Universität Hamburg

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Seminar zur Industriebetriebslehre
Business Consulting

Hausarbeit zum Thema:

Total Quality Management

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List of Abbreviations

ANSI	-	American National Standards Institute
BPR	-	Business Process Reengeneering
CIP	-	Continuous Improvement Process
CWQC	-	Company-Wide Quality Control
DIN	-	Deutsches Institut für Normung
EFQM	-	European Foundation for Quality Management
EOQ	-	European Organization for Quality
EQA	-	European Quality Award
HOQ	-	House Of Quality
ISO	-	International Organization for Standardization
JIT	-	Just In Time
JUSE	-	Union of Japanese Scientists and Engineers
MBNQA	-	Malcolm Baldrige National Quality Award
MRP	-	Material Requirements Planning
PDSA	-	Plan-Do-Study-Act
QFD	-	Quality Function Deployment
QM	-	Quality Management
QMS	-	Quality Management System
SQC	-	Statistical Quality Control
TQM	-	Total Quality Management

1. Introduction

"We will win and the industrial West will loose. The reason for your failure lies in your own hands. Not only your companies but also your heads are built according to the tayloristic model. Your bosses adopt the thinking and your employees are following the instructions. Deep inside you are convinced that this is the only way to lead a company. You understand management as forwarding the ideas out of your heads into the heads of your employees."

This is how K. Matsushita, director of a Japanese company, described the superiority of the Japanese way of thinking at the end of the eighties. His opinion seemed to be accurate. A few years later, the Western companies began to adopt the Japanese practice of quality orientation and employee involvement and started implementing Japanese management approaches as Total Quality Management (TQM) and Continuous Improvement.

This paper is going to focus on the background, the development and the fundamentals of the TQM - Philosophy . It is structured in five sections. Following a brief introduction, the second chapter will analyze the meaning of quality for a Quality Management System (QMS). Chapter three highlights the history and development of the approach. The objectives, principles and elements of the TQM-Strategy will be illustrated. In the fourth section attention is drawn to methods of evaluating QM-Systems, including the ISO 9000 certification as well as quality awards. The paper closes with a conclusion.

2. The Meaning of Quality

Before an approach to Total Quality Management can be developed, it is necessary to examine the meaning of quality for the company concerned. Therefore two basic aspects of a Quality Management System must be taken into account, the definition of quality and the analysis of the costs of quality.

2.1 Definitions of Quality

Quality can be defined in different ways, depending on who is defining it or what it is related to. In literature a variety of signification can be found, ranging from "quality as a product´s or service´s fitness for use" to the official definition by the DIN (Deutsches Institut für Normung) or the ANSI (American National Standards Institute), who determine quality as „the totality of features and characteristics of a product or a service that bears on its ability to satisfy given needs."

As most definitions are rather broad and not very precise, it is useful to distinguish firstly between quality from the customer´s or the producer´s perspective and secondly between product or service quality. The change on the market from a "seller" to a "customer market" clarifies the need for a customer orientated definition of quality. Hence, in a general sense

quality can be defined as “meeting or exceeding the expectations of the customer” and therefore be equated with “customer satisfaction”.

For practical purposes it is necessary to be more specific and to determine quality by using different quality dimensions. David Garvin has developed eight dimensions, which can be examined to characterize the quality of a product:

1. The *Performance* dimension refers to the primary operating characteristics of a product.
2. The *Features* describe capabilities or extra-functions of the product which are not part of the normal performance expectations.
3. The *Reliability* dimension indicates the probability of a successful performance of the product for a specific period of time under specified conditions.
4. *Conformance* alludes to the degree to which the product´s design and characteristics meet established standards.
5. The *Durability* dimension is a measure of the product´s life span before replacement.
6. The *Serviceability* dimension is related to the speed, ease and cost of repairs.
7. The *Aesthetics* dimension deals with the appearance of the product.
8. The *Perceived Quality* assesses the customer´s perception of the quality of the product. This dimension combines the prior seven dimensions with the corresponding values for the customer and forms the image or reputation of a product or a brand.

In order to characterize the quality of a service, Berry, Zeithaml and Parasuraman suggested five determinants. They underline the important role of the employees in order to achieve customer expectations and provide a useful complement to the eight dimensions offered by Garvin:

1. The *Reliability* indicates the ability to perform the promised service dependably.
2. The *Assurance* dimension describes the courtesy and competence of the employees.
3. *Tangibles* cover physical facilities, equipment and the appearance of the personnel.
4. The *Empathy* dimension refers to the flexibility to satisfy individual customer wants.
5. *Responsiveness* stands for the willingness of the employees to provide prompt service.

By analyzing such criteria, a company is in a position to identify relevant quality dimensions and therefore to define the quality of the product or service in a detailed manner. It is an essential prerequisite for each company introducing a Quality Management System to determine an individual quality definition which is orientated to the requirements of its customers.

5.2 Costs of Quality

The quality costs represent the second main foundation of a QMS. For a long time quality improvement and cost reduction have been seen as opposite targets. Cost analyses revealed that better quality could only be achieved through higher investments. But in order to effectively analyze the costs of quality, a company must also take the price of poor quality into account. Therefore quality expenditures can be divided into two major categories: the costs of quality or rather of achieving good quality, including prevention and appraisal costs, and the costs associated with poor quality, the failure costs.

Prevention costs include all expenses of planning, designing, coordinating and controlling the system to prevent defectives. They also cover expenditures of redesigning the process or the product to remove the cause of poor quality and moreover costs for information and training.

Appraisal or *inspection costs* are the costs of measuring, testing and analyzing materials, parts, products, the production process and service procedures to ensure that quality specifications and standards are being met.

Failure costs, also referred to as price of nonconformance, can be categorized as internal and external failure costs. Internal failure costs result from defects that are discovered during the production of a product or a service. They mainly cover yield losses caused by scrapped products and rework costs, but also process downtime costs and losses through price reductions for defective products. External failure costs are incurred after the customer has received a poor quality product or service and include customer complaints, product returns and warranty claims as well as liability costs. Furthermore, lost sales caused by dissatisfied customers or a negative brand image can be considered.

The totality of quality costs is formed by adding the three basic kinds of expenses. The target of a QMS is to reduce these total costs but also to achieve a higher level of quality. To understand a possible effect of a QMS on quality costs, as shown in Figure 1, the dependence of costs and the grade of completion or moreover the efficacy of the QMS must be examined.

Figure 2 shows an imaginable structure of this relationship.

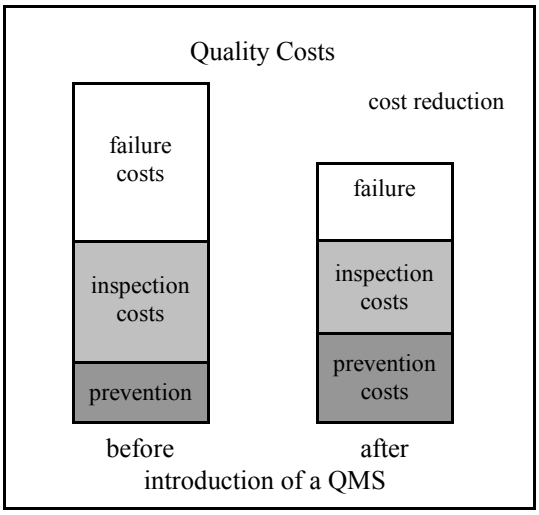


Figure 1: Changes in costs through a QMS

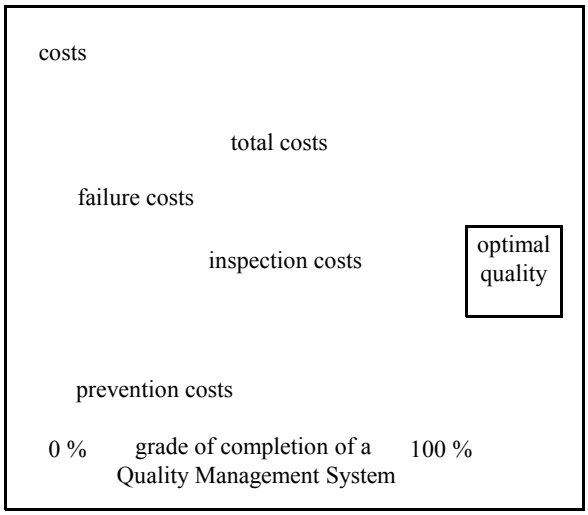


Figure 2: Optimal quality costs

The costs of prevention and inspection increase in accordance to a superior stage of the QMS. The greater expenses should lower the percentage of defects produced so that the failure costs decline. The expenses for inspection decrease as the production process becomes more dependable and the total costs reach a minimum when the amount of prevention costs exceeds the sum of inspection and failure costs.

3. Total Quality Management – A Management Philosophy

Having determined the significance of an individual, customer orientated definition of quality and the meaning of quality costs as foundations for a QMS, the approach to the Total Quality Management Concept can be developed.

3.1 History and Evolution of the TQM-Concept

In literature readers often get the impression that the Western World only adopted the Japanese style of Quality Management. But the development of QM-Systems must be divided into different phases to clarify that several American scientists played key roles in the evolution process of the TQM-Strategy. At the beginning of this century, Frederick W. Taylor introduced a series of new concepts for work improvement in the USA. Although he isolated the worker from responsibility for improvement, he laid the foundation for the first step towards a QMS by introducing a “Quality Inspection System”. The next phase began in the 1920s and was influenced by Walter Shewart, who developed the technical tools that formed the beginning of “Statistical Quality Control” or “Quality Assurance”.

The origins of TQM as a company-wide Quality System can be traced back to Japan after World War II. While in the USA and Europe this period was characterized by “Partial Quality Control Systems” to improve mainly employee involvement, W. Edwards Deming, a disciple

of Shewart, taught his Quality System approaches to Japanese managers, changing the focus from technical aspects to a managerial philosophy. Influenced by other American scientists such as J. Juran, P. Crosby or A. Feigenbaum, QM-Systems became more widely implemented and sophisticated and were also applied to non-manufacturing functions. Quality became the most important strategic issue in Japanese companies covering all organizational functions.

American firms, maybe startled by the renowned MIT-study "The machine that changed the world", observed the increasing Japanese quality level and began to adopt TQM-Concepts in the 1980s. Ford, Xerox and Motorola were among the first who benchmarked Japanese practices and implemented similar TQM-Systems. Their success motivated in the following years many other American companies to realize a quality orientated strategy and the term TQM also became popular among European firms.

3.2 Definition and Objectives

Today many companies all over the world use TQM-Concepts. But TQM can not be seen as a uniform or s standardized system. The concept rather represents a "management philosophy" or a "thinking approach". Schmalzl/Schröder describe TQM as "a totality of attitude of mind, strategy, methods and techniques aiming at continuous quality improvement".

TQM constitutes a "long-term integrated concept, targeted at guaranteeing and continuously improving the quality of a product or a service in development, design, manufacturing and field service, through involvement of all employees, in order to enable an optimal satisfaction of the wants and needs of all customers." This definition emphasizes the main objectives of the concept: It is a system approach, a company-wide strategy, also reflected by the term **total**. Partial concepts are not accepted. The key component is customer-orientated **quality,** as defined in chapter 2.1, and the approach represents an operational **management** strategy.

To differentiate the TQM-Concept from other management notions, it is helpful to examine the fundamental targets of a company: Quality, Flexibility (time) and Productivity (costs). Figure 3 shows them in form of the "Magic Triangle".

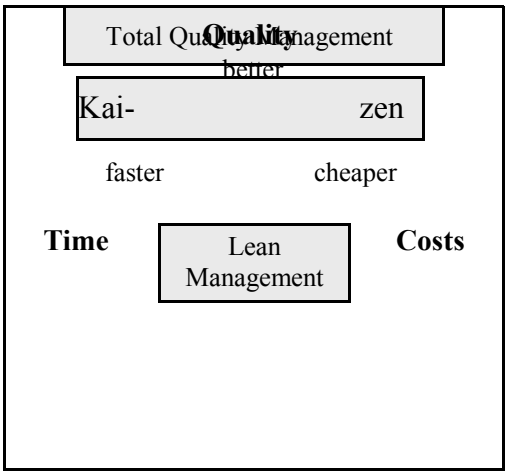


Figure 3: The Magic Triangle

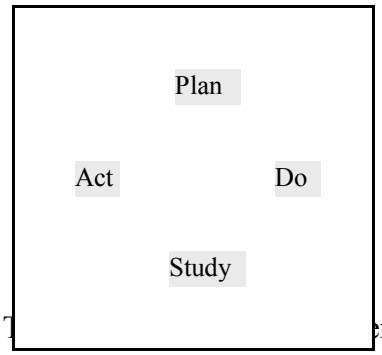
A. Töpfer and H. Mehdorn summarize the inter-dependence of the concepts as follows: TQM is the ideological target and offers the conceptual frame for a company. Kaizen or Continuous Improvement provides a formal method or instrument. Lean Management is a strategy orientated at process optimization and focuses mainly on costs and time. It is also seen as "target en route". The different approaches can be used as independent concepts. As their objectives overlap and match widely, it is advantageous to arrange and implement them in an integrated manner.

3.3 Principles of a TQM-Strategy

The objectives of the TQM-Concept lead to a "set of management principles" which create the core of the strategy. In this context it is necessary to understand that "all TQM´s are not alike". In order to develop an individual TQM-System a company must therefore put the main emphasis on relevant principles depending on the branch of business or on the structure of the company. The fundamental principles of the TQM-Philosophy are Continuous Improvement, Customer Focus, Process Improvement and Employee Involvement.

3.3.1 Continuous Improvement

In literature Continuous Improvement, in Japanese called Kaizen, is defined as a universal, all-inclusive approach to customer satisfaction but also as an operative element of a QMS. As TQM is a long-term orientated strategy, it is indispensable not only to see Kaizen as a formal method that is practiced if necessary, but moreover as "the employees´ attitude towards work" which lead to a complete change in enterprise culture. The principle is based on the belief that any aspect in a company can be improved and thus it forms the base for customer, employee and process-orientation, i.e. for the three remaining principles.



The Continuous Improvement Process (CIP) represents the dynamical component of the Kaizen-Philosophy. Figure 4 shows the PDSA-Cycle or Deming-Wheel, which lies at the heart of the CIP. It is a four-stage process for quality improvement formulated by Deming and Shewart. The first step, the "plan-stage", includes identifying a process or a problem that needs to be refined and developing a plan for improvement. In the "do-stage" the plan is implemented on a test basis and improvement is measured. The collected data is analyzed in the "study-stage" in order to find out if the goals set in the plan step were achieved. If the results are successful, the revised process is implemented in the "act-stage" and set as standard procedure. The cycle then starts over again to identify new quality problems.

3.3.2 Customer Focus

The fundamental external alignment of a company is its customer-orientation. All activities are orientated towards their effect on the market and on the customers. The first step of succeeding in this principle is the identification of the relevant customer or target group. The company´s definition of quality is then determined by the customer´s needs and wants, as discussed in chapter 2.1. Once understood, the customer´s expectations must be translated into product or service specifications.

However, customer orientation is not only influenced by external but also by internal customer satisfaction which provides an essential prerequisite of meeting external customer requirements. Internal customers are employees who rely on the output of other employees in preceding process steps. Everyone in the organization must realize that firstly he represents an internal customer while receiving a product or a service and secondly a supplier when he delivers it to the next stage. In order to satisfy the external customer, quality has to come from the source of the process and must be carried through the complete procedure.

3.3.3 Employee Involvement

The fact that every employee is an internal customer in the process chain underlines the importance of a commitment to total employee involvement. The TQM-Concept is a top-down as well as a bottom-up approach. First of all the strategy must be presented and launched by the management and afterwards all employees have to contribute to the success of

the concept. A change occurs in the organizational structure and in all different fields of activity. The organization´s senior members shift from being commanders or controllers towards being coaches and teachers. The employees and workers experience an empowerment of their assignments and responsibilities. Quality control becomes part of their work. They are directly involved in the QM-Process and participate in identifying and solving quality problems. Furthermore, motivation and employee satisfaction is promoted through training, teamwork, a better information flow and communication in the company.

3.3.4 Process Improvement

Employee satisfaction and the cultivation of sound internal customer-supplier relations are a prerequisite in order to accomplish the last principle, business process optimization, which includes process control, review and improvement. As the company´s activity represents an extensive combination of different process steps, the employees have to learn not only to focus on the process step they work on but on the whole procedure and the role and importance of every stage. Therefore the objective is to simplify process operations and to make them more transparent. Key processes are to be defined and activities that do not add value to the product or the service are to be reduced or eliminated. In the end, interfunctional collaboration and an integration of the process parts lead to a rapid, efficient and flexible operation system.

Within the framework of process improvement, the TQM-Concept is often combined with other management approaches, such as Business Process Reengeneering (BRP) and Lean Management, or with production scheduling and inventory management concepts, such as Just In Time - Production (JIT) and Material Requirements Planning (MRP).

3.4 TQM Instruments

In order to successfully implement a TQM-Concept and to translate the TQM-Principles into action, a variety of management instruments and tools can be utilized. As the description of all different techniques is beyond the scope of this work, only two of the most important instruments will be mentioned: Quality Function Deployment (QFD) and Benchmarking.

Quality Function Deployment is a system for customer orientated product or service evolution, which was originating in Japan in the 1960s. It is a means of translating customer wants into the appropriate technical requirements for each stage of product or service development and production. Targeted at cost reduction and customer satisfaction, the objective of this method is to produce a product that is “as good as expected by the customer and not as good as possible in terms of technical measurements”.

The structure of QFD is often explained with a “House of Quality” (HOQ), as shown in Figure 6 in the appendix. The analysis includes six basic steps: Firstly the identification of

customer wants, followed by the determination of relevant quality dimensions and important product characteristics; thirdly the analysis of the relationship matrix between customer requirements and quality characteristics, which is the heart of the HOQ; thereafter the importance rating of the product features and a competitive evaluation and at the end the examination of interactions between the different quality characteristics.

The process of competitive comparisons aiming at improving a company´s position on the market is called *Benchmarking*. It provides a continuous, systematic procedure to measure a firm´s products, services or process performances against those of industry leaders. Competitive benchmarking is based on comparisons with a direct industry rival. Functional benchmarking compares areas such as administration, customer service and sales operations with those of outstanding firms in any industry. The benchmarking process starts with determining the gap between the company´s performance and that of the benchmarking firm in the relevant area. The causes for this gap have to be analyzed and afterwards improvement plans are to be developed and implemented. The long-term target of the company is to achieve the position as a "benchmarking company with best practice".

4. The Evaluation of Quality Management Systems

Quality Management Systems can be evaluated by two entirely different approaches. The ISO 9000 certification verifies that a QMS fulfills required quality standards. Quality Awards analyze a company´s efforts and performance in terms of quality improvement.

4.1 The ISO 9000 Standards

The International Organization of Standardization (ISO), composed of national standard institutes of more than a hundred countries (e.g. the ANSI or the DIN), devised in 1987 a set of standards that govern documentation of quality programs: ISO 9000-9004. It is a standard series that consists of five documents which provide guidelines for developing an effective quality system. The most comprehensive and difficult standard to attain is ISO 9001, a quality assurance model that covers all functional areas of a company, including development and design, production, installation and servicing. The twenty elements of this model are shown in Figure 7 in the appendix. The ISO 9002 standard is more limited in scope and focuses only on companies that produce and install a product or service. ISO 9003 is a model for quality assurance in final inspection and test. ISO 9000 and 9004 provide guidelines for implementing the different quality management programs.

The ISO certificate is issued for three years by an accredited registrar who assesses the quality program of the company and examines if the system is in compliance with the required ISO 9000 standards. A study of 325 German companies analyzed the reasons for a company to

pursue the ISO standardization. The results revealed the main motives, as shown in Figure 8 in the appendix. They were competitive advantages, followed by customer requirements, marketing and the improvement of product quality.

4.2 Quality Awards

The second approach to the evaluation of QM-Systems are Quality Awards. A variety of national and international prizes measuring and analyzing Quality Systems have been introduced in the last few decades. Next the three most important and powerful programs are described.

The *Deming Prize* was the first award honoring a company´s efforts for quality improvement. It was established in Japan in 1951 by the Union of Japanese Scientists and Engineers (JUSE) in recognition and appreciation of W. E. Deming´s achievements in the development of Statistical Quality Control (SQC). The award is divided into two major types: The Prize for Applications, focusing on organizations that are applying programs of company-wide Quality Control, and the Prize for Individuals, rewarding excellence in research. The former analyzes a criteria catalogue of ten checkpoints which are subdivided into 63 sub-criteria. The checklist is shown in Figure 11 in the appendix. Honoring only Japanese firms during the first three decades, the award was opened to foreign companies in 1984.

During the 1980s American companies realized the increasing power and competitiveness of Japanese firms because of their orientation towards quality. In order to spur improvement of the quality of American products and services, in 1987 the U.S. Congress introduced the *Malcolm Baldrige National Quality Award* (MBNQA), named after the former Secretary of Commerce. The award aims at stimulating companies to improve quality, recognizing achievement in quality, establishing guidelines for self-evaluation and disseminating information about successful quality programs. The seven evaluation criteria of the MBNQA, as shown in Figure 12, focus on the soundness of the approach to company-wide quality improvement. Each year, the award is given to one or two companies in each of the three categories: manufacturing, services and small businesses (either manufacturing or service).

In 1988 the European Foundation for Quality Management (EFQM) was set up as a consortium of leading European companies. Inspired by the success of the MBNQA, the EFQM launched in 1992 the *European Quality Award* (EQA) in cooperation with the European Organization for Quality (EOQ) and the European Commission. The evaluation model of the EQA is divided into two basic categories: the Enablers and the Results. A total of nine criteria, which are shown in Figure 13, are to be examined by each company in form of a self-appraisal to take part in the award.

4.3 Critical Analysis

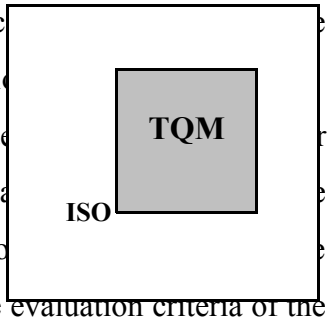
In view of the different approaches to Quality System analysis various questions arise. The two most important are: What are the incentives for a company to apply for one of these evaluation models and what impact do they expect of a participation? And secondly: Do the different approaches provide a support on the way to a successful TQM-Strategy and do they reflect the principles and fundamentals of the TQM-Philosophy?

The reasons for many German companies to implement an ISO 9000 standardization were already mentioned in chapter 4.1. The main motive was described as competitive advantages. But critics argue that fulfilling a minimum standard, which is the only requirement of the certificate, can not be seen as a great advantage. Furthermore, probably due to the wide distribution of ISO 9000, the standard is not only required by most customers, moreover it is expected and taken for granted. Therefore analysts remark that “it can rather be a disadvantage not to have the ISO certificate than a benefit to have one”.

A main incentive for participating at quality awards can be seen in the reputation and recognition for quality that awaits the winner. Besides, the efforts which are necessary to implement the Quality System seem to pay off. The 16 winners of the MBNQA from 1988 through 1995 outperformed the Standard & Poor´s 500 stock index by three to one in terms of return on investment. But awards can also raise the problem that the award winner is regarded as the only “winner” of a contest while the other participants are seen as “losers”, not considering and honoring their efforts made for quality improvement. The second question relates to the connection between TQM and the evaluation methods. The ISO 9000 standards do not cover any aspect of customer orientation which provides the most powerful fundamental of TQM.

Figure 5: ISO vs. TQM

Critics go as far as to argue that "anyone who is convinced by the TQM-Philosophy must disapprove and refuse the ISO standardization" because the certific… quality of the products or services and represents only a documentati… On the other hand, the ISO process is regarded as a useful first ste… pursuing TQM programs (Figure 5). Finally, each firm must rea… represents only a foundation for a TQM-Concept and that the co… structure of the QMS according to the TQM-principles by itself. The evaluation criteria of the quality awards reflect the concept of TQM in a more appropriate way. Especially the MBNQA and the EQA assign "customer focus and satisfaction" the most important part in the evaluation process. Besides, a company that fulfills the ISO 9000 requirements would only achieve 25% to 40% of the maximum score of the EQA or MBNQA, which again emphasizes the different focuses of the models. Hence, it is incomprehensible why in 1995 almost 65% of 325 interviewed German companies preferred the ISO certificate as intended standard for their QMS (cf. Figure 11), although more than 84% were planning to introduce a TQM-Concept in the future (cf. Figure 10). This is only explainable through the widespread misunderstanding of the real meaning of the TQM-Philosophy and its fundamentals.



5. Conclusion

In the last few years various analysts began to criticize that TQM does not improve the profitability of the concerned companies and that it is only one out of many "management in-words". In this context it is important not to forget that TQM provides a long-term orientated strategy and it does not aim at short-term profitability improvement. Furthermore TQM does not represent a book with recipes for success. Success rather depends on the management and its ability to implement the strategy and to efficiently use the potential of the employees of the company. Therefore each company must question itself if the failure of the strategy was due to the fundamentals and beliefs of the TQM-Philosophy or maybe due to a wrong implementation of the concept and inappropriate expectations of its effects. Even if the term TQM disappears from the management scenes and becomes a dead "in-word", each manager must ask himself, why customer orientation and a company-wide commitment to quality should not have a positive impact on a company´s performance?

Appendix

Figure 6: The House of Quality

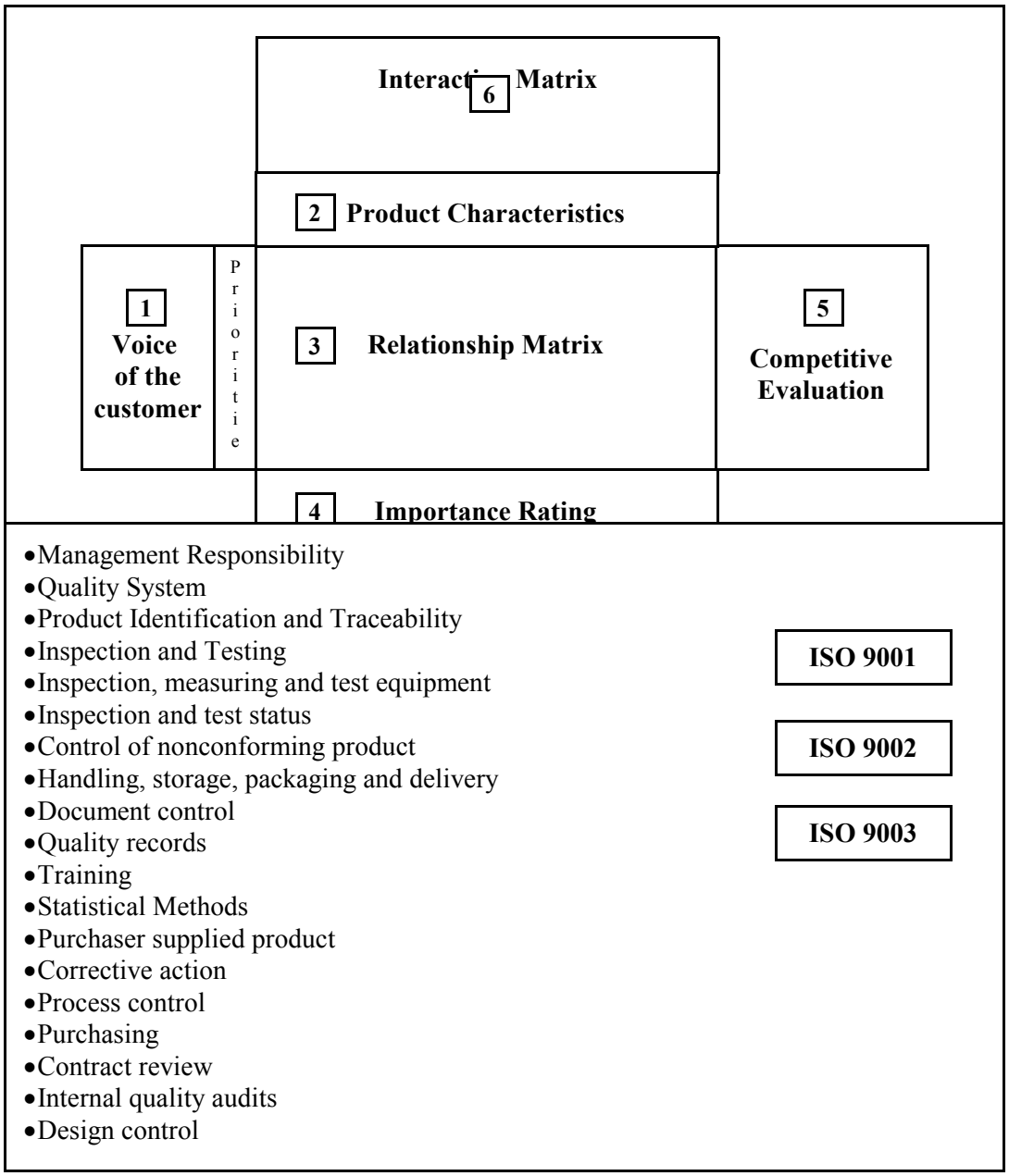


Figure 8: Reasons for implementing DIN ISO

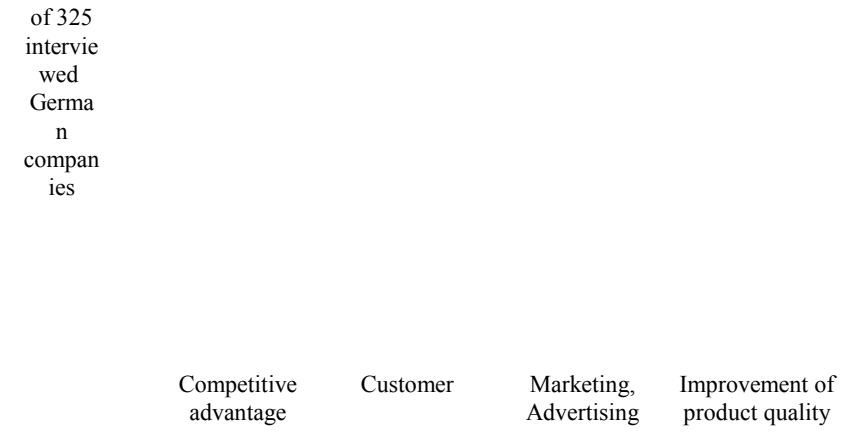


Figure 9: Introduction of a TQM-System in German companies

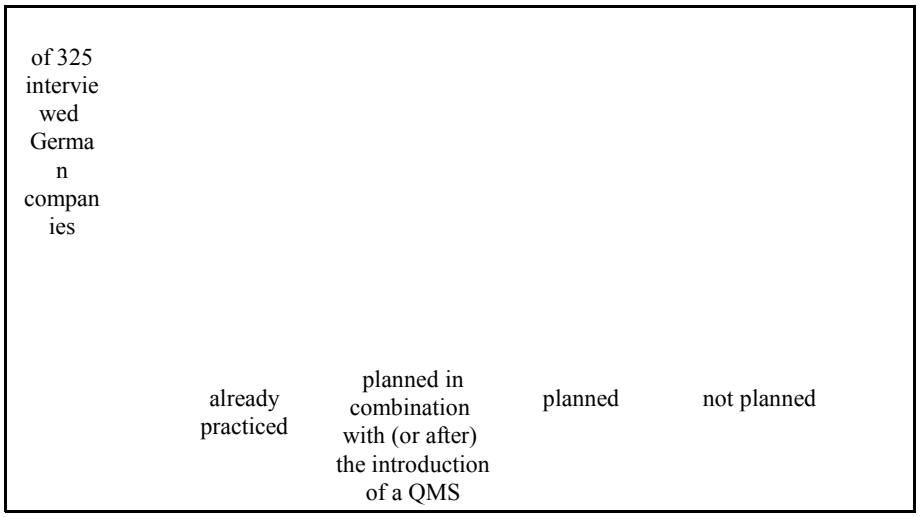


Figure 10: Intended Standard for the QMS

1. Policy
2. Management of Organization
3. Education
4. Information Gathering
5. Analysis
6. Standardization
7. Control
8. Quality Assurance
9. Results

1. Leadership	90
2. Information and Analysis	75
3. Strategic Planning	55
4. Human Resource Development and Management	140
5. Process Management	140
6. Business Results	250
7. Customer Focus and Satisfaction	250

Enablers	
1. Leadership	100
2. Policy and Strategy	80
3. People Management	90
4. Resources	90
5. Process	140
Results	
1. Customer Satisfaction	200
2. People Satisfaction	90
3. Impact on Society	60
4. Business Results	150

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