



Quality Management in Project – A case of ABB S.A

By

SILOU STILIANI

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



June/2011



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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.



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Quality Management In Project – A Case of ABB S.A

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Declaration

I confirm that the dissertation that I submit is my own work and the work and ideas of others are expressly acknowledge and attributed.

Acknowledgments

First of all, I would like to offer my gratitude to my supervisor Professor George J. Besseris, with whom it was a real honor cooperating, and whose insightful comments and expert advice enriched the final product of this paper and his contribution in carrying out this dissertation was more than essential. Special thanks to my colleagues in ABB S.A., Athens, Greece for providing me with valuable information and business intelligence contributing the best to fulfill this dissertation.

In addition, I would like to take the opportunity to thank my family and my closest friends for always being there for me and for supporting me in both good and difficult times.

Biography

I am an employee of ABB S.A. My job title is Electrical Sales Engineer and responsible for the Quality Management System in my department. The relationships I am interfacing with are reporting to my Supervisor and to the General Division Manager, I have internal contact with Service and software development staff, lab supervisors, General Managers of Group and external contact with customers, suppliers, and software development engineer as well as SAP user. My major responsibilities are defined as critical duties and routine duties.

Critical Duties:

1. Assist in UPS installation projects, planning and implementation.
2. Monitor and improve operations procedures related to technical departments.
3. Analyze critical issues and provide guide lines for applicable solutions.
4. Perform purchase orders in SAP ERP system.
5. Responsible for the annual audit of the quality management system.

Routine Duties:

1. Provide advanced helpdesk support level including first point of contact in operation problems and requests by Group Engineers, update and maintain databases, analyze problems and arrive at workable solutions.
2. Monitor and improve operations procedures related to technical departments

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1 INTRODUCTION

1.1 Introduction to the subject

Project Management is winning ground day by day. It is an old profession that is being refreshed and updated continuously as it is considered to be one of the main means towards business excellence. The performance in Project Management is strongly related to the experience of implementing projects, which is known as maturity, for both individuals and organizations. The main reasons for undertaking this thesis project is to identify the appropriate processes for the project, identify the inputs, outputs and the objectives for the project's processes, identify the process owners and establishing their authority and responsibility, design the project's processes to anticipate future processes in the life cycle of the project and define the interrelations and interactions among the processes. Furthermore setting the quality policy and identifying the objectives for the project, provide the infrastructure and resources to ensure achievement of project objectives, provide an organizational structure conducive to meeting project objectives, making decisions based on data and factual information, empowering and motivating all project personnel to improve the project processes and product and planning for future preventive actions.

1.2 Outline of the dissertation

ABB is among the first companies in the industry to implement quality management processes. The process of this paper is to analyze the company's strategic position in the market under a quality perspective. Specifically we set to investigate how quality management process, in terms of the ISO and furthermore the SOX framework are integrated with the guidance of project management in projects and in ABB infrastructure. Specifically how their implementation can contribute to

the best performance of the company. We will try to discover possible strategies or tactics to optimize their positive effects on the overall company's value.

2 FIGURE OUT THE AREA OF THE STUDY

2.1 Overview of the Global Electrical Equipment Industry

In order to define the boundaries of the present study it is essential to provide a description of the generic market field, in which the empirical investigation and analysis will be realized. The global electrical equipment industry includes all the electrical components and equipment produced and transported globally, but also all the products belonging to the heavy electrical equipment market

More specifically, the electrical components and equipment market consists of the revenues accrued by companies from the production and the selling of electric cables and wires, electrical components, such as switchgear and circuit breakers, or unclassified equipment used in the heavy electrical equipment sub-industry. Such products cover a wide range of industrial and household applications, while companies operating in this sector may focus on retail, selling final products to consumers (business-to-consumer), on industrial trading, in the form of intermediary components (business-to-business), or both, according to their size and production capacities. Therefore, apart from the consumer market, which is marginally the main source of revenues, electrical equipment companies have a great stake in a variety of other industrial sectors, e.g., constructions, telecoms, and production engineering (Datamonitor, 2008; ABS, 2004).

2.2 Asea Brown Boveri – Company Profile

As demonstrated in the previous section Asea Brown Boveri (ABB) is one of the key players in the electrical equipment industry. Because of its growing business

performance, its innovative nature, and its particular emphasis on control and quality management issues (ABB Group Annual Report, 2010; Datamonitor, 2010), ABB will provide the focal point of the present study. In this sense, a description of the company's profile, as well as a discussion on its individual characteristics is considered to be important, in order to better understand the business functions and processes on which performance control and quality issues will be explored.

2.3 ABB History

The ABB Group was formed in 1988 through the merger of the Swedish company ASEA and the Swiss BBC (Brown Boveri et Cie). The history of ASEA and BBC goes back to the late 19th century (1883 and 1891 respectively). In its course, ABB has acquired more than 40 companies, such as the power transmission and distribution businesses of Westinghouse Electric Corporation and Combustion Engineering (CE) and Elsag Bailey Process Automation. As an example of its leading position in technological research, during the late 90's, the company launched the world's first high-voltage generator, called Powerformer, which proved to be a breakthrough and stimulated further relevant research. In the following years, ABB Group adopted a restructuring scheme and reconfigured its business units to establish a single parent holding company to enhance corporate control and overall performance. Once again proving its orientation towards innovation, ABB made a great investment in 2002 opening a research and development center in Bangalore, India to focus on software development and industrial IT systems.

After having divested its nuclear power, power generation, and rail businesses, the company continued selling off many of its subsidiary companies further reinforcing cost efficiency, control, and flexibility. Among others, some of the

most important recent (2004 onwards) projects that ABB has undertaken include (a) an order of \$390 million worth to build a key power link from the Three Gorges hydropower plant in central China to the coastal city of Shanghai, (b) the designing, building, and installation of a new link connecting the power grids of Finland and Estonia, (c) a \$450 million contract from Kahramaa, Qatar General Electricity and Water Corporation, to support the country's rapid growth by expanding the power transmission, and (d) the biggest cable order worth \$350 million, from the National Grid in the UK and state-owned TenneT in the Netherlands for a high-voltage connection between the power grids of the UK and the Netherlands (Datamonitor, 2010; ABB Annual Group Report, 2010).

The power technologies division serves electric, gas and water utilities, as well as industrial and commercial customers. Automation technologies division provides products and services for automating and improving industrial and commercial processes.

2.4 Financial Status

Today ABB is among the leaders in the world market of electrical equipment and power and automation technologies, with a presence in over 100 countries. The company primarily operates in Europe and Asia, but also in the Americas, Middle East and Africa. It is headquartered in Zurich, Switzerland and has a world-wide workforce of about 116,500 employees (ABB Group Annual Report, 2010). The shares of the group are traded in the stock exchange markets of Zurich, Stockholm and New York. The company recorded revenues of \$31.598 million during the fiscal year ended in December 2010; a decrease of 31.795 over 2009. The operating profits of the company reached \$9,529 million decreasing by 9,325 over the year 2009 and

increasing by 10,940 over the year 2008 as listed in the table. The net profit was recorded at \$2,561 million in the fiscal year 2010, measuring decrease of 2,901 compared to the previous year (ABB Group Annual Report, 2010). Table one illustrates briefly the financial annual results.

Table 1: ABB Group Annual Report - Analysis of consolidated results of operations

| (\$ in millions, except per share data in \$) | 2010 | 2009 | 2008 |
|---|--------------|--------------|---------------|
| Orders | 32.681 | 30.969 | 38.282 |
| Orders Backlog at December 31 | 26.193 | 24.771 | 23.837 |
| Revenues | 31.589 | 31.795 | 34.912 |
| Cost of sales | (22.060) | (22.470) | (23.972) |
| Gross Profit | 9.529 | 9.325 | 10.940 |
| Selling, general and administrative expenses | (5.652) | (4.491) | (4.795) |
| Non-order related research and development expenses | (1.082) | (1.037) | (1.027) |
| Other income (expense), net | (14) | (329) | (566) |
| Earnings before interest and taxes | 3.818 | 4.126 | 4.552 |
| Net interest and other finance expense | (78) | (6) | (34) |
| Provision for taxes | (1.018) | (1.001) | (1.119) |
| Income from continuing operations, net of tax | 2.722 | 3.119 | 3.399 |
| Income (loss) from discontinued operations, net of tax | 10 | 17 | (21) |
| Net income | 2.732 | 3.136 | 3.378 |

| | | | |
|---|--------------|--------------|--------------|
| Net income attributable to noncontrolling interests | (171) | (235) | (260) |
| Net income attributable to ABB | 2.561 | 2.901 | 3.118 |
| Amounts attributable to ABB shareholders: | | | |
| Income from continuing operations, net of tax | 2.551 | 2.884 | 3.142 |
| Net income | 2.561 | 2.901 | 3.118 |
| Basic earnings per share attributable to ABB shareholders: | | | |
| Income from continuing operations, net of tax | 1,12 | 1,26 | 1,37 |
| Net income | 1,12 | 1,27 | 1,36 |
| Diluted earnings per share attributable to ABB shareholders: | | | |
| Income from continuing operations, net of tax | 1,12 | 1,26 | 1,37 |
| Net income | 1,12 | 1,27 | 1,36 |

Source: Datamonitor (2010)

As one of the world's leading electrical engineering companies, ABB facilitates utility and industry customers in improving their power performance to enhance productivity in a sustainable way, while limiting to the minimum the subsequent negative environmental impact. In fact, the company's policy regulations clearly manifest that ABB's Management is totally committed in creating additional value to the products and services produced, throughout quality-centered processes.

Moreover, the company's business portfolio can be classified into five main divisions:

- Power products
- Power systems
- Automation products
- Process automation, and
- Robotics

Briefly stated, Power Products are the key components to transmit and distribute electricity. The division incorporates ABB's manufacturing network for transformers, switchgear, circuit breakers, cables and associated equipment. It also offers all the services needed to ensure products' performance and extend their lifespan.

Power Systems offers turnkey systems and services for power transmission and distribution grids, and for power plants. Substations and substation automation systems are key areas. Additional highlights include flexible alternating current transmission systems (FACTS), high-voltage direct current (HVDC) systems and network management systems. In power generation, Power Systems offers the instrumentation, control and electrification of power plants.

ABB's automation products business, serves customers, with energy efficient and reliable products to improve productivity, including drives, motors and generators, low voltage products, instrumentation and analytical, and power

electronics. More than one million products are shipped daily to end customers and channel partners, spanning a wide range of industry and utility operations, plus commercial and residential buildings.

The main focus of process automation is to provide customers with integrated solutions for control, plant optimization, and industry-specific application knowledge. The industries served include oil and gas, power, chemicals and pharmaceuticals, pulp and paper, metals and minerals, marine and turbo charging. Key customer benefits include improved asset productivity and energy savings.

ABB is a leading supplier of industrial robots - also providing robot software, peripheral equipment, modular manufacturing cells and service for tasks such as welding, handling, assembly, painting and finishing, picking, packing, palletizing and machine tending. ABB has installed more than 160,000 robots worldwide (ABB Ltd, 2010; Datamonitor, 2010).

In addition, ABB provides a full range of lifecycle services from spare parts and equipment repair, training, migration to remote monitoring and technical support. Application and process knowledge provides proficiency resulting in measurable performance improvements. Finally, ABB delivers products and expertise through channel partners such as original equipment manufacturers, engineering, procurement and construction firms, wholesalers and distributors.

The following tables summarize the proportionate revenue contribution of ABB's each business division as well as the percentages of the geographical revenue distribution.

Table 2: ABB Group Annual Report - Revenues by division in \$ millions

| | 2010 | 2009 | 2008 |
|---------------------------------------|---------------|-------------|-------------|
| Power Products | 10.199 | 11.239 | 11.890 |
| Power Systems | 6.786 | 6.549 | 6.912 |
| Discrete Automation and Motion | 5.617 | 5.405 | 6.588 |
| Low Voltage Products | 4.554 | 4.071 | 4.747 |
| Process Automation | 7.432 | 7.839 | 8.397 |

Source: Datamonitor (2010)

Table 3: ABB Group Annual Report - Revenues by region in \$ millions

| | 2010 | 2009 | 2008 |
|-------------------------------|---------------|-------------|-------------|
| Europe | 12.378 | 13.093 | 15.815 |
| Asia | 8.872 | 8.684 | 8.967 |
| The Americas | 6.213 | 6.049 | 6.428 |
| Middle East and Africa | 4.126 | 3.969 | 3.702 |

Source: Datamonitor (2010)

2.5 Strategic Status

ABB operates in a turbulent business environment with highly dynamic elements, e.g., technological obsolescence and innovation, disclosing a series of both opportunities and threats. In addition, such competitive market fields require that a company is thoroughly examining its core competences in combination with its vulnerable points. For example, even though the broad variety of product offerings may provide diverse revenue streams to ABB, increasing raw material prices could exert considerable pressure on the company's profit margins and, consequently, reduce its ability to follow a competitive pricing strategy. Therefore, the need to constantly re-adapt to the business environment forces, taking advantage of the opportunities and trying to avoid threats, while, in parallel, balancing the company's internal strengths and weaknesses is imperative for surviving in the industry and achieving growth. The SWOT analysis presented below provides an overview of the

company's strategic position in the global electrical equipment and power automation market.

Table 4:SWOT ANALYSIS

| STRENGTHS | <u>WEAKNESSES</u> |
|---|-------------------------------------|
| Broad Product Portfolio | Asbestos litigation |
| Wide Geographic Base | Weak performance of robotic segment |
| Strong Order Book Position | Sizeable non-core activities |
| Robust Financial Performance | |
| <u>OPPORTUNITIES</u> | <u>THREATS</u> |
| Product Launches | New EU Directive |
| Positive Outlook for the oil and gas sector | Intense Competition |
| Growing Global Demand for Electricity | Increasing raw materials prices |

Source: Datamonitor (2010)

Strengths

Broad Product Portfolio: ABB has a broad product portfolio, followed by a greatly diversified stream of revenues. This broad portfolio of services not only enhances the market share of the company across various markets, but it also increases cross-selling opportunities, whereas the diverse revenue streams increase the company's independence and limit its exposure to risks associated with a particular segment.

Wide geographic base: ABB has a wide geographical base. It operates in about 100 countries across Europe, Asia, the Americas, and the Middle East and Africa and is well diversified in terms of revenue generation across these regions.

Strong order book position: The group generated significant new orders in recent years as we can see in the figure below.

ABB Group Annual Report 2010
Key financial data

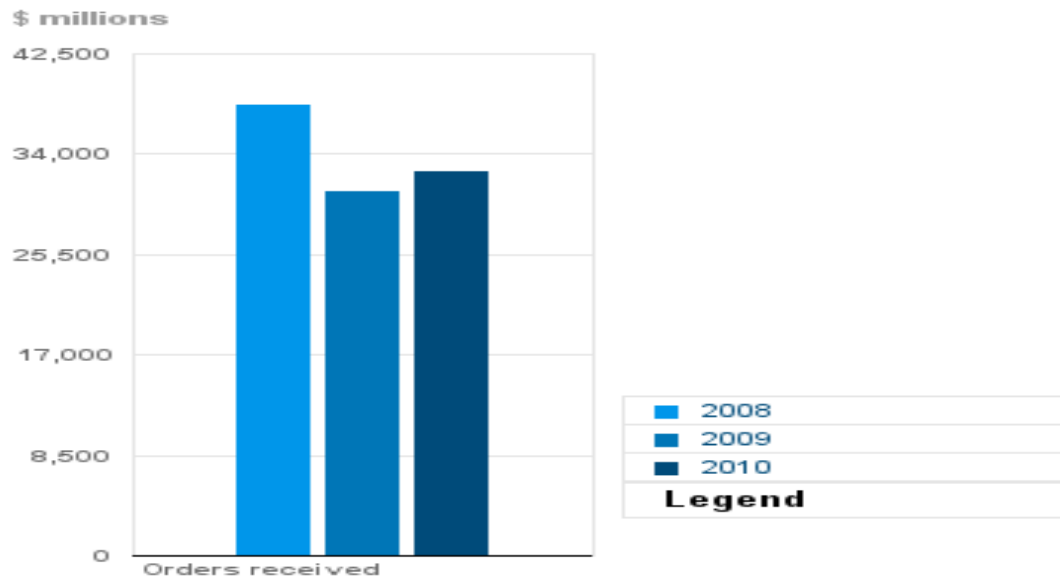


Figure 1: Order Received Data 2008-2010

Source: Datamonitor (2010)

Robust financial performance: The Company has delivered superior financial results over the years. The revenues of the company have reduced as we can see in the figure below compared to previous years.

ABB Group Annual Report 2010
Key financial data

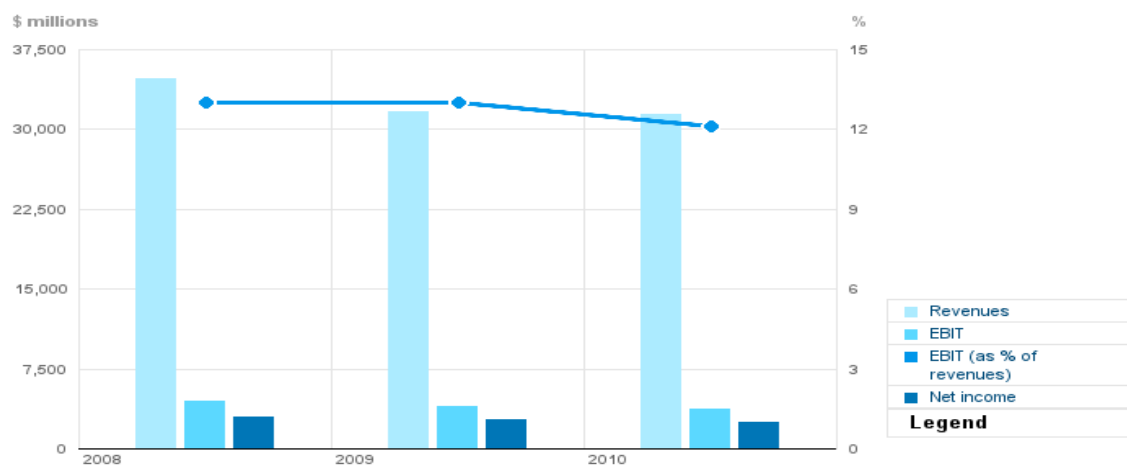


Figure 2: Total Revenues-Net Income-Ebit 2008-2010

Source: Datamonitor (2010)

Weakness

Asbestos litigation: Combustion Engineering (CE), a subsidiary of ABB, has been a co-defendant in a large number of lawsuits claiming damage for personal injury resulting from exposure to asbestos. CE filed for bankruptcy protection in 2002. Under the Plan of Reorganization announced in 2003, ABB offered to establish a \$1.2 billion trust fund for claims against CE.

Sizeable non core activities: ABB has a great number of noncore activities despite the substantial divestments that took place over the years. The company's noncore businesses include all operations unrelated to its five core businesses, i.e., power products, power systems, automation products, process automation products and robotics, and, among others, include petrochemicals, building systems, equity ventures and structured finance businesses. Despite the fact that noncore business functions were reduced, ABB aspires in additional reduction, in order to further limit the losses involved in these activities. Noncore businesses, besides requiring an increased working capital commitment, take up valuable executive time, which would be better spent on the more important core businesses. This can be achieved through the strictest control of the overall business procedures, by more intensively utilizing quality management procedures (ISO), as well as through more effective economic control and financial reporting internal controls (SOX) that have already been installed. Through an optimized, holistic approach of internal quality such weaknesses can be eliminated.

Opportunities

Growing global demand for electricity: The World's total net electricity consumption is expected to double by 2030, growing at an average rate of 2.7% per

year, from 14,781 billion kilowatt hours in 2003 to 21,699 billion kilowatt hours in 2015 and 30,116 billion kilowatt hours in 2030. China and the US lead the growth in annual net electricity consumption with increases of 4,300 billion kilowatt hours and 1,963 billion kilowatt hours, respectively, over the projected period (ABS Energy Research, 2004). Specifically ABB has operations all over the world. Therefore, growing demand for electricity worldwide would provide revenue generating opportunities to ABB.

Product launches: ABB has launched many products in the recent past. The most recent from Sonelgaz which is the national power of utility in Algeria and its aim is to build the three new substations and upgrade in the northern region of the country the four existing ones. “The new substations and the upgrades will significantly enhance distribution capacity and help meet growing industrial and residential demand for electricity in the country,” Peter Leupp, head of ABB’s Power Systems division. Product launches such as this would further enhance the portfolio of the company and in turn strengthen its performance and market position.

Threats

Increasing raw material prices: ABB purchases large amounts of commodity-based raw materials, including steel and copper. Steel prices have witnessed a phenomenal increase in the last few years. In addition, the global demand for steel is high due to major construction projects in India, Thailand and China such as the 2008 Beijing Olympics and 2010 Shanghai World Exposition. This has put steel prices at a premium. Furthermore, the ongoing consolidation in the steel industry has added to higher prices. The prices of copper have also increased sharply in recent years. Furthermore, the copper market is expected to continue to witness

strong prices primarily due to extremely low inventory, supply disruptions helping to maintain tightness and continuing robust demand (ABS-Energy Research, 2004).

Since copper, aluminum and steel are important raw materials for the company; its operating margins are likely to be adversely affected in the medium term.

Intense competition: The market in which ABB operates is a very competitive one. The company faces competition in several specific respects, including product performance, developing integrated systems and applications, pricing, new product introduction time and customer service. The principal competitors for ABB's automation technology products and services include Emerson Electric, Honeywell International, Invensys, Schneider Electric and Siemens (Datamonitor, 2010).

In conclusion, ABB appears to be a strong, aspiration company that constantly follows the changes of the environment, paving the way in business innovation. In such a highly competitive landscape companies need to heavily invest in tools and activities to further improve their internal processes efficiency. Quality Management tools, such as ISO 9001, and internal financial control and reporting frameworks, such as the Sarbanes – Oxley Act, might play an essential role towards this objective. Within this context, and provided that ABB is among the first companies in the industry to implement quality management processes, the purpose of this paper is to analyze the company's strategic position in the market under a quality perspective. More specifically, we set to investigate how quality management processes, in terms of the ISO and the SOX framework, are integrated in ABB's infrastructure, and, most importantly, how their implementation can contribute to the best performance of the company. We will try to identify any possible interactions, or conflicts, between these

two quality systems, while, moreover, we will attempt to discover possible strategies or tactics to optimize their positive effects on the overall company's value. In the following section, the ISO 9001 and the SOX Act frameworks are going to be discussed, in order to be analyzed in further stages of this study.

3 INTRODUCTION TO THE QUALITY MANAGEMENT AND ISO FRAMEWORK & THE SARBANES-OXLEY ACT

Total Quality Management Framework and ISO 9001 series.

As we said earlier we are going to analyze ISO 9001 and SOX Act theoretical framework and then examine them into the infrastructure of ABB. Concerning ISO 9001 before giving the definition it would be useful, as ISO is classified into Total Quality Management framework, firstly to define TQM and what does it means when we use the term Quality. In order to separate the meanings of these two different terms, quality and Total Quality Management we have to mention that when we use the term quality we quote to a specific product or service separately while when we mention the term TQM we approach quality by the perspective of a company which has implemented quality management philosophy in its operational management structure. Total Quality Management also known as Total Quality Control (TQC) is the application of quality principles to all facets of an organization (The Quality Library, 2008).

The term quality often causes confusion, because it is interpreted with different way, depending on the viewpoint by which it is faced. Of the many meanings of the word quality, two according to Juran and Godfrey (2000), are of critical importance to quality management.

“Quality means those features of products which meet customer needs and thereby provide customer satisfaction. Furthermore, Quality means freedom from defecencies” (Juran & Godfrey, 2000; Derbitsiotis, 2001; Dwyer, 2002). In addition according to Crosby (1979), Derbitsiotis (2001), quality is defined as conformance to requirements. On the other hand now, concerning TQM, several researchers define total quality management differently. For example, a baseline technical definition of

what TQM is all about has been given by the American Federal Office of Management Budget Circular, “TQM is a total organizational approach for meeting customer needs and expectations that involves all managers and employees in using quantitative methods to improve continuously the organization’s processes, products and services. (Milakovich, 1990, p. 209).”

In addition, the American Federal Office of Management defines TQM as, a total organizational approach for meeting customer needs and expectations that involves all managers and employees in using quantitative methods to improve continuously the organization’s processes, products, and services. (Morgan & Murgatroyd, 1997, p. 7)

Furthermore according to Saylor (1992) and Milakovich (1990): “Total quality management is a leadership and management philosophy and guiding principles stressing continuous improvement through people involvement and quantitative methods focusing on total customer satisfaction”.

According to the latter definition TQM is not merely a technical system. In fact, TQM is associated with the organization itself, which is also a social system. Pike and Barnes (1996) argue that organizations are not only technical systems, but also human systems. In addition, Oakland (1993) states, that TQM is an attempt to improve the whole organization’s competitiveness, effectiveness, and structure.

For Dale (1999), TQM is the mutual co-operation of everyone in an organization and associated business processes to produce products and services, which meet and, hopefully, exceed the needs and expectations of customers. TQM is both a philosophy and a set of management guiding principles for managing an organization. (p. 9)

Evolution of Quality

In order to TQM gain a concrete form and its concepts and ideas acquire an acceptance from the industry community much work needed to take place over the centuries to reach this stage.

During the early days of manufacturing, an operative's work was inspected and a decision made whether to accept or reject it. As businesses became larger, the need of full time inspection jobs started to increase more and more. Accompanying the creation of inspection functions, other problems arose:

- More technical problems occurred which required specialized skills
- Lack of training to the inspectors
- Inspectors in order to increase output were obligated to accept defective goods
- Skilled workers were promoted into other roles, leaving less skilled workers to perform the operational jobs, such as manufacturing

These changes were the beginning of a separate inspection department constitution with a "chief inspector", reporting either to the manufacturing manager or the general manager. With the creation of this new department, new services and issues came on such as standards, training, and recording of data and accuracy of measuring equipment. It became clear that the responsibilities of the "chief inspector" were more than just product acceptance, and a need to address defect prevention emerged. Hence the quality control department evolved, in charge of which was a "quality control manager", with responsibility for the inspection services and quality control engineering (Martínez-Lorente, et al., 1998).

In the 1920's statistical theory began to be applied effectively to quality control, and in 1924 Shewhart made the first sketch of a modern control chart. His work was later developed by Deming and the early work of Shewhart, Deming, Dodge and Romig constitutes much of what today comprises the theory of statistical process control (SPC). However, there was little use of these techniques in manufacturing companies until the late 1940's.

At that time, Japan's industrial system was virtually destroyed, and it had a reputation for cheap imitation products and an illiterate workforce. The Japanese recognized these problems and set about solving them with the help of some notable quality gurus – Juran, Deming and Feigenbaum.

In the early 1950's, quality management practices developed rapidly in Japanese plants, and become a major theme in Japanese management philosophy, such that, by 1960, quality control and management had become a national preoccupation.

By the late 1960's/early 1970's Japan's imports into the USA and Europe increased significantly, due to its cheaper, higher quality products, compared to the Western counterparts (DTI, 2008; Martínez-Lorente, et al., 1998).

Sarbanes-Oxley Act

Accounting/Auditing in North America was adopted from England. However, while British public companies were required to have audits under national law known as the Companies Act, American public companies audits were not regulated by U.S. government. The recent plague of corporate financial scandals has shaken investor confidence to its foundations. Faith in corporations and their CEOs and CFOs has never been lower (OpenPages, 2003). As a result, the Sarbanes-Oxley Act

was signed into legislation on July 30, 2002 to make public companies more transparent in their financial reporting and more proactive in sharing material information with other participants in the financial reporting chain such as auditors, audit committees, analysts, and investors. The Sarbanes-Oxley Act of 2002 has dramatically changed oversight of auditing by establishing the Public Company Accounting Oversight Board (PCAOB), which is appointed and overseen by the Securities and Exchange Commission (SEC), an agency of the Federal government (Oiu & Wright, 2005).

The Sarbanes-Oxley Act has been described as the single most important securities act in the history of the United States. SOX is particularly important due to the fact that it requires the CEO and CFO to personally certify the integrity of financial information. This requirement encourages the awareness and involvement of the high level management in the implementation of and compliance with this Act (Oiu & Wright, 2005).

SOX is the U.S. government's response to the financial scandals at Enron, WorldCom, Tyco and other large companies under the purview of the Securities and Exchange Commission (SEC) (Brickey, 2003). SOX give the Securities and Exchange Commission (SEC) overall responsibility for implementing the law. The SEC, in turn, creates the Public Company Accounting Oversight Board (PCAOB) to develop specific rules and oversight functions to implement independent audits under Sarbanes-Oxley (Panko & Ordway, 2005).

Composed of 11 titles, the act mandates strict requirements for financial accounting of public companies and transforms the public accounting industry. In reforming disclosure procedures and corporate governance, the various titles and

sections of SOX define management responsibilities in annual and quarterly reports, the control environment, risk management, and monitoring and measuring control activities.

SOX is a law, not a standard. It tells you what to do but provides no guidelines on how to do it. Hence, many companies are adopting the risk management framework of the Committee of Sponsoring Organizations of the Treadway Commission (COSO, 2004) as a standard of compliance to SOX. COSO was formed in 1985 to support the National Commission on Fraudulent Financial Reporting, an independent private sector initiative. The sponsors are major professional financial associations in the United States, and the commission has representatives from industry, public accounting, investment firms and the New York Stock Exchange (Stimson, 2005).

3.1 ISO framework

The ISO 9000 series of quality management and quality assurance standard are published by the International Organization for Standardization (ISO) which is based in Geneva. The standards were published in 1987 and based on the earlier British Standard 5750, with input from other countries such as Canada. The five standards in the series (ISO 9000-ISO 9004) provide a quality system framework for development in nearly all types of industry (Hoyle, 1996; Derbitsiotis, 2001; Yung, 1997; Zeng, et al., 2005; Terziovski & Power, 2007).

The ISO 9000 series standards have their origins in the military procurement standards developed during the Second World War. They finally led to the publication of the first commercial quality management standards BS 5750 by the British Standards Institute in 1979. In 1987, the British Standards BS 5750 were

adopted with a few changes as the international standards: ISO 9000 (Boulter and Bendell, 2002). However, careful study of the ISO 9000 series of standards in recent years by certain major groups of users or potential users identified a number of needs that are not easily met in the 1987 version. Also, there was a sense that the 1987 version should be revised to take into account changes in technology, terminology and practice (Yung, 1997). In particular, the key areas needed to be revised were:

- The importance of all people's needs being satisfied.
- Management commitment with a greater emphasis on executive roles.
- Full involvement of human resources.
- Operational processes showing linkages to the overall system.
- Customer satisfaction and the importance of meeting customer requirements.

The standards were updated in 1994. The ISO 9000:1994 standards provide corresponding sections for different type of business and are consisting of ISO 9000, 9001, 9002, 9003 and 9004 certification standards. These standards are based on the concept that certain minimum characteristics of a quality management system could be usefully standardized, giving mutual benefit to suppliers and customers alike. The major purpose of these standards is to provide an effective quality system reflecting a company's practices of producing goods and services that conform to specified requirements in order to enhance and facilitate trade.

ISO 9000 describes the guidelines for use of a particular standard whereas ISO 9004 describes the guidelines for establishing an internal quality management system within the broad and general context of total quality management. The other three standards, ISO 9001, 9002 and 9003, are the generic standards containing

minimum requirements for establishing and maintaining a documented quality system to inspire confidence in customers that the intended products or services meet customer requirements. Of the three, ISO 9001 is the most widespread standard, including all activities in all stages, namely design/development, production, installation, and servicing. (Rao Tummala & Tang, 1996).

3.1.1 Quality Management Systems-ISO 9001:2000 Requirements

The new ISO 9001:2002 grouped into four main chapters which are:

- Management responsibility
- Resource Management
- Product-service realization
- Measurement, analysis and improvement (ISO, 2000; Derbitsiotis, 2001; Tan, et al., 2003).

The process model is given in Figure 3 and it is a theoretical presentation of the generic quality management system requirements specified in this International Standard.

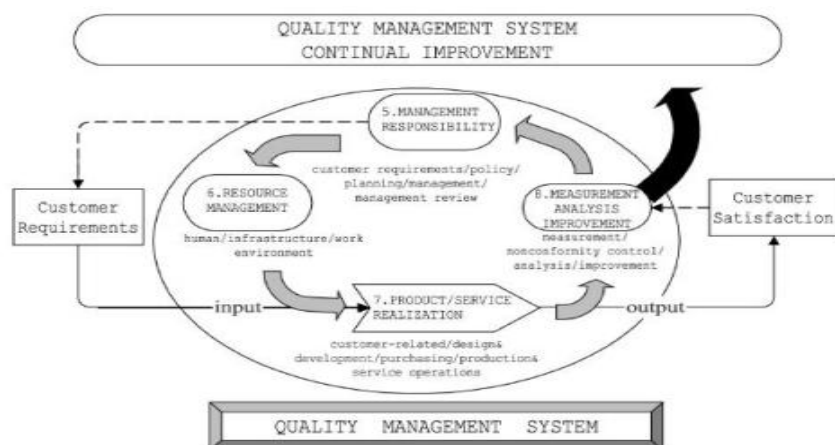


Figure 3: ISO 9001:2000 process model. Source: (ISO, 2000; Derbitsiotis, 2001; Tan, et al., 2003)

This model is also known as “Plan-Do-Check-Act” (PDCA) methodology and can be applied to all processes.

- Plan: establish the objectives and processes necessary to deliver results in accordance with customer requirements and the organization's policies.
- Do: implement the processes.
- Check: monitor and measure processes and product against policies, objectives and requirements for the product and report the results.
- Act: take actions to continually improve process performance (ISO, 2000).

3.2 Sarbanes-Oxley Act

As reported above the Sarbanes-Oxley Act was signed into legislation due to the lack of accurate financial reporting from the side of companies and due to the continuous increasing of financial scandals. In response to the series of business failures and corporate scandals that began with Enron in 2001, the U.S. Congress enacted the Sarbanes–Oxley Act of 2002. One of the more significant measures associated with the act is to protect investors by improving the accuracy and reliability of corporate disclosures which as an extension influences the personal finances and investments of a stakeholder (SOX-Act, 2002). SOX outlines the duties of the chief executive officer (CEO), the chief financial officer (CFO), and the auditor, including making each personally responsible for ensuring the credibility of the financial reporting provided to stakeholders (Brown & Nasuti, 2005; Holt, 2006; Dalton & Dalton, 2005). In order to achieve results in the field of accurate financial reporting and provide insurance to the stakeholders of a company several sections

were established to complete an integrated business tool under a legislation perspective ready to be implemented in any company. Therefore in the next chapters we are going to report these sections and analyze the way that interacts with a company's business activities.

3.2.1 Compliance

All of the companies that are listed on the American Stock Exchange are obliged to report to the SEC and must disclose a report of supervision on the company's internal controls over financial reporting in their annual reports by documenting and analyzing them in a detailed way. The auditor must confirm and report on management's assessment of the effectiveness of the internal control over financial reporting. The auditor also requires the company to document and to maintain evidence to support management's assessment. Internal control over financial reporting can be defined as a process planned by, or under the control of the company's CEO and CFO (Tackett, et al., 2006; Rausch, 2006; Leech, 2003; Simmons, 1997; Kaarst-Brown & Kelly, 2005; Panko & Ordway, 2005; Tone-at-the-Top, 2005). Although the PCAOB does not require corporations to use a specific framework, it has specifically listed only a single framework as acceptable, and most companies are using this framework to implement SOX.

This is The Committee of Sponsoring Organizations of the Treadway Commission (COSO) framework created as a model of "Internal Control - Integrated Framework" for the first time in 1992. COSO's definition of internal control and related concepts used in the report are consistent with Sarbanes-Oxley Act's requirements and provides a structure for successful compliance. It builds the foundation of the majority of solutions in respect of Sarbanes-Oxley and is widely recognized as the standard for measurement of the effectiveness of internal controls.

It is designed as an organization-wide structure for internal control, which is defined as a process with the board of director as its target (Rausch, 2006). Its objectives are:

- Effectiveness and efficiency of operations.
- Reliability of financial reporting.
- Compliance with applicable laws and regulations (Quall, 2004; Simmons, 1997; Rausch, 2006; COSO, 1994; Panko & Ordway, 2005).

The first category addresses an entity's business objectives, including performance and profitability goals and safeguarding of resources. Management should provide assurance regarding use or disposition of assets. The second relates to the preparation of reliable financial statements, including interim and condensed financial statements and selected financial data derived from such statements, such as earnings releases, reported to the outside world. The third deals with complying with those laws and regulations to which the entity is subject. In this paper, we are only directly concerned with SOX compliance (Simmons, 1997; Panko & Ordway, 2005).

Reasonable Assurance

Good controls cannot completely guarantee that goals will be met. However, an effective control environment will give reasonable assurance that goals will be met. Concerning controls, it would be useful to report that this framework focus on controls. The purpose of controls is to help organizations keep their organizational processes on track to achieve the company's goals. Controls generally fall into one of three categories which are shown in the figure that follows.

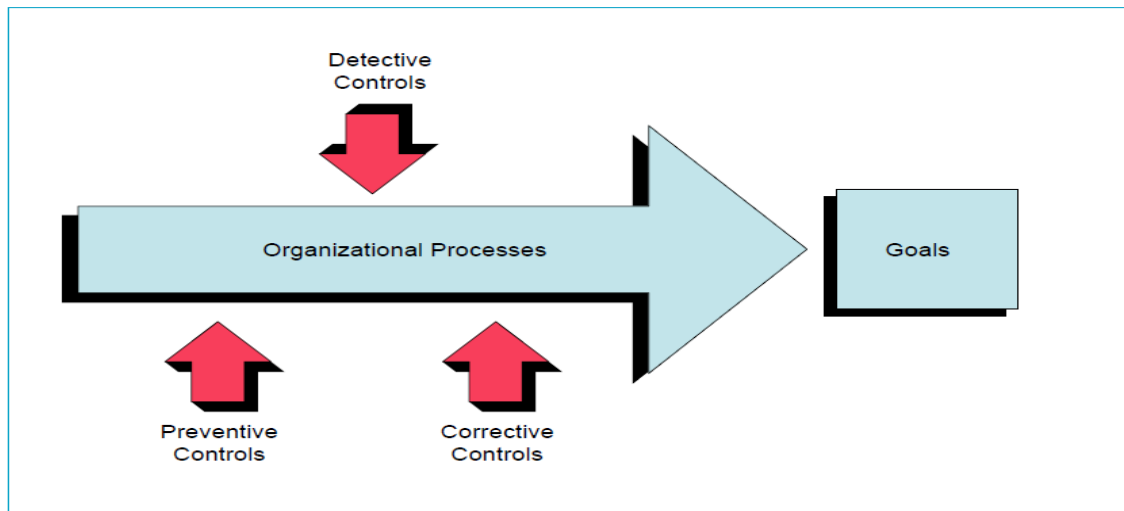


Figure 4: The Categories of Controls

Source: (Panko & Ordway, 2005)

- Preventive controls attempt to keep deviations from occurring in the first place.
- Detective controls attempt to detect deviations when they occur, so that action can be taken.
- In some cases, there are corrective controls, which fix deviations (Panko & Ordway, 2005).

3.3 Background of the study

In the previous chapter we have presented the theoretical framework and relevant literature on which our analysis will be realized. We reviewed the Global Electric Equipment Industry, a market sector that, due to its functional and technology-based character and quality issues. We, moreover, focused on the ABB Ltd, which is among the leading players and strongly representative of its category, and consists the object of the present study. ABB is one of the most innovative electric equipment companies, among the first to conform and utilize the Total Quality Management principles. Therefore, even though the characteristics of such an analysis cannot lead us to generalizable results, ABB's investigation may provide

useful insights for other companies in the field and set some benchmark guidelines with respect to Quality Management adoption. Drawing the limits of our study, we further provided an overview of the two most important business tools frameworks (i.e., ISO and SOX) and discussed on the specific details, regarding the adoption and implementation of each model. The theoretical knowledge offered throughout the previous chapters will be used as a research guide in the following sections. More specifically, the next section describes the methodological considerations involved and proceeds with analyzing both ISO 9001:2000 and Sarbanes Oxley Act quality frameworks within ABB. A discussion of the relevant findings and implication is presented in the concluding chapter of the thesis.

4 METHODOLOGY AND ANALYSIS

4.1 Methodological Considerations

For the purposes of this study a case study research method has been employed. In general, case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships within a specific context. Hence, in order to gain thorough understanding and knowledge of how Total Quality Management frameworks are being employed in modern business processes this approach seems to be appropriate. More specifically, the research object of the present study is the ABB Company and the research interest is centered on the implementation and the interaction of the ISO and SOX frameworks.

Drawing on the literature presented above and the characteristics of the specific case the following main areas are to be investigated:

- Issues on the implementation of the ISO framework
- Issues on the implementation of the SOX framework
- Comparisons and issues on the interaction between the ISO and the SOX framework
- Possible advantages and disadvantages that emerge from such TQM frameworks

4.1.1 Data Collection & Analysis Approach

The data collection process mainly consists of the researcher's observations, as the researcher is an employee of the company in question and is directly involved with the processes where Quality Management Frameworks are being employed. In addition, a considerable documentation review of the company's internal manuals has been utilized, while further understanding and insights valuable to the data analysis has been obtained through unstructured interviews with the company's executives.

Overall, quality manual and documentation review provided the primary source of data, while the knowledge obtained through the researcher's observations and experience was used to interpret information and draw further inferences.

4.2 ABB's Quality Manual

General

ABB as we saw earlier is composed by five main divisions of interest which are:

- Power Systems
- Power Products
- Automation Products
- Process Automation
- Robotics

In order to analyze how ISO 9001:2000 is implemented inside ABB it is necessary to focus in one of these main divisions in order to provide its structure and operational procedures. The information that we are going to provide describe and document the quality system requirements in the business operations of ABB Industry Ltd for Power Generation hereinafter, called the organization.

Each department in the organization is expected to structure, implement and maintain a quality management processes consistent with the values and expectations as documented. Demonstrate the ability to effectively meet specified requirements, exceed customer expectations, and achieve targeted levels of profitability. ABB's quality philosophy expects from every employee to be able to measure performance to customer requirements and world-class standards and to be actively involved in continual improvement of processes. The management shall provide leadership,

training, and resources required to enhance employee development to meet these expectations.

4.2.1 *Quality Management System*

a. General Requirements

ABB's management shall establish, implement and continually maintain an effective quality management system to comply with the ISO 9001:2000 standard. The QMS is implemented with process management approach and the business process is guided by the ABB Process Navigator (GPN).

b. Documentation Requirements

General

The organization's QMS shall include as a minimum the following documentations:

1. Statements of quality policy and quality objective
2. The quality manual to address the policies and describe "what" controls is in place in the quality system, including references to other documents that provide implementation guidelines.
3. Procedures that are required by the ISO 9001:2000 standard
4. The ABB-Group process documents, process tools, guidelines and/or operating procedures required to ensure effective planning, operation and management
5. Quality records per ISO 9001:2000 to ensure the organization's operations are controlled and maintained

Documents can be maintained in various media such as paper, electronic, magnetic, or optical as appropriate. Irrespective of the chosen medium, control of

documents procedure shall describe the necessary controls for the documents as required.

Quality manual

This quality manual that the organization established and maintained includes:

1. The QMS certification scope, and justification for any exclusions of this QM
2. References to local procedures, and ABB documents that are used,
3. Description of the activities interaction between processes of the QMS,
4. Description of the organization's responsibilities in the QMS,
5. Adopted policies to address related clauses in ISO 9001:2000 requirements.

Control of documents

The organization's documentation system is categorized into 4 levels:

- Level 1-Quality Manual that describes the organization's QMS.
- Level 2-Local procedures and process guidelines adapted from the ABB Group.
- Level 3-Work instructions (if needed) to support the procedures and processes.
- Level 4-Records, work related documents, manuals, standard and references needed to ensure conformity of products delivered to customer.

The Quality Manual is maintained and controlled by the Quality Management Representative (QMR). Documents required by the QMS are managed per the

“Control of documents” procedure. Records to demonstrate control of processes and conformances are managed per the “Control of records” procedure.

The Control of Documents procedure shall define controls needed to:

1. Approved documents for adequacy by authorized personnel prior to issue,
2. Review and update as necessary and re-approved documents,
3. Ensure that changes and the current revision status of documents are identified,
4. Ensure relevant versions of applicable documents are available at points of use,
5. Ensure documents of external origin are identified and distributions are controlled,
6. Prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose.

Control of records

Records are established and maintained to provide evidence of conformity to requirements and effective operation of the QMS. A documented procedure for “Control of records” is established for identification, collection, indexing, access, filing, storage, maintenance and disposition of records to demonstrate conformance to specified requirements. Control of records shall be identified in areas as appropriate for legibility, easy to retrieve storage, detrimental environment protection, security, and retention periods.

4.2.2 Management Responsibility

a. Management Commitment

The QMS is established and authorized by the organization's business unit manager. The management's commitment is to develop, implement, and maintain the QMS to comply with the ISO 9001:2000 standard and continually improve its effectiveness:

1. Communicate the importance of meeting customer as well as statutory and regulatory requirements.
2. Establish and deploy quality policy and set quality objectives.
3. Regular review of quality policy and objectives for adequacy and suitability.
4. Conduct management reviews of the QMS periodically for improvements.
5. Ensure availability of resources.

b. Customer Focus

The management, in line with corporate objective, shall effectively adopt a customer centered strategy and executed throughout the organization. The management shall ensure that customer requirements are determined and fulfilled with the objective of enhancing customer satisfaction from front-end sales to delivery of the product and after sales support. Appropriate to ABB emphasis on customer focus everyone shall monitor customer perceptions of quality and service in meeting requirements. Capture and resolve customer complaints to improve customer satisfaction and performance.

c. Quality Policy

The top management shall establish and implement quality policy that it is consistent with the corporate policies and objectives with regards to quality. The management shall ensure effective implementation of the quality policy such that:

1. The quality policy is communicated and understood within the organization.
2. The quality policy is appropriate for the organization.
3. Commitment to comply with requirements and continually improve the QMS through periodic reviews is practiced.
4. Process performance index, quality goals are established, monitored and reviewed.
5. Document a quality policy statement on the commitment to quality

d. Planning

The management shall effectively plan and develop the QMS at all levels guided by the eight quality management principles of ISO 9004:2000 which are:

- a. Customer focus
- b. Leadership
- c. Involvement of people
- d. Process approach
- e. System approach to management
- f. Continual improvement
- g. Factual approach to decision making
- h. Mutually beneficial supplier relationship

Applicable processes and tools deployed by the ABB group shall be applied to drive the business process and support the customer centric strategy in ABB.

- **Quality objectives**

The management shall set quality objectives based on the framework of its business and quality policy. Quality objectives, including those needed to meet requirements for products shall be established at relevant functions and levels in the organization. Each department shall establish performance indicator(s) to monitor against the objectives set and make improvements. Quality objectives are reviewed and revised as necessary by the management to ensure that they are current in achieving the targeted improvements.

- **QMS Planning**

The management shall plan the QMS such that it facilitates achievement of the quality objectives. Emphasis is placed on the planning of the processes that form the overall quality system.

Planning is achieved by means of regular reviews on:

1. directions and policies set by the ABB group,
2. current implementation levels of the processes and tools,
3. improvements intended for the organization,
4. provisions of resources,
5. gap analysis of the quality system, against the ISO:2000 requirements

and group processes implemented

6. changes in business environments that may affect adaptability of the QMS,
7. regulatory and legal requirements

8. levels of detail required to document operating procedures and instructions

9. adequacy of the monitoring and measurement controls in place including analysis and improvements

10. mitigations of risks involved in accepting and delivering an order

Outputs for quality planning generated from the above review may include:

1. generation of product specific quality plans,
2. documentation of product or project specific procedures,
3. identification and preparation of product/ project specific quality records,
4. customer requirements for product or project management documentation,
5. including monitoring, inspection, test, verification, and validation activities,
6. risk reviews to be manage and documented in specific product/ project records,
7. Documentation of quality procedures and/or work instructions depending on the department activities, methods used, and competence level of the staff.

e. Responsibility authority and communication

Top management in the organization has the overall responsibility for quality. Responsibilities and authorities are deployed and communicated within the organization.

- **Management representative**

The management representative appointed by management shall have the following responsibility for quality:

1. Ensure an adequate quality system procedures are documented by individual department to meet the requirements of ISO 9001:2000 standard.
2. Ensure that the processes needed for the QMS are established, implemented and maintained regularly through internal quality audits and management reviews,
3. Conduct internal audits to verify that procedures are implemented and verification activities related to product and service quality are executed satisfactorily.
4. Update the management on the corrective and preventive actions taken by the departments concerned to ensure continuing effectiveness of the quality system.
5. Ensure that customer concerns are logged and resolved by the resolution owner.
6. Awareness of customer feedback and requirements within the organization.
7. Liaise with third party (including certification body) on matters relating to the QMS,
8. Review and initiate necessary changes to the quality system and its procedures for improvement as deemed appropriate by the management,

9. Appoint internal audit team to conduct audits on the organization's quality system,

10. Initiate periodic management reviews of the QMS.

- **Internal Communication**

The management supports open communications within the organization to ensure communications on effectiveness of the QMS are participated at all levels.

Appropriate information channels are established and carried as necessary through:

a. Electronic media such as intranet, e-mails, ABB web-sites, unit portals, & tools,

b. Audio-visual presentations,

c. Management lead communication sessions,

d. Conference/ discussions/ meetings,

e. Notice boards/ in-house newsletters,

Examples of communication activities include:

- Promulgation of quality policy, quality objectives and QMS requirements.

- Management presentations on business performance and results.

- Review of ABB group recommended process implementations and results.

- Management reviews of the QMS.

- Quality audits (internal & external).

- Feedback on status of Customer Complaint Resolution Process (CCRP).

- Cross Functional Team (CFT) discussions on customer requirements and orders.

- Departmental meetings on process, product and system improvement issues.

f. Management Review

The management shall review the QMS at least once a year. Additional reviews may be held as required to ensure its continuing suitability, adequacy, and effectiveness.

- **General**

Reviews shall include assessing opportunities for improvement to the quality system, the quality policy, quality objectives and the need for any changes. Management reviews shall be recorded and maintained.

- **Review Input**

Inputs to management reviews include information on:

1. follow-up actions from previous management reviews,
2. performance against set policies and objectives,
3. results of audits,
4. actions and resolutions on customer feedback/ complaints,
5. suggestions and feedback from staff or external parties,
6. product, process and service performance and conformance,
7. status of preventive and corrective actions,
8. current and anticipated changes (internal and external) that could affect the QMS,
9. changes in regulations or customer expectations

10. Resource adequacy and recommendations for improvements.

- **General**

Outputs from the management reviews include decisions and actions related to:

1. improvement of the QMS and its processes,
2. improvement of product / service related to customer requirements,
3. amendment of the quality policies and objectives if needed,
4. responsibilities for action items, and
5. resource needs.

4.2.3 Resource Management

a. Provision of resources

Management shall provide resources sufficient to create quality products, service and customer satisfaction. Resource needs are continually reviewed for improvement to effectively maintain the QMS to meet customers and interested parties requirements.

Resource management shall encompass human resources, facilities and equipment, infrastructure, building, workspace, environment, information and technology, suppliers/ partners, financial resources and other resources required in the organization to complete the matrix of management needs.

b. Human Resources

Involvement of people is vital to the success of an effective QMS. Planned human resources are maintained and documented with the HR department.

- **General**

Managers shall ensure that personnel assigned to activities affecting product or service quality are competent based on appropriate education, training, skills and experience.

- **Competence, awareness and training**

Competency of personnel is assured through selective hiring and planned training. Management and HR shall review requirements for the company's yearly training plan. The HR department shall establish documented procedure for people development and training.

- c. **Infrastructure**

The management shall identify and determine infrastructures for product realization. Planned infrastructures provide conveniences for personnel to work efficiently to meet product requirements and interested party needs.

Infrastructures such as building, workspace, equipment (hard/soft wares), utilities, finances, training center, call center, supply, and supporting services (i.e., transport and communication) are provided and maintained by the company's shared services.

- **Work environment**

The management provides proper work environment to enhance involvement and performance of people to achieve productivity and product conformity. This includes:

1. a healthy and safe workplace in accordance with legal requirements,
2. availability of resources identified in section 6.3,
3. work ethics documented in the ABB intranet on mission and values,
4. ergonomic considerations in workspace settings,
5. defining proper work methods,
6. to create an environment that allows interface between personnel of different processes that leads to process management realization.

4.2.4 Measurement, analysis and improvement

a. General

The effectiveness of ABB's QMS is demonstrated by management's commitment to establish and involve in monitoring, measurement, analysis and improvement activities related to product conformity, control of processes and quality system. These activities are planned at different stages of the realization process to ensure timely, accurate corrective actions and decisions are taken when required.

The responsible person or team shall monitor, measure, review and analyze results during the product realization stages as identified above. Examples are: review of contract, design & development inputs/output, project management costs and schedule, conformance tests, and supplier's performance. Plus, management reviews of the QMS and audit activities. The results of these activities are information sources for corrective, preventive actions, and evaluations for facilitating improvement activities.

Methods of monitoring and measurement shall include as applicable, the use of statistical techniques, trend studies from data collection, calculations, and reports etc. Decisions and actions taken as a result of reviews are communicated as appropriate to relevant or interested parties via the internal communications.

- **Customer Satisfaction**

Monitoring and measuring ABB's performance on customer satisfaction and/or dissatisfaction shall complement the management's policy on customer focus. These are some of the methodologies and opportunities we use to capture and act on information relating to our customer care:

1. Sales visits: Communicate with customer to understand their perception on ABB product qualities, price, technology and service. Information gathered will be use to improve our product, sales and/or service offers.

2. Customer surveys: Customer surveys are sent out periodically and customer satisfaction is measured in three stages during projects' execution:

- I. Factory Acceptance Test (FAT)
- II. Site Acceptance Test (SAT)
- III. Final Acceptance Certificate (FAC) – Project completed warranty period.

Information received are documented and reviewed for performance improvement.

3. CCRP (Customer Complaint Resolution Process): The CCRP tool is used to centrally manage complaints/feedbacks received from customer. The CCRP include capture, action plan, resolution, verification and validation to complete resolution loop. Reports can be generated to monitor CCRP performances. Users can use these reports to know about customer feedbacks. Success stories with customers can be shared within ABB companies to drive towards stronger customer relationships.

4. Other sources: Market needs survey, service and delivery, or information relating to competitions can be use to help improve customer satisfaction.

- **Internal Audit**

Documented procedure for internal audit is established within the organization. Internal audits are conducted periodically to assess conformance, effectiveness and adequacy of the current QMS and its compliance to the ISO

9001:2000 standard. The audit may include (where relevant) assessment of effectiveness of the organization's control on the implementation of common processes (example, SOX, SAP, OHS, and ABB Group released tools) used in business operations.

Audit program is planned base on the status and importance of the processes, activities, areas to be audited, results of previous audits and its quality impact. Details of audit criteria, scope, frequency and methods are defined in the procedure and audit program that may include the following:

Integrated Quality Systems Review (IQSR). In order to audit related ABB business processes the relevant IQSR questionnaire is used. IQSR is only applicable to business processes described in the process navigator.

The QMR shall plan schedules to audit the QMS activities at least once a year. Personnel who have the skills, knowledge and qualification on the activity being audited may lead or assist to carry out the audits. To ensure an audit is not bias and is free of influence, auditors shall not audit their own work.

Responsible personnel for the area being audited shall take timely corrective actions to eliminate nonconformities and their causes to prevent recurrence. The auditor(s) shall verify effectiveness of implemented corrective actions and results are documented and reported to the management and responsible area. The management shall review results of internal audits to improve effectiveness of the QMS and plan for continual improvements.

The management shall determine information required to know the level of customer satisfaction, product conformance, process conditions, and supplier

performance, to conclude suitability and effectiveness of the quality management system.

Data needed shall be identified, collected, analyzed, and interpreted from the monitoring and measurement activities at various process stages to provide the information knowledge.

The management team shall use the acquired information to initiate a “Plan–Do–Check–Act (PDCA)” cycle to coordinate continual improvement efforts and facilitate decisions.

4.3 SOX Analysis inside ABB

Concerning Sarbanes Oxley Act implementation into ABB’s organizational structure we are going to present how ABB complied with the law by presenting the integrated internal control over financial reporting processes and activities. ABB has implemented a reporting procedure framework which is called ABACUS reporting system. ABACUS reporting system is contained by different ABACUS codes depend on the reporting units and the geographic country. These reporting units are a subdivision of the five main divisions of the group, concerning the products that they have under their supervision and are responsible to report financially for. When we face these product groups from a commercial view, ABB calls them business units but when we are talking about reporting their financial progress they are called reporting units.

The processes and activities of the internal controls over financial reporting are going to be approached in an ABACUS reporting unit level in order to facilitate assessing design effectiveness of the structure and adequacy of controls, i.e. that the controls are designed and in place to prevent, detect and correct errors and irregularities in financial reporting. Internal controls over financial reporting need to

be documented and assessed by the management of each ABACUS reporting unit in the Group. These tasks should be structured, focused, efficient, and intuitive. Specific templates have been designed and provided to facilitate this work.

During the process of documenting and assessing internal controls over financial reporting, it is possible that certain control gaps or deficiencies will be identified, either as design inadequacies or operational ineffectiveness. In cases where such deficiencies are identified, these will have to be documented on the remediation log and tracked through resolution on a high priority basis.

The overall objective of improving, documenting and testing internal controls is driven from the “Group Financial Statement” perspective. These statements are consolidated from the ABACUS reports from the reporting units and therefore, for the purpose of this paper, reference unit means an ABACUS reporting unit.

4.3.1 ABB’s Approaches

Documentation and testing of internal controls over financial reporting at the process and activity level in an ABACUS reporting unit, is using an approach called by ABB, the Three-Pillar approach designed to improve and strengthen the control environment in the Group. This three pillar methodology as outlined below provides structure and guidance to achieving this objective.

Table 5: ABB’s three Pillar Approach

| PILLAR I | PILLAR II | PILLAR III |
|--|--|--|
| Framework | Entity Level Control | Process/Activity Level Control |
| The framework provides the basic conceptual structure for internal control over financial reporting. | Entity level controls are those controls that monitor operations and establish and oversee the | Process / activity level controls are controls over financial reporting that are associated with processes / activities throughout the |

| | | |
|---|--|--|
| <p>The framework provides the definition of internal control as adopted by ABB in Group Directive GD/CEO-02 Internal Control. It describes the five components upon which internal control over financial reporting is built: Control Environment, Risk Assessment, Control Activities, Information & Communications, and Monitoring. The framework is applicable to the entire organization and is intended to strengthen existing corporate governance.</p> | <p>control environment and risk assessment process at the overall Group level, as well as at individual location / reporting unit levels. Entity level controls provide management with the mechanisms to: maintain the appropriate control environment, monitor the business, assess risks to the organization, and provide adequate and appropriate information and communication.</p> | <p>organization that enable ABB to prevent and detect errors and reduce the risk of material misstatement.</p> |
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4.3.2 Documenting process flows, financial risks and internal controls over financial reporting

Seventeen (17) financial processes/activities have been defined, covering all significant accounts and disclosure items from the Group Consolidated Financial Statements prospective. These are:

- Financial Accounting & Reporting (including financial closing and ABACUS reporting)
- Purchasing & Accounts Payable
- Inventories
- Projects
- Accruals and Provisions
- Revenue & Accounts Receivable (excluding Projects)
- Property, Plant & Equipment

- Intangibles
- Investments & Divestments
- Personnel & Payroll
- Cash Funds (including cash receipts and disbursements)
- Taxation
- Financial Management (including treasury and special financing transactions)
- Long-Term Borrowings
- Shareholders' Equity
- Commitments and Contingencies
- IT/IS General Controls

IT/IS General Controls is not a typical finance process. However in most ABB locations financial processes are to a varying degree supported by electronic data processing platforms. Some are simple and straightforward accounting packages and some are complex ERP systems. There are many financial controls which are automated and thus to rely on the consistency, accuracy and reliability of the electronic/automated operations. It is necessary to ensure that related IT/IS systems and platforms are operated in a secure and controlled environment for all of the applications used in financial reporting. The IT/IS General Controls are designed to ensure that financial applications operate in a secure and reliable environment.

4.4 Comparing ISO and SOX inside ABB-interactions

From the analysis of ISO 9001:2000 and Sarbanes-Oxley Act and the way that these two business tools are implemented in ABB Ltd a comparison could be done in order to identify similarities and interactions in the organizational structure of the

company. It is identified that quality management systems can help top management maintain effective corporate governance and satisfy the requirements of the Sarbanes-Oxley (SOX) Law. Here now, it's going to be quoted for each five components of the COSO internal controls framework:

- Control Environment
- Information and Communication
- Risk Management
- Monitoring
- Control Activities

a comparison with the requirements of ISO 9001:2000 but also a description of the relationship of these requirements with each one of the five components.

Control Environment

The control environment of ABB is in position to set the guidelines of the organization about compliance and generally the company's operational structure under Sarbanes Oxley framework. The corresponding clause of ISO 9001 provides the general requirements of the quality management system (QMS). Further, both standards ISO 9001 and SOX require the establishment of objectives, but also require control of documents and records. For this cause, control environment from the side of SOX and clauses planning product realization planning measurement, analysis and improvement present similarities.

Information and Communication

To satisfy COSO, information must be identified, captured and communicated so that people can carry out their responsibilities. In the same direction ISO (QMS) requires to increase the decision making process through information and

communication within the organization by establishing document requirements, quality manual, control of documents and control of records concerning the information streaming and the control of documents and records within the company and internal communication, customer communication and purchasing information concerning information and communication within the organization for both customers and suppliers.

Risk management

Risk management constitutes one of the most critical components of the COSO framework but also for ISO's quality management system. The data obtained in ISO 9001 as a result of process and product measurements can be used in risk assessment a fact that presents similarities with the way COSO requires about Sarbanes Oxley.

Monitoring

Monitoring requires assessing the quality of system performance over time. This is done through periodic assessments and continual monitoring of processes. ISO 9001 also requires monitoring and measuring processes and products.

Control activities

Control activities are the actions taken to address risk and achieve the objectives of the corporation. Control activities occur throughout the organization, at all levels and in all functions. In ISO 9001, the key to control the organization's performance is the continuous improvement. As part of this improvement ISO 9001 requires documented procedures to define corrective and preventive actions in order to manage or eliminate risks to the organization.

5 DISCUSSIONS

5.1 Introduction

In this final chapter of the study we set to draw an overall evaluation, and discuss on the implications, of the quality frameworks investigated in relation to their ability to enhance business performance. Any possible difficulties or impediments arising from their adoption, implementation and interaction are also subject to the discussion presented below. In other words, as already mentioned, the aim of the present thesis is to examine the impact of two of the most prevalent business quality applications, ISO and Sarbanes Oxley Act, from a multinational organization perspective, in order to identify their implementation implications as well as their success and failure factors.

5.1.1 ISO Framework Interpretation

Implementing a quality management system as ISO 9001:2000, leads ABB to gain multiple benefits. First of all, the adoption of such systems contributes to the enhancement of the belief that ABB Ltd is a highly customer-oriented company. Apart from the obvious contribution to the company's reputation in the market, this belief gets integrated in the company's organizational culture and philosophy developing a customer-based mentality both among the company's employees and the administration. Customer needs are better understood through customer feedback, predicted by such quality systems, which is easily retrievable and analyzed. Moreover, the existence of the ISO processes strengthens the reliability of the individual departments of the company, by providing a well-defined operational structure and allocation of duties, thus, improving the overall management structure and power flows.

Of equal importance is the creation of a discrete channel of communication between the employees (within and across departments) and the administration that improves information and knowledge flow, leading to less misunderstandings and subsequent mistakes. Empirical observations revealed that when ISO processes were clearly followed better understanding among employees was achieved, enhancing department collaboration and team work. Knowing that they are doing the right things (and *how* to do it) leads people to develop positive morale and increased productivity. This way quality framework can become a considerable asset for the company's future performance.

Finally, better and more organized documentation and control of the business processes leads to consistency in functions' performance, with less scrap and rework necessary.

On the other hand, apart from the advantages mentioned above some disadvantages are also identified. The most commonly observed is the increased load of bureaucracy. The need to follow the processes occupies employee time, which can be translated into money loss for the company. For example, the involvement of different divisions and employees with a single process sometimes generates confusion, producing the negative communication effects. To overcome such issues, more employee training courses could be organized to familiarize them with the processes and provide them a solid theoretical and practical understanding. Observations show that perfect knowledge of the ISO processes could have a considerable effect in reducing bureaucracy and the frustration it generates. Another important disadvantage that shall be considered is the restriction of initiative for employees outside the authority predicted by the quality system. This can be a serious

issue for companies which depend on the ideas and imagination of its employees. Initiative and brainstorming tasks would have to be developed in addition to make sure that people are thinking “outside of the box” and creativity is promoted.

In the case of ABB, it might also be useful to establish an electronic way of filling up the documents required to complete a process and getting approval for further acts. Utilizing a computer based approval management system, which could be in position to support online access and instant approval for all persons engaged would be essential.

5.1.2 *SOX Framework Interpretation*

According to Sarbanes Oxley Act compliance the biggest challenge for ABB was the documentation and the creation of information technology and information systems to fulfill the internal control requirements. The documentation of financial controls and processes has helped the company to gain financial efficiencies and clarify different positions against competitive organizations while the internal audits enhanced the effectiveness of those controls. The main goal of internal control audits is to provide the top management and the board of directors with an accurate understanding of the financial and operational status (Liebesman, 2005). In this way shareholders and stakeholders’ financial safety will be ensured, enhancing the company’s profile towards its customers and the market.

However, negative issues may arise as the continual need for material and technical application increases in order to provide accurate internal controls and audits that guarantee the objectivity of financial reports. While such implementation costs are considerable, SOX shall bring more added value to the companies by reorganizing their control processes (Liebesman, 2006). An independent IT department and ERP systems are essential, but also expensive to maintain. In addition

the risk of a probably failure of all these electronic equipment exists and shall not be underestimated. These issues have to be thoroughly examined before the company proceeds in any such adoption.

It should be noted here that the Sarbanes Oxley Act is mainly employed in the USA and a relevant establishment in the European region is believed to be crucial. For a start the European version of SOX doesn't have to be as detailed as its American counterpart, but only to be in position to conform companies to a more comprehensive and well-documented financial management.

5.1.3 Integrating ISO with SOX

Many observers have noticed the similarity between ISO 9001 and the SOX requirements of internal control arguing that companies ISO 9001 certified/registered have a framework in place that can be emulated to meet these requirements (Stimson, 2005). For example, ISO 9001 offers a complete set of managed and applied procedures towards the better administration of the business activities. The procedures are distributed where necessary, are regularly updated and audited. SOX requirements share similar characteristics. Although some (limited) confounding might be present, combining Quality management systems (ISO) with the financial auditing functions and procedures could result in more effective internal control and increase the accuracy of the financial figures, facilitating management's decision making and efficiency (Liebesman, 2005).

5.2 Limitation of the Study

It must be mentioned that, as with any set of empirical studies, the analysis, the findings as well as the knowledge generated in this paper is subject to certain limitations imposed by both intellectual and practical considerations.

In terms of the theoretical review even though in this dissertation a considerable amount of relevant research in this area was utilized and –provided the

limitation accompanying such a study (e.g., time, money, other resources etc) – as far as we can determine, every significant piece of theory was included, we can make no claim that this selection is complete. There will be practitioner and academic papers we missed. It can, therefore, be assumed that if more elements and theoretical considerations had been incorporated in the conceptual development, different relationships could have been revealed and different interpretations and conclusions could have been drawn.

In practical terms, on the other hand, our study failed to incorporate solid and measurable research data. Due to the unwillingness of the company's executives to participate in the research as subjects it was necessary to adopt a less structured, and, thus, less legitimate, research approach in order to collect the necessary information and data. Therefore, the validity and generalizability of the results are in question and will have to be tested in several contexts adopting a more strict research methodology, both qualitative and quantitative in nature.

In the context of the limitations mentioned above, the present study is considered to provide a fair understanding of the issue at hand, providing several insightful implications and stimulating further considerations for future research.

6 BIBLIOGRAPHY

- ABB Ltd www.abb.com *Our Businesses* [Online][Cited May 25, 2011.]
<http://www.abb.com/cawp/abbzh252/a92797a76354298bc1256aea00487bdb.aspx>
- ABS-Energy Research., 2004. *Electrical Equipment Demand Forecasts*. 3rd Edition, London.
- Juran, J. M. and Godfrey, B. A., 2000. *Juran's Quality Handbook*. 5th Edition. New York : McGraw-Hill, 2000. 0-07-034003-X.
- The Quality Library, 2008., *Vanderbilt University-Engineering Management Program-Continuous Quality Improvement*. [Online] 2008. [Cited: June 15, 2008.]
<http://mot.vuse.vanderbilt.edu/mt322/Tqm.htm>
- Derbitsiotis, K. N., 2001. *Ανταγωνιστικότητα με Διοίκηση Ολικής Ποιότητας*. [ed.] Nikitopoulos Stathis. Athens : Ideotypo.
- Crosby, P. B., 1979. *Quality Is Free*. New York : McGraw-Hill, 1979
- Milakovich, M. E., 1990. *Total quality management in the public sector*. National Productivity Review. Vol. 10, 2, pp. 195-215.
- Morgan, C. and Murgatroyd, S., 1997. *Total Quality Management in the public sector*. Buckingham, UK. Open University Press.
- Pike, J. and Barnes, R., 1996. *TQM in Action: A practical approach to continuous performance improvement*. 2nd Edition. London : Chapman and Hall.
- Oakland, J. S., 1989. *Total Quality Management*. Oxford : Heinemann.
- Dale, B., 1999. *Managing Quality*. 3rd Edition. Oxford : Blackwell-Business.
- Martínez-L., Angel R., Dewhurst, F. and Dale, B. G., 1998. *Total quality Management: Origins and evolution of the term*. The TQM Magazine. Vol. 10, 5, pp. 378-386.
- Oiu, M. and Wright, C., 2005. *The role of information security in Sarbanes-Oxley compliance*. Issues in Information Systems. Vol. 6, 2.
- Brickey, F. K., 2003. *From Enron to WorldCom and beyond: Life and crime after Sarbanes-Oxley*. Washington University Law Quarterly. Vol. 81, 357, pp. 358-401.
- Panko, R. R. and Ordway, N., 2005. *Sarbanes-Oxley: What about All the Spreadsheets? Controlling for Errors and Fraud in Financial Reporting*. European Spreadsheet Research Information Group. pp. 1-45. University of Greenwich, UK.

Enterprise Risk Management Framework. COSO-(The-Committee-of-Sponsoring-Organizations-of-the-Treadway-Commission)., 2004. s.l. : Price-WaterhouseCoopers.
Stimson, W. A., 2005. *Sarbanes-Oxley and ISO 9000*. Quality Progress. pp. 24-29.

Stimson, W. and Dlugopolski, T., 2007. *Financial Control and Quality*. Quality Progress. pp. 26-31.

Hoyle, D., 1996. "Quality systems – a new perspective". Quality World. Vol. 22, 10, pp. 710-713.

Hoyle D., 2006. *ISO 9000:Quality Systems Handbook*. 5th. Oxford : Butterworth-Heinmann, 2006. ISBN:0-7506-6785-0.

ISO., 2000. *ISO 9001:2000E Standard, Quality*

Boulter, L. and Bendell, T., 2002. "How can ISO 9000:2000 help companies achieve excellence?What the company think". Measuring Business Excellence. Vol. 6, 2, pp. 37-41.

Yung, Winco K.C., 1997. *The values of TQM in the revised ISO 9000 quality system*. International Journal of Operations & Production Management. Vol. 17, 2, pp. 221-230.

Liebeman, S. L., 1996. *Sustaining a process of continuous improvement: Definition and key factors*. The TQM Magazine. Vol. 8, 2, pp. 49-51.

Rao Tummala, V.M. and Tang, C. L., 1996. *Strategic quality management, Malcolm Baldrige and European quality awards and ISO 9000 certification.Core concepts and comparative analysis*. International Journal of Quality & Reliability Management. Vol. 13, 4, pp. 8-38.

SOX-Act., 2002. *Public Company Accounting Oversight Board*. PCAOB. [Online] 2002. [Cited: March 30, 2008.] <http://www.pcaobus.org/>.

Brown, W. and Nasuti, F., 2005. *Sarbanes-Oxley and enterprise security:IT Governance and what it takes to get the job done*. EDPACS,The EDP Audit,Control and SecurityNewsletter. Vol. 33, 2.

Holt, G. E., 2006. *SOX: "best practices" or too much accountability*. The Bottom Line: Managing Library Finances. Vol. 19, 3, pp. 139-145.

Dalton, Dan R. and Dalton, Catherine M., 2005. *Sarbanes-Oxley legislation and the private company: if not a marriage, then certainly an engagement*. Journal of Business Strategy. Vol. 26, 2, pp. 7-8.

Tackett, J. A., Wolf, F. and Claypool, G. A., 2006. *Internal control under Sarbanes-Oxley: a critical examination*. Managerial Auditing Journal. Vol. 21, 3, pp. 317-323.

Rausch, T., 2006. *Holistic business process and compliance management*. Systems Integration. pp. 301-310.

Leech, T. J., 2003. *Sarbanes-Oxley 30 & 404: A White Paper Proposing Practical, Cost Effective Compliance Strategies*. Ontario, Canada : Card Decisions .

Simmons, M. R., 1997. *COSO based auditing*. The Internal Auditor. Vol. 54, 6, pp. 68-73.

Kaarst-Brown, M. and Kelly, S., 2005. IT governance and Sarbanes–Oxley: The latest sales pitch or real challenges for the IT function? s.l. : IEEE.

Tone-at-the-Top., 2005. *Putting COSO's Theory into Practice*. Altamonte Springs, USA : Institute of Internal Auditors. Vol. 28.

Rausch, T., 2006. *Holistic business process and compliance management*. Systems Integration. pp. 301-310.

