CityUniversity
of Seattle

"INVESTIGATION OF THE APPLICATION OF QUALITY TOOLS IN PROJECTS – A CASE STUDY IN A COMMERCIAL COMPANY"

By

Epitropakis Konstantinos

A THESIS REPORT
Presented to the Project Management Program in the
School of Management of
City University of Seattle
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF SCIENCE PROJECT MANAGEMENT

CityUniversity
of Seattle

December / 2008

CityUniversity
of Seattle

"INVESTIGATION OF THE APPLICATION OF QUALITY TOOLS IN PROJECTS – A CASE STUDY IN A COMMERCIAL COMPANY"

By

Epitropakis Konstantinos

A THESIS REPORT
Presented to the Project Management Program in the
School of Management of
City University of Seattle
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF SCIENCE OF PROJECT MANAGEMENT

This Master Thesis was elaborated in the frame of the collaboration of the City University of Seattle and the Graduate Technological Education Institute (T.E.I.) of Piraeus to fully implement at TEI of Piraeus Campus the CU's MS in Project Management Program approved by the Hellenic Ministry of National Education and Religion Affairs as by decision E5/58291 published in the Hellenic Government Gazette (FEK) B/924/5- July-2005.

CityUniversity
of Seattle

December / 2008

LIBRARY RELEASE & APPROVAL

"INVESTIGATION OF THE APPLICATION OF QUALITY TOOLS IN PROJECTS – A CASE STUDY IN A COMMERCIAL COMPANY"

I, Epitropakis Konstantinos, do hereby irrevocably consent to and authorize the City University of Seattle Library to file the attached thesis "INVESTIGATION OF THE APPLICATION OF QUALITY TOOLS IN PROGECTS – A CASE STUDY IN A COMMERCIAL COMPANY" and make such paper available for use, circulation, and reproduction by Library users at the City University of Seattle Library and all site locations.

I state at this time that the contents of this paper are my own work and completely original.

_____

Student Signature *Date*

APPROVED:

_____

Advisor Name *Signature* *Date*

_____

Advisor Name *Signature* *Date*

_____

Program Director Name *Signature* *Date*

ACKNOWLEDGEMENT

To my family and my sister for their encouragement
and patience during the period of this research.

Epitropakis Konstantinos

CURRICULUM VITAE

Epitropakis Konstantinos has a bachelor degree in Electrical Engineering of University of Eastern Macedonia, Kozani. For the last years, he is working as a manager in the electrical department of Company X. His responsibility is to supervise electrical activities and deliver the tasks when they are finished for another activity to begin or for the project to be delivered.

For the time being, he is taking courses at City University as post-graduate of MS of Project Management program, from where he expects to get the appropriate knowledge in order to make his work more effectively.

Name: Epitropakis konstantinos
Student Number: 20085358
Title: Investigation of the application of quality tools in projects – A case study in a commercial company

ABSTRACT

Numeric references make a case for the integration of Total Quality Management within the project management process. Some people support the opinion that TQM is a way of managing for the future. In other words, traditional structures and short term solution must be in the past. Any organization that wants to survive and achieve a competitive advantage must focus on the customer. They must see the project under the customer's eyes in order to satisfy their needs, wants and expectations. What is more, continuous improvement practices and learning processes are obligated in order to apply the TQM philosophy in whole organization structures. Therefore, the quality management system must be adopted separately at every aspect of the organization but in accordance with the system operation in view of updating the system at all and produce high quality products and services.

THESIS CHECKLIST

STUDENT NAME EPITROPAKIS KONSTANTINOS NICOLAOS **SID#** 20085358
Last First Middle

ADDRESS 22 AGONISTON ATHENS ATTICA 15121
STREET CITY STATE ZIP

COURSE NO. PM 601 **CREDITS** 1 **TERM** SPRING **YEAR** 2008

THESIS TITLE: Investigation of the application of quality tools in projects – A case study in a commercial company

REVIEWING FACULTY_____ **DATE**_____
Signature

Element	Check if Present
1. Title Page	√
2. Signature Page	√
3. Library Release Form	√
4. Copyright information	√
5. Dedication	√
6. Acknowledgements	√
7. Curriculum Vitae	√
8. Abstract	√
9. Table of Contents	√
10. List of Figures	√
11. List of Tables	√
12. Text of Report	√
a. Introduction	
b. Problem Statement	√
c. Review of Literature	√
d. Methodology and Procedures Used	√
e. Results	√
f. Discussion, Conclusion & Recommendation	√
13. Bibliography	√
14. Appendices	√

Comments on required Elements needing changes:

_____

_____

_____

_____

Reviewing Faculty Signature_____ **Date**_____

THESIS APPROVAL FORM

STUDENT NAME **EPITROPAKIS KONSTANTINOS NICOLAOS** SID# **20085358**
Last *First* *Middle*

ADDRESS **22 AGONOSTON ATHENS ATTICA 15121/GREECE**
Street **City** **State** **Zip/Country**

COURSE NO. **PM 601** **CREDITS** **1** **TERM** **SPRING** **YEAR** **2008**

THESIS TITLE: **Investigation of the application of quality tools in projects – A case study in a commercial company**

Statement from student: This research report is an original work never published or submitted to any other university. All sources used in the writing of the project are identified. I understand that both an electronic copy and a bound of my Thesis or Research Project will be placed in the City University Library and may be accessible to the public.

The Framework for achieving an effective Problem Solving & Decision Making System

STUDENT _____ DATE _____
Signature

1.1.1.1.1.1 To be completed by faculty

I hereby acknowledge that I have read and approved the thesis submitted by the above student:

PROJECT or THESIS ADVISOR:

_____
Signature

PROJECT or THESIS ADVISOR _____DATE _____
Print or type name

GRADE (if required) _____

SENIOR FACULTY _____DATE _____
Signature

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Nature of the study

Company X is a company that imports air conditioning units from China. It is located in Ilion, Athens, and occupies 12 employees. The main activity of Company X is the import of air conditioners from Company Y which has its headquarters in China and the supply of retailers with the particular products. Company X has a certain retail network of 1000 stores which purchase products from the company. The particular network, which has been created after many years of the company's operation in Greece, expands year after year.

The secondary activity of the company involves the promotion and the installation of air conditioners to companies, offices and industries. Although this activity faces multiple problems such as installation delays, customer complaints, and projects out of budget it is still in its infancy and appears extremely profitable. Therefore, the upper level management of the company makes attempts to solve these problems and improve the particular field in order to make it as efficient as the primary activity. This particular activity of Company X consists of four basic departments:

- The promotion department which deals with the advertising of the company products to individual customers.
- The sales department which deals with customer orders and sales.
- The import department which handles the imports products, from either abroad or the leased logistics warehouse, for individual customers.
- The technical department which undertakes the installation of air-conditioning units to individual customers and provides the customer service.

With these stages anyone can easily see this department has a large number of stakeholders. Communicating with customers is a significant element of the company. Quality plays a very

important role in communicating and understanding customer needs and expectations, improving the internal procedures and finally in providing high quality products / services to customers. Therefore, through quality a company can earn both customer satisfaction and customer loyalty. A commercial company should include quality in its projects in order to succeed in the commercial market. Products as well as services must be more competitive than those of rival companies in order to be successful and obtain a leading position in the market.

An attempt will be made to use quality tools so as to improve customer services and products promotion in order that the company provides high quality services to its customers. The employment of quality tools will help the installation / service department of Company X to improve the collaboration with its stakeholders; it will also have the capability of improving and evaluating its projects based on customers' expectations and needs. By incorporating quality into projects the company should be able to improve its projects and deliver them to the customers punctually and less costly.

The nature of the study is to examine the importance of embedding quality into the projects, how quality can help to improve the overall status of the less efficient department, and discuss whether it's necessary for a commercial company to use quality tools in its projects. Also the author wants to indicate which of the quality tools can help the improvement of the department and to what extent it can benefit itself from these tools.

Need Assessment

Stakeholders of the installation / service department of Company X are the customers[1], logistics companies that collaborate with Company X, the company from abroad

[1] This category includes direct customers of ACN S.A. who purchase products from the company and indirect customers that purchase the products from department stores for which the company has undertaken the obligation to cover the guarantee requirements and the product service.

that constructs these products for Company X, the collaborating companies and the project manager(s) that control the commissions.

The benefits that stakeholders can receive from the study are multiple. Attenuation of cost and accrual quality will mean that the customers (direct or indirect) are going to receive better services as their needs and expectations will be better understood. This fact will have a positive effect on customer satisfaction and brand loyalty, and therefore on the project managers, the company as a whole and the companies that it collaborates.

Purpose of the Study

The purpose of the study is to investigate the effectiveness of applying quality tools to project processes of a commercial company and examine the extent to which these tools will contribute to company profits. More particularly, quality tools such as Quality Function Deployment (QFD), "just-in-time", and Statistical Process Control (SPC) will be applied on all the processes of the problematic department in an effort to meet the needs and expectations of the customers, decrease customer complaints, and improve relations between company and customers. Finally, the author will use quality tools in the project processes in order to augment the company profits. The ultimate goal of this investigation is to help the company attract more customers and therefore make extra profit.

Relation to the Program of Study

Nowadays, the highly competitive environment of the market makes it necessary for companies to find out new ways of accomplishing the needs and the expectations of the customers. Companies must offer high quality products or services. Using quality tools can

help in providing higher quality products and services and helps in understanding what the customer wants.

According to PM511 (Project Quality Management) quality is everywhere. It is in life, in the project, the services, in people's daily life. It has to be dealt with and used in order to increase competitiveness and improve projects and services. To achieve these goals, quality tools must be deployed. Finally, the particular Program of Study has placed emphasis on the use of these tools in order to help detect problems, find the better solutions for these issues, and improve relationship with the customer.

CHAPTER 2

Problem statement

The technical department of a commercial company faces quality problems such as time and cost overruns which make the particular department inefficient and cause problems in relation to customer satisfaction as they spoil the image of the company and have a negative effect on the profits.

Rationale

Quality is to earn the satisfaction and meet the expectations of the customer. Moreover, quality assists in controlling a problem in project phases even before these problems arise. Using quality tools in a project means being able to satisfy one's current customers and by successfully doing that, it will be easier to attract new customers. Therefore it is believed that this methodology will go a long way into improving the situation of the particular company.

Not many commercial companies use quality tools in their projects and this fact results in failing to satisfy the customer in many cases, or, it can cause the project to fall out of budget and behind schedule. The tools of quality management may prove useful in controlling and correcting each phase of the project and offer the company more benefits.

Quality tools such as Quality function deployment (Q.F.D.), statistical process control (S.P.C.), cost-of-quality analysis, quality assurance (Q.A.), earned value, project review, and documentation may help project managers control the project in each phase, from the beginning to the end. These quality tools may also help project managers to embed quality into their project processes, correct some processes which are out of control during the project, and ensure that the project is appropriate for the needs of both the customer and the

company. They may also help him/her to control the cost of the project, and create the earned value method, the project review, and the documentation. Another quality tool, which is very important, is the Pareto analysis which helps project managers cover customer expectations with the companies' products or services. The research will make an effort to apply the most suitable quality tools on the case study so as to check them for consistency.

Expectations

The main expectation of this thesis is that it will provide, through extensive research, a clear insight into the importance of using quality tools on project processes. Another expectation is that the methodology put forward by this research will be applied by the administration of Company Y in order to improve their products and services.

CHAPTER 3

What is quality

According to Oakland quality signifies "excellence of a product or service". If it is to be combined with management customers' needs and expectations must be taken into consideration. Oakland suggests that quality almost equals reliability as part of a product's acceptability relies on it being able to perform adequately over a time period and it is a chief factor in purchasing decisions that examine alternatives. According to the same author a definition by which quality is synonym to "meeting customer requirements is not restrictive to the products or services' functional characteristics as satisfying customers' requirements consistently results in the customers being delighted.

Apart from their own definition of Quality, Oakland and Dale cite a number of authors considered experts on the particular field such as Feigenbaum who defines quality as the end product and service features of marketing, engineering, manufacture and maintenance which result in the customer's satisfaction by the use of the product or service. Dale also cites Juran who defines quality as "fitness for use". Juran breaks quality into "quality of design, quality of conformance, availability and field service". More particularly, he suggests that by increasing conformance the cost of quality is reduced. Another expert on the field, Deming as cited by Dale suggests that quality improves productivity and competitive position as it reduces statistical variation. Deming defined quality as a function of quality of design, quality of conformance and quality of the sales and services. Finally, both Oakland and Dale cite who addresses his definition to top management executives suggesting that quality is "Conformance to requirements". Crosby claims that profitability increases through quality improvement as quality "reduces costs and raises profits".

Total Quality Management

Total quality management (TQM) dates back to the fifties which is when the term "Quality Management" was first introduced by the Japanese. Later in the eighties it became popular in the U.S. and Europe as the success of the Japanese firms in global markets became known. In the nineties Quality Management became of major importance in many organisations and at that time it started being referred to as Total Quality Management. (Stashevsky and Elizur Intro.) According to Billings and Youmans TQM was first developed in the manufacturing field and provided a generic framework for the constant improvement of procedures with a view to optimizing quality and productivity.

There are many definitions of total quality management provided by leading experts on the field. These definitions share many common characteristics but each of the writers adds important elements to the definition. Oakland defines TQM as an approach that improves the competitiveness, effectiveness and flexibility of an organization, involves planning, understanding and organising each activity and relies on everybody regardless of position in the organisation. Oakland claims that for an organisation to be effective, all its parts must work together on common goals and every person should realize that all their activities affect others and vice versa. He also suggests that the management must adopt a "problem prevention mentality" which it must persuade everybody to follow. Finally Oakland suggests that the personnel should be trained to study the processes as teams and correct the causes and not the symptoms of the problems.

Dale adds that the principles of TQM should be implemented by every branch and at every level of an organisation "with an emphasis on integration into business practices, and a balance between technical, managerial and people issues". He also suggests that TQM demands a broadening of outlook and skills and an increase of creating activities and that it demands great sophistication in the application of tools and techniques, increased emphasis

on human capital, management of processes, personal development and systematic attempts to terminate wastage and valueless activities. Finally Dale introduces the notions of the "internal" and "external" customers defined further by Barkley and Saylor below, maintaining that the ultimate aim of TQM is to delight both.

Barkley and Saylor add to the definition of TQM by defining each term separately. More particularly they maintain that the role of "Total" is to emphasise the idea of involving "everyone and everything" in the organisation. In defining "quality" they suggest that it is synonymous to customer satisfaction. They go on to define the "external customer" as the ultimate user of the product or service and the "internal customer" as the next process in the organisation. Finally they end the definition by stating that "Management" involves the creation and maintenance of the TQM environment.

Traditional Management and TQM

The main difference between traditional and Total Quality Management is that the first one focus on the product rather than on the customer that is the primary priority of TQM. What is more, traditional managers used to blame the workers/ employees about the bad quality of some products. In our days, TQM philosophy reallocates the responsibilities in the middle management which is in charge of applying and monitoring the quality in whole organization function.

Generally, traditional manners looking for applying quick quality solutions, control resource by functions and people by their productivity. In the contrary, TQM provide long term solution oriented by continues improvement processes, empower members to participate in quality tasks and improve their dexterity and finally manage the quality as a complex system can affect the whole organization operation. The following table illustrates the most popular differences between the two quality management styles.

Table 1: Traditional Management vs TQM

Traditional management	Total quality management
Looks for "quick" fix	Adopts a long-term, strategically oriented philosophy
Firefights without an analytic component	Uses a disciplined methodology of continuous improvement
Operates the same old way with a commitment to stability	Advocates breakthroughs, innovation, and creative thinking
Adopts improvement randomly	Systematically selects improvement
Inspects for defects and errors	Focuses on prevention
Decides by using opinions	Decides by using facts
Throws money and technologically at tasks	Maximizes people resources
Controls resources by function	Optimizes resources across the whole organization
Controls people	Empowers people
Targets individual performance to meet job description requirements	Focuses on team performance to meet customer expectations
Is primarily motivated by profit	Strives for total customer satisfaction
Relies on programs	Is a never-ending process

Source: Bruce T. Barkley and James H. Saylor, Customer driven, Project management building quality into project processes

T.Q.M. Guiding principles

The fundamental issue of T.Q.M. management principles in business environment is to satisfy the customer, satisfy the supplier, and continuously improve the business processes. According to Barkley and Saylor the TQM guiding principles are fundamental rules which are necessary for TQM to be implemented. James R. Evans and William M. Lindsay expressed the opinion that the underlying principles of quality management are recognized as

the foundation of high-performance management system and an important factor for competitive success[2].

Initially, the first principle is to **focus on customer and stakeholders**. Bruce T. Barkley support the opinion that customer is the principal judge of quality[3]. In other words, there are numerous reasons which can affect the level of customer needs, wants and expectations. To meet or exceed this issue we must totally understand all product and service characteristics that contribute to customer satisfaction. The expression *customer driven standards must* be the rule for every company which tries to enhance its quality standards and make customers to feel satisfied and secure.

On the other site, all stakeholders who participate in a project's life cycle must known that they have an effect on the quality of the final deliverable. To be more precise, an organization success bases upon the knowledge, skilfulness, inspiration and motivation of its employees and stakeholders. What is more, effective communications channels must be added in view of achieving well define relationships and decrease problematic behaviours which can influence the communication with the customer and lead the whole project's quality at danger.

The second principle is the **participation and teamwork by everyone in the organization**. The main reason for Japan's rapid quality success is that Joseph Juran focuses on the knowledge and the experience of the entire workforce. This means that employees must feel freedom to participate in the in project processes such as decision in order to share their skills and add quality value to the project. Furthermore, one more significant issue of organization total quality is the teamwork which can be an effective way for a company to resolve systemic problems and handle difficult conditions. In other words, different point of

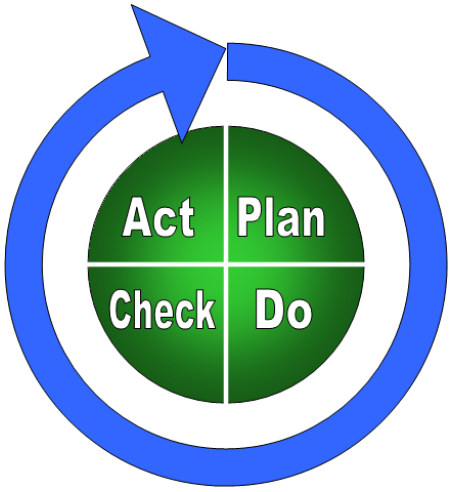
[2] James R. Evans and William M. Lindsay, (2002), *The management and the control of quality*, (5nd ed.), South-Western: Thomson Learning

[3] Barkley, B. T., & Saylor, J. H. (2001). *Customer-driven project management: Building quality into project processes* (2nd ed.). New York: McGraw Hill.

views can recognize hidden factors which pose at danger the quality and find profitable ways to manage it.

Every project is constituted of several processes which is a sequence of activities in view of achieving a specific result. This is the meaning for the final principle which is to **lead the projects by continues improvement and learning processes**. To explain what authors means continuous improvement is an ongoing endeavor to update products, services, processes or activities. The most popular model to do that is the PDCA cycle. The next figure illustrates this model and gives some useful explanations about its function.

Figure 1: PDCA Cycle



PLAN: Establish the objectives and processes necessary to deliver results in accordance with the specifications.

DO: Implement the processes.

CHECK: Monitor and evaluate the processes and results against objectives and Specifications and report the outcome.

ACT: Apply actions to the outcome for necessary improvement. This means reviewing all steps (Plan, Do, Check, Act) and modifying the process to improve it before its next implementation

Source: Wikipedia, free encyclopedia

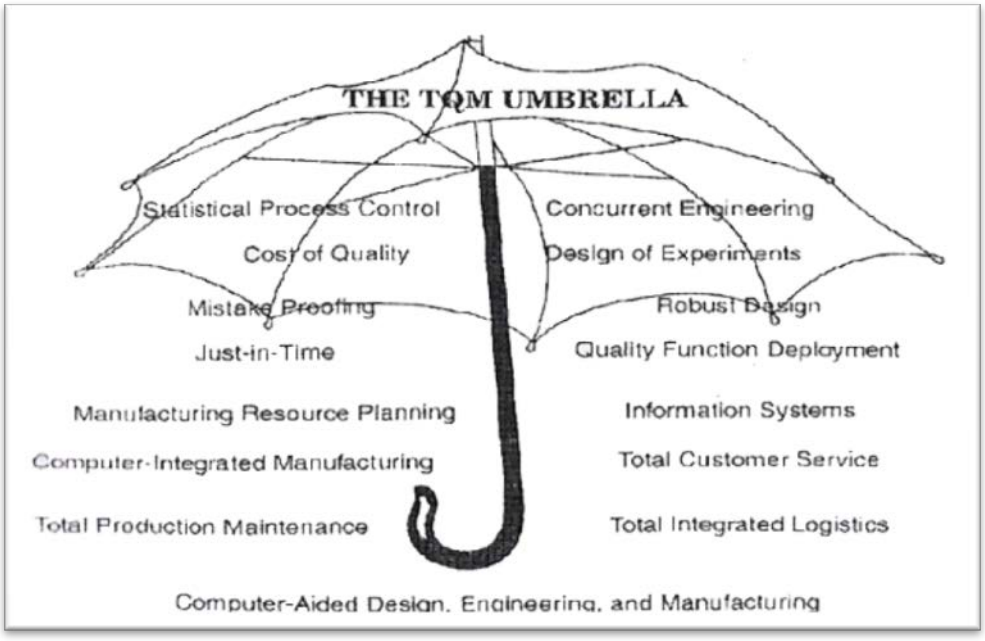
Finally, **learning processes** are based upon feedback among different department, which can help organization to underline past errors and pitfalls which can affect the quality of the final deliverable. Similarly, record specific experience and innovative ways can help project managers to guarantee or increase the quality of the future projects. It is enormously important to keep a document on prior projects because we will be in position to react

immediately in same or similar condition. What is more, specific information can provide the opportunity training team members in view of updating their skilfulness.

The TQM umbrella

TQM is a distinctive and extremely effective management approach. As we analyze in the above lines, the philosophy of total quality management provide the opportunity to enclose continues improvement processes. The TQM umbrella encircle all the entire management techniques, tools and models which can help each organizations to improve its processes and manage the future projects under the umbrella of the total quality management. The most notable elements are the statistical process control (SPC), just in time management, cost of quality, quality function deployment (QFD) and so on. The next figure illustrates the TQM umbrella which it is worthy of note that it is created by the James R. Evans and William M. Lindsay

Figure2: TQM Umbrella



Source: Bruce T. Barkley and James H. Saylor, Customer driven, Project management building quality into project processes

One thing that we have to pay extra attention is that it is not necessary for a company to apply all the above manners in view of assuring its success. The collection must be based upon measurable data and specific problems which demand an accurate solution. After that, feedback processes and teamwork environment will provide the opportunity to add quality value in a product and consolidate continues improvement to whole enterprise function.

Customer driven TQM

TQM has a customer-first orientation. This means that customer must be the uppermost priority for each organization which works under TQM philosophy. Flexible organization processes must be in position to react and respond rapidly at every customer requirement. In other words customer must lead the projects.

Traditional structures tend to make their decision according to their needs, tactics and strategies, rather than to identify what customer or market really want. The only way to understand the usefulness of customer driven is to define at first who is the customer. A big amount of people believe that a customer is a person who buys products or services. However, this person named consumers and can be characterized as an external customer or a final customer. However, during products life cycle (design, production, promotion, and sales) there are different persons who engaged in this process. For instance, the company's employees can be internal customers because receive goods and services for a suppliers in order to use them in the production phase.

In conclusion, each company which demands to adopt customer driven processes must identify at first who is the customer. Following, they have to clarify their needs wants and expectations and finally adopt all these valuable information as a guideline to

organization function. Customer driven project s management builds on the strengths of both total quality management and project management approaches[4].

Creating Satisfied Customers

The most difficult process in the relationships with the customer is to identify their needs and expectations. Moreover, we must find a profitable way to translate these requirements into quality outputs during the design, production and delivery process. The customer points of view about his needs and expectations called *expected quality* and refer to the customer hope about the final deliverable. In the same way, *actual quality* represents exactly the final outcome of the project. The differ between these points must be zero in view of addressing all customer requirements as we can see in the following equation.

Figure 3: Equation of satisfy customers

Perceived quality =Actual quality – Expected quality

Perceived quality = 0 (satisfied customer)

Perceived quality >0 (actual quality is higher than the expected)

Perceived quality <0 (actual quality is lower than the expected)

Source: James R. Evans & William M. Lindsay, The management and control of quality[5]

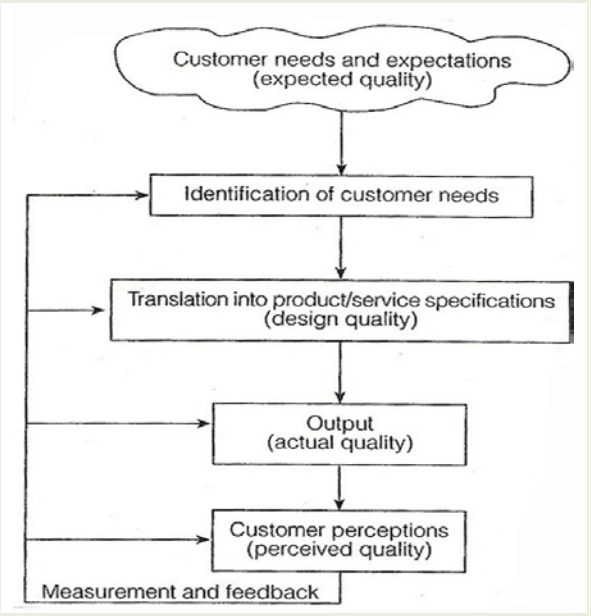
Any difference between the expected and actual quality implies problematic circumstances. More specifically, when the sign of the above equation is positive this means that the actual quality is bigger than the expected, so as the customer is extremely satisfied. In the contrary way, when the sign is negative means that the final outcome do not address customer wants or expectations and they are tremendously unsatisfied. Thus, we have to

[4] : Barkley, B. T., & Saylor, J. H. (2001). *Customer-driven project management: Building quality into project processes* (2nd ed.). New York: McGraw Hill.

[5] James R. Evans and William M. Lindsay, (2002), *The management and the control of quality*, (5nd ed.), South-Western: Thomson Learning

develop product and services according to customer eyes in view of avoiding unsatisfied condition. James R. Evans figures out the above equation in the next shape and provides some useful ways to achieve product in accordance with the customer expected quality. For instance, we have to listen and learn from the customers. The customer voice must lead the project lifecycle. What is more, ongoing relationships with the customer promote the trust and make easier the collaboration with two parties. Finally, the customer must have access to the project in view of recording his satisfaction or complains.

Figure 4: Customer Driven Quality Cycle



Dimensions of TQM

There are numerous literature sources about the dimensions of Total Quality Management. This means that there are many points of views about the accurate number of dimensions which participate in the framework of TQM. Except of the number or the role of each dimension it is critical to emphasize in the relationships and interactions among them which means that quality dimensions works as a systemic environment. Potential omissions in the operation of one dimension it is clear that will have an impact in the whole quality management system.

It is remarkable to underline that the implementation of TQM dimensions will take time, money and extremely effort before benefits become visible. The following table illustrates the most principal dimensions with its definitions according to the literature review.

Table 2: Dimension of TQM

Dimensions	Description
Top management support	This is the most critical dimension in order to achieve a successful TQM implementation. What is more, top management has the main responsibility to adopt quality culture in firm's operation. Leadership and motivation skill are necessary to share the spirit of TQM in employees behavior.
Customer relationship	This dimension refers to the necessity to recognize what makes customer satisfy and establish on going relationships with them.
Supplier relationship	The supplier selection process must be based on the at most in the quality and less in the price. It is essential for the organization success to establish long term relationships with the suppliers in order to work together to pick up the quality on products and services.
Workforce management	This dimension underline the ways which must be followed by top management in view of empower the employees to work together under quality specification and upgrade their knowledge through training and role playing methods in order to be ready to participate in the quality improvement process.
Employee attitudes and behavior	In combination with the above dimension, any organization which demands high quality levels must find the ways to motivate the employees makes them feel proud and secure for their job and provide accomplishable targets to increase their satisfaction.
Product design process	In TQM environments all the department must have the ability to participate in design process in view of examining separate specification according to their mastery.
Process flow management	Housekeeping along the lines of the 5S concept. Statistical and non-statistical improvement instruments should be applied as appropriate. Processes need to be mistake-proof. Self-inspection undertaken using clear work instructions. This dimension is based upon the 5S concept.
Quality data and reporting	Any experience about quality issues must be record in specific formats and accessible by everyone in the company. What is

	more, feedback is important to keep updated these records.
Role of the Quality Department	It is obligatory for the quality department to undertake an autonomy role in organization function in order to measure with quality indicator the progress of the other departments and help them to collaborate if it's necessary.
Benchmarking	Even though the cost of this dimension, it provides the opportunity to improve organization processes through the examination of the other organizations in the market

Elements of TQM

Some professional managers strongly support the opinion that quality is the key to competitive advantage in today's business environment[6]. One of the most popular is the Edward W. Deming who was responsible for the rise of Japan as a manufacturing nation. To be more precise, Deming help Japanese manufacture to develop high quality products without to increase the levels of cost or to demand expensive machinery. In addition, Dr Deming encouraged the workers education and training and maintained an effective relationship and communication between management and the employees.

The 14 points that Deming introduced in the fifties with regard to TQM continue to epitomize the role of TQM until nowadays. As Deming said, these 14 points would be the basis for the transformation of the American industry (Out of crisis, 1968). They would not merely solve problems. Their implementation was going to be indicative of the management's intention of staying in business and protecting the interests of investors and employees. The relevance of the 14 points to this research and almost to every piece of literature dealing with quality is that they apply anywhere, to small organizations as well as to large ones, to the service, industry as well as to manufacturing. They even apply to a division within a company.

[6] Deming, W. Edward (2000). *Out of the Crisis*. Retrieved August, 2000, By MIT press

According to his theory, TQM refers to continuous improvement processes and not at least an ineffective system of rules and complex mechanisms. Dr Deming claimed that the reason why companies didn't produce quality products was that management was preoccupied with ''today'' rather than the future (Kerzner, 2003). In the next page we analyze with detail the theory of Deming's 14 principles.

Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs:

As Deming said, "There are two problems: problems of today, and problems of tomorrow, for the company that hopes to be competitive in business environment. Today problems refer to organization effort to resolve potential pitfalls which can affect the quality of product that put out today. On the other hand, future problems provide the necessity to apply continues improvement processes and provide new opportunities for our members in order to maintain high levels of quality.

Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change:

In order to adopt a quality philosophy in an organization it is necessary not only the models and accurate techniques but also to establish an atmosphere of well defined relationships and on-going relationships. Moreover, cross functional enterprises are extremely difficult to be in a systemic way of thinking. Therefore, project manager must be a skilful person who can incorporate different cultures and ways of thinking in view of achieving organization success.

Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place:

As Deming said, "When product leaves the door of a supplier, it is too late to do anything about its quality". This means that we have to build quality at the begging of the product. An effective way to accomplish that is to train our employees, to establish brainstorming processes, to learn for past failures and so on. Audits, tests and fundamental theories can help us to plan and monitor the project in order to identify potential errors. However, TQM demand the human factor as the most important factor of the project processes.

End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust:

The price alone has no meaning for the organization success. Project manager priority is to focus on the lowest total cost and not to the initial. What is more, he is in charge to create long term relationships with the stakeholders (customer and vendors and so on) which must be based upon the reliability and mutual confidence. The customer needs to feel safe in order to trust the organization implicitly and continue their collaboration.

Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs:

There are some clever and easy to answer questions which can help the project manager to delineate the level of customers' satisfaction. For instance, are your customers are more satisfied that they were last year? Are the suppliers happier? If the answer is no, it is indispensable to find profitable ways to fix it. On the other site, if the answer is yes we

need feedback to record our achievement and try harder to upgrade all the organization functions. In any case, the project manager and the organization at whole must be in wakefulness to re plan the company's picture in view keep the customer secure every day.

Institute training on the job:

The new role of the management is to provide specific opportunities to the employees to advance their skills and expertise. The team member must be able to understand different issues and having a profitable participation in project's lifecycle. Role playing and training days are necessary for competitive companies. Moreover, the project manager as mentor must have the ability to help team members identify their abilities and create an efficient career path.

Institute leadership the aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul as well as supervision of production workers:

As put by Senge, the leader should be a designer, a creator of an environment (P. Senge, *The fifth Discipline*, Doubleday, New York, NY, 1990). In other words, an effective project leader must have the ability to motivate employees, underline specific roles and responsibilities, recognize conflicts conditions and resolve it with success and establish accurate communication channels among stakeholders. Flexible leadership styles provide the opportunity to handle difficult conditions and deliver the product on time, in budget and according to customer specifications.

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

It is possible for the employees who working under fear to decrease their productivity and reduce their willingness and enthusiasm to improving the quality process. It is important for an organization to learn from the mistakes. Employees must have the tolerance from the administration to fail without the fear to lose their work.

Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service:

Companies and project teams are becoming more culturally diverse with each passing business day[7]. Multicultural teams can affect the project's operation and pose the whole project at danger. For this reason, the project manager must establish a bridge between different cultures and achieve effective communication among their employees. What is more, everybody who participate in a project must be enclosed in a decision process in view of decreasing the conflicts and make common acceptable decisions.

Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force:

Zero Defects, pioneered by Philip Crosby, which means to decrease the number of defects and errors in zero[8]. Nevertheless, this seems to be extremely difficult in practice.

[7] Steven W. Flannes & Ginger Levin, (2001), *People skills for project managers*, Management concepts

[8] Taguchi, G. (1992). Introduction to Quality Engineering: *Designing Quality into Products and Processes* (9th Ed.). Hong Kong: Nordica International Limited.

Thus, the real meaning of this expression is to minimize the likelihood of errors. What is more, the belief that slogans and exhortations can motivate the employees to increase their productivity is behind the times. The new management demands of the project managers to create a "big picture" with clear objectives and responsibilities.

Eliminate numerical quotas for the work force and numerical goals for management:

Numerical goals and strict quotas reduce the productivity and create stressful conditions in company's environment. The only numbers that Deming believes are permissible are those that set forth actual facts of enterprise survival, such as, unless our sales improve 10 percent next year, we shall be out of business[9]. Therefore, we must find a way to measure the progress under quality indicator in view of decreasing the use of quotas or other work standards.

Remove barriers that rob people of pride of workmanship. Eliminate the annual rating or merit system:

A simple explanation of the above statement is to allow employees to feel good about their work, and they will do good work[10]. More specifically, barriers between departments and bureaucracy functions may have an effect on people productivity. In accordance with the previous principle management by objective provide pressure circumstances which discourage employees to increase their trend to enhance their knowledge and expand their productivity.

[9] Deming, W. Edward (1986). *Out of the Crisis*. Cambridge. MIT Center for Advanced Engineering Study

[10] Caro, L. M., & Garcia, J. A. M. (2007). Measuring perceived service quality in urgent transport service. *Journal of Retailing and Customer Services*, 14(1), 60–72. Retrieved Saturday May 5, 2007 from www.sciencedirect.com

Institute a vigorous program of education and self-improvement:

It is possible to think that thirteen principle is similar with six principle. However, the main difference is that six point focuses on job training while thirteen point deals with people development. Every competitive organization has to develop people knowledge through education and self improvement processes as a result to apply this achievement in organization lifecycle.

Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job:

The main issue of the last principle is to manage the company with the aim of making the first 13 points happen. TQM philosophy must be adopted initially at the top management. Furthermore, top management is in charge of applying this way of thinking at every level of the company and empowers the idea that transformation is everybody's job. In case of a company failed to apply TQM process at first, it is required to develop a root-cause analysis to underline the problems and re plan the processes according to TQM values.

Project quality management

(PMBOK) project quality management includes the processes required to ensure that the project will satisfy the needs for which it was undertaken. It includes "all activities of the overall management function that determine the quality policy, objectives, and responsibilities and implements them by means such as quality planning, quality control, quality assurance, quality improvement, within the quality system.

1. Quality planning: identifying which quality standards are relevant to the project and determining how to satisfy them.

2. Quality assurance: evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.
3. Quality control: monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.

These processes interact with each other and with the processes in the other knowledge areas as well. Each process may involve effort from one or more individuals or groups of individuals based on the needs of the project. Each process generally occurs at least once in every project phase. Although the processes are presented here as discrete elements with well-defined interfaces, in practice they may overlap and interact in ways not detailed here.

Quality and project processes

Harold kerzner[11] refers to the project management as a basic principle of planning, scheduling and controlling. In the same way, he defines the total quality management as process of addressing all customer requirements in the final result. It is obvious that there are clear interactions between these methods which can affect (negative or positive) the quality of the final project's outcome.

Nevertheless, the most common mistake for the project managers is to see the quality as an external factor of the project. As a consequence, they do not use the quality as a key factor in order to calculate project's indicators, such as time, cost and performance. This means in practice that we plan a project without taking into account important issues about the customers' (stakeholders) needs, wants and expectation. Hence, the key to success is to

[11] James P. Lewis, (2001). *Project management, A system approach to planning schedule and controlling*, (3rd ed.). New York: McGraw Hill

manage the quality as a way to satisfy the customers and lead the project according to their specification. According to the Bruce T. Barkley, there are four forces which are in charge of securing the customer pleasure.

The first one is the customer *expectations*. The project managers are obligated to identify this issue and integrated in the whole project function. It is worthy of note that this attempt demand skillful managers with high level of communication and negotiation skills. The next one is the *feeling about the project manager and team*. To be more precise, it must be necessary to create ongoing relations and efficient communication channels in view of establish the trust and the reliability among the team members. Also, *feedback from stakeholders* can help the project manager to identify potential threats or problematic behaviors which may pose the project's process at danger. Finally, the last force is the *project performance* which refers to the project manager responsibility to keep the project on track and give the customer a sense of secure.

According to Juran[12], the firms are obligate to develop quality culture in project management process in order to handle sporadic or chronic problems which influence the project lifecycle. Sporadic problems refer to short term circumstances which appear in project and demand easy to use solutions. On the other hand, chronic problems refer to more critical circumstances which demand strongly quality management systems in order to handle it. Particularly, chronic problems are rooted in the organization structure and appear at every project process. The solution founded on the adoption of quality improvement process in whole projects phases in light of developing total quality-oriented organizations.

Conclusively, quality measures are a useful way for the project manager to plan, schedule and control complex projects. Every task or activity of project management must be judged under quality conditions. The result of this combination will provide the opportunity

[12] Juran's official site (http://www.juran.com)

to develop ongoing relationship with the customer, efficient collaboration among the departments and precise knowledge for future projects.

Quality tools and techniques

Today's market is complicated and is becoming even more so. The increasing global competition in combination with the shorter product life cycles, force them to spent extra money and time in view of adopting a competitive advantage. In the same way, customers have been more fastidious and demand high quality products and services. According to Andeasen and Cooper opinion customers have also become used to getting products with very high quality even in the initial phases (Andreasen, 1991; Andersson et al., 1992; Cooper, 1993). At the same way, open markets and competitive environments force the enterprises search new customer needs and find from profitable ways to cover them.

The key to success for all the above factors is to focus on the quality. To be more precise, quality must be the driving force behind of each process or procedure. Zero defects and do it right at the first time ways must be followed. Customer needs must be translated in organization environment. Profitable knowledge and precise information must be available for each person who participates in project processes. All the above issues are enclosed in the total Quality Management. The goal is not just to focus on a few things at a time, but to focus on the right things (Bergman & Klefsjö, 1994).

In chapter 5 we will use some valuable tools and techniques in order to handle the company's X quality problem and establish continues improvement and learning processes. At the end of this part we will mention the most popular tools and techniques and we will focus on its theoretical use. The first tool called **Just in Time (JIT)** and refers to the company's ability or availability of having the needful materials just in time to use. Taiichi Ohno is credited with developing and perfecting it for Toyota's manufacturing plants in

Japan in the 1970s[13]. The fundamental philosophy of this method is to increase organization flexibility by using effective inventories in order to increase the profitability and decrease the wastes of time and cost.

The **Quality Function Deployment (QFD)** method was developed at the Kobe Shipyard of Mitsubishi Heavy Industries and nowadays is one of the most popular quality models[14]. The main idea of QFD is to apply the customer voice in the whole project environment. The final outcome of the model is a matrix table that called quality house. The function of the model is based upon six steps where the output of each phase is the input for the others. The first one is to *identify the customer requirements*. There are many methods to do that but the most effective is to follow the customer voice. Any information from the customer is important and the basic input in this stage of the process. The second step is to *identify technical requirements*. In other words, we should translate the customer requirements in the language of the designer and engineer. It is critical to develop measurement tools in view of monitoring the interactions among the technical issues. According to the Quality house there are three basic symbols which present these relationships and use it to fill the matrix[15].

Table 3: Basic symbols of QFD

●	Highlidghts very strong relationships
△	Highlights strong relations
○	Highlights weak relationships

[13] Tina K. Walsh ,*Just-in-time (JIT) philosophy improves quality in user documentation*, Retrieved February, 2003, from http://www.readpen.ca/article.html

[14] Bennington, L., & Cummane, J. (1998). Measuring Service Quality: *Total Quality Management*, 9 (6), 395–405. Retrieved Wednesday June 11, 2008 from www.acg.edu

[15] See Appendix Quality function deployment pp.65

The third step is to *develop a relationship matrix between the customer and technical requirements*. The main purpose of this process is to examine if the final technical requirement is in agreement with the customer requirements. The next step is to *evaluate the competitors' product and services* in view of underlining potential strengths and weaknesses. This very productive process because provide the opportunity for further improvement and evolution in order to achieve a competitive advantage. As a consequence, we have to *evaluate whether the competitors' products address customer requirements*. Under this assessment we will be in position to identify threads and weaknesses of our products and services which can affect the customer satisfaction. Finally, the last step is to *deploy critical technical requirement in the remaining of the process*. More specifically, some characteristic are enormously important for the customer, so we have to secure that will be applied in the final outcome.

It is commonly accepted that total quality management is not just a simple way to reduce the cost or increase the productivity. Alternatively, TQM is a profitable way to specify areas for improvement and consolidate continues improvement in the whole enterprises' function. The **cost of quality** based upon the expression "*do it right first time*"[16]. In other words the point it is not only to do the right things or to do the thing right but to do the right things right. According to Philip Crosby version, there are three crucial components which explain the operation of cost quality method. Specifically, we have to focus on the cost of monitoring defects and errors, cost of concerning defects and errors and cost reducing defects and errors.

The next tool named **flow chart** and is suitable to figure a sequence of activities and tasks. The illustrated process can be anything such as a project plan, a manufacturing function, a figure of a production line and a communication plan. The main advantage of

[16] Philip Crosby, *Developer Of the Zero-Defects Concept*, Retrieved August, 2001, by Wolfgang Saxon

flow chart model is that helps the project manager to develop understandable graphs of how the result will be achieved. What is more, provide the opportunity to enclose quality aspects and indicators in order to guarantee customer need, wants and expectation. Lastly, an effective flow chart contributes to establish productive communication among the members who participate in the same process.

Finally, **documentation** is one more critical quality management tool which is in charge of monitoring the organization processes and securing that quality is added at any level of design or production phase. For this reason project manager is forced to include quality aspects in the planning phase in order to be in position to measure the progress under specific quality characteristics and not only to control what work has been done and how. This effort demands more accurate feedback from the participants in the project and precise guidance from the project manager.

CHAPTER 4

Description of Methodology

The above literature examined different points of views about the participation of TQM in companies' processes. The author tries to figure specific models and techniques which will provide effective ways and possible solution of our case study. What is more, we pay specific attention in the necessity of the quality improvement and learning processes.

The fundamental objective of this thesis is to highlights the company's X weaknesses which raise the cost and makes the customer to feel unsatisfied. What is more, we focus on its relationships with the other stakeholders such as suppliers, employees and logistic company. Except for the resolve of the problem, author's priority is to implement TQM philosophy in the whole operation of the company X. To be more precise, we endorse the employees in the management process and will try to upgrade their knowledge about quality aspects. The main target is to design quality product and services at first. Our endeavor will be based upon the use of quality tools and techniques.

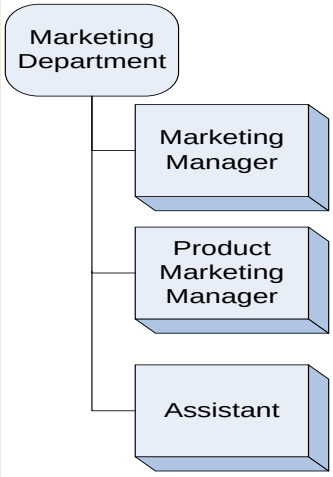
Case Study

Company X is a medium class company that imports air conditioning units from china. It is located in Ilion, Athens, and occupies 12 employees. The company X has been activated in complete air conditioning solution to companies, offices and industries since 1998. Until today company has computerized more than 1000 collaborations with stores in Greece market which purchase products. Its priority is to delivery high quality products in low prices. The Company x take on oneself the promotion and installation of products and afford technical after sale support for ad hoc information and medium level damages. In case

of appear harmful damages or advance problems the company Y is in charge of providing specific service support through the technical department which is located in Athens.

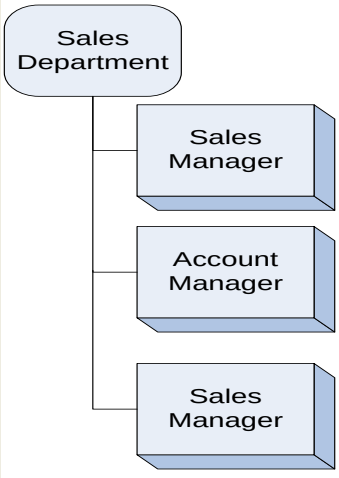
The company X is divided in four main departments which is the marketing department, the sale department, the import departments and the technical department. Initially, the marketing department is in charge of managing the sponsors, developing unique advertising and making the company widely acknowledgeable in Greek market. The diagram illustrates the operation of the marketing department and the members who participate in its operation. The marketing manager is responsible to communicate and come to terms with sponsors, send feedback to company administrator, allocate responsibilities to the other department members and monitor their progress. Moreover, product manager undertake specific agreements and product campaigns and is responsible to inform the marketing manager about the projects progress. Finally, assistant is an employee who offers office support services.

Figure 5



The sales department focuses on customer sales and company X orders. In the same time this organization section pays attention to customer satisfaction processes. It is consisted of three members who are the sale manager, the account manager and the sales engineer. To be more precise, sales manager is responsible to communicate with customers, offer qualified leads and send feedback to supervisor. Likewise, he must be informed about the whole department process. Account manager center of attention to identify and determine the levels of customer happiness. What is more, he has to secure quality standards and the enterprises progress

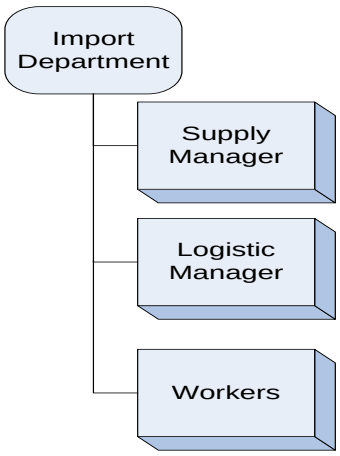
Figure 6



through the recorded of specific barriers. Sales engineer is a technical expert who provides important information about the products specification and is in charge to train the technical department and the customer technical department about the new product specifications.

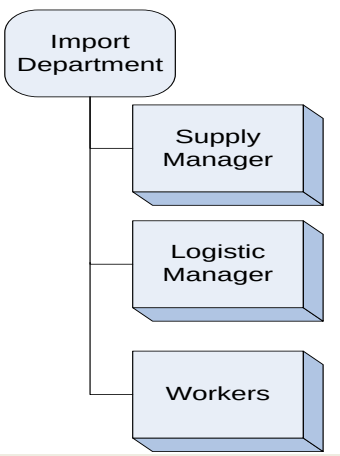
The import department is the most crucial sector for the company's operation. These people are responsible for the order to be in time in the company's storage according to quality standards and products specifications. Supply manager intercommunicate with ports to manage the shipment and secure the orders assurance. Furthermore, this person tries to avoid potential delays which can be appeared in China's and Greece's custom houses. The effective interaction between sales and import department is essential to avoid false interpretation which can produce pitfalls in whole organization process. The logistic manager based in Company's X storage and is accountable to define the well operation of the logistic process. In other words, this person administers the orders; calculate the products reserves and feedback precious information in supply manager. The workers have assistant position which means to place products and documentation the distribution.

Figure 7



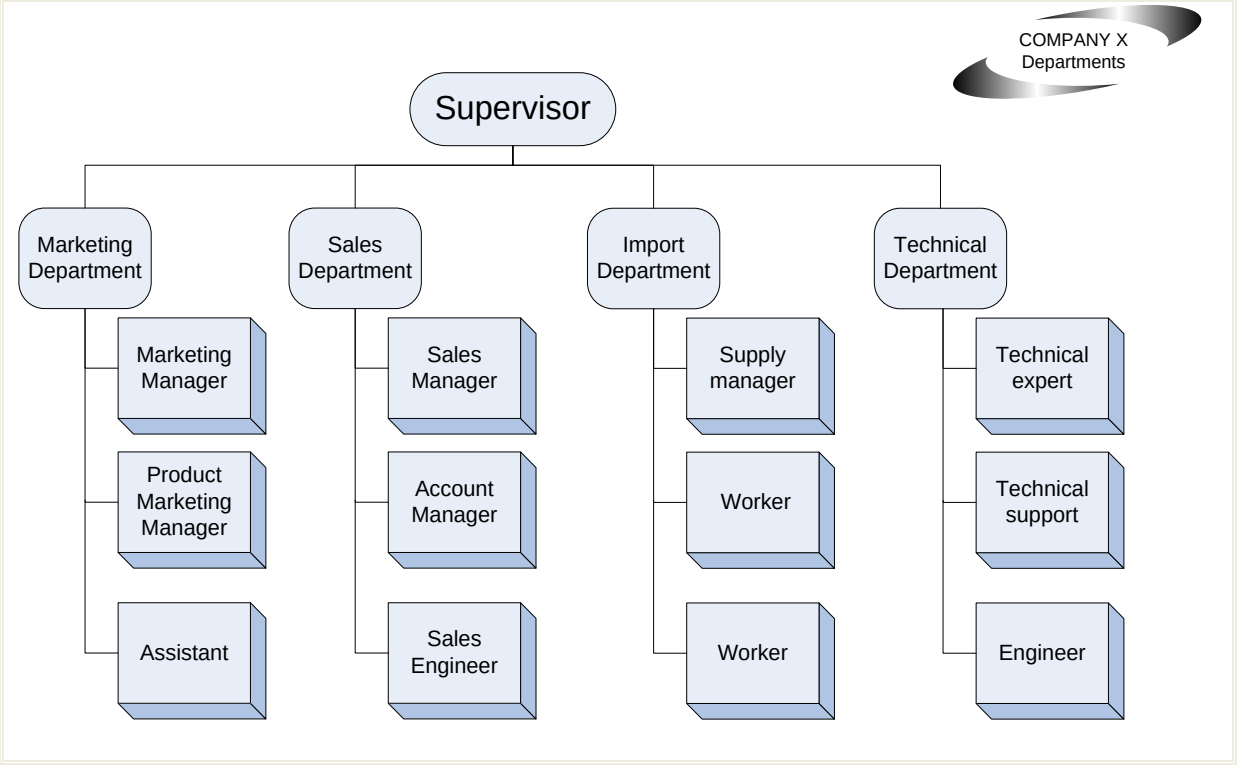
Finally, technical matter is under the jurisdiction of technical department. All the members of this sector participate to the installation processes in customer places and provide useful after sale support. Analytically, technical expert is the supervisor of the team members. He is responsible to secure the quality of the final deliverable and offer technical guidelines about its operation. In the same way engineers are mastery and well educated persons who can guarantee the zero

Figure 8



defects philosophy in the final outcome. In addition, there is a technical office support which resolves potential questions or report to technical experts for further in company's place support. It is worthy of note that all the above departments are under the control of credit department which control financial issues and import specific economical reports and statements to the company's supervisor. The next picture illustrates the whole organization structure.

Figure 9: The framework of company X



The main subject of thesis case study is to examine a common order which includes the order to Company Y and Greek companies, the equipment delivery steps, the installation process and finally the after sale support. The author's priority is to identify potential neglects which will be resolved under the installation of quality processes.

When a new project arises the sales department focuses on the customer expectation and prepares a proposal according to their needs. In this process participate the sales manager who present the customer point of view, the technical manager who propose specific

solution and schedule a brief time line for the installation phase and finally the supply manager who undertake the mission to check in the storage for stock equipment or to start a new order. In all this process the credit department calculates the cost and offer crucial information to the supervisor who is in charge to develop the project plan. When the sales department and customer come in agreement the next step is to design the project plan and start the order phase. During this process, some part of the equipment which imported from Greece is directly available; as a result to start their placement without remains the Company's Y products. When the order arrives the supply manager is responsible to prepare all documents that custom house needs and receive the air cooling equipment. The technical department finishing the project and implement some kind of test in order to ensure the well operation of the whole construction.

There are many cases where delays affect the project's operation and have an impact to company X name in the market. More specifically, after the examination phase and the determination of project plan the sales manager sent the order to the Company Y manager. However, the company Y late seven days to sent the equipment without to inform earlier the company X about the delays to reschedule the project plan and secure the project processes. The main reason for this delay is the company Y tight schedule in the production line. As a consequence, the equipment delays affect the installation process and bring additional delays because the technical department is unable to continue the process without the Chinese equipment. Likewise, the Greek supplier brings equipment with wrong specification which adds five more days in the project schedule. This happens because some of the parts of this equipment have incompatibility with the Chinese air cooling system. Except for the additional time, the company X forced to pay extra in view of procuring the new devices immediately.

It is obvious that rough calculations and ineffective communication channels with the project stakeholders lead the whole project to failure. To be more precise, the quality standards and continues improvement processes must be adopted in company X in view of securing the project life cycle, promote the company's name and satisfy the customer.

CHAPTER 5

Results of Study

As it is commonly accepted, projects are defined as unique works, with specific time, cost and specifications. In view of achieving a well defined project we must analyze at first the most suitable project management tools. This way can help us to understand the construction of project management and recognize the ways which lead the project out of scope statement.

WBS

Initially, the first tool is the WBS (Work Breakdown Structure). The WBS is a deliverable – oriented hierarchical decomposition of the work to be executed by the project team, to accomplish the project objectives and create the required deliverable[17] (PMBOOK p.112). In other words, work breakdown structure is a hierarchical tree which can help the project manager to "break down" the project into manageable tasks and activities. After that, it is easier to allocate roles and responsibilities, calculate the cost and manage the time with the most valuable way. Furthermore, we can use the WBS to make clear the project scope to stakeholders and monitor closely the control points and milestones.

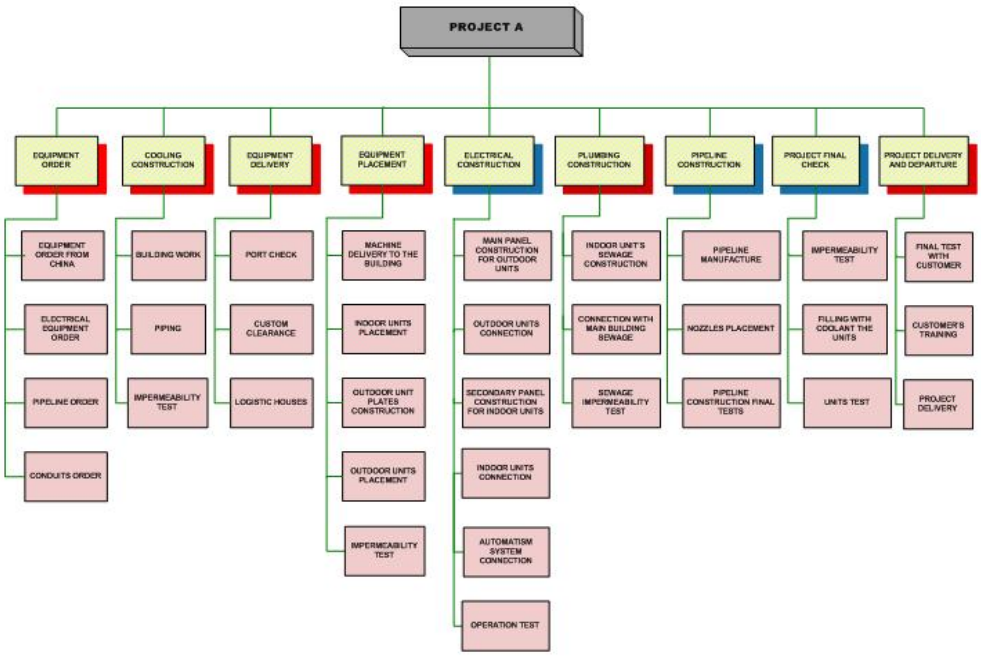
It is worthy of note that this method can be applied in every project independent of the matter, time and cost. It is not necessary to be a technical expert in order to design an accurate WBS. The only needful information is the big picture[18]. The outcome of the Work Breakdown Structure can be used as input in the following tools such as Gantt chart and

[17]Project Management Institute. (2004), *A guide to the project management body of knowledge* (PMBOK® Guide) (3rd ed.). Newtown Square, PA: Author.

[18]Kerzner, H. (2005). Project Management – A systems approach to planning, scheduling, and control (8th Ed.). Hoboken, NJ: John Wiley and Sons.

network diagram. The next figure illustrates the work Breakdown Structure of our case study.

Figure 10: Case study's WBS

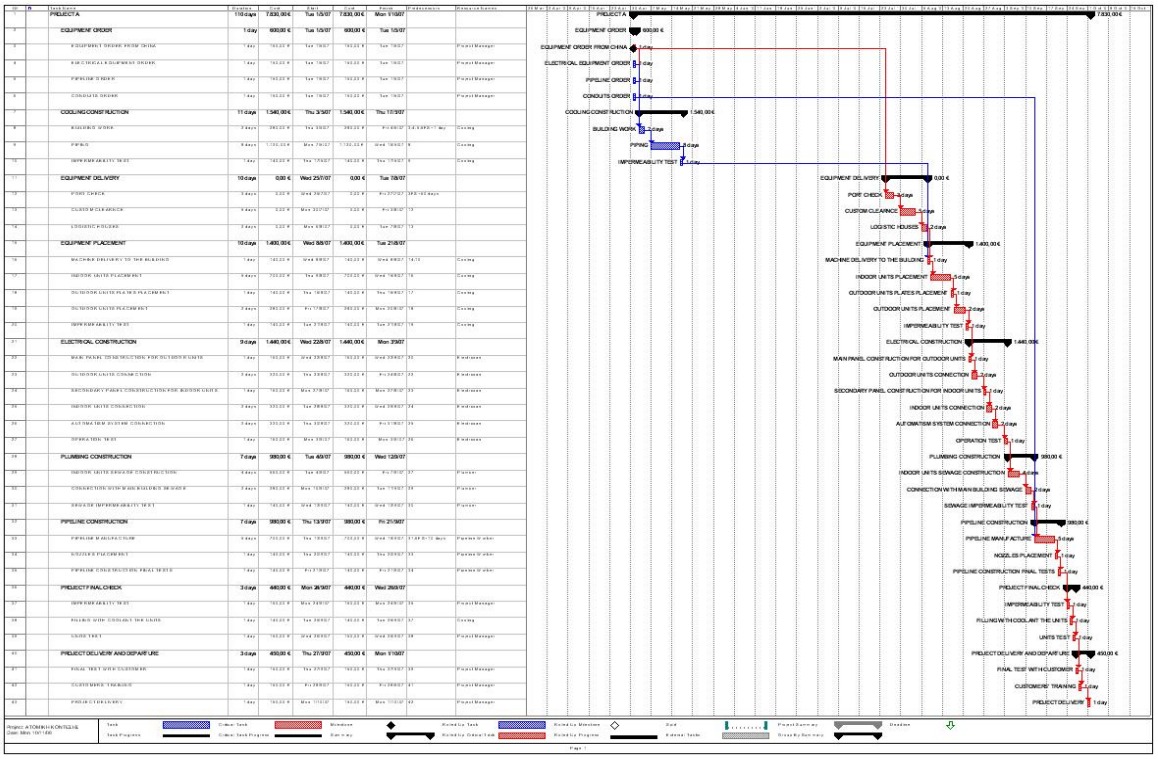


Gantt chart

The Gantt chart is a graphical illustration of the duration of tasks and activities against the progression of time. Actually, it is a schedule tool but it is also an effective way to monitor the project's success. As we state in the WBS explanation, the outcome of WBS are the critical inputs of Gantt chart structure. The main advantage of Gantt chart is its capacity to present the status of each activity. In other words, the project manager has the opportunity to identify how the progress or the delay of each activity can affect the progress of other. This issue is extremely critical because a minor change in the duration or the cost of one activity can affect whole project's progression.

To be more precise, using the Gantt chart in project management we can portrait the project's duration, as well the critical path which can be very useful informationwhen we obligated to re plan the project in view of solving possible troubles. What is more, through the Gantt chart process we can well define the cost of project tasks and activities and illustrates the relationship between them. Finally, Gantt chart tool is an effective way for the project manager to monitor the whole project function, identify problematic circumstances and avoid misunderstood conditions. The next figure represents the Gantt chart of our case study.

Figure 11: Case study's Gantt chart

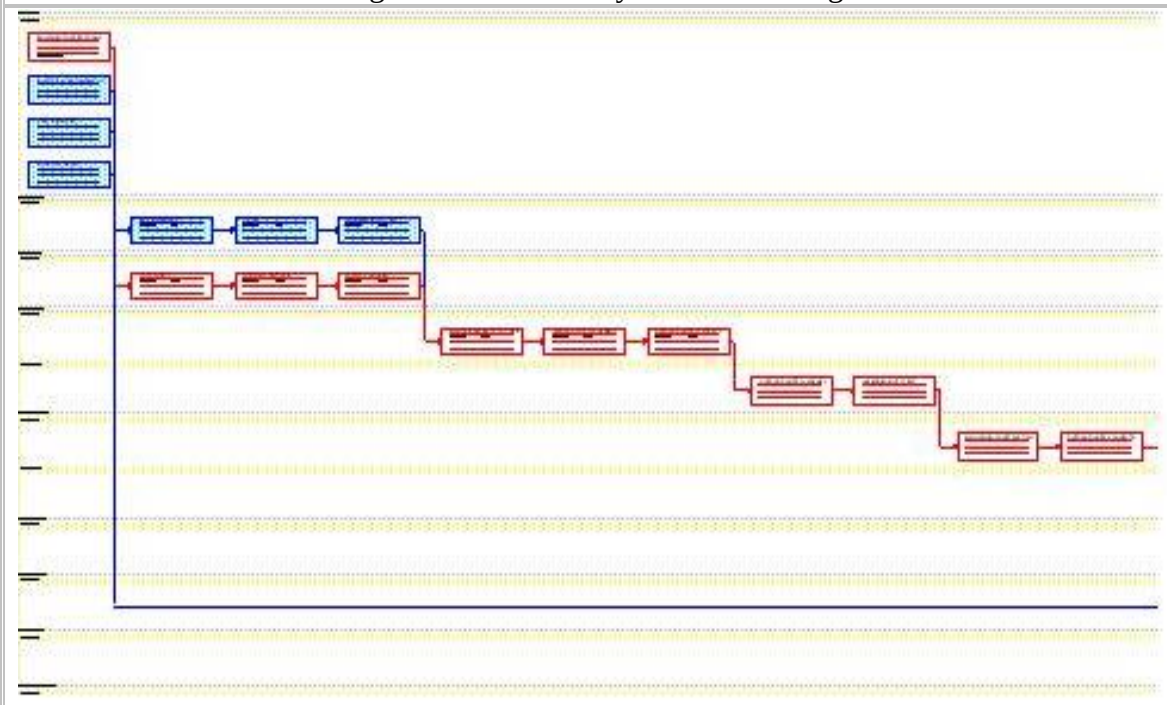


Network Diagram

The next step in a project schedule process is to develop the network diagram. Network diagram is the logical representation of activities that defines the sequence or the work of a project. It shows the path of a project, lists starting and completion dates, and

names the responsibilities for each task. At a glance it explains how the work of the project goes together[19]. The fundamental usefulness of this method is the creation of critical path. To be more precise, any delays of the activities which are included in the critical path have an effect on the initial schedule of our project. The next figure illustrates the network diagram of our case study.

Figure 12: Case study's Network Diagram



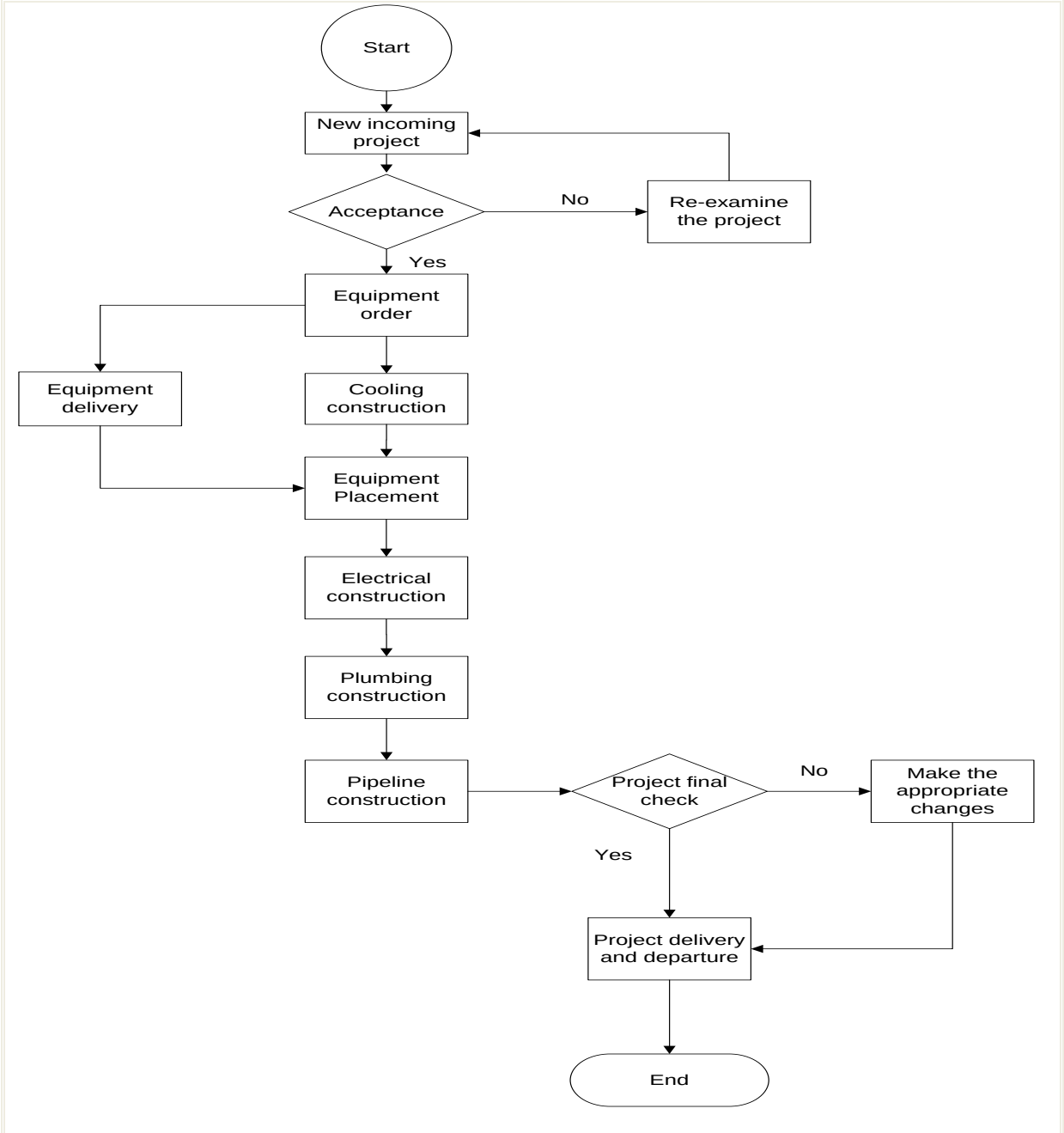
All the activities with the red color belong to the critical path. For instance, the seven days delay in machines transportation from china to Greece is an effect of Company's Y delay to produce the machines. As a consequence, the customer clearance set back which has an impact in whole project duration at seven days. Additionally, we have also delays in the delivery of operational panel to the external units and the operational sub-panel to the internal units.

[19] *Project Management Institute. (2004), A guide to the project management body of knowledge (PMBOK® Guide) (3rd ed.). Newtown Square, PA: Author*

Implementation of quality tools

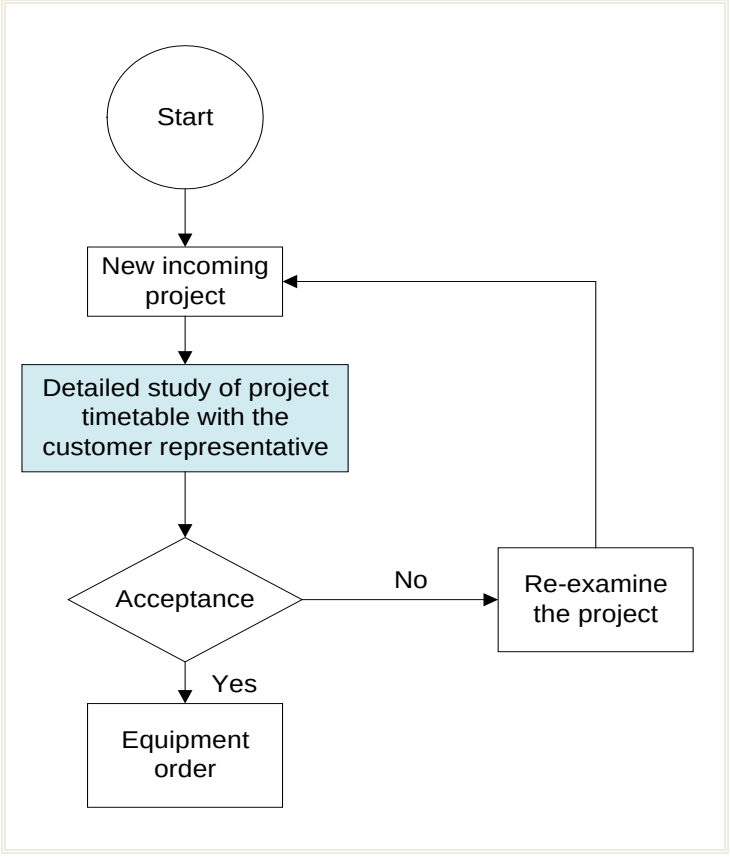
After the presentation of the project schedule and the examination of the delays problems it is the right time to use some quality tools in view of updating our collaboration with the customer and adopt continues improvement philosophy in whole organization process. The following flow chart depicts the present strategy that company X follow to order the equipment from China and Greece enterprises.

Figure 13: The present process for the order equipment



It is obvious that there is no any providence about the managing of delays. More specifically, the customer has no idea about the margin of times when he called to accept the offer. This means that the quality of communication between the companies is very low. What is more, the lack of accurate forms increase misunderstood circumstances between the company's X and Y departments. As a result, our company has no plan or managing ways to control potential delays that will be appeared. On the other hand, company Y has no idea about the impacts of company's X operation when any delays appear.

Figure 14: Inform the customer about the timetable

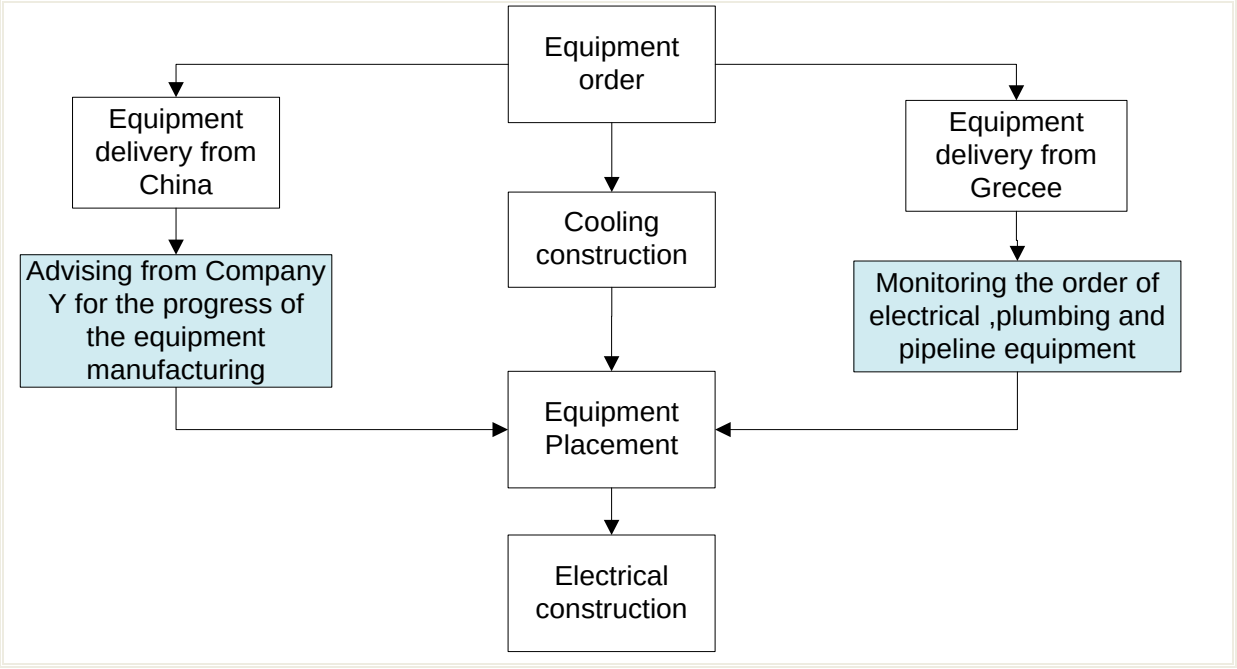


This figure is a part of a new flow chart which inserts one more task in order to resolve the above problem. The customer representative except for the offer must inform the company's Y manager about the timelines of the project. It is possible to secure this matter by applying one more option in the contract about the delays. This option will explain with details the time that Company Y need to send the order and it is possible to apply risk management methods in view of handling potential problems which can affect the whole project progression.

In addition, one more evidence which prove the lack of quality communication among the companies' departments is the incompleteness of report about the progress of the order (company Y) or the cooling construction Company X. Likewise, the same communication

problem appears with the Greek companies too, which are in charge of supplying the electrical, plumbing and pipeline equipment. It is tremendously useful for company X project manager to be informed about the arrival time of the orders in view of rescheduling the initial plan and reduce the impact of the delays. The next part of the following flow chart illustrates exactly what author's mean.

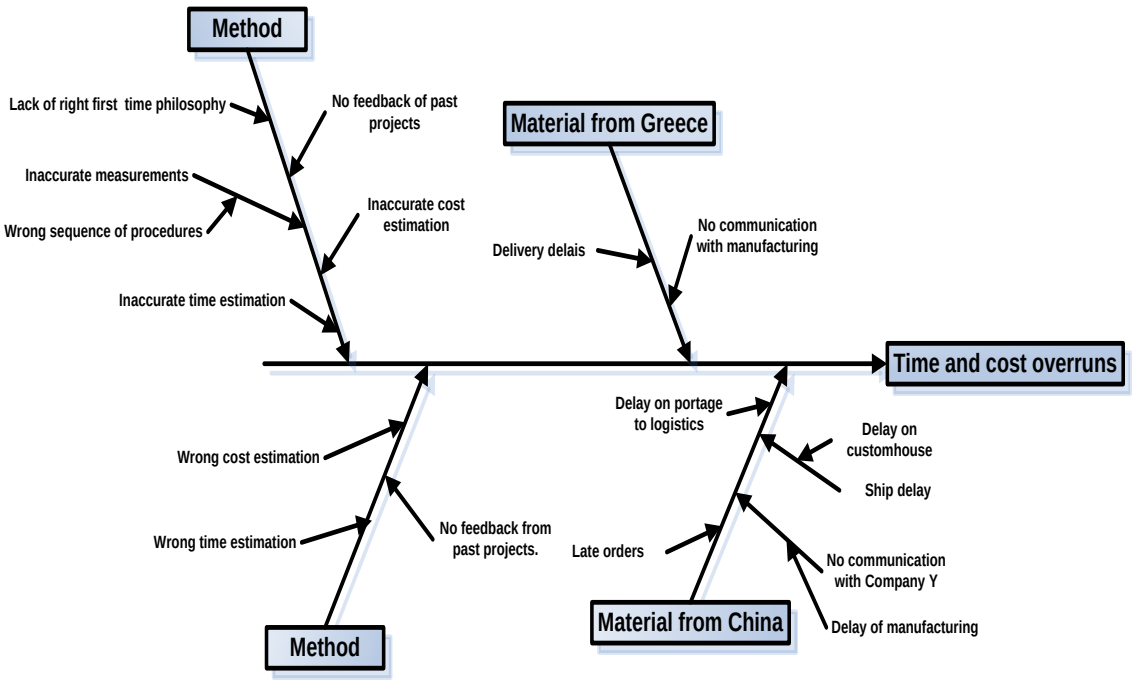
Figure 15: Add feedback processes among the supply companies and company X



The next step of author's study is to address all the problematic causes which influence the collaboration between the companies and establish communication barriers among them. The cause and effect analysis is a valuable tool which can help us to address all these factors. There are two ways to apply this tool, the fishbone diagram and the tree diagram. The first one is based upon the brainstorming process where the members who participate in a project called to define several categories of causes. On the other hand, tree diagram develop a chain of causes according to the answers of specific questions such as why is this happening?, what is causing this? and so on. A different option of this model is the five whys method.

We choose the first way which is portrayed in the next page. We slit the diagram in two parts where the first refers to organization which are located in Greece and the second on to the organization which is located in China. The crucial outcome of this process is the recognition of the factors which are responsible for the time and costs overruns.

Figure 16: Fishbone diagram



As we can see, there are many troubles with the collaboration of two companies. More specifically, the cooperation with Greek companies suffer from lack of communication about the delivery time, the specification of the equipment, short measure feedback among department and wrong sequence of procedures. As a result, the incorrect time and budget estimation mislead the project. Correspondingly, the major reasons for the unproductive communication with the Chinese company are the unmanaged delays, the lack of ongoing relationships and the wrong estimation of time and cost. It is obvious the necessity of applying quality standards which can minimize the problems and improve the communication channels among the organizations.

The next important issue is to find a profitable way to secure the well operation of installation phase. Initially, we have to pay extremely attention to increase the knowledge and education of our technical members. This means that training programs and executive seminars must be adopted in view of develop technical specialist who can manage complicated projects without incorrect estimation and inaccurate installations. What is more, department managers have to empower the employees to take on greater responsibilities and contribute in decision making processes in order to upgrade their collaboration behavior.

What is more, ISO 9001:2000 is an effective quality management system which can secure the design, develop and installation process. ISO 9001:2000 is based on a systematic, process approach and strives to control and improve organizational results[20]. To explain what author means, ISO 9001:2000 denote specific guideline for the quality management system which accomplish customer necessities and enhances customer satisfaction. Moreover, ISO processes can increase the productivity of after sale support procedures in view of increasing the levels of customer satisfaction. In the same way, ISO installation can reinforce company X name and bring at the edge of Greek market.

Finally, the last step is to develop accurate report forms in order to demand on the company Y and Greek suppliers to send feedback about the progress of our orders. According this way, project supervisor will have the capability to take countermeasure in light of reducing the impacts and reschedule the project in proportion to new conditions. In addition, the preparation of contract must to enclose specific parts which will protect the company X to add additional costs by the delays of company Y.

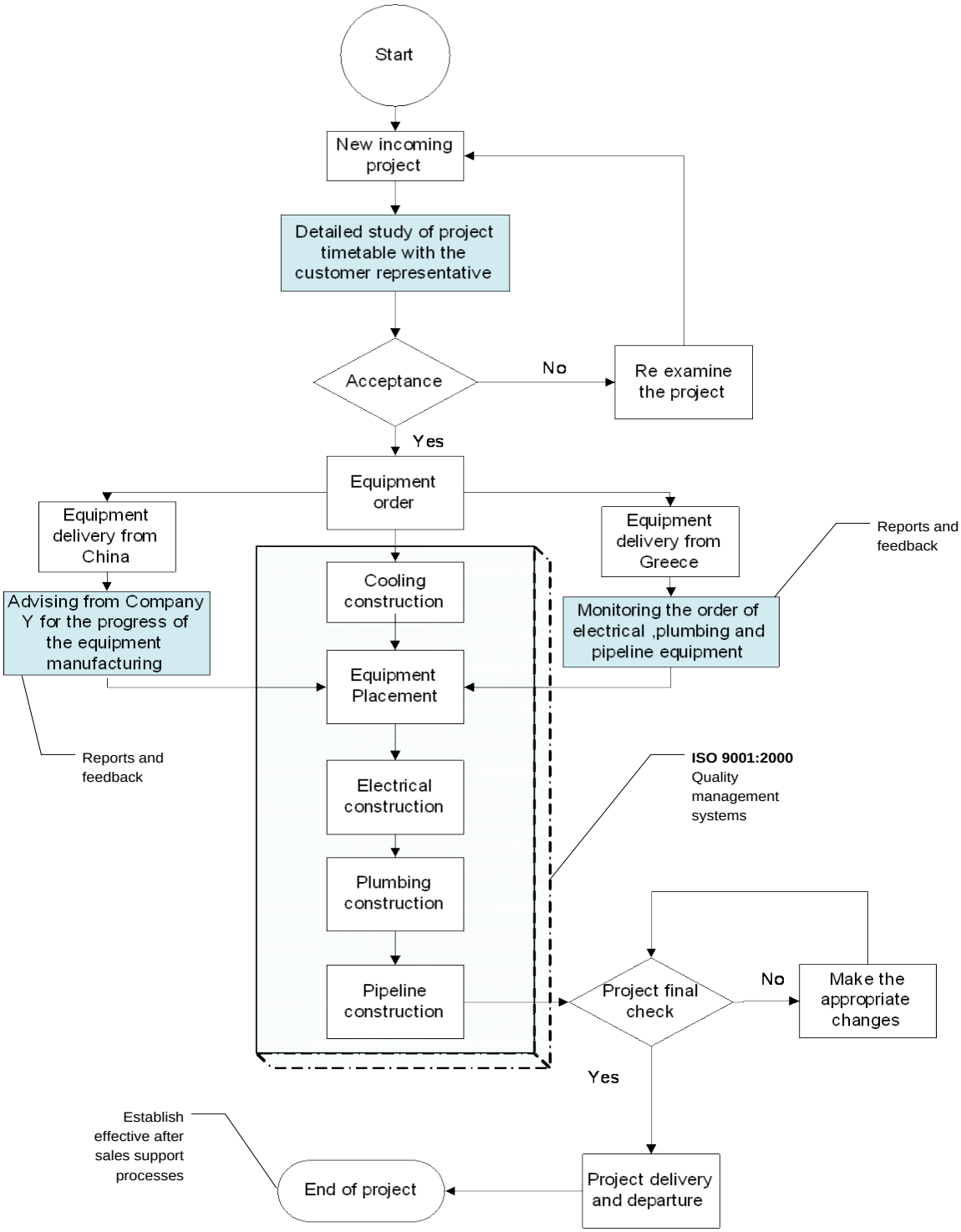
The next page illustrates the prior flow chart with the additional quality aspects. It is worthy of note that the quality issues refers not only to the order process but also to the whole

---

[20] *Wikipedia, the free encyclopedia*

company's function. It is essential for the company to manage the quality as a systemic issue which can update the traditional structures and apply quality management philosophy.

Figure 17: Case study solution



CHAPTER 6

Discussion, Conclusions and Recommendations

Some people support the opinion that TQM is a way of managing for the future. To be more precise, TQM is not just a simple way to assuring product and services quality. It is a fundamental way to manage people and processes according to customer needs, wants and expectations. The importance of TQM is in the statement "doing the right things right, first time"[21].

In addition, any enterprise is a dynamic environment which develop interactions and interrelationships among the different departments (internal and external) and stakeholders (internal and external). The only way to comprehend this behavior and figure out how this huge process works is to concentrate on the system thinking theory. It is hopeless to believe that the adoption of quality system in production process can add quality value to whole company operation. On the contrary, we may achieve to increase for a time our productivity in the system but the same system will work to set barriers in view of stopping the progress and bring the balances according to the other parts of the system. Correspondingly, the enforcement of quality methods which upgrades the communication processes is foredoomed to fail because of the behavior of whole organization system.

It is obvious that the systemic approach of organization process is necessary in view of highlighting the different parts of the system, underlining their connections, identifying the barriers and pitfalls and finally applying continues improvement and learning processes in the whole system function. It is important to understand that one's department outputs are the input of some other departments and so on. Likewise, one little mistake in one part of the system operation can develop insurmountable obstacles to the other and lead the whole

[21] Barkley, B. T., & Saylor, J. H. (2001). *Customer-driven project management: Building quality into project processes* (2nd ed.). New York: McGraw Hill.

process to failure. The quality management system must be adopted separately at every aspect of the organization but in accordance with the system operation in view of updating the system at all.

Effective decision-making is an elementary process in business management environment. In other words, one more vital factor which can affect the organization quality system is the way which follows in the decision making and problem solving procedure. It is commonly accepted that an enormous percentage of business success based upon success decision and problem solving procedures. According to chaos and system thinking theory decision making is complex, active and non linear process which demands specific attention for the companies. Precisely, decision process has to map the problem or a decision as a part of the system and take into account all the external factors which can influence the final result. What is more, complex conditions and problematic consequence among the sub systems must be addressed in light of avoiding domino effects and harmful circumstances.

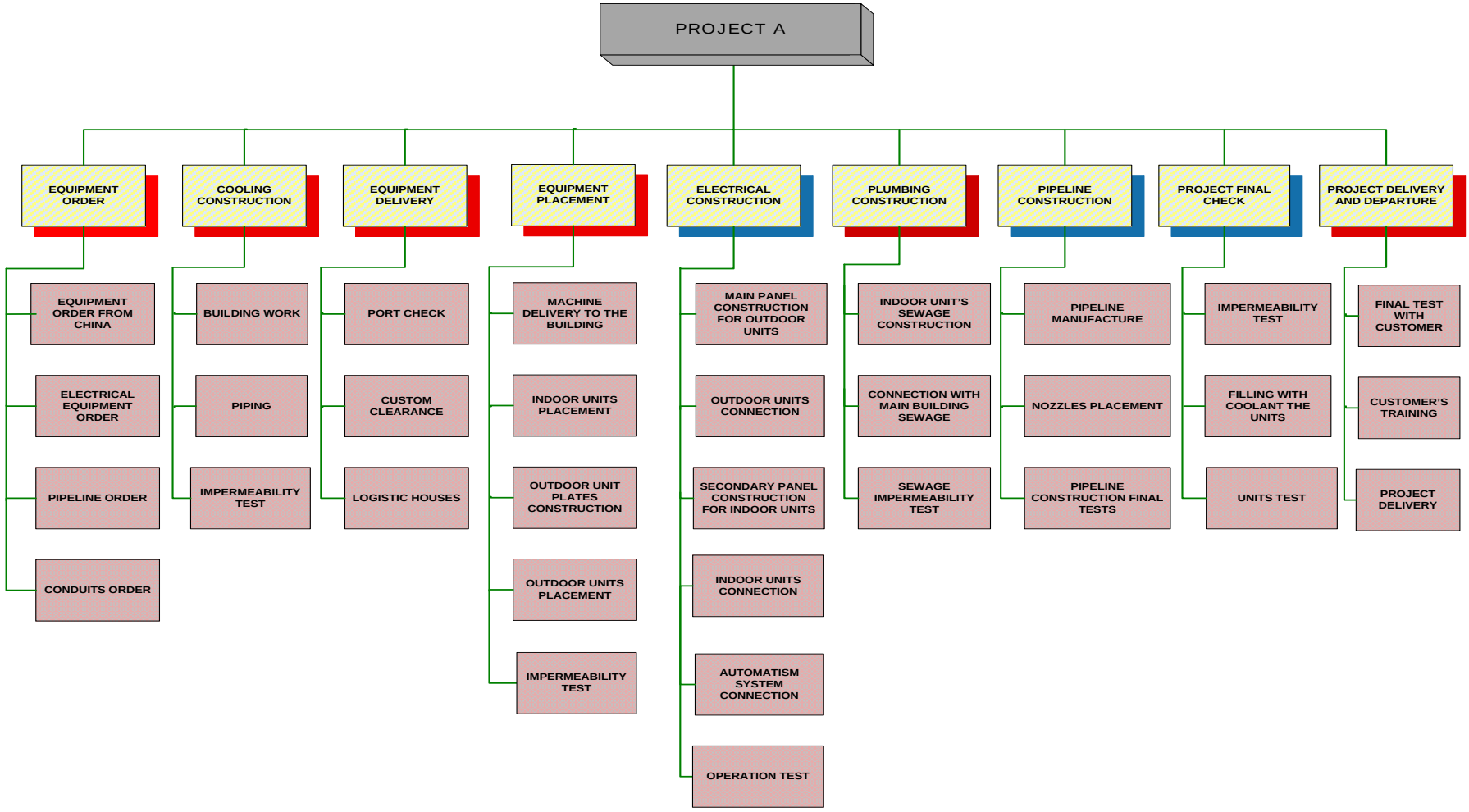
The organization must focus their concentration to customer voice. This subject demands the development of new products or to optimize the processes in view of developing innovation ideas and services. QFD (Quality Function Deployment) model is one of the most profitable ways to secure or upgrade the quality on products and services. . The main priority of QFD model is to identify and clarify the spoken and unspoken customer needs, enclose the customer to project process in view of elucidate his specifications and finally, monitor the competitor in order to recognize potential strength and weaknesses which can help the company to achieve a competitive advantage.

To sum up, all the above analysis describes potential methods and ways to increase the quality in organization systemic approach. By inference, the main issue is to understand that quality is not an effortless process which can be applied by traditional ways. On the contrary, quality management must be adopted in whole organization occupations though the

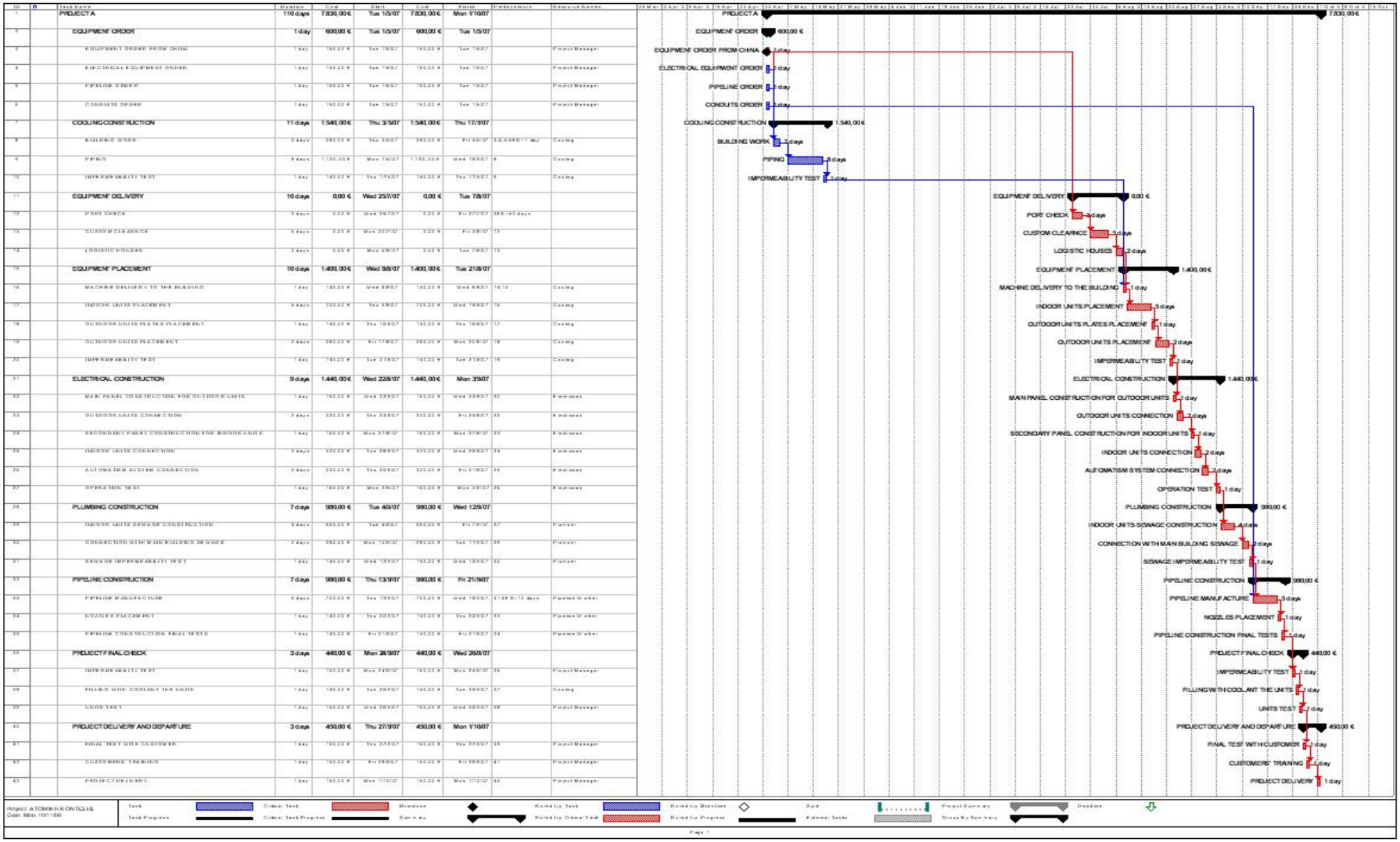
continuous improvement and learning process. The key to success is to follow quality principles and create feedback process in order to measure the progress and control potential wrong consequences.

APPENDICES

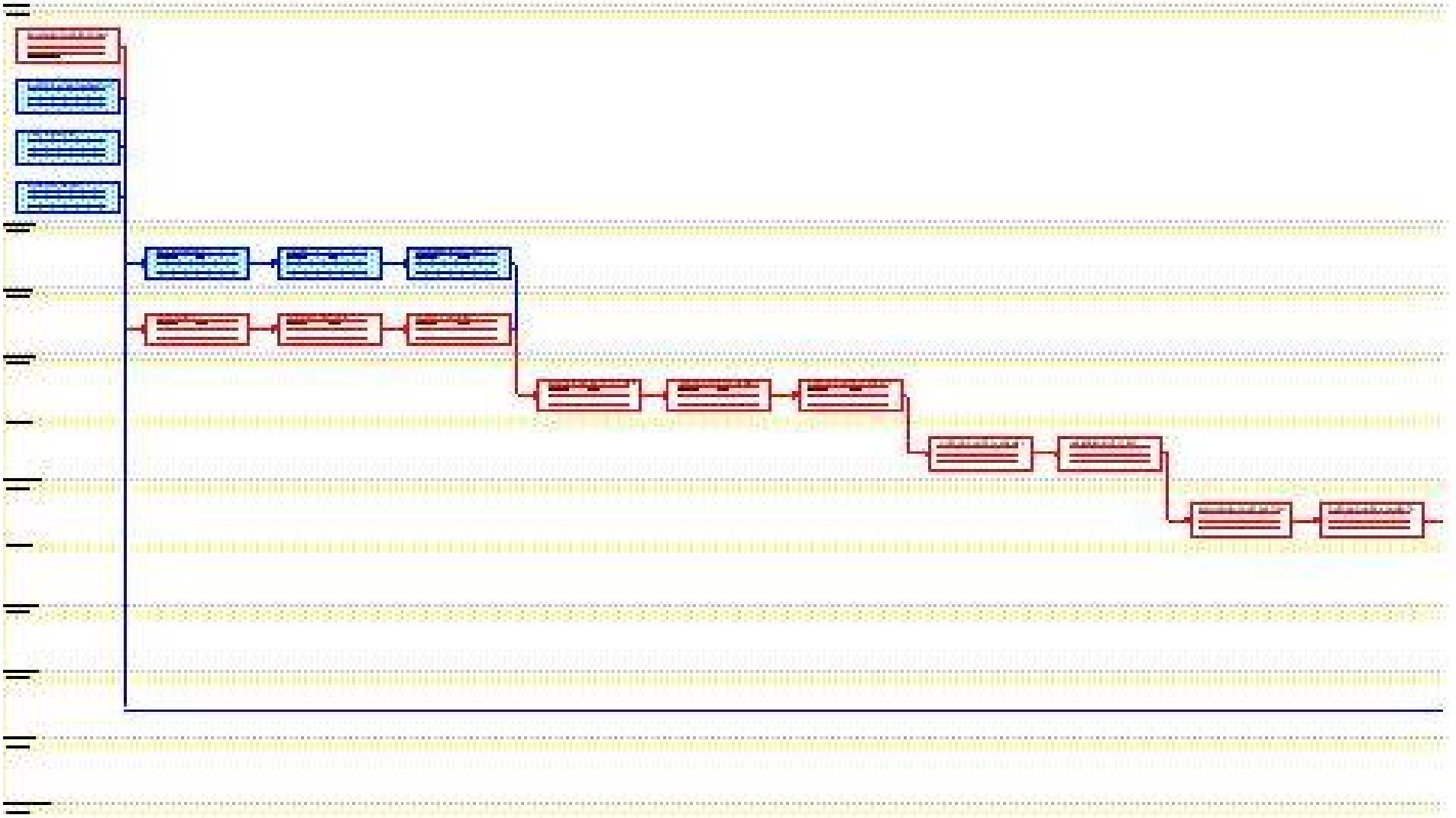
WBS



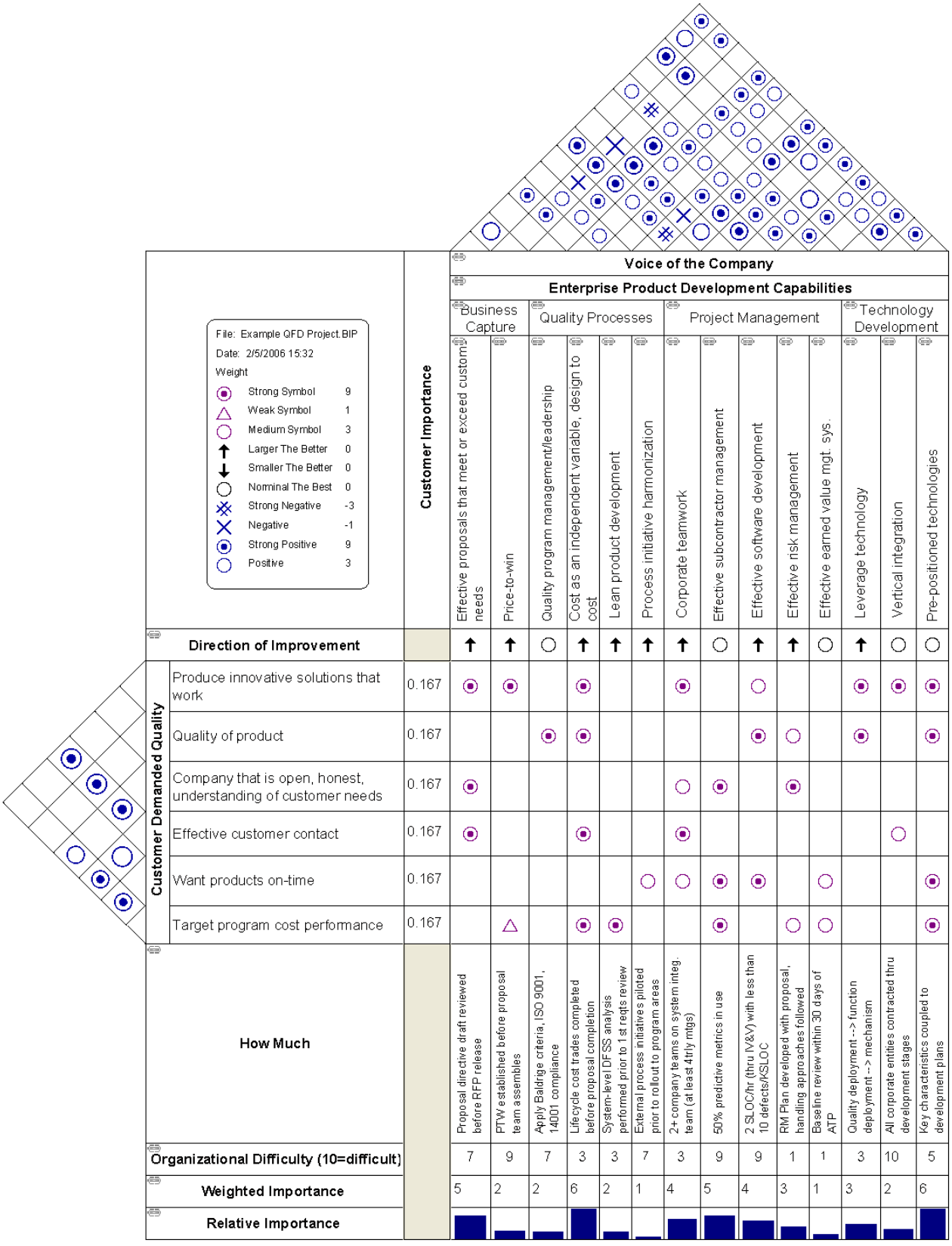
Gantt chart


PROJECT A
EQUIPMENT ORDER
EQUIPMENT ORDER FROM CHINA
ELECTRICAL EQUIPMENT ORDER
PIPELINE ORDER
CONDUITS ORDER
COOLING CONSTRUCTION
BUILDING WORK
PIPING
IMPERMEABILITY TEST
EQUIPMENT DELIVERY
PORT CHECK
CUSTOM CLEARNCE
LOGISTIC HOUSES
EQUIPMENT PLACEMENT
MACHINE DELIVERY TO THE BUILDING
INDOOR UNITS PLACEMENT
OUTDOOR UNITS PLATES PLACEMEAT
OUTDOOR UNITS PLACEMENT
IMPERMEABILITY TEST
ELECTRICAL CONSTRUCTION
MAIN PANEL CONSTRUCTION FOR OUTDOOR UNITS
OUTDOOR UNITS CONNECTION
SECONDARY PANEL CONSTRUCTION FOR INDOOR UNITS
INDOOR UNITS CONNECTION
ALFOMATISM SYSTEM CONNECTION
OPERATION TEST
PLUMBING CONSTRUCTION
INDOOR UNITS SEWAGE CONSTRUCTION
CONNECTION WITH MAIN BUILDING SEWAGE
SEWAGE IMPERMEABILITY TEST
PIPELINE CONSTRUCTION
PIPELINE MANUFACTURE
NOZZLES PLACEMENT
PIPELINE CONSTRUCTION FINAL TESTS
PROJECT FINAL CHECK
IMPERMEABILITY TEST
FILLING WITH COOLANT THE UNITS
UNITS TEST
PROJECT DELIVERY AND DEPARTURE
FINAL TEST WITH CUSTOMER
CUSTOMERS' TRAINING
PROJECT DELIVERY

Network diagram



Quality Function Deployment



File: Example QFD Project.BIP
Date: 2/5/2006 15:32
Weight

Strong Symbol	9
Weak Symbol	1
Medium Symbol	3
Larger The Better	0
Smaller The Better	0
Nominal The Best	0
Strong Negative	-3
Negative	-1
Strong Positive	9
Positive	3

		Customer Importance	Effective proposals that meet or exceed customer needs	Price-to-win	Quality program management/leadership	Cost as an independent variable, design to cost	Lean product development	Process initiative harmonization	Corporate teamwork	Effective subcontractor management	Effective software development	Effective risk management	Effective earned value mgt. sys.	Leverage technology	Vertical integration	Pre-positioned technologies
			Voice of the Company													
			Enterprise Product Development Capabilities													
			Business Capture		Quality Processes				Project Management					Technology Development		
	Direction of Improvement		↑	↑	○	↑	↑	↑	↑	○	↑	↑	○	↑	○	○
Customer Demanded Quality	Produce innovative solutions that work	0.167	◉	◉		◉			◉		○			◉	◉	◉
	Quality of product	0.167			◉	◉					◉	○		◉		◉
	Company that is open, honest, understanding of customer needs	0.167	◉						○	◉		◉				
	Effective customer contact	0.167	◉			◉			◉						○	
	Want products on-time	0.167						○	○	◉	◉		○			◉
	Target program cost performance	0.167		△		◉	◉			◉		○	○			◉
	How Much		Proposal directive draft reviewed before RFP release	PTW established before proposal team assembles	Apply Baldrige criteria, ISO 9001, 14001 compliance	Lifecycle cost trades completed before proposal completion	System-level DFSS analysis performed prior to 1 st reqts review	External process initiatives piloted prior to rollout to program areas	2+ company teams on system integ. team (at least 4/rly mtgs)	50% predictive metrics in use	2 SLOC/hr (thru IV&V) with less than 10 defects/KSLOC	RM Plan developed with proposal, handling approaches followed	Baseline review within 30 days of ATP	Quality deployment --> function deployment --> mechanism	All corporate entities contracted thru development stages	Key characteristics coupled to development plans
	Organizational Difficulty (10=difficult)		7	9	7	3	3	7	3	9	9	1	1	3	10	5
	Weighted Importance		5	2	2	6	2	1	4	5	4	3	1	3	2	6
	Relative Importance															

BIBLIOGRAPHY

Barkley, B. T., & Saylor, J. H. (2001). *Customer-driven project management: Building quality into project processes* (2nd ed.). New York: McGraw Hill.

Bennington, L., & Cummane, J. (1998). Measuring Service Quality: *Total Quality Management*, 9 (6), 395–405. Retrieved Wednesday June 11, 2008 from www.acg.edu

Bossink, B. A. G. (2002). The strategic fuction of quality in the management of innovation, 13 (2), 195–205. Retrieved Thursday June 12, 2008 from www.acg.edu

Caro, L. M., & Garcia, J. A. M. (2007). Measuring perceived service quality in urgent transport service. *Journal of Retailing and Customer Services*, 14(1), 60–72. Retrieved Saturday May 5, 2007 from www.sciencedirect.com

CH2MHILL. Project Delivery System (P.D.S.) (4th Ed.). Denver, CO: Author

Dale B. G., Y-Wu, P., Zairi, M., Williams, A. R. T., & Van Der Wile, T. (2001). Total Quality Management and Theory: *An exploratory study of constribution*, 12 (4), 439–449. Retrieved Wednesday June 11, 2008 from www.acg.edu

Dale, B. G. (2002). *Managing quality* (3rd ed.). Oxford: Blackwell publishers Ltd.

David, F. R. (2001). Strategic Management: *Concepts & cases* (8th Ed.). New Jersey: Prentice Hall.

Douglas, C. M. (1996). Introduction to Statistical Quality Control (3rd Ed.). U.S.: John Wiley and Sons.

Gronroos, C. (2000). Service Management and Marketing. *A Customer Relationship Management Approach* (2nd Ed.). England: John Wiley and Sons.

Gustafsson, A. (1997). Total Quality Management, 8 (2/3), 173–178. Retrieved Thursday June 12, 2008 from www.acg.edu

Jack B. R. (2002). TQM tools and techniques. Retrieved Thursday June 12, 2008 from www.qualityamerica.com

James P. Lewis, (2001). *Project management, A system approach to planning schedule and controlling*, (3nd ed.). New York: McGraw Hill

James R. Evans and William M. Lindsay, (2002), *The management and the control of quality*, (5nd ed.), South-Western: Thomson Learning

Kerzner, H. (2005). Project Management – A systems approach to planning, scheduling, and control (8th Ed.). Hoboken, NJ: John Wiley and Sons.

Kerzner, H. (2005). Using the project management maturity model. *Strategic planning for project management* (2nd Ed.). Hoboken, NJ: John Wiley and Sons.

McAdam, R., Leonard, D., Henderson, J., & Hazlett, S. (2008). A grounded theory research approach to building and testing TQM theory in operations management, 36, 825–837. Retrieved Thursday May 22, 2008 from www.sciencedirect.com

McMahon P., & Lane J. D. (2002). Quality tools produce results, 81 (1), 63–1. Retrieved Thursday June 12, 2008 from www.acg.edu

Nilson, L., Johnson, D. M., & Gustafsson, A. (2001). The impact of quality practices on customer satisfaction and business results: product versus service

organizations, 6, 5–27. Retrieved Wednesday May 14, 2008 from www.sciencedirect.com

Oakland, J. S. (1999). *Total quality management: The route to improving performance* (2nd ed.). Oxford: Butterworth – Heinemann.

Pitt, L. F., Watson R. T., & Kavan, C. B. (1995). Service Quality: *A measure of Information Systems Effectiveness,* 19 (6), 173–187. Retrieved Wednesday June 11, 2008 from www.acg.edu

Project Management Institute. (2004), *A guide to the project management body of knowledge* (PMBOK® Guide) (3rd ed.). Newtown Square, PA: Author.

Rose, J., Pedersen, K., Hosbond, J. H., & Kraemmergaard, P. (2007). Management competences, not tools and techniques: A grounded examination of software project management at WM-data. *Information and software Technology*, 49(6), 605-624. Retrieved Saturday May 5, 2007 from www.sciencedirect.com

Slack, N., Chambers, S., & Johnston, R. (2001). *Operations management* (3rd ed.). Harlow, England: Financial Times Prentice Hall.

Stutely, R. (2002). The definitive business plan (2nd Ed.). Great Britain: Prentice Hall.

Taguchi, G. (1992). Introduction to Quality Engineering: *Designing Quality into Products and Processes* (9th Ed.). Hong Kong: Nordica International Limited.

Thompson, J. L. (2001). Strategic Management (4th Ed.). London, UK: Thomson Learning.

Tina K. Walsh ,*Just-in-time (JIT) philosophy improves quality in user documentation*, Retrieved February, 2003, from http://www.readpen.ca/article.html

Winn, C. R., & Green, S. R. (1998). Applying Total Qualiy Management to the Educational Process, 14, 24-29. Retrieved Monday June 9, 2008 from www.themanager.org

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1990). Delivering quality service. *Balancing Customer Perceptions and Expectations*. New York: The Free Press.

Other resources

Wikepidia, free encyclopedia from www.wikepidia.com