFFECT OF IMPLEMENTING A PROJECT QUALITY SYSTEM

ON GREEK MANUFACTURING COMPANIES

By

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The Effect of Implementing a Project Quality System on Greek Manufacturing Companies

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Curriculum Vitae

Ioannis Bogiatzoglou, Mechanical Engineer

Ioannis Bogiatzoglou is a graduate of the mechanical engineering department of Technological Educational Institute of Crete. In the period of his study he had the opportunity to work in the department of computerization of the institution for two years and to acquire further knowledge in computers. The course of project management during his studies was the spark for the further attachment in the theoretical object.

For two years and during his studies for the City University Master of Science program of project management he worked briefly as project engineer for small size projects in an iron constructions company and as supporting member for the computerization of urban planning.

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The Effect of Implementing a Project Quality System on Greek Manufacturing Companies

Abstract

The link between project schedule and cost with the project's final outcome was until recently the companies' main issue for successful managing. However the need for an emphasis in other features of the projects has been recognized. This thesis is a research for the current status of the Greek manufacturing companies' project quality system. Through interviews and a questionnaire identifies the focus of the project quality system and its effect on project management processes and the quality of the project's outcome. Finally the data derived from this research are analyzed and recommendations concerning the focus of companies' future efforts, in respect with a Total Quality Management system, are being offered.

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Chapter 1

Nature of the Study

Quality is one of the most important attributes of a project's outcome. Its importance lies in its ability to satisfy stated and implied needs of the customer. Greek manufacturing companies have made a late start in understanding the importance of this attribute and to proceed with efforts for its integration into their processes. These efforts are being focused in the implementation of a project quality system which is a framework tool for the management of the interrelated processes in a project that impact the meeting of customer expectations.

This study will examine the impact that a project quality system has in achieving the fulfillment of the quality attribute of a project. It will also show how the project management processes will be affected by it. The field for this research will be the Greek manufacturing companies where the quality attribute in their projects is in an incubational phase.

Needs Assessment

Stakeholders for this thesis can be considered the top management of Greek manufacturing companies who are the primary decision makers for the implementation, or lack of implementation, of projects in their companies; the project managers who assume almost entirely the burden of the project success and its attributes; as well as the customer who is the final recipient of the project's outcome. This thesis will provide stakeholders with a view of:

- The definition and role of the project quality system in manufacturing projects
- The impact on customer satisfaction
- The effect of implementing a total quality management system in a manufacturing company

- The total quality management system as a step towards continuous improvement

- Improving the efficiency of Project Management processes.

Purpose of the Study

The author expects that this study will identify ways that Greek manufacturing companies will benefit from the implementation of a total quality management system by improving a project's quality result, improving the project management's processes and the accelerating progression towards continuous improvement.

Relation to the Program of Study

PM 511, Project Quality Management provided a specific and analytical point of view about the integration of quality into the project management processes. It also provided basic thinking about the designing and implementation of a project quality system, total quality management, and continuous process quality improvement. In order for a project manager to be effective and creditable, he must incorporate all these concepts into the project management processes.

PM 505, Systems Concepts and Thinking in Project Management helped in understanding the definition and use of systems and system dynamics, as well as Critical chain project management. This way a project manager can analyze the project management process and describe how actions within various phases or management areas affect other project areas.

The instructors of City University have supplied the proper tools and knowledge for project management, which the author can apply to the fulfillment of his purpose

Definition of Terms

The following terms defined are used in this proposal.

Continuous improvement - Quality philosophy that assumes further improvements are always possible and that processes should be continuously reevaluated and improvements implemented.

ISO 9000:2000 – It is a set of specifications and standards for quality management systems that cover design, development, production, installation and servicing organizations.

Project quality system – A system that outlines how will be improved and controlled all of the processes (that will ultimately lead to improved business performance).

Quality - Performance features and characteristics of a product or service to satisfy a stated or unstated need

Quality management - The policy and associated procedures, methods and standards required for the control of projects with the purpose of reducing the risk of project failure and provide the opportunity for continuous improvement

Scope - The sum total of all project's products and their features

Total quality management (TQM) - A management approach of an organization, centered on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction

Chapter 2

Problem Statement

A project quality system provides the framework for planning, implementing and assessing the work performed in a project. Greek manufacturing companies often have difficulties in meeting the quality aspect of a project's scope, due to the lack of designing and integration of a well-defined project quality system into the project management processes.

Rationale

Quality is a term that for many is considered ambiguous. For many years several interpretations had been given, all of them describing different aspects of the term. It is a fact that the general perception of quality for manufacturing companies in Greece, at least until a certain time period in the past, refer to merely conformance to specifications. A similar view existed in other types of companies in Greece also, not only manufacturing.

The need for an emphasis in other features of the projects has been recognized since there was no real improvement in the final outcome of project with the means used so far. Until now the main concern of companies and managers were the schedule and cost constraints of a project, which have the most immediate and most obvious effect on a project's outcome. Significant improvement has been made over these two constraints concerning the final outcome since various methods of the project management processes have been used selectively according the needs of each company.

Ambiguity existed concerning the aspect of quality and everything around it. This had to do mainly with the systemic approach to quality, meaning the total actions, methods, means and personnel that are included in a company, and have quality as a target. Nikos Logothetis (1999) said that Greek manufacturing companies are currently working their way

through an era that is called, the quality awakening era. As a result, awareness has been created concerning a project's quality, which characterizes it as an important factor of a project's success.

The efforts that companies and project managers have made so far are focused on past experience, lessons learned and the implementation of the ISO quality system. There are companies that accomplished their goal and have completed successful projects with an emphasis on quality. However, these efforts haven't brought the desired results mostly because the reluctance of the companies to embrace changes into their culture, which is a necessary step for quality improvement.

Hypothesis/Objectives

This study will show how the implementation of total quality management system in a manufacturing project will improve the project management processes of the company and the quality of the project's outcome in meeting the desired expectations through continuous improvement.

Chapter 3

Review of Literature

The review of literature has as purpose to discover the effect of quality systems in the outcome's quality and the project management processes of manufacturing projects. The effort is focused on the finding of elements that will show how the focus and behavior of quality systems, with proper implementation can provide benefits for companies adopting them. What is more, we will focus on Greek companies' quality background, since manufacturing companies have not strayed from these conditions. Therefore the literature review is organized into four sections: project management processes, quality management, quality management systems and Greek manufacturing companies quality background.

Project Management Processes

As a process we define the sequence of operations that receive input and produce output using recourses like time, space and expertise. Project management processes consists the backbone of project management and balances the factors that determine project success. These factors, or else project requirements, are mostly referred on three basic elements of each project, time, cost and scope. These elements are often called the golden triangle because any change in one of them immediately affects another, affecting ultimately the whole project.

The Project Management Body of knowledge (PMBOK 2004) defines project management processes as the set of interrelated actions and activities which are associated with each other by their performance for an integrated purpose. This means that the processes are linked with the outcome since the outcome of each process is input to another until the

final product. Therefore we can say that project management itself is a broad process with input the project's outcome.

Project management processes are organized into five major groups called project management process groups. These groups are initiating, planning, executing, monitoring and controlling, and closing process group. The initiating process group includes all processes for an inchoative project definition and justification. The planning process group includes all the processes need for the clear definition and planning of all project's elements using information from inside and outside sources of the project. The executing process group includes all the processes required for the implementation of the work defined in the project plan. The monitoring and controlling process group involves all processes needed for the monitoring and controlling of the execution phase. Finally the closing process group includes all processes needed for the formal termination and delivery of the project.

The processes groups are being performed always in the same sequence and are independent of application areas. There are being applied on nine basic knowledge areas, meaning areas with specific knowledge requirements. These project management knowledge areas are:

- Project integration management

- Project scope management

- Project time management

- Project cost management

- Project quality management

- Project human resources management

- Project communications management

- Project risk management

- Project procurement management

Each project management knowledge area contains specific processes of the process group. On the following table is shown the setting of project management processes in relation to knowledge areas and process groups.

Knowledge Area Processes	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring & Controlling Process Croup	Closing Process Group
Project Management Integration	Develop Project Charter Develop Preliminary Project Scope Statement	Develop Project Management Plan	Direct and Manage Project Execution	Monitor and Control Project Work Integrated Change Control	Close Project
Project Scope Management		Scope Planning Scope Definition Create WBS		Scope Verification Scope Control	
Project Time Management		Activity Definition Activity Sequencing Activity Resource Estimating Activity Duration Estimating Schedule Development		Schedule Control	
Project Cost Management		Cost Estimating Cost Budgeting		Cost Control	
Project Quality Management		Quality Planning	Perform Quality Assurance	Perform Quality Control	
Project Human Resource Management		Human Resource Planning	Acquire Project Team Develop Project Team	Manage Project Team	

Project Communications Management		Communication Planning	Information Distribution	Performance Reporting Manage Stakeholders	
Project Risk Management		Risk Management Planning Risk identification Qualitative Risk analysis Quantitative Risk Analysis Risk Response planning		Risk Monitoring and Control	
Project Procurement Management		Plan Purchases and Acquisitions Plan Contracting	Request Seller Responses Select Sellers	Contract Administration	Contract closure

Table 1 Mapping of the Project Management Processes to the Project Management Process Groups and the Knowledge Areas (PMBOK, 2004)

However an interesting systemic view of project management in literature is the resemblance of the interaction of project management processes with Deming's plan-do-check-act cycle (Kleim, Ludin 1998; PMBOK 2004; Kemp 2006). In traditional project management the process groups were considered to be applied in a linear way. Modern project management makes this relation with Deming's cycle using as links the outputs of each process. More specifically the process included in planning correspond to the plan element of Deming's cycle, the process of executing correspond to the do element and the processes of controlling and monitoring correspond to the check and act elements of the cycle. Additionally since projects have a beginning and an end the processes of initiation and closure are inputs and outputs to this cycle.

This resemblance between project management and the Deming cycle occurred because in a project some processes are being repeated and revised in order to be more

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effective. This concept agrees with the PDCA cycle which is a framework for process or system improvement. Therefore it would be appropriate to say that a quality management concept runs beneath project management.

Kemp (2006) noted that if project management is evaluated from a continuous improvement perspective then it is possible to diagnose problems to the three main elements of project management, meaning scope, time and cost which are the most obvious from the rest six knowledge management areas meaning integration, quality human resources, risk, communication and procurement. This view implies that each process affects another but not necessarily in the sequence of the process groups since they are all parts of the system. These effects can also occur with the use of tools and concepts of other processes.

Lazlo (1999) identified several quality concepts that affect project management. Among them leadership, customer focus, lessons learned and continuous improvement had important effect on communication, motivation, scope definition and risk management.

Orwing and Brennan (2000) claim that project management can be considered a repetitive operation for project based organizations. Therefore quality management concepts as customer focus, teamwork and continuous improvement can be viewed as main focus for the project management processes. Furthermore they denote that formal project management can be replaced by quality management in project based organizations and provide successful results.

Another interesting view is the link between the outcome variables of project management processes with specific quality management practices like training programs, customer focus, process control and benchmarking. This was the outcome of a study conducted by Barad and Raz (2000) on manufacturing companies from Israel and which concluded that there is a specific need of quality practices for the improvement of the outcome variables with more important training which affects all variables, and process

control which affects the stability of the process. This prospect is also being enhanced by Bryde and Robinson (2007) who indicate in their study that a quality program has significant effect in the elements of time, cost, technical focus, customer requirements and stakeholders and their corresponding project management processes.

Quality Management

In order to establish an understanding of how quality management affect project Management processes, it is vital to provide an outline of quality management. This is important because there are several different views on quality and it's management that each contributes in its own way in projects.

Quality is a term that has taken various meanings through time. Initially quality was a perception. When a product or service was considered effective then it also was considered to possess quality. Later on attention for quality was given on certain elements of the product in respect with its use. Therefore a product was considered quality product when certain features of it exceeded these of other products. The first breakthrough came with the introduction of inspection, statistics and rework. The only concept of quality at the time was conformance to specifications. This was achieved by inspecting at the end of any process to determine if specifications have been met, by the use of statistics in order to establish goals of conformance and by rework which was additional effort and cost to fix non-conforming products. Today the focus of quality has turned to customer focus, variation and continuous improvement. The customer requirements are of primary concern for quality since they are at its base. Variations are the differences that exist on the outcomes of similar products. Quality's interest is in controlling these variances through the use of statistical methods that determine its predictability. And finally continuous improvement is the never-ending effort modifying processes in order to improve results. Kerzner (2003) provides a helpful contrast

of the views of quality in the past and present in order to better understand the change of focus on quality.

PAST	PRESENT
Quality is the responsibility of blue-collar workers and direct labor employees working on the floor	Quality is everyone's responsibility, including white-collar workers, and the indirect labor force,
Quality defects should be hidden from the customers (and possibly management)	Defects should be high-lighted and brought to the surface for corrective action
Quality problems lead to blame, faulty justification, and excuses	Quality problems lead to cooperative solutions
Corrections-to-quality problems should be accomplished with minimum documentation	Documentation is essential for "lessons learned" so that mistakes are not repeated
Increased quality will increase project costs	Improved quality saves money and increases business
Quality is internally focused	Quality is customer focused
Quality will not occur without close supervision of people	People want to produce quality products
Quality occurs during project execution	Quality occurs at project initiation and must be planned for within the project

Table 2 Changing Views of Quality (Kerzner, 2003)

The most contemporary definition for quality has been given by the International Standard Organization which is "the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs". Literature has set several different directions for

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this definition which either change it or enhance it. Kerzner (2003) and Verzuh (2003) concur with this definition of quality, supplementing that quality is defined by the customer. Verzuh expand this definition by adding the unexpressed customer requirements. These social or human requirements, as he characterizes them, are the product of the interaction between buyer and seller throughout the transaction process. Kerzner furthermore devotes that terms like "customer satisfaction" or "fitness of use" must be considered goals of quality and not definitions.

The term "fitness for use" for quality has been introduced by Juran (1998) who identifies two critical meanings for quality. The first is about these features that will provide enhanced customer satisfaction by meeting the customer needs. This meaning is closely connected with financial benefits since increased customer satisfaction is considered to be linked with income. The second meaning for quality is "freedom from deficiencies". This meaning is about the elimination of rework which will significantly contribute in cost reduction.

Evans and Lindsay (2005) define quality as the meeting or excess of customer expectations. Furthermore, for the analysis of this definition he divides customers into three categories, the consumers which are the final recipient of the final product; the external customers which are recipients of a product or service other than the final outside organization; and the internal customers which are recipients from within the company. In their book also provide several perspectives from which quality can be viewed: These perspectives are:

- Judgmental perspective considers that quality is the superiority of one feature or product over another

- Product-Based perspective suggests that quality is a measurable variable which affects quantitative attributes of a product

- User-Based perspective defines quality as what customer wants

- Value-Based perspective is related to value, meaning the interaction of satisfaction with price

- Manufacturing base perspective which is conformance to specifications

All these perspectives of quality are subjective since they are dependable on the position of the viewer. The levels of quality that he specifies are separated into organizational, process and performer level. At the organizational level the main concern for quality is to satisfy the external customer demands. At the process level quality is about the systemic effectiveness of the processes through the various departments of the organization. And finally at the performer level quality is conformance to specification as originated from organizational and process levels. In this level are also included cost, innovation and accuracy.

A different point of view about quality gives Rose Kenneth (2006) in his book "Project quality management: why, what and how". He introduces quality as a forth constraint into the project's triangle making it equal but not tradeable as the existing constraints time, cost and scope. In the general context he agrees with the ISO definition for quality. Yet he particularizes the definition on central themes for quality products, defects, processes, customer and systems supplementing that the approach on quality should involve customer focus, variation, and continuous improvement. Furthermore he emphasizes on the counterentropic aspect of quality. To be more precise he does not consider natural for a process or a product to be of quality, but as he states "a result of hard, deliberate work that begins with planning, includes consideration of contributing elements, applies disciplined processes and never ends".

Another customer focused approach on quality which also defines quality as what customer wants, is provided by Kemp (2006). He combines four major disciplines in his

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approach, philosophy, economics, marketing and operations management which when combined in the correct order give a multiple perspective on quality always in relation to the customer and his satisfaction. Moreover he denotes that the difficulty in addressing quality is identifying the customer's wants which are directly affected by the four levels of quality universal, cultural, social and personal.

As the need for quality over the years was increased, so was the need for its management. Quality management is a product of the always increasing need of humanity to ensure quality and in a more general context of success. Therefore quality management is a set of processes methods and standards used to ensure that the pursued outcome will accomplish the delimited specifications. In order though to reach its final composure, it developed passing through various stages to reach its final composure. (The Original Quality, n.d.).

In the beginning days of manufacturing the concept about quality was merely an acceptance inspection of the final outcome. The responsibility was left in the hands of people who worked on the production. As companies became larger the need for an inspection department was needed mostly due to deficiency of worked caused by the work overload and the lack of training on issues that required special handling. Yet over the years the inspection department was not only responsible for the outcome acceptance but for the prevention of defects also. Hence the quality control department was introduced into manufacturing companies with the responsibility of quality control engineering and inspection services.

In the 20's the statistical theory was brought forward and in combination with quality control was the first major effort for control of the processes. Major contribution to this effort was the theory of statistical process control (SPC) initially developed by Shewhart and finalized by Deming. However this theory was not set to use by the manufacturing companies until the late 40's.

The first notions of integrated quality management came from Japan in the early 50's. With the help of Deming, Juran and Feigenbaum Japan evolved to be leader in quality issues and quality management. Deming's philosophy was focused around continuous improvement and manufacturing as a system. He though of quality as a result of work efforts to the total cost ratio, indicating that with people and organization focus on quality then quality will increase and cost will fall over time .(*W. Edwards Deming,* n.d.). Furthermore, he acknowledged as a primary weighting factor the involvement and responsibility of the management. For this reason he taught the importance of top management's leadership, customer/supplier partnerships and continuous improvement on processes. He also introduced Shewhart's plan, do, check, act cycle as a problem solving approach with emphasis on learning and ongoing improvement. The climax of this contribution to quality management view was "the system of profound knowledge" which is consisted of four interrelated parts: the appreciation for a system, the understanding of variation, the theory of knowledge and psychology. This "system" was considered to be the explaining of the foundations from which derived the 14 points for management and the 7 deadly diseases. (Appendix A).

Juran (1998) had also the same view as Deming about the contribution of top management to quality. Yet he chose to "fight" through the system for quality improvement. He focused on three major quality processes which he called the quality trilogy. The first is quality planning which is about the setting of goals and actions to achieve quality, the second is quality control which is the control of performance in order to meet the pre-defined quality goals and the third is quality improvement which is the analysis on project by project basis for the setting of performance improvement plans. Additionally acknowledging the impact of customer satisfaction on quality he emphasized the need for on-going improvement (Appendix A).

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Feigenbaum is best known as the founder of the phrase total quality control. He defined this phrase as "An effective system for integrating quality development, quality maintenance and quality improvement efforts of the various groups within an organization, so as to enable production and service at the most economical levels that allow full customer satisfaction". He thought of quality as a business tool for which quality cost can be used as measurement and evaluation tool (Appendix A). He also proposed three steps in order for an organization to achieve quality. The first is Quality Leadership which emphasizes the management's focus and lead on quality efforts, the second is Modern Quality Technology which suggests the introduction of qualified personnel into the processes as a mean to evaluate and implement new techniques for customer satisfaction and the third is Organizational Commitment Which is about the training and motivation of workforce and integration of quality in all organizational activities.

The economic resurrection of Japan through these quality management philosophies and the infiltration of Japanese products of superior quality into foreign markets gave a late awakening call in the West. This call can be translated into companies' sole initiatives for quality mostly using total quality management as a base. In this spirit, Philip B. Crosby (1980) in his book "Quality is free" proposes the concepts that quality has no cost and that its goal must be zero defects. He also introduces the four absolutes for quality and proposes 14 steps for quality improvement using as basic elements, determination, education and implementation (Appendix A).

Since then the focus on quality has been shifted to the creation of specific frameworks awards and certifications which recognize the use of quality management on companies. The most known and widely use are the Malcolm Baldrige National Award, the International Standard Organization, Six Sigma and lately the European Quality Award.

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Contemporary literature provides a general outline of quality management processes and principles. This outline has been designed in a way that meant to be compatible with most approaches and frameworks expressed for quality management over time. Deviations or alternative approaches though in the management of quality are not an uncommon phenomenon. Yet most of them are based on specific frameworks.

In 1996 and in 2004 with its first and third edition PMI published the "PMBOK A guide to Project Management Body of Knowledge" as an overview of all practices used in order to ensure the success of any given project. Quality management was acknowledged as an integral part of project management and was defined as the processes which include all the activities needed to determine quality policies, procedures and responsibilities. The three processes which consists the essence of project quality management are:

- Quality planning, meaning the actions that identify goals and standards for quality and the elements of a project's quality system. The major outcome of this process is the quality management plan, the quality metrics and the process improvement plan.

- Quality Assurance includes all the systematic activities that provide the confidence that the project will employ all processes needed to fulfill requirement. The outcomes of this process are updates on quality standards and project management plan, and recommendation for corrective actions.

- Quality control which is the activities and techniques used to monitor and verify compliance of project results with the quality standards. The outcomes of this process are corrective and preventive actions, defect repair, control measurements and outcome validation.

PMBOK additionally stresses that the model of project quality management that proposes differs from product quality management because it can be applied into every project and not only into specific kind of projects. Moreover it recognizes the importance of

customer satisfaction, management responsibility, prevention over inspection and continuous improvement which are vital parts of modern quality management.

Bruce T. Barkley (2001) proposes an alternative method of quality management. He suggests that project quality management is the process of integrating quality into the project managements processes. In his book "Customer driven project management: building quality into project processes" he introduces a new paradigm where he combines total quality management and project management. This approach focuses on the achievement of total customer satisfaction and on the performance and improvement of a project based on the interrelation of the strengths of both total quality management and project management. More specifically it uses continuous improvement, focus on customer, people involvement from total quality management and the methods of planning, controlling, and delivering successful outcomes from project management. The customer driven project management improvement methodology is a continuous process designed to ensure that in every process it is applied on the outcome will totally satisfy the customer.

It is consisted of eight steps which are formed to be able to be applied in every process of the project. These eight steps are:

1. Define the quality issue

2. Understand and define the process

3. Select improvement opportunities

4. Analyze the improvement opportunities

5. Take action

6. Check results

7. Implement the improvement

8. Monitor results

The customer driven project management improvement methodology along with the elements of focus on project mission and teamwork are three basic elements of the implementation of "customer driven project management".

Verzuh's (2003) quality management approach was primarily based on the ISO principles. In his view of quality management is a well-established discipline that helps achieving the customer requirements within the time and budget constraints. In his book "the portable MBA in project management" he identifies four basic components of quality management; 1) customer requirements, 2) design and managing systems and processes, 3) continuously improving processes and systems in a cost-effective manner and 4) innovation, all of them expansions of basic ISO principles.

For the requirements of the customer component Verzuh categorizes the requirements into business and technical and uses the quality function deployment method to prioritize them including the cost and difficulty for implementation criteria.

For the second component, design and managing systems and processes, he embarrasses four quality management principles that derive from viewing the system as compliance to requirements set. These principles are visibility, documentation, standardization and traceability.

Continuous improvement is engaged by Verzuh in two steps. The first is through inspection and prevention at the early stages of the project in order to reduce the "garbage in" and the second is the use of quality management principles in order to solve process problems.

Finally for the innovation component of his view of quality management, Verzuh proposes the scouting technique which creates possible openings for innovation by scanning all trends that have an impact on people's expectations.

Summarizing all the components into a need to do phrase for the project manager Verzuh quotes: "The important point for a project manager list of quality management is to define, track and improve on both the customer's expressed/contracted requirements "(Verzuh 2003).

Kerzner (2003) does not differentiate his view of quality management from the proposed view of the PMBOK. However he gives great significance on the concepts of quality policy and quality objectives. These two concepts are not given the appropriate weigh in the PMBOK, with the second to be incorporated into quality planning. Furthermore, Kerzner adds the concept of quality auditing which is an independent inspection from qualified personnel in order to verify conformance of the project to specifications. Finally he stresses that everyone inside an organization is responsible for the quality of the project's final outcome and everyone from top management to the project team members must actively participate.

A combination of the two most known quality management approaches Kenneth H. Rose (2005) uses in his book "Project Quality Management: Why, What and How" in order to present his view of quality management. More specifically he combines the three elements of the PMBOK quality planning, quality assurance and quality control with the three elements in Juran's Trilogy quality planning, quality control and quality improvement. In his definition of quality suggests that the key to project quality lies in making more effective and meaningful transfers of proven quality methods to a general project management domain. In his concept the outcome of this inosculation is a quality management approach which includes the processes of quality planning, quality assurance, quality control and quality improvement.

Analyzing more this set of processes called "quality journey" he provides seven steps as the framework of quality management which can be applied in any project. These seven

steps are 1) identifying customers, 2) identifying requirements, 3) identifying specifications, 4) quality assurance activities, 5) quality assurance plan, 6) quality control and 7) quality improvement.

In reality in his quality management approach he represents the PMBOK processes with the addition of Juran's quality improvement process which is based on the Deming's plan-do-check-act cycle.

Sid Kemp (2006) in his book "Quality management demystified" identifies two basic concepts for quality management, standardization and the scientific method. Standardization is the process that includes all the activities that determine if we conform to the standards and what to do in order to meet them. The scientific method is the process used to make and test theories. Moreover he adds that if customer requirements can be added in the technical requirements from the quality view then quality definition can be correlated with scope definition.

According to his view of quality management, which is based on the SIPOC model, there are five stages that constitute this framework: Quality definition, quality planning, quality control, quality assurance and delivering quality. More specifically he adds two processes to the PMBOK processes of project quality management, one in the beginning and one in the end. These two processes concern the definition quality before the definition of the processes by using requirement elicitation in order to specify the requirements and the promoting of principles able to offer customer delight like total quality management methods.

Furthermore he indicates that the use of quality management principles in project management and vice versa can be of great benefit for a company or a project since contribute in significant cost reduction and the reduction of risks able to put a project in jeopardy.

The importance of the values of quality management was pinpointed by Lagrosen and Lagrosen (2006). These values or principles are considered to be the third of the three levels of quality management with the other two being the tools and techniques, and the models and systems. They identified six basic values, which can be seen as behavioral values also that believed to be the most promising for the future. These six values are customer orientation, leadership commitment, participation of everyone, continuous improvements, process orientation and management by facts.

This view is also enhanced by a study conducted in a Swedish company which concluded that the top management's intensified commitment on quality along with joint leadership and communication of the basic values of the company (that are not just words), throughout the company, on which has developed methodologies for continuous improvement, has led the company to become one of the quality leaders in it's country by winning a quality award twice (Palmerg, Garvare 2006).

What is more Svensson (2006) in his article about the strategic perspective of quality management notes that sustainability must be the current focus of companies for quality management in order to be efficient and competitive now and in the future.

The development of quality management from a statistical method to modern quality management practices had great impact and provided significant results in the organizations' efficiency and operations. To this also contributed the placement of the quality management concept right under the top management which increased the efforts of companies to implement quality management practices (Bayo-Moriones, De Cerio 2003).

On a study conducted in Tunisian companies it has shown that specific elements of quality management have significant results on specific parts of organizational performance. For example information analysis and quality system improvement have direct positive effect on product quality while employee training and participation with organization for quality

affect positively financial performance. Additionally infrastructure practices have a significant direct effect on organizational performance (Lakhal, Pasin, Limam 2006). Moreover there has been identified a relation between quality models with internal operations efficiency improvement, cost savings, and financial benefits from market image improvement (Saizarbitoria, Landin, Fa 2006).

Yet each country had a different perspective concerning quality management. Each country focused on different elements accordingly with its implied needs (Lagrosen 2002). UK focused on people, France focused on communication, Germany on procedure and structure and Italy on leadership. This aspect indicates that quality management can be beneficial in many ways by focusing on different elements.

Quality Management Systems

Quality management system is a framework tool for the management of interrelated processes that has an impact on meeting customer requirements. It is a structure that outlines responsibilities, procedures, processes and recourses in order to efficiently implement quality management and improve business performance.

In this part of literature review we will focus on the international standards organization's (ISO) standard for quality management system and in Total Quality Management (TQM) which is a business improvement philosophy. Furthermore we will provide a brief outline of the European Quality Award model (EQA) since TQM cannot be accredited and EQA is considered a byproduct of TQM.

The ISO standards is a set of specification standards designed in order to maintain an effective quality system. It is a framework tool which needs a pre-existing quality system in the background, even in a vestigial form, which will improve and verify. Its focus is based on developing, recording and implementing procedures that will assure consistency of

operations in a company. Yet it does not ensure that performance improvements will be achieved. It only verifies that processes able to achieve quality exist.

The main idea prior its first publication in 1987 by the International Standard Organization, was that it would be easier for all companies to collaborate if they all complied with the same standard. The first publication has as a reference the British standard BS 5750. Two versions have been made since then. The first was in 1999 which included 27 standards and informational documents and the second in 2000 which is the current version.

ISO 9000:2000 standard is consisted of three elements. The first is ISO 9000 which is a document that contains key concepts and terminology for the standards. The second is ISO 9001 which includes specific requirements for a quality management system that must be met in order to be certified and the third is ISO 9004 which provides guidelines for improving processes beyond the requirements of ISO 9001.

According to Kemp (2006) the system has been designed in a way to ensure that quality is defined from the customer and his requirements, that the company will provide confidence that is consistent with what it says and the plan-do-check-act cycle will be used for problem correction and improvement. However Boys, Karapetrovic and Wilcock (2004) believe that ISO 9004 does not fulfill its purpose because it is not used in the extent expected and it is not providing the benefits designed for.

The basic quality management principles of ISO 9000:2000 express the expectations that the use of the ISO standard will result in. In a general approach, they reflect many of the core values of total quality management and consequently of the Malcolm Baldrige National Award and the European Quality Award (Evans, Lindsay 2005).

These principles are:

- Customer focus involves understanding, meeting and exceeding customer's wants, needs and expectations.

- Leadership is about defining the organization's objectives and communicating them in order to create a participating environment for the people.

- Involvement of people; includes the involvement and use of people and their skills for the organizations benefit.

- Process approach, is the view of managing all activities as part of a process.

- Systems orientated management is the treatment of all interrelated processes as a system.

- Continuous improvement refers to the improvement of organization's overall performance.

- Factual approach to decision making is about using and analyzing all available data and information before making a decision.

- Mutually beneficial supplier relationship; refers to the creation of value for the organization through the relationship with the suppliers.

Beyond the philosophical approach the ISO 9000:2000 basic principles have, extensive documentation is required in order to be proven that these principles are followed and certification to be achieved. More specifically the documentation needed refers to the quality policy which is a statement from the top management, the quality manual which addresses the organization's requirements for certification, the quality objectives which is a document about the assignment of goals to specific organizational element, the quality processes which is a clear and specific definition of the processes that address the ISO requirements and finally the quality records which is the document that proves the performance of the organization.

Even though this required documentation is considered to be a very bureaucratistic method and a significant drawback for the implementation of ISO 9000:2000 framework, there are significant recorded benefits in literature. More specifically an ISO survey

(Liebesman 2000) conducted in user experiences from U.S noted that the benefits that delighted users were the use of data in business management, the increased management commitment, the improved customer satisfaction and relationship, and the effective management reviews. Additionally bottom line improvements were identified like quality of products and improved productivity.

What is more Gotzamani (2005) mentioned that the implementation of ISO 9000:2000 helps the organization to be more flexible, adaptive and operable, shifts their focus to operational results and eliminates previous complex documentation. Finally a comparison between ISO 9000:2000 and the Baldrige criteria reported that ISO can serve as a first step towards TQM (Kartha 2004; Gotzamani 2001).

Total quality management is a method that involves the cooperation of top management and employees of a company for the continuous improvement of overall performance. It is a combination of quality management tools used for the reduction of losses and increase of business. A clear and well-structured definition of total quality was given in 1992 by a group of companies and universities which is the following:

Total Quality is a people- focused management system that aims at

continual increase in customer satisfaction at continually lower real cost. It

is a total system approach and an integral part of high-level strategy; it

works horizontally across function and departments, involves all employees

top to bottom and extends backward and forward to include the supply chain

and the customer chain. It stresses learning and adaptation to continual

change as keys to organizational success.

The foundation of total quality is philosophical: the scientific

method. It includes systems, methods and tools. The systems permit change;

the philosophy stays the same. Total quality is anchored in values that stress

the dignity of the individual and the power of community action.

This definition covers and joins many aspects of organizational culture, attitude and framework providing at the same time the purpose of total quality. This purpose is to significantly lower the costs of operations by eradicating defects through knowledge and experiences in incorporated to the processes (continuous improvement), and total internal and external customer satisfaction. In other words the purpose is "do it right, the first time, every time".

Kemp (2006) defines the total quality management as the collaboration of scientific management with dedication, focus and creativity. Moreover he specifies the essential elements of total quality management which constitute the "total" part of the term. These elements refer to everyone's focus on quality, training of employees on PDCA cycle and other TQM techniques, and the empowerment of employees. Additionally he refers to organization's departmental self-management, the creation of cross-functional teams for problem solving, the collaboration with suppliers for solving problems outside the organization, fact-based decision-making and the definition of quality as an internal value.

Lau and Anderson (1998) gave three dimensions on TQM, the philosophical, the strategic and the measurement. The philosophical involves the obligation of top management to define, incorporate and communicate quality into the organization's missions. The strategic dimension involves goals and actions that will satisfy customer needs. The measurement dimension is based on strategic and involves a measurement system that will provide top management valuable data for continuous improvement decision making.

The core concept of total quality management lies on Deming's 14 points for continuous improvement (Appendix A). However total quality is based on three fundamental principles with first being a focus ton customers and stakeholders meaning the meeting of

customer's expectations through the understanding of the attributes that contribute to customer value, secondly the participation and teamwork of everyone in the organization since one person working in a process understands it better and finally a process focus supported by continuous improvement and learning which is viewing processes as a system and making efforts for continuous improvements. These principles must be supported by organizational infrastructure, a set of management practices and a set of tools and techniques. The following figure shows the relation between infrastructure, practices and tools and techniques with the three basic principles of TQM.
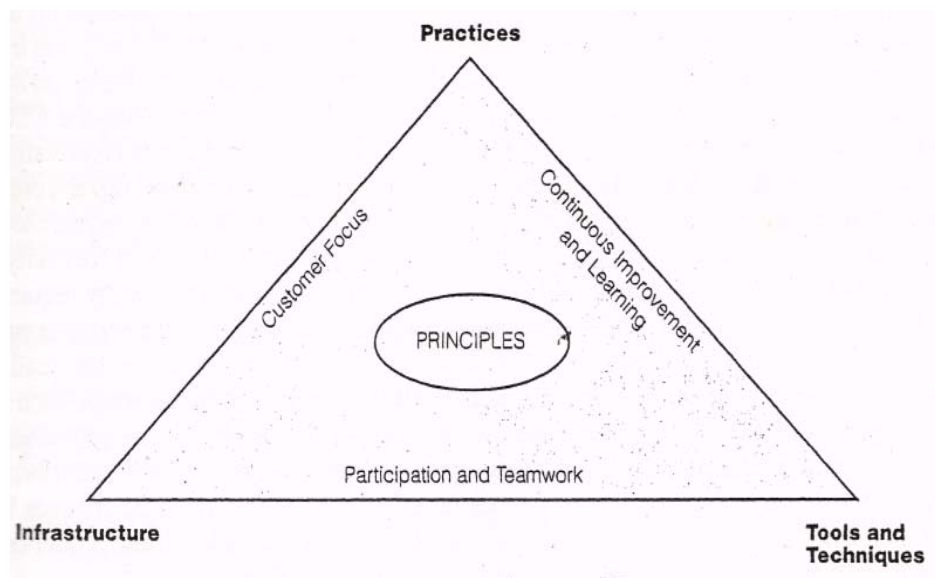
Figure 1 The Scope of TQM (Evans, & Lindsay, 2005)

There are eight key elements where an organization must focus on, in order to successfully implement TQM. These eight elements are being divided into four groups. The first group is called Foundation and involves the elements of ethics, integrity and trust. The second group is called Building bricks and includes the elements of training, teamwork and leadership. The third group is called Building Mortar which includes communication and the forth group is called Roof and includes the element of recognition.

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Figure 2 Key Elements of TQM (Padhi, n.d.)

No matter how much focus is being given on the eight key elements, successful implementation of TQM requires a change in organizational culture which can only be achieved if people are willing to change. However the successful implementation of TQM can provide many benefits for the organization embracing this framework.

Kerzner (2003) in his book "A system's approach to planning, scheduling and controlling" refers to several companies that have been benefited from TQM by defect reduction, on-time delivery improvement, improved customer satisfaction, reduced cycle times and financial improvement.

Furthermore a study conducted in Turkey (Bayazit 2003) reveals that 62% of major companies have fully implemented the TQM framework with results like quality improvement, decrease in price, on time delivery, increased profitability, market share as well as customer satisfaction, teamwork and decrease in defects.

Another study revealed that the effect of critical factors on non-financial performance had more impact on financial performance that the direct effect of critical factors of TQM had (Demirbug, Tatoglu, Tekinkus, Zaim 2006). This means that criteria such as market development and market orientation had produced more value for the companies than profit and revenue, with the most important practices used being training, employee relation and data reporting.

As conclusion it is very interesting to point out the current level of TQM adoption in organizations. Mele and Colurcio (2006) have identified three main aspects for the evolution of TQM. These aspects are innovation, excellence and value. The systematic use of the basic TQM elements provides a growing field for the innovating processes helping organizations to achieve excellence. Excellence though is achieved by the fulfillment of all internal and external organizational needs and interests, with a final result stakeholder value. Therefore in order to achieve excellence and consequently value, two levels of TQM must be focus on. The first is the strategic dimension which is an extension of customer management, and the second is the organizational dimension which concerns the development of further innovation.

Primarily based on the TQM philosophy, the European Quality Award (EQA) or else Business Excellence Model was created in 1992 by the European Foundation of Quality Management (EFQM). Its first and main purpose was to be an assessment tool for the EQA. Now it is considered to be a practical tool for self-assessment, benchmarking with other organizations, improvement identification, common language throughout the organization and a structure for the organization's management system. Its structure is based on eight fundamental concepts of excellence. These concepts are: results orientation, customer focus, leadership and constancy of purpose, management by process and facts, people development and involvement, continuous learning, improvement and innovation, partnership development and public responsibility. Each and every one of these concepts has a significant meaning for the framework and produces specific and significant benefits.

It is also significant to stress that the EQA is applied within the European region similar to the Malcolm Baldrige Award which is for U.S. organizations only. It is considered to be an alternation of TQM which can be proven very valuable since it could possibly be used as an intermediate step to TQM as TQM cannot be accredited.

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Greek Manufacturing Companies Quality Background

The term of quality in Greece was never fully defined and comprehended until the very recent years. Until then as quality was considered anything that had a positive outcome and by positive we mean anything that worked sufficiently enough or had a good aesthetic result. Nevertheless quality existed in some early projects even though it was not a prerequisite.

K. Dervitsiotis (1999) mentions in his article about quality in Greece that in ancient Greece quality was primarily embedded in works of art literature, architecture, theater as also in the science of mathematics. Additionally Greek ancient philosophers were the first that expressed some quality principles in their tutoring even though not intentionally (Logothetis, 2002). Among them Socrates through his obstetric method, Plato through his expressed opinion about the consuming know how and Aristotle with his characteristic phrase "Perfection is not an act of but a habitual fact" confirm that quality existed in many parts of life.

The period of antiquity follows a long period of quality inexistence due to various occupations the country experienced such as the Romans, Turks and Germans. A turning point in the focus for quality was the joining of the country into the European Economic Community in 1981 which interconnected the involving countries removing any obstacles for business dealings and increasingly the pressure for performance improvement in manufacturing and services (Dervitsiotis 1999). The following years did not have much to offer concerning quality since the term was not clearly communicated and not serious efforts had been made except some individual reports mostly on education. The main obscureness in relation to the concept of quality, which led Greek companies to a nomadic approach to quality, was observed in the systemic approach meaning the total activities, procedures and

resources which are incorporated in a system and work with quality as a goal
(Theophanopoulos 1999).

The 90's was the period that the country experienced the first awakening for quality. Motivated by the European Union, the introduction of the ISO certificate created a strong interest for the manufacturing companies. By 1991 only two companies had been awarded with the certificate, a number which rapidly changed in the following years reaching 222 certificates in 1995, 500 certificates in 1998 and 2.325 in the year 2002 (I. Stratou 2002; ISO survey 2002; Lipovatz, Stenos, Vaka 1998). Major contribution to the ISO certification growth was the enactment in 1995 by the government of the financial support of the companies' that make efforts to achieve the certification. Yet the number of the companies was significantly low comparing the number of certificated companies in other countries (Papandreou 1998).

The motives that led Greek manufacturing companies to adopt the ISO 9000 standard certification covered a significant spectrum of organizational needs. Four basic reasons are recognized for the adoption. The first concerns the image and reputation of the firm adopting the certification, because it could be used as an effective advertising tool for the company's promotion. The second reason is about corresponding into the increasing market demands. As more and more companies adopted the certificate it became a necessity to make an effort to achieve the competitors' advantage. The third reason is to simplify the procedures that the customer is involved, meaning at that time only the contract and acceptance procedures. Finally the forth reason is associated with internal procedure improvement.

It is interesting though to mention that Greek manufacturing companies did not need to have all the previously mentioned motivating reasons in order to adopt ISO certification. This view is being amplified by a survey conducted in 1995 involving the motives for ISO implementation and which stated that the basic reason for the adoption of ISO certification is

external pressure and not internal improvement (Lipovatz, Stekos, Vakas 1999). The result of this study reflected the limited awareness that existed in Greek companies in that time for the held of quality. As a result of this view there was some criticism concerning the use of ISO certification and its adoption as an effect of the motives Greek companies had.

Latest studies have shown that the motives for the adoption of the ISO certificate have been shifted from market demands to internal improvement. More specifically there have been identified three main certification motives, with first being the companies' overall quality policy, second the improvement of the companies' project final outcome and the quality improvement of internal operations (Tsiotras, Gotzamani 2002).

Nevertheless the chosen motives that drive a company towards the ISO implementation are very significant due to their impact and contribution to the company's overall performance and the performance improvement. If a company sets as a goal the certification itself then it will stagnate since there will be no further efforts for improvement. This company will not seek to achieve the competitive advantage offered by the ISO possibilities but they will focus only on the advertising purposes. On the contrary companies that have the proper motives also have the desire for developing a quality system that will benefit them by adding value through quality improvement.

What is more Deligiannakis (2001), head of an ISO accreditation company, has identified several difficulties as far as the installation and implementation of ISO certificate in Greek companies. According to his findings most Greek companies are interested in the implementation of ISO certificate only if the relevant investment can be subsidized by the state. Additionally he noted that companies do not dispose financial resources for the development and implementation of a quality system which affects the outcome negatively and pinpointed the need for employee training in order for a company to be certified. Finally he indicated that a reason for adopting the ISO certification is the participation in national

competitions and international customers which enforce the small or medium companies as their suppliers.

In Greece the first phase of the ISO certification worked as a self-organizing procedure for the Greek manufacturing companies. The use and implementation of a quality system such as ISO 9000 has significantly contributed towards quality improvement of the manufacturing companies' project outcome, but also has set rules and procedures that have assisted the improvement of their management and productivity. In a survey conducted on managers of Greek companies (Tsiotras, Gotzamani 1996) about the benefits ISO certification has provided, there have been identified several of them which are separated into internal and external using the company as a reference point. The internal benefits that derived from that survey are:

- The modernization of the company's internal organization and procedures in order to constantly be in the cutting edge

- The communication improvement through well defined channels of communication

- The increase of personnel involvement through the creation of a quality awareness

- The optimization of procedures with the use of internal quality audits in order to minimize activities that do not add value

- The improvement of the final outcome quality and the simultaneous restriction of quality cost

- The development of a preclusive lessons learned process

- Emphasis on process control

However beyond the internal benefits, the managers identified also some external benefits which are;

- Satisfaction of domestic and international market demands and pressures

- Increased customer satisfaction

- Increased company's reputation and trust

- Improved supplier selection through evaluation criteria

It is also fact that the ISO certification has also benefited the financial performance of the certified companies. Even though the benefits are not significantly greater than the pre−certification period, the type and percentage of financial benefit are directly related to the reasons that the ISO certification was adopted. To be more precise, taking into account the strategic orientation of the company and more specifically Porter's(1980,1985) three generic types of strategic orientation: cost leadership strategy, market differentiation and focus strategy; financial performance differs from specific indices for each orientation like profitability indices or turnover and market growth (Dimara, Skoras, Tsekouras, Goutsos 2004).

A change in the focus for quality was administered by the European Policy for Quality promotion in 1995 from conformance to standards and ISO certification to quality management based on TQM principles and continuous improvement. Significant contribution towards this new focus is the introduction of the European Quality Award which is the evaluation tool of a self assessment framework followed by a set of instructions for its implementation. While ISO has a specific structure with specific and well defined requirements and steps to achieve certification, the TQM model has not any specific requirements set and requires total change in culture and commitment through predefined self designated subsequent procedures, thus creating confusion. For this reason a small percentage of Greek companies, mostly in the manufacturing sector, have turned to this new framework and the achievement of the EQA.

The EQA has been characterized as an intermediate step towards the TQM (Tsiotras, Gotzamani 2005) which has been chosen by Greek companies to built awareness of quality among internal and external customers, while the ISO has been applied in order to promote

the confidence that specified requirements have been met. In general it is considered as a complementary to ISO or visa versa, since it addresses sectors not fully covered by ISO like customer focus, continuous improvement, people participation and partnership, benchmarking and strategic quality planning. Nevertheless EQA has never been effectively utilized by Greek companies due to the lack of orientation and the incoordination with the existing quality system.

For the time being ISO is the dominant quality system that the majority of the Greek manufacturing businesses have adopted. Its' use and effectiveness are primarily depended on the motives that a company had for its adoption. However in general terms the overall performance of Greek companies has significantly improved with the implementation of the ISO quality system, including also the fields of leadership, strategic quality planning, quality data, human resources, process management and customers which are integral parts of the TQM philosophy (Gotzamani, Tsiotras 2001).

Yet companies must focus on these so called soft elements of TQM. A research on the employee skills and training has shown that even though human resources have shift the view from administrative to a strategically orientated role with increasing interest in training and corporate strategy, the need for training in Greek companies is great and especially in the sectors of quality management and customer service. This need is not referring only in the technical skills of the personnel but on the human and conceptual also. This way the effect of training could be improvement of final job, improvement on teamwork and on the quality of the final product (Papalexandris, Nikandrou 2000; Papalexandris, Chalkias 2002).

From the above analysis derives that the ISO certification can provide a good step towards TQM. It is imperative though to notice the self-evident, meaning that ISO is not TQM. A longitudinal study on the contribution of ISO standards towards TQM in Greek industries (Gotzamani, Theodorakioglou, & Tsiotras 2006) comes to a conclusion that even

though ISO can serve as a good first step towards TQM, it is not necessary that the

companies will move forward since the journey to continuous improvement is affected by

other factors equally important.

Chapter 4

Methodologies and Procedures Used In the Study

In earlier chapters of this thesis, we have recognize as the purpose of this study the identification of the benefits provided from the implementation of a total quality management system in Greek manufacturing companies regarding project's final outcome quality and the improvement of the project management processes. In order to do so the main goal is to determine whether Greek manufacturing companies have performed the necessary steps towards continuous improvement by implementing a project quality management system.

The methodology used in this study is based on the "Evaluation project" which is about confirming that a purposed aspect of the business is delivering the results that was supposed to deliver. In our case this view is referred to the purpose of this study meaning the total quality management benefits. The whole process of this study has been divided into two sections. The first section was the research of literature and the second was the holding of interviews with project managers through a questionnaire designed by the author.

The research of the literature has focused on four major pillars. The first pillar was to define the project management processes and the systemic approach of these processes concerning their interacting impact. The second was to identify the various approaches of quality management and their transformation from initially conceived tools to contemporary systems of processes with a purpose to uphold quality in every aspect of the process. The third was to describe the two most widely adopted quality management systems which are included in the subject of this thesis, in order to view where they focus for successful effluence of results. Finally the forth pillar was the background of Greek manufacturing companies concerning quality and the systems adopted.

The main purpose of researching the literature was to identify how quality management systems were formed, the interrelation that have with the project management processes and how it is possible to affect them. Moreover we examined the evolution of the concept of quality management in Greece and more particular in Greek manufacturing companies until the recent past in order to reflect how quality management affect their businesses.

The second section of this study was based on the completion of a questionnaire and on interviews with project managers from a variety of manufacturing companies established in Greece. Both the interviews and the questionnaire, which were conducted after the literature research in order for the author to have a complete view of the quality system's benefits, had as a purpose to identify the current condition of the companies concerning the implementation of a quality system and its effect on other aspects of their business.

The questionnaire was consisted of 11 questions. There were four types of questions: Open questions which were used to allow the interviewee to provide freely information, specific questions used to determine facts, probing questions which check for more detail or clarification and allow exploring specific areas and closed questions that require a yes or no answer. In a general context the questions were divided into two fields for research, where the first field included questions 1 - 6 and concerned the current situation and effects of the companies' quality system and the second field included questions 7 – 11 and concerned the view that interviewees have for the improvement of the quality system and the implementation of a total quality management system.

More specifically the first set of questions was developed to retrieve information about the types of projects each company undertakes, the definition that the company considers for quality, the type of quality system that the company has, the reasons for adopting a quality system and results from its use and its focus. The second set of questions

was developed to retrieve information about the company's perspective to ensure quality, the processes where quality can be integrated, the responsibilities of top management for improvement regarding quality management and the possible transaction and results to a total quality management system. It is significant though to underline that the questionnaire tend to shed light to TQM critical factors in order to identify the company's performance. The full version of the questionnaire can be viewed in the appendix B.

The interviews were in fact a more extensive discussion of the questions included in the questionnaire. They provided additional information about the current status of the companies and their future perspective concerning quality management.

The combination of data provided from literature, questionnaires and interviews were compiled and analyzed using desreptive statistics in order to be compared to the theoretical principles of total quality management which is considered fundamental for continuous improvement and hopefully produce a set of improvement recommendations.

It is expected that the outcome of this study will provide a focus point of what needs to be done, on behalf of the manufacturing companies, in order to implement a project quality system that will improve the quality attribute of their projects and drive them towards continuous improvement. The research is expected to identify the critical areas on which the success of a project quality system depends, and by analyzing the collected data a set of recommendations will be made that will be of benefit to the companies and their projects' outcome.

Chapter 5

Results

Introduction

This chapter is the core essence of this thesis since firstly is the outcome of the whole research and secondly provides food for thought for the development of the next chapter. It is the results as they derived from the procedures and processes described in methodology. The results have been divided into two sections, as the procedures in methodology, and have revealed several interesting findings. The two sections are: the literature findings and the questionnaire/interview outcome.

Literature findings

In a general context, literature proves and justifies the title of this thesis, meaning that there is an effect in implementing a project quality system which is primarily reflected in the projects outcome and the project management processes. Additionally it provided information on the structures and effects of the two most widely researched and adopted quality systems, and on the evolution and status of the Greek manufacturing companies' quality focus.

In this in-depth research we have firstly identified the systemic structure of the project management processes. We have seen that these processes are independent but interrelated elements which comprise a unified system; project management. Therefore, as parts of a system, each process is able to create an impact that will have a possible effect on any other process of the same system independently the application group or sequence. Furthermore many have underlined the similarity of the project management processes structure and effect

with Deming's PDCA cycle which implies a common ground between project management and quality management concerning their implementation and behavior. In this spirit, we recognize that quality can have a serious effect on project management processes, as indicated from the several paradigms provided in literature.

Another significant finding was the evolution of quality management over time. More specifically we have identified that contemporary quality management covers and influences many aspects of business. It has a variety of efficiency levels since it has developed many abilities and it is involved in many organizational functions, from top management to the bottom line employees and from operations management and re-engineering, up to customer and supplier relationships and finance. This is primarily caused due to the different definitions of quality that have been developed over the years by significant personalities and who have stressed different aspects of quality.

In continuing the view of contemporary quality management, a brief description and analysis has been made regarding the two major, and most widely used in the region, frameworks that ensure quality. The first is ISO 9000:2000 which is a framework with prescribed requirements that certifies the existence of certain practices which uphold quality. The second is TQM which is a philosophy committed to a focus on continuous improvement which by emphasizing on statistical tools and techniques along with the use of elements that involve the human factor, seeks to improve and maintain the quality of processes. However, even though both are based on similar principles that cover a wide range of organizational aspects, the implementation effect differs with the certification of the first being, most of the times, an end in itself and therefore not ensuring improvement, and the second requiring perpetual commitment and effort in a vague, from a requirements definition angle, framework.

Finally the research has shown that quality management, in its more formal version, has been a concern for Greek manufacturing companies in the recent past, mostly due to the European Union's and the government's promptitude. Yet, the need for this focus for quality has been acknowledged and expressed primarily with the adoption of the ISO certificate, providing several benefits for these companies. Today, with the exception of some sporadic cases, the ISO quality system is the dominant system used which is expanded in order to cover from production lines to the projects undertaken from manufacturing companies.

In a peroration of all the above we have identified that quality management systems play significant part in projects successful completion. They facilitate and improve the processes involved in the management of a project which as systemic parts help for the improvement of the final outcome. This improvement has not only as a goal the quality perspective of the project but also has an effect on other aspects of the processes. Greek manufacturing companies have recently experienced the incubational phase of the quality development and have turned their focus on the adoption of the ISO certificate which is considered helpful and easy to be acquired. However it is the author's opinion that companies must focus on the efforts for continuous improvement, an aspect which is covered by ISO 9000:2000 but is let on the companies' discretion.

Questionnaire/interview assessment

The second phase of the research was based on interviews with project managers of manufacturing companies and the fulfillment of a questionnaire. The interviews were an extensive discussion over the questionnaire; therefore we shall focus on the information derived from the questionnaire since there is no significant deviation observed between the answers given in interview and in the questionnaire.

The questionnaire has been created with a view to identify, the perception and the condition in which Greek manufacturing companies find themselves concerning project quality systems. However there were some limitations in conducting this study. The reluctance of project managers to provide quantitative data of the quality system's impact on their businesses is one of them. This reluctance existed mainly for two reasons. The first reason is that this type of information is considered classified from companies and therefore providing them ungrudgingly was not an option. Secondly, the provision of this type of data required great amount of time to be collected which was considered a luxury regarding the manager's workload. What is more, the increased workload was a reason that prevented managers from participating to this study. This had as a result only 5 from the 35 proposed meetings to take place which corresponds to only 14,28 % of success. Finally, the level of quality focus the companies had prior the implementation of a specific quality system has a significant effect on the study's results since it creates a substantial difference in the answers on the questionnaires.

The first three questions were open type questions where the interviewee was given the freedom to provide the information expressed in his own way without having any limitations. The first question concerned the types of projects that manufacturing companies undertake. This question has been set in an effort to group the projects in order to have a clear view of the companies' projects in order to relate them with the focus of quality. The aggregation of the responders asserted that they assume production projects, while 60% of them include research and development projects in their business. Finally only a 20% stated that it also assumes projects that have as a purpose the internal improvement of production processes.

A definition for what the interviewees consider quality is, in respect with the projects their companies undertake, was the subject of the next question. The purpose of this question

was to identify their view of quality which in combination with the types of projects they assume we would have information about the focus of the quality system. A variety of different answers followed this question with the 80% declaring that their primary focus is requirements fulfillment. Only 40% considered that quality is related with customer satisfaction, while all the other answers, meaning process improvement, product quality and competitive received 20% each.

Quality Definition
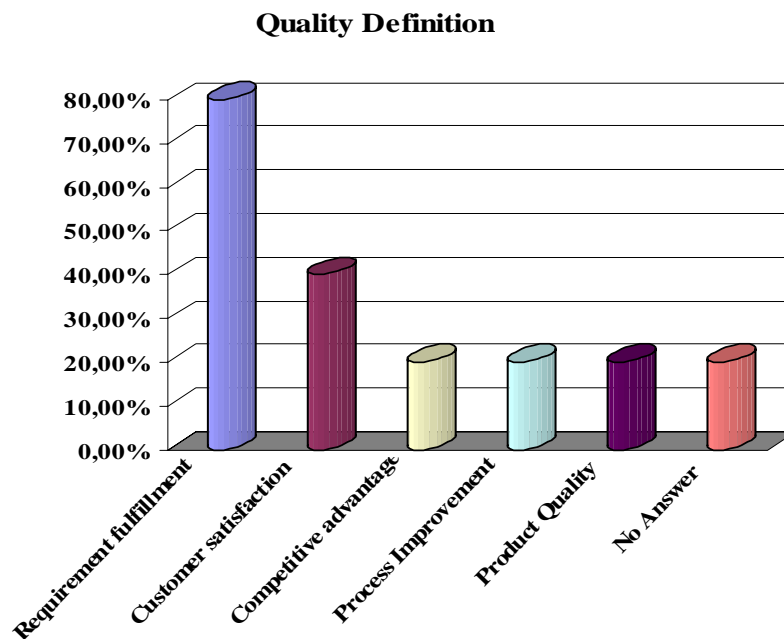
Figure 3 Companies' Quality Definition

The third question is an enquiry about the quality system the companies have adopted. All the companies participating in this research came to a unison in this subject stating as the system that use for the management of quality ISO 9000:2000. Partial incompatibility with this consensus was shown only by one company which has also endorsed elements of total quality management in its practices.

The following three questions close the first set of questions which concerns the situation and effects of the companies' quality system. These three questions are a

combination of specific and probing type questions, with specific answers in each question where the interviewee is called to mark a degree of magnitude.

The forth question was set in order to identify the motivation behind the adoption of a quality system. In the proposed question about the purpose of the adoption, five answers were available for marking with a degree of magnitude. The main three reasons for the adoption of a quality system according to the project managers' opinion are the reduction of waste products, the increased customer confidence and cost reduction through prevention. The market demand is a reason which is being diverged between mediocre and very high magnitude.

Purpose of adoption

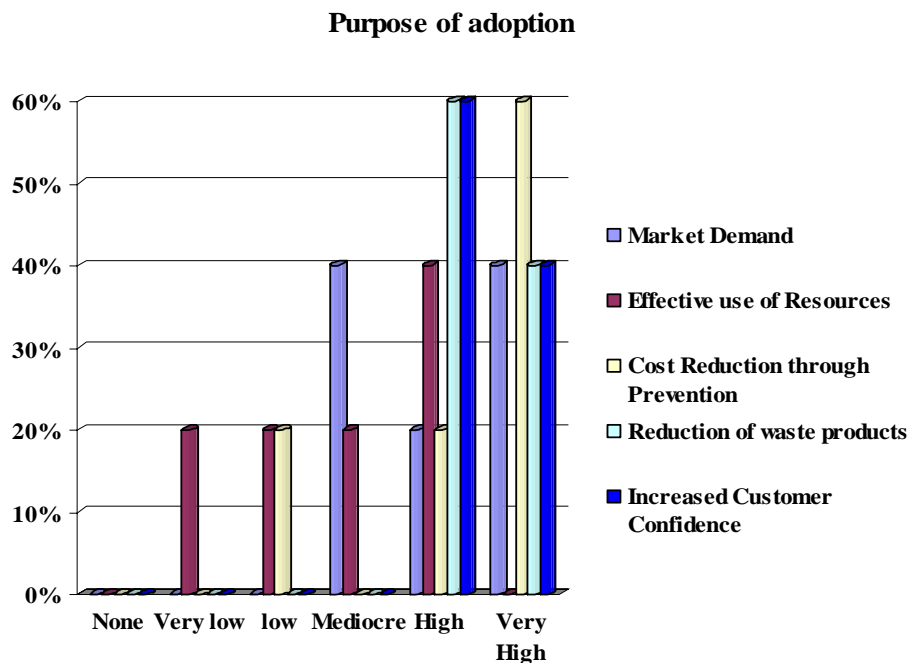**Figure 4** **Certification Motivation**

The results from the use of the quality system are the issue of the following question. The purpose of this question is to verify that a quality system has an effect on other factors of business. The proposed answers of this question cover significant elements of an organization which are at the same time basic elements of the TQM philosophy. This will help us in

understanding the level of effectiveness of the quality system and how possibly the implementation of TQM will benefit these factors.

There is great ambiguity concerning the results of the quality system on several factors. More specifically communication, risk management corporate strategy, supplier relationship and change management are factors on which the interviewees have denoted different opinions concerning the impact from the quality system. A moderate impact from the use of the quality system was identified in leadership, human resource management and time management, while high and very high impact was noticed in the product quality, the strategy for quality, customer relationship and cost management. As it has been shown from this small sample the significant results were observed on factors that are directly connected with the meaning of quality and less with circumferential factors that theoretically have an indirect effect from quality systems.
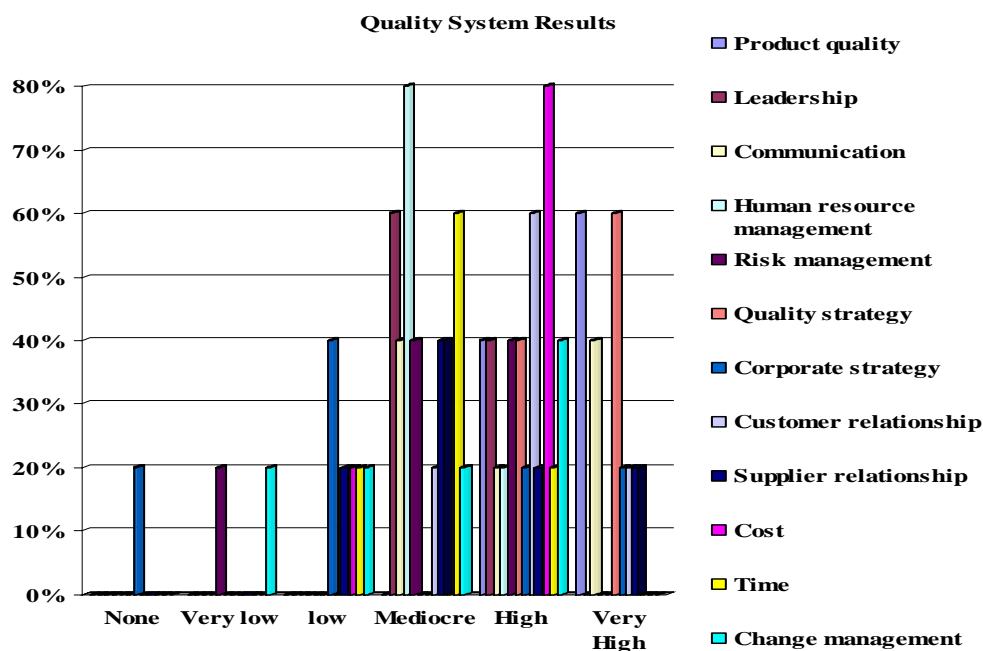
Figure 5 Effect of Project Quality System

The final question of the first set involves the elements on which the quality system is focusing. The rationale of this question is to contradict the focus of the quality system with the aforementioned results in order to evaluate the efficiency of the practices used. It is no

surprise that the majority of the responses showed that their quality system is focused on all basic elements of a project quality system, meaning quality plan, quality assurance, quality control and quality improvement. However there are some responses that deviated from this general indication showing a more conservative view.

Focus Elements
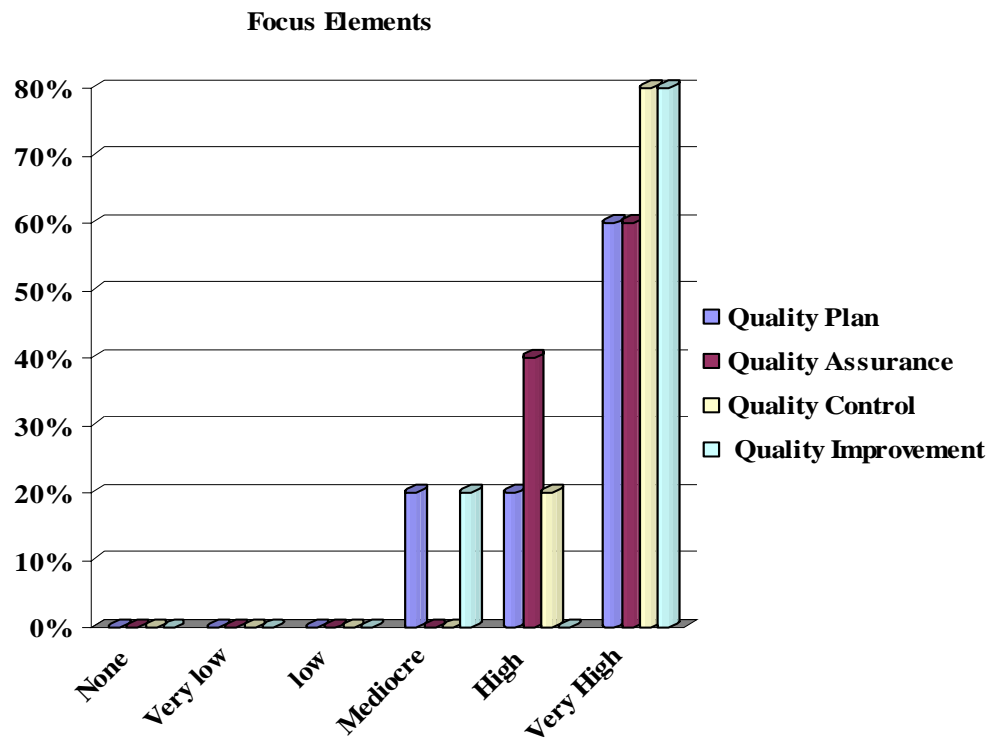
Figure 6 Focus of Project Quality System

The second set of questions has as a purpose to view the thoughts and opinions that interviewees have for the improvement of the existing quality system or the implementation of a total quality management system. When the project managers where asked to identify the best possible way to ensure quality in their projects, the responses were diverse. Among the twelve given answers, the top two ways identified were through quality planning and training which received 60%. Sequentially, the factors of process improvement, conformance to requirements, quality control and responsibility assumption followed with each one receiving 40% of the responses. Finally the least acknowledged ways were employee participation,

resource management, leadership, top management commitment, fact based decision making and value added audits.

How to Ensure Quality
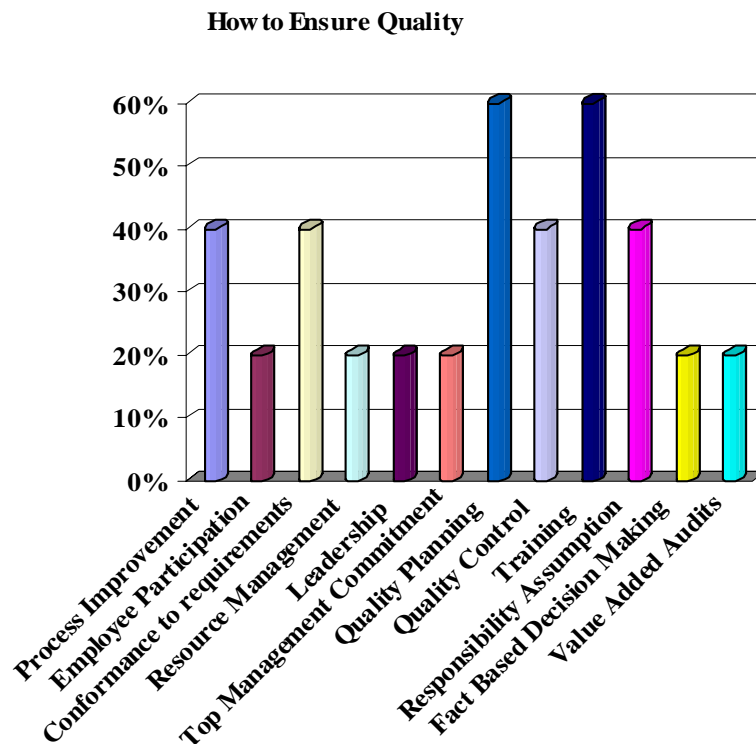
Figure 7 Key Points to Ensure Quality

They next question concerned the prospect for quality integration and the key points were quality can be integrated. This question has been placed in order to understand the elements on which project managers pay attention for ensuring quality into their projects. Even though all project managers verbally came to a consensus that quality can integrated in almost all aspects of business, the results of this question provided once more a variety of opinions. More specifically the top four points for integrating quality are quality planning, quality control, project indices and the planning phase of the project. The remaining proposed elements came second in preference from the project managers by declaring more conservative conviction for the integration of quality in these elements. However it is significant to indicate that only one company went beyond the proposed key points by

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mentioning risk management, configuration management, communication and customer satisfaction evaluation as key points for integrating quality,

Key Points for Quality Integration
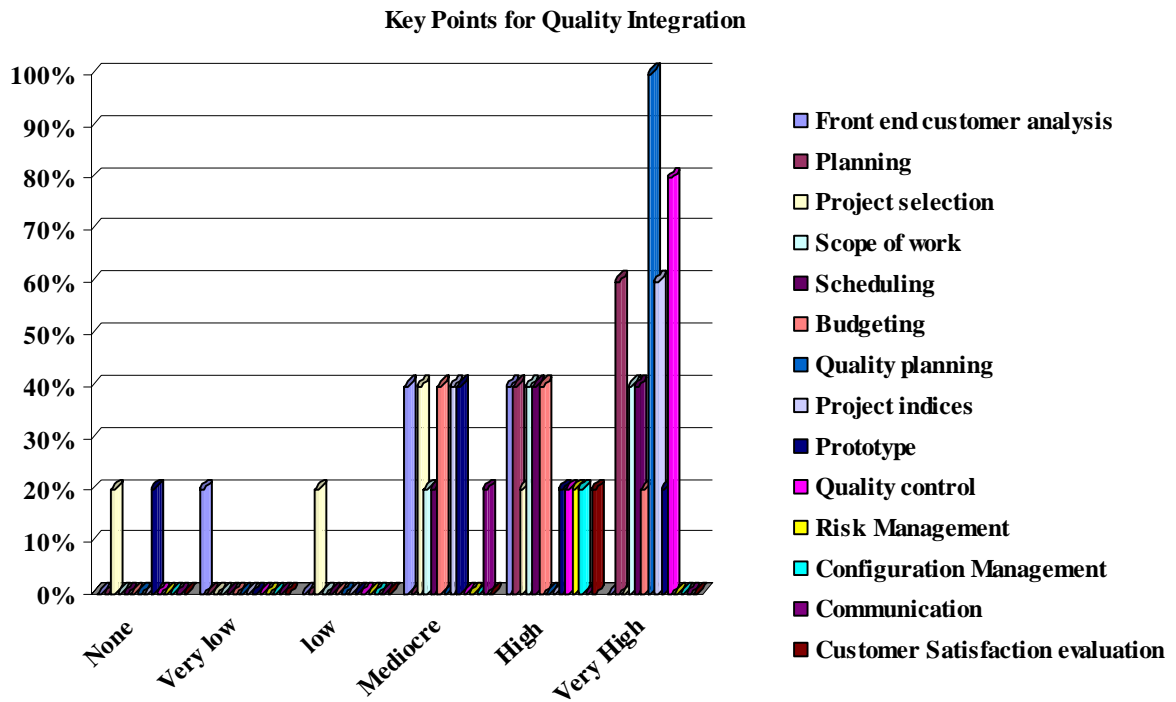
Figure 8 Key Points for Integrating Quality

The top management's responsibilities for the system's improvement were the issue of the next question. The top management's commitment on quality was the first thought on the 60% of the interviewees followed by resource commitment, strategy for quality, quality improvement and training. What is more, as responsibilities of the top management were also acknowledged the policy and planning for quality, information analysis and evaluation, as well as fact bases decision making which is directly connected with information analysis and finally the radical change of organizational culture which should be more quality centered.

Top Management Responsibilities
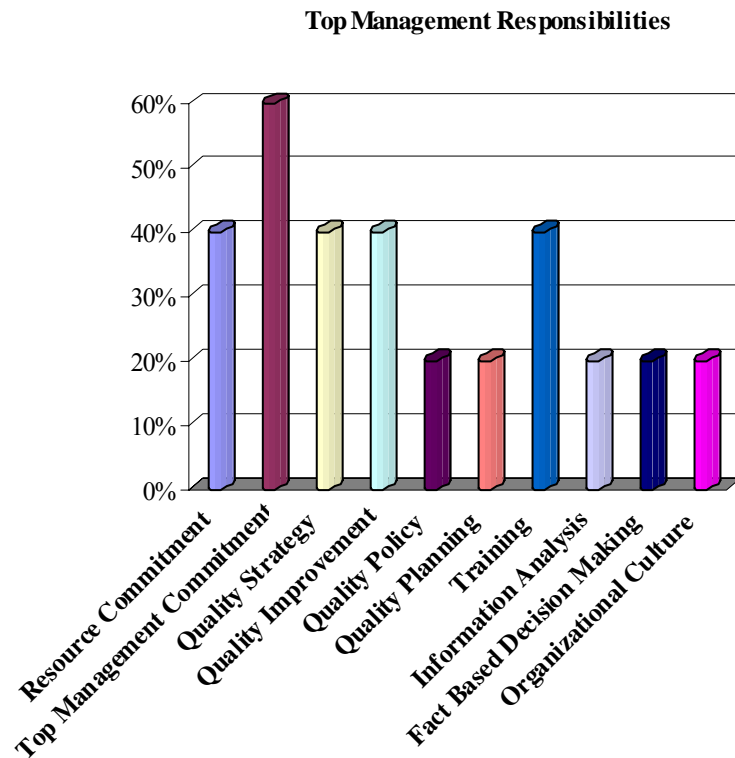
Figure 9 Top Management Responsibilities

 Finally the last two questions project managers were asked was about the idea of implementing a total quality management system in their businesses. The first of the two questions involved the ability of the companies to adopt a TQM system. 60% of the interviewees responded that a transaction from the current quality system to a total quality system is possible. However the reasons that this transaction is possible differ from company to company, with the 66,6% declaring that they already incorporate TQM practices and the 33,3% to present the transaction to TQM as a business need. The transaction to TQM was denied from a 20% of the responders since they consider the existing system to adequately cover the TQM elements. It is also worth to mention that 20% skipped this question.

 The final question of the questionnaire was placed in order to identify the beliefs of the project managers about the possible improved results using TQM. Once more 60% answered that TQM would improve up to date results and processes and more precisely that it would improve employee participation, cost reduction, productivity , resource management,

customer focus and would provide financial benefits. At the same time it would facilitate

continuous improvement and promote a uniform culture. On the other side 20% stated that

benefits from ISO would not significantly surpass the benefits provided by ISO, while

another 20% skipped the question.

Improved Results Using TQM?
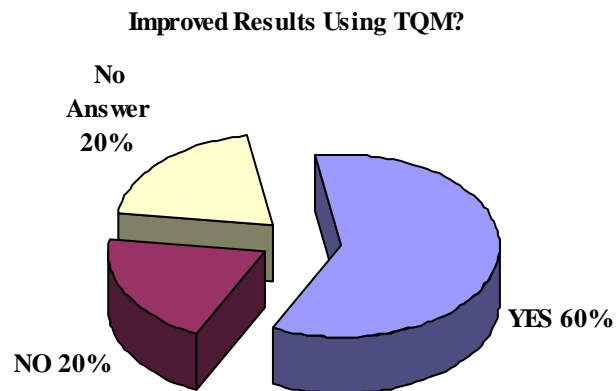
Figure 10 Improved Results From TQM?

The most common theme observed was the diversity of opinions in most questions

which some times possessed several paradoxes. This is primarily caused by the small sample

which answered the questionnaire; however there were specific answers which cannot be

explained like corporate strategy and risk management in the question about the results from

the existing quality system. Nevertheless important outcomes have derived from this chapter

which that will be thoroughly discussed in the following chapter.

Chapter 6

Discussion, Conclusions and Recommendations

A project is a temporary endeavor undertaken to accomplish a particular aim. Project management is the process used in order to manipulate the activities that this endeavor is consisted of, with the use of certain tools, techniques and sub-processes, so that the requirements set for the successful completion of this aim to be met. It is a process of initiating, planning, executing, monitoring and closing down a project.

In a broader sense, project management is a system comprised of parts that tie in together to accomplish the project's purposed goal. These parts can be considered as subsystems of the main system, meaning project management, which receive inputs and through a variety of processes (project management processes) generate outputs. Therefore if a part is changed or produces an output that affects other parts, then by definition the whole system is changed. This creates a link between the project management processes where each one affects another and consequently the whole project, by its result. One of the subsystems able to affect the whole project management process is the project quality system.

The project quality system is a framework for the management of the interrelated processes in a project that impact the meeting of customer expectations. It is a structured and documented framework that illustrates the guidelines, objectives, principles, responsibilities, and the planning of an organization in order to ensure that the processes will produce a quality outcome. However the whole function of the project quality system is based on concepts like continuous improvement, the view of work as a process, customer satisfaction, variation, quality planning, quality assurance and quality control.

Continuous improvement is a concept on which a constant effort exists for a process to be improved through the knowledge and experience that are being integrated in it. Mostly

based on Deming's plan-do-check-act cycle, continuous improvement is a concept that assumes the ability of all processes for improvement and that this improvement should be implemented in order to make the processes to efficiently produce their output.

Process is a sequence of activities organized in way to receive input and produce output that will achieve a specific aim. If project management is a process, then the project management processes are sub-processes or activities that work together towards a common goal, the project management's goal. They are links in a chain that create value, with each link's ending to contribute in the following link and consequently to the final goal. On the other hand the links that do not add value must be excluded from the whole process, an objective accomplished with the use of the quality system.

The output of each process has a recipient, which can either be internal to the organization commencing the process or external. These recipients are called customers. Customer satisfaction is the fulfillment, from the process view point, of the customer's confirmed, implied or unexpected needs and wants. The level of customer satisfaction derives from the fulfillment of these needs and wants, and it is a partial objective of the quality system to uphold it and increase it.

This fulfillment however cannot always be accomplished in an ideal level, but there will be some deviation from the customer's requirements. Variation is the difference that exists between the theoretical fulfillment of the requirements and the reality. It is a factor that influences possibly the project's final outcome and the level of customer satisfaction. The project quality system has as intention to improve the processes efficiency by the use of statistical tools in order to eliminate if possible this variation.

Finally quality planning, assurance and control are indispensable elements of the project quality system. They are used in order to thoroughly analyze and assign activities and responsibilities which ensure quality in the processes, ensure that these activities will be

implemented so that the objectives of the system will be achieved, and that these activities will be constantly monitored in order to fulfill their purpose. They are the backbone of any quality system which, along with continuous improvement, they complete the technical aspect of the project quality system.

Viewing though the project quality system from a holistic point of view, it is recognized that the successful implementation of the technical aspect of the system isn't sufficient enough for the efficiency of the project quality system. There is another softer, human focused, but equally significant approach of the quality system since it also contributes in its successful implementation. This approach includes the elements of leadership, employee participation and empowerment, and teams that have quality as a goal.

Leadership is the ability of facilitating the performance of individuals with a purpose the successful achievement of the ultimate goal. It is about creating the vision and the structure to achieve this vision which illustrates the project's goal. Moreover it has to do with communicating this vision to the employees and ensure that all processes will be effectively carried out. It is not only though top management's responsibility to apply leadership. Everyone interested in the successful completion of the goal is able to provide such services.

Employee participation and empowerment are significant elements that help improve processes and consequently the final outcome of the process. The basic concept is that employees should be more involved and empowered over their line of work with the ability, authority and responsibility to modify processes, within a reasonable context, in order to improve them and provide an improved outcome, since none knows them better than they do. However in order for this element to be proven supportive for the quality system it is a prerequisite for the employees to be well trained so that they posses the skills needed for the additional responsibility and also have the initiative and trust in themselves that they are able to achieve this task.

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Another element that also facilitates the successful implementation but also the operational function of the quality system are teams that have quality as a focus. Since quality is an aspect widespread in all organizational facets, the development of ad-hoc or ongoing teams with the proper training are necessary in order to understand and manage the interconnections that exist within or among processes, and their impact on other elements such as quality, productivity and cost and other business elements. The value of these teams is described in the following table.

Team processes offer the following benefits to the organization:	Individuals can gain the following benefits from teams:
- Synergistic process design or problem solving. - Objective analysis of problems or opportunities. - Promotion of cross-functional understanding. - Improved quality and productivity. - Greater innovation. - Reduced operating costs. - Increased commitment to organizational mission. - More flexible response to change. - Increased ownership and stewardship. - Reduced turnover and absenteeism	- Enhanced problem-solving skills. - Increased knowledge of interpersonal dynamics. - Broader knowledge of business processes. - New skills for future leadership roles. - Increased quality of work life. - Feelings of satisfaction and commitment. - A sense of being part of something greater than what one could accomplish alone.

Table 3 Value of Teams (Retrieved June 3, from http://www.asq.org/learn-about-quality/teams /overview/overview.html)

As looking through these concepts that influence the project quality system in retrospect, we observe that each and every one of these concepts has a direct or indirect effect on project management processes. Either by affecting significant variables that contribute on the project management processes' outcome or by affecting the human factor, a project quality system adds value to project management processes in order to achieve an outstanding performance and at the same time improve for future projects.

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Reviewing the data that derived from the interviews and the questionnaire concerning the quality system's status of the Greek manufacturing companies, it has been observed that the definition for quality that companies support is by far requirements fulfillment. This view implies that the concern for quality and consequently the quality system's focus is mostly turned on the specifications of the product and how these will be achieved. Surprisingly enough the customer satisfaction definition wasn't on the companies top list of priorities. Even though this definition is widely considered by literature as the measure of success regarding quality, it hasn't received the expected recognition indicating the constant concentration over the technical aspects of their final product.

Taking under consideration that the majority of the companies interviewed have adopted the ISO 9000:2000 quality system in which the customer focus is one of the basic principles, then we can deduce that Greek companies have been adhered on the previous edition of the ISO certification which promoted conformance to requirements. What is more the massive choice of adopting the same quality system would make appropriate to consider that the motivations for adopting the specific system are related with the view of quality companies have. This consideration is being confirmed from the motivating reasons companies provided, which indicate that customer confidence, reduction of waste and cost reduction being the primary reason, with the first being an increased market share reason and the following two to be addressing the technical aspects of their processes.

Furthermore the results from the use of the quality system enhance the fact that the quality system focuses on the technical aspects of the processes which have a direct impact on the outcome's quality. As the data derived from the corresponding question show the most significant results have been observed on cost reduction, product quality, customer relation and quality strategy, while results on other elements like leadership human resources, communication and corporate strategy stray from mediocre to very low, it is increased the

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view that the concern of the companies concerning quality management is unilateral providing results only from the use of technical tools. Nevertheless, the mediocre results show an increase on elements that directly involve the human factor, which though can be considered as a side effect of the current focus due to the increased requirements on these elements.

The inference that the companies' quality system is primarily focused on the technical aspect of the system contradicts with the view of the companies have that their quality system focuses on all basic elements of quality management, meaning quality planning, quality control, quality assurance but also quality improvement. The only logical conclusion that comes out of this question is that the use of the quality system is ineffective concerning quality planning and quality improvement. This can be elicited by the association of the results from the use of the quality system and the view of quality the companies have in respect with the focus of the quality system.

As it would be expected the future view of the project managers for the quality system to be substantial different, improving radial elements of the quality system, the responses to the corresponding questions have shown the completely opposite. More specifically, even though the project managers have identified as the top two ways to ensure quality, quality planning and training which means that they recognize the importance of the human factor and contradicts with their current meaning for quality, however these two have been selected in order to enhance current practices and amplify the current focus of the quality system.

What is more, the initially indicated lack of broadening view of the quality system is also reinforced from the proposed points for quality integration, which once more are concentrated one the improvement of technical practices and how they will be designed in order to achieve their ultimate goal. It is also very important to mention that this prospect of the proposed points for quality integration indicates that quality management is considered to

be a unique and independent system which acts circumferentially of project management and not within.

However, the realization of commitment as one of the very important top management's responsibilities for the optimization of the quality system is a very important factor which implies that there is a specified need for this commitment. This partly explains the demonstrable focus of the quality system only on the technical aspect and not in more holistic approach.

Indisputably positive nonetheless, is considered the willingness of the project managers in the perspective of implementing a total quality management system. Even though the number of responses received while conducting this research can be considered as a misapprehension concerning the importance of quality systems and the role they play in overall business success, the recognition of a total quality system as a superior tool is a step in the right direction. Furthermore, it is the belief of the interviewees, as well as the author's, that the benefits that will provide includes the benefits of the current system, while at the same time will turn the focus towards continuous improvement with the participation of the entire workforce.

Hides, Irani, Polychronakis and Sharp (2000) suggest that the adoption of a total quality management system practices is able to form a basis for implementing effective project management. As we have seen from the analysis of the status of the Greek manufacturing companies' project quality system, it seems that the quality system lacks on focus upon the soft elements of TQM which are those that are related with behavioral aspect of the company, meaning leadership, human resource, employee empowerment, teams and customer focus. A recent study (Lewis, Pun and Lalla, 2006) has shown that most companies having ISO implement the hard elements of TQM, meaning tools and processes that support the technical aspect of business, while a small percentage implements the soft elements. This

difference exists due to the inability of quantifying the soft elements of TQM. Therefore since TQM is equally depended on the soft elements, ISO is not sufficient enough on its own to reap the maximum benefits of TQM.

A question rises though, whether the adoption of an ISO system, even in its partial form, would benefit a possible transaction to a TQM system. Literature indicates that the adoption of ISO is a good first step towards successful and effective implementation of TQM, however further improvement is on the companies discretion (Gotzamani, Tsiotras 2001; Mc Adam, Jackson, 2002). Moreover, Magd and Curry (2003) suggest that the two approaches complement each other with ISO creating stability and consistency an then the implementation of TQM can enhance employee motivation, operational efficiency and achieve overall organizational success. Companies therefore wishing to remain competitive and improve their quality system use ISO as a part of TQM which is a much broader system.

In concluding the research conducted for the identifying the effect of implementing a project quality system in Greek manufacturing companies, the author recommends the following concepts to be considered. This will help companies to form a basis for the implementation of a total quality system which is considered to be more beneficial than ISO in terms of quality for the final outcome of projects as well as project management processes. These concepts are commitment, training, improvement teams, measurement, preventive actions, recognition and appraisal and continuous improvement goal setting.

Commitment is one of the most important factors in a quality system. It is the binding pledge which ensures that a company will pursue anything that has set as a goal with patience and persistence. It is a factor that initially takes off from top management's side in order to be diffused in every aspect of the company up to bottom line employees. Therefore it is top management's responsibility to commence and distribute this view in order to ensure participation and support improvement.

Training is a structured approach designed to communicate skills, techniques and methodologies to employers and their employees in order to learn and use efficiently and effectively new processes for their performance improvement. It is a vital concept for retrieving the best out of employees, increasing their productivity and broadcasting the importance of their work. Furthermore it is essential for building a quality approach in a company.

Improvement teams can be teams designed and developed for the improvement of specific functions. They can be ad hoc teams that will be dissolved when their goal is achieved, or can be formed in a permanent basis. The combination of multiple skills can be proven beneficial for a company since they can reach and provide improvement solutions approaching an issue from different angles and perspectives. In order though for improvement teams to be proven beneficial commitment and training are a necessity.

Measurement is a concept that facilitates management since quantifiable objects are easier to be managed. It provides a reference point for the efficiency of practices, a medium of increasing the concentration over the effort and a tool for effective decision making. It can be expanded from physical quantities to anything that matters a company as long as the levels of measurement are the appropriate. In addition displaying and reviewing the measurement is imperative so that the measured quantity is understandable from anyone so that an awareness to be cultivated concerning the progress which has to be visible to everyone in the company.

Prevention is the responsibility that everyone in a company has to identify and analyze the cause of errors in order to perform the appropriate actions for their resolution. Preventive actions are the actions involved in processes that block or recognize potential errors which might jeopardize the outcome of the process. It is the formation of a closed loop within existing processes that will provide feedback and continual re-evaluation of the

process until identifies and eliminates all errors. These actions must be well documented so that they will provide a learning experience used as focus for future training.

Recognition and appraisal provide motivation for the employees and promote their participation to the overall success. Empowerment and fairness are the triggering points of this concept which along with specific guidelines and communication of the recognition will supply the company with the anticipated benefits.

Finally continuous improvement goal setting is one of the core concepts for the implementation of a total quality management system. This concept refers to the setting of very specific goals that aim to the specific improvement of processes. This goal setting must be constant, sequential and able to be achieved. However in order to be effective, first is a necessity for a company to be able to recognize problems, understand the requirements, measure them, and make preventive actions for solution.

However companies that find difficulties in implementing a total quality management system may follow an adjacent route for achieving improved efficiency over their processes and their outcomes' quality by adopting the EFQM excellence model. This model is a by-product of TQM, issued by the European Foundation of Quality Management, and it is easier to implement with clear and defined requirements.

It is the author's understanding, that this research is a subject of methodological limitations since the number of companies participating do not cover a representative percentage of Greek manufacturing companies. Therefore additional research is needed which the author strongly believes that must be carried out by a governmental or state competent authority, taking into consideration the low participation of the companies in the research of this study. This way we can come to a more concrete understanding of the status of companies' project quality system and verify if the indicated unilateral focus that companies have, is valid or not.

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Appendices

Appendix A– The Quality Gurus

W. Edwards Deming

Fourteen points of quality management:

1. Create constancy of purpose towards improvement of product and service

2. Adopt the new philosophy. We can no longer live with commonly accepted levels of delay, mistakes and defective workmanship

3. Cease dependence on mass inspection. Instead, require statistical evidence that quality is built in

4. End the practice of awarding business on the basis of price

5. Find problems. It is management's job to work continually on the system

6. Institute modern methods of training on the job

7. Institute modern methods of supervision of production workers. The responsibility of foremen must be changed from numbers to quality

8. Drive out fear, so that everyone may work effectively for the company

9. Break down barriers between departments

10. Eliminate numerical goals, posters and slogans for the workforce asking for new levels of productivity without providing methods

11. Eliminate work standards that prescribe numerical quotas

12. Remove barriers that stand between the hourly worker and their right to pride of workmanship

13. Institute a vigorous program of education and retraining

14. Create a structure in top management that will push on the above points every day

Seven deadly diseases:

1. Lack of constancy of purpose to plan product and service that will have a market and keep the company in business, and provide jobs.

2. Emphasis on short term profits

3. Evaluation of performance, merit rating, or annual review

4. Mobility of management; job hopping

5. Management by use only of visible figures, with little or no consideration of figures that are unknown or unknowable

6. Excessive medical costs

7. Excessive costs of liability

Dr. Joseph M. Juran

The Quality Trilogy

- Quality improvement

- Quality planning

- Quality control

Ten Steps in the Quality Improvement Process

1. Build awareness of the need and opportunity for improvement

2. Set goals for improvement

3. Organize to reach the goals

4. Provide training throughout the organization

5. Carry out projects to solve problems

6. Report progress

7. Give recognition

8. Communicate results

9. Keep score

10. Maintain momentum by making annual improvement part of the regular systems and processes of the company

Philip M. Crosby

His four absolutes of quality:

- Quality is conformance to requirements

- The system of quality is prevention

- The performance standard is zero defect

- The measurement of quality is the price of non-conformance

Crosby's 14 Steps to Quality Improvement

1. Make it clear that the management is committed to quality

2. Form quality improvement teams with representatives from all departments

3. Assess and evaluate the quality awareness/concern of employees

4. Raise the quality awareness/concern of employees

5. Take actions to correct problems

6. Establish a committee for a zero defects program

7. Train supervisors

8. Hold a "zero defect day"

9. Encourage people to establish improvement goals for themselves and their teams

10. Encourage employees to communicate to management the obstacles to attaining

11. Improvement goals

12. Recognize those who participate

13. Establish Quality Councils

14. Do it all over again - the quality improvement program never ends

Armand V. Feigenbaum

Five Steps to Excellence in Product Development

1. Make quality a full and equal partner with innovation from the beginning of product development.

2. Focus on customer inputs as the fundamental basis for specifications.

3. Emphasize getting high-quality product design and process matches upstream.

4. Make full-service component suppliers a quality partner at the beginning of design rather than a quality surveillance problem later.

5. Make the acceleration of new product introduction a primary mea sure of the effectiveness of a quality program.

Appendix B - Questionnaire

General Information

Date ___/___/___

Company_____

Address_____

Name_____

Position in company_____

Telephone _____

Questions

1. **What type of projects does your company manage?**

_____

_____

_____

2. **What is quality for your company with regard to project management?**

_____

_____

_____

3. Which type of quality system has your company adopted?

_____

_____

_____

4. What were the reasons that your company adopted a quality system?

Mark your degree of magnitude in the content of each proposal according to the clue that is found in the end of table

	0	1	2	3	4	5
Market demand						
Effective use of resources						
Cost reduction through prevention						
Reduction of bad products appearance						
Increased customer confidence						

Relation of proposed reasons with reality
(0 = None,   1 = Very low,   2 =Low,   3 = Mediocre,   4 = High,   5 = Very High)

Ioannis Bogiatzoglou

5. **What type of results you had from the use of the quality system?**

A) Processes

Mark your degree of impact in the content of each proposal according to the clue that is found in the end of table

	0	1	2	3	4	5
Product quality						
Process management						
Communication						
Human resource management						
Risk management						
Quality strategy						
Corporate strategy						
Customer relationship						
Supplier relationship						
Cost						
Time						
Change management						

Relation of quality system with results
(0 = None,   1 = Very low, 2 =Low,   3 = Mediocre,   4 = High,   5 = Very High)

B) Elsewhere

Please add any processes not included in the previous list

	0	1	2	3	4	5

Relation of quality system with results
(0 = None,   1 = Very low, 2 = Low,   3 = Mediocre,   4 = High,   5 = Very High)

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C) Please if possible provide quantitative data

_____

_____

_____

6. **In which of the following elements of project quality system is the quality system of your company focused on?**

Mark your degree of magnitude in the content of each proposal according to the clue that is found in the end of table

	0	1	2	3	4	5
Quality Plan						
Quality Assurance						
Quality Control						
Quality Improvement						

Relation of quality system with elements
(0 = None,   1 = Very low,   2 = Low,   3 = Mediocre,   4 = High,   5 = Very High)

Please add any processes not included in the previous list

	0	1	2	3	4	5

Relation of quality system with results
(0 = None,   1 = Very low,   2 = Low,   3 = Mediocre,   4 = High,   5 = Very High)

Ioannis Bogiatzoglou

7. Which is, from your point of view, the best way to ensure quality in a project or in a product?

_____

_____

_____

8. What are the key points or windows in the project management process where quality can be integrated?

Mark your degree of magnitude in the content of each proposal according to the clue that is found in the end of table

	0	1	2	3	4	5
Front end customer analysis						
Planning						
Project selection						
Scope of work						
Scheduling						
Budgeting						
Quality planning						
Project indices						
Prototype						
Quality control						

Relation of quality with elements
(0 = None, 1 = Very low, 2 =Low, 3 = Mediocre, 4 = High, 5 = Very High)

Please add any processes not included in the previous list

	0	1	2	3	4	5

Relation of quality with elements
(0 = None,   1 = Very low,   2 =Low,   3 = Mediocre,   4 = High,   5 = Very High)

9. Which are the possible responsibilities of company's top management for the optimization of the quality system's use?

_____

_____

_____

10. Is the transaction from your company's quality system to the adoption of total quality management system (TQM) possible?

YES [ ]   NO [ ]

Why

_____

_____

_____

Ioannis Bogiatzoglou

11. Do you consider that the use of a total quality system would improve the up to date results?

YES [ ]   NO [ ]

If yes in what sectors?

_____

_____

_____

Appendix C - Questionnaire Results

Companies Participated: 5

1. What type of projects does your company manage?

Type of projects	Companies	Percentage
Production projects	5	100,00%
Process improvement projects	2	40,00%
R & D projects	3	60,00%

2. What is quality for your company with regard to project management?

Quality Definition	Companies	Percentage
Requirement fulfillment	4	80,00%
Customer satisfaction	2	40,00%
Competitive advantage	1	20,00%
Process Improvement	1	20,00%
Product Quality	1	20,00%
No Answer	1	20,00%

3. Which type of quality system has your company adopted?

Type of Quality System	Companies	Percentage
ISO 9000:2000	5	100,00%

4. What were the reasons that your company adopted a quality system?

Purpose of Adoption of a Quality System	Degree of magnitude					
	None	Very low	low	Mediocre	High	Very High
Market Demand	0%	0%	0%	40%	20%	40%
Effective use of Resources	0%	20%	20%	20%	40%	0%
Cost Reduction through Prevention	0%	0%	20%	0%	20%	60%
Reduction of waste products	0%	0%	0%	0%	60%	40%
Increased Customer Confidence	0%	0%	0%	0%	60%	40%

5. What type of results you had from the use of the quality system?

Quality System Results	Degree of impact					
	None	Very low	low	Mediocre	High	Very High
Product quality	0%	0%	0%	0%	40%	60%
Process management	0%	0%	0%	60%	40%	0%
Communication	0%	0%	0%	40%	20%	40%
Human resource management	0%	0%	0%	80%	20%	0%
Risk management	0%	20%	0%	40%	40%	0%
Quality strategy	0%	0%	0%	0%	40%	60%
Corporate strategy	20%	0%	40%	0%	20%	20%
Customer relationship	0%	0%	0%	20%	60%	20%
Supplier relationship	0%	0%	20%	40%	20%	20%
Cost	0%	0%	20%	0%	80%	0%
Time	0%	0%	20%	60%	20%	0%
Change management	0%	20%	20%	20%	40%	0%

Ioannis Bogiatzoglou

6. In which of the following elements of project quality system is the quality system of your company focused on?

Focus Elements	Degree of magnitude					
	None	**Very low**	**low**	**Mediocre**	**High**	**Very High**
Quality Plan	0%	0%	0%	20%	20%	60%
Quality Assurance	0%	0%	0%	0%	40%	60%
Quality Control	0%	0%	0%	0%	20%	80%
Quality Improvement	0%	0%	0%	20%	0%	80%

7. Which is, from your point of view, the best way to ensure quality in a project or in a product?

How to Ensure Quality	Companies	Percentage
Process Improvement	2	40%
Employee Participation	1	20%
Conformance to requirements	2	40%
Resource Management	1	20%
Process Management	1	20%
Top Management Commitment	1	20%
Quality Planning	3	60%
Quality Control	2	40%
Training	3	60%
Responsibility Assumption	2	40%
Fact Based Decision Making	1	20%
Value Added Audits	1	20%

Ioannis Bogiatzoglou

8. **What are the key points or windows in the project management process where quality can be integrated?**

Key points for Quality Integration	Degree of magnitude					
	None	**Very low**	**low**	**Mediocre**	**High**	**Very High**
Front end customer analysis	0%	20%	0%	40%	40%	0%
Planning	0%	0%	0%	0%	40%	60%
Project selection	20%	0%	20%	40%	20%	0%
Scope of work	0%	0%	0%	20%	40%	40%
Scheduling	0%	0%	0%	20%	40%	40%
Budgeting	0%	0%	0%	40%	40%	20%
Quality planning	0%	0%	0%	0%	0%	100%
Project indices	0%	0%	0%	40%	0%	60%
Prototype	20%	0%	0%	40%	20%	20%
Quality control	0%	0%	0%	0%	20%	80%
Risk Management	0%	0%	0%	0%	20%	0%
Configuration Management	0%	0%	0%	0%	20%	0%
Communication	0%	0%	0%	20%	0%	0%
Customer Satisfaction evaluation	0%	0%	0%	0%	20%	0%

Ioannis Bogiatzoglou

9. **Which are the possible responsibilities of company's top management for the optimization of the quality system's use?**

Key points for Quality Integration	Degree of magnitude					
	None	Very low	low	Mediocre	High	Very High
Front end customer analysis	0%	20%	0%	40%	40%	0%
Planning	0%	0%	0%	0%	40%	60%
Project selection	20%	0%	20%	40%	20%	0%
Scope of work	0%	0%	0%	20%	40%	40%
Scheduling	0%	0%	0%	20%	40%	40%
Budgeting	0%	0%	0%	40%	40%	20%
Quality planning	0%	0%	0%	0%	0%	100%
Project indices	0%	0%	0%	40%	0%	60%
Prototype	20%	0%	0%	40%	20%	20%
Quality control	0%	0%	0%	0%	20%	80%
Risk Management	0%	0%	0%	0%	20%	0%
Configuration Management	0%	0%	0%	0%	20%	0%
Communication	0%	0%	0%	20%	0%	0%
Customer Satisfaction evaluation	0%	0%	0%	0%	20%	0%

10. **Is the transaction from your company's quality system to the adoption of total quality management system (TQM) possible?**

Transaction to TQM	YES	NO	No Answer
Transaction to TQM	60%	20%	20%

Ioannis Bogiatzoglou

11. Do you consider that the use of a total quality system would improve the up to date results?

Improved Results Using TQM?	YES	NO	No Answer
Improved Results Using TQM?	60%	20%	20%