TRENDY EKONOMIKY A MANAGEMENTU
TRENDS ECONOMICS AND MANAGEMENT
ISSN 1802-8527 (Print) / ISSN 2336-6508 (Online)

2016 27(3): 39–48
DOI: http://dx.doi.org/10.13164/trends.2016.27.39

Status of a Quality Management System in the Czech Republic as a Condition for Business Competitiveness

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Abstract

Purpose of the article: Corporate management understands the importance of proving the quality of their products as well as other aspects, particularly environmental and safety issues in business connections and their possible negative impact on the company's competitiveness and image.
Methodology/methods: A data analysis was carried out based on a questionnaire research conducted in a selection group of Czech businesses with the objective to identify the reasons for introducing and using a management system, or to identify difficulties and problems in introducing it. The questionnaire research was statistically processed using analytic classification, hypotheses testing as well as a correlation analysis.
Scientific aim: The objective of the research was to validate or invalidate the hypotheses concerning the measures taken by a business in implementing and maintaining a quality management system (QMS), problems in its implementation, and to analyse competitive advantages and influence on the image.
Findings: The research results confirmed that internal reasons for QMS implementation prevail in national businesses. Nevertheless, the main problem is the complexity of QMS/ understanding of the QMS by employees. An implemented QMS motivates the personnel, however, only a small number of enterprises use it to motivate their employees. The main benefits quoted by the respondents were improved company process management and relations between the processes, increased customer satisfaction as well as improved corporate image.
Conclusions: A quality management system helps organisations to introduce system and order. Corporate processes are systematically managed, which significantly contributes to meeting the business objectives of a company. Having integrated the implemented QMS in their organisation, the respondents demonstrated they can effectively work with it and flexibly react to the changes faced in the present market environment.

Keywords: management, quality management system, process management, competitiveness, image

JEL Classification: L23, M19

Introduction

Trends in the world economy, demographic growth, rapid development of information and communication technologies, globalization – these factors escalate the situation where the competition is even tougher. Borders between businesses, countries or economies are effaced. The standard of living has been growing, new opportunities are emerging, demands are growing and customer requirements are changing (Heywood, 1997).

National manufacturers have to face growing foreign competition within globalization. The market is oversaturated with products and their substitutes, prices are going down, costs are cut. Everybody is doing their best to survive.

The only certainty we have in this age of dynamic development is perhaps the certainty of continuous changes. What differentiates successful top companies and organizations on the market from the others is particularly a unique, clearly defined and consistently applied long-term strategy. The company management must enforce it by using various methods and instruments across the organisation.

Currently, the implementation of a quality management system (QMS) is one of the key instruments in organisations. It is necessary for the organisation either to maintain or improve its competitiveness on the market. This applies not only to large-scale organisations, but small and medium-sized businesses as well.

The existence of businesses is directly bound to their future customers. The main objective of the QMS, which is an integral part of the company management, is to guarantee the maximum rate of customer satisfaction at minimum cost (Špejcharová, 2010).

The main reason for QMS implementation is that the systems contribute to the prevention of defects and deficiencies and allow for continuous improvement in striving for customer satisfaction. In conditions of the growing complexity of current products and technologies, increased demands for safety and harm-free products, deficiencies in the quality of products are strictly penalised. Compensation for damage can significantly affect the financial situation of an organisation and unsatisfied customers can damage the corporate name and image.

Both Czech and foreign companies use the international ISO 9001 standard to build a QMS, or additional upgrades can be used for other specific industries (automotive, health devices, foodstuffs, *etc.*). A QMS according to the ISO 9001 standard can be used for all types of organisations irrespective of their size or scope of business. The core principle is the process approach, which allows the continuous interconnection and management of individual processes and their links. To apply the process approach, the PDCA (Plan – Do – Check – Act) method is used (Corbett, 2006).

Czech businesses started QMS implementation and certification subject to the ISO 9001 standard as early as when the first version of the standard was issued. The system was certified in 18 organisations in 1993. At the end of 2014, there were already 13,229 organisations. The largest increase in the number of certified organisations was in 2010, with 16,242 businesses (ISO, 2014). This implies that also Czech companies consider a QMS as an important tool for the management and proof of quality of their processes and products.

The efficiency of QMS certified systems in the Czech Republic was examined in research conducted by, for example, Nenadál *et al.* (2005), Šnajdr *et al.* (2006), Hyršlová *et al.* (2011), looking into how the certification influences selected indices and factors of the organisation's development. Certified systems were an instrument for effective company management in the analysed organisations, as well as for obtaining and maintaining customers, and they were associated with the success of a company on the market. They helped the businesses to be more flexible concerning changes and to introduce innovative activities. It brought an important change towards adapting to new conditions within the unified EU market to Czech businesses. This is very positive.

Ōtsuki (2011) states that in developing countries, particularly in Eastern Europe, international QMS standards positively influence the performance of organisations as well as company image.

This is not surprising, and merely confirms that before the Czech Republic joined the EU market, some Czech business enterprises implemented QMS standards in organisations only to comply with formal legislative requirements of the global market, without any practical reflections in the company management.

Scientific studies on the incentives and efficiency of QMS implementation in Eastern European countries, *e.g.*, in Lithuania, Ruzevicius *et al.* (2004) state that internal non-financial incentives for QMS implementation in Lithuanian companies primarily prevail over external factors. Organisations use the implemented QMS to achieve higher efficiency.

The study conducted in Serbia (Diaye *et al.*, 2008) analyses the problems of QMS implementation in manufacturing businesses and organisations

providing services. It concluded that both types of businesses face similar problems. The main barrier for the implementation and participation of personnel in processes in manufacturing organisations is their QMS commitment.

Slovenian researchers (Pivka, Ursic, 2002) analyse relationships between the implemented QMS in an organisation and its financial success on the market, the efficiency of the implemented QMS, and the proposals implemented for a successful certification process.

Similar issues are dealt with by Georgev, Georgev (2015), as well. He analyses the incentives for QMS implementation in Bulgarian companies. He concludes that better image and competitiveness are the main incentives in connection with the economic development in the country. He proves a positive correlation between the incentives and benefits of the implemented QMS.

Hence, the article will analyse selected factors of an internal/external character for implemented QMS in Czech companies as a prerequisite for strengthening image and their competitiveness on the contemporary market.

1. Methodology

From April to June 2016, 227 business were sent an electronic questionnaire. The selection group involved companies from all regions of the Czech Republic. The legal form of the addressed companies was limited liability company or joint stock company, the turnover of which did not exceed one million crowns per year. The number of employees in the selection group is shown in Table 1.

The responses obtained from respondents were classified according to the analytic classification, which allowed mutual relationships and dependencies between the established information to be examined by way of determination of the hypothesis and correlation. The following hypotheses were determined for our research (see Table 2).

In hypotheses processing, Yes/No questions have to be processed and a decision has to be made if, with a given uncertainty of α, the following hypothesis can be accepted:

1. Yes or No response prevailed.
2. The first question was answered positively by more respondents than the second question.

Because Yes/No responses can be considered a binary chance quantity. If a Yes response is matched with 1 and a No response with 0, their sum will show a binomial distribution (Mittelhammer, 2013).

The expected value μ of the binomial distribution can be expressed as follows:

$$\mu = p \cdot n\,, \tag{1}$$

Table 1. Selection group structure.

Selection group structure		
Number of employees in the company	**Number of responses**	**Percentage of responses**
Large business (215 or more employees)	67	30%
Medium-sized business (51–250 employees)	148	65%
Small business (with fewer than 50 employees)	12	5%
Total	227	100%

Source: Own processing.

Table 2. Determined hypotheses.

Number	Hypothesis
H1	Are the incentives for QMS implementation in Czech companies of a mostly external character?
H2	The main obstacle for QMS implementation in an organisation is understanding by employees/complexity of requirements from employees?
H3	An implemented QMS in an organisation is motivating and employees take an active part?
H4	Did the implemented QMS influence the strengthening of the image and competitiveness of the company?
H5	Are lower costs the main reasons for QMS integration in an organisation?
H6	Is there a positive correlation between motivation for the implemented QMS and benefits for the organisation?

Source: Own processing.

where p is the probability of occurrence of the Yes response and n is the total number of responses.

The variance is given by the relationship:

$$\sigma^2 = p \cdot n(1-p). \tag{2}$$

The probability that an event will occur can be expressed as follows:

$$P[X = x] = \binom{n}{x} p^x (1-p)^{n-x}. \tag{3}$$

The distribution function can be computed:

$$P\left[X > \frac{n}{2}\right] = 1 - F\left[\frac{n}{2}\right] = 1 - \sum_{k=0}^{\frac{n}{2}} \binom{n}{k} p^k (1-p)^{n-k}. \tag{4}$$

The probability that a positive response prevailed can be computed as follows:

$$P\left[X > \frac{n}{2}\right] = 1 - F\left[\frac{n}{2}\right] = 1 - \sum_{k=0}^{\frac{n}{2}} \binom{n}{k} p^k (1-p)^{n-k}. \tag{5}$$

Figure 1. Probability $P\left[X > \frac{n}{2}\right]$ with which the positive response prevails depending on the number n of responses and relative frequency p of positive response.

Testing of the hypothesis that a Yes response was prevailing.

If the probability that Yes response was prevailing exceeds or equals $1-\alpha$, the hypothesis is declared valid. This will happen if the following inequality is complied with:

$$P\left[X > \frac{n}{2}\right] \geq 1 - \alpha. \tag{6}$$

After the adjustments, we get the condition for acceptance of the hypothesis:

$$\sum_{k=0}^{\frac{n}{2}} \binom{n}{k} p^k (1-p)^{n-k} \leq \alpha. \tag{7}$$

Testing of the hypothesis that positive response to the first question was prevailing.

On condition of the statistical independence of responses to the first and second question, the cumulative probability will be given by the following relationship:

$$P[X = x, Y = y] = P[X = x]P[Y = y]. \tag{8}$$

The probability that a positive response to the first question was prevailing can be recorded as follows:

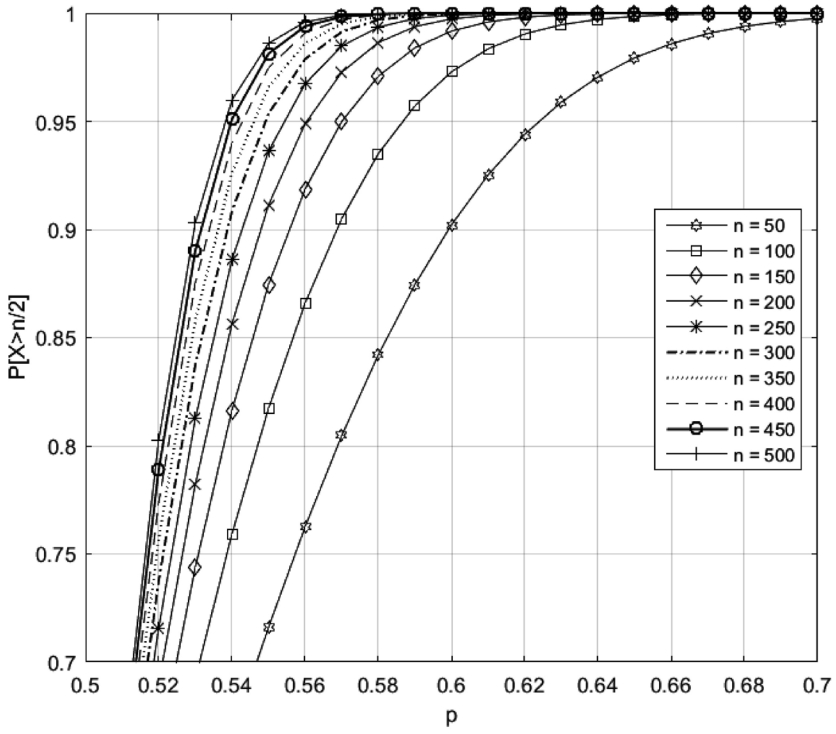

Figure 1. Probability (original graph calculated in Matlab).

$$P[X > Y]. \tag{9}$$

This probability can be computed using the formula of total probability.

$$P[X > Y] = \sum_{t=0}^{n} P[Y = t] P[X > Y|t] = \\ = \sum_{t=0}^{n} P[Y = t] P[X > t], \tag{10}$$

where $P[X = t] = \binom{n}{t} p_2^t (1 - p_2)^{n-t}$ is the probability with which the second question was answered times positively.

$$P[X > Y] = \\ = \sum_{t=0}^{n} \binom{n}{t} p_2^t (1 - p_2)^{n-t} \left(1 - \sum_{k=0}^{t} p_1^k (1 - p_1)^{n-k}\right), \tag{11}$$

where p_1 is the relative frequency of positive responses to the first question and p_2 to the second one.

The hypothesis will be considered accepted if $P[X > Y] > 1 - \alpha$.

The objective of the correlation analysis is to identify whether there is a relationship between the reasons for QMS implementation in a company and the benefits for an organisation. The correlation coefficient was computed in the SPSS STATISTICS 23 programme using the Spearman coefficient with a level of relevance of 1%. The coefficient value equals:

$$\rho = 1 - \frac{6 \cdot \sum_i (p_i - q_i)^2}{n(n^2 - 1)}. \tag{12}$$

The correlation rate will be within the interval from –1 to +1, the closer the value is to 1 or –1, the stronger the relationship is between the variables. Two programmes were used to analyse data – spreadsheet editor Microsoft Excel and the IBM SPSS STATISTICS 23 statistical data analysis programme.

2. Discussion

Motivation factors for the implementation of ISO international standards for quality assurance management in an organisation have been analysed in a large number of scientific-research works worldwide. The issue can be looked at from two points of view. Firstly, there are researches based on the analysis of internal motivation factors (increase in productivity, efficiency, improvement of products, company processes, operations, *etc.*), and those based on the analysis of external motivation factors (customer requirements, customer satisfaction, increase in competitiveness, company image). For example, (Kadasah, 2012; McCrosson *et al.*, 2013) states in his research that external factors prevail over internal in the implementation subject to the international ISO standards. This is also proved by the fact that generally, ISO 9000 standards have become the main precondition for entering the global market (Heras-Saizarbitoria *et al.*, 2010).

However, some researchers (Gupta, 2000; Jang, Lin, 2008) state that internal factors prevail in the acceptance of such standards such as ISO of the 9000 series, which are a specific stimulus in the organisation within the strategic management of an organisation, particularly for those which strive to implement Total Quality Management (TQM) – complex quality assurance management.

3. Results

The objective of our research was first to identify QMS in Czech companies and then to analyse current internal/external motivation reasons, obstacles, use and impacts for its implementation in an organisation as a prerequisite for strengthening its image and competitiveness on the current market.

Of the total number of addressed companies in the whole Czech Republic, only about 2/3 (resp. 81%) of them have a quality management system in place. Only 1/3 (resp. 19%) of active respondents stated they did not have any management system implemented. There can be more reasons for not having implemented the QMS. One of them can be the fact that the company has no need, either because of internal or external resources for QMS implementation in the company. Another reason can be the decision of the management not to implement a QMS – cost of the certification process, reluctance to understand the standard by employees, formalities, transition to another standard, or other factors associated with that. We were happy to find out that 2% of respondents are considering implementing QMS in their organisation in the future, so they feel the need to strengthen their competitiveness on the market. The most frequently considered QMS in a company is ISO 9001.

The number of ISO 9001 certificates means they are the most frequent standard for quality assurance management in an organisation, which is reflected by their number worldwide in 2014 – 1,138,155. The number increased by only 1% compared to 2013, but it continues growing. Europe features a

lower number of ISO certified businesses due to the continuing economic crisis. The largest corporations are already ISO 9001 certified and focus more on the certification of other specific industry-related standards such as ISO 14001, ISO 2200, OHSAS, ISO 13 485 and similarly (ISO, 2014).

This is also confirmed by our research conducted in Czech companies, with respondents indicating the implementation of more than one QMS in the organisation. QMS was first implemented by large corporations (all of them had had a QMS in place for more than 7 years at the time of our research). Large corporations were followed by medium-sized companies, with small businesses following gradually.

Apart from the already quoted ISO 9001, respondents most often stated they had certification under ISO 14001, OHSAH 18001. This set of international standards belongs to the group of standards most frequently integrated by businesses.

Business enterprises find system integration necessary in the present economic environment. It is a voluntary tool for the effective management of company processes not only regarding quality but also the environment, safety and protection of health of personnel, which increases their overall effectiveness, followed by an overall improvement of the economic performance of an organisation (Priestol *et al.*, 2008).

The industries of the respondents in our research differed, which was reflected in other QMS implemented in organisations. These are particularly food systems focused on food safety, mostly HACCP, IFS, GMP. Among those QMS systems not stated, the industry-related standards most often quoted by respondents were, for example, the automotive industry, chemicals industry, health and information management. It confirms the group of respondents is statistically meaningful.

Based on the analysis of internal and external incentives for QMS implementation in Czech businesses, the addressed respondents most often quoted the increase in quality of their products and services, the requirements of their customers and improvements in company processes.

All these reasons confirm the fact that the company management fully understands the importance of quality parameters in business relationships and the economic influence. Of 78% of probabilities, factors of internal environment of the organisation prevail over the external environment in the addressed national companies for QMS implementation, which is a very positive finding – Table 3.

In similar research conducted in national companies (Šnajdr *et al.*, 2006, Nenadál *et al.*, 2005, Hyršlová *et al.*, 2011) reasons from the external environment for introducing a QMS system in practice particularly prevailed. In the past, businesses were forced to have a QMS in place in their organisation if they wanted to get public contracts, which led only to the formal introduction of a QMS into practice without its understanding or development in an organisation.

In our research, respondents quoted the complexity/understanding of individual requirements of standards by employees as the most frequent obstacle to QMS implementation in the organisation. With a certainty exceeding 95%, the obstacle to QMS implementation in domestic businesses is understanding/complexity of requirements from employees. Another obstacle for introducing a QMS in an organization was the cost comprising the price of the implementation as well as maintenance of the QMS. These reasons are followed by idleness of some acts which might relate to their substantiation/tangibility in practice and understanding the fundamentals of the standard. The last obstacle identified by the respondents was a moderately increased bureaucratic burden related to stringent requirements of the standards, *i.e.*, controlled documentation (Table 4).

Crosby (1979) and Juran (1992) have already declared that the better employees understand work

Table 3. H1 Result.

Number	Hypothesis	Result
H1	Are incentives for QMS implementation in Czech companies of a mostly external character?	Not confirmed 0.78

Source: Author own study.

Table 4. H2 Result.

Number	Hypothesis	Result
H2	The main obstacle for QMS implementation in an organisation is understanding by employees/ complexity of requirements from employees?	Confirmed 0.95

Source: Author own study.

processes and standards, quality improvement and its measurement, the higher the final quality will be.

Human resources are one of the most important factors of the economic efficiency and competitiveness of a business enterprise in this case. One of the fundamental principles of the QMS in an organisation requires the full involvement of all personnel in using their skills and abilities. An organisation management has various stimuli available by which they can correctly motivate their staff members (Armstrong, 2007).

The research shows that the implemented QMS in an organisation leads to motivation and active involvement of personnel with a certainty exceeding 95% (Table 5).

However, a very interesting finding is that only a few companies (6%) use the implemented QMS as an instrument for the greater motivation and commitment of all employees in the organisation, whereas a functional QMS in an organisation anticipates the active involvement of all personnel in the company processes, where proposals for improvement are expected from the employees.

If the top management is able to impassion their staff members in the future of the company and can properly manage the changes planned to be implemented in the organisation, the employees are then motivated and bring the company better business results. The same applies if they are proud to be a part of the company, and believe that the company for which they work is one of the best employers with their education background and expertise (Nenadál *et al.*, 1998).

Apart from factors such as the relationship to employees, opportunity for career development and effective processes, respondents also quoted the feeling of satisfaction with the work performed and non-financial recognition of their executives as important for employees in the Czech Republic (Petříková, 2002).

In the assessment of the impacts of QMS implementation, most of the organisations stated that the benefits prevail over the cost of the system implementation and certification. The following main benefits were quoted by more than half of the respondents: improvement in company process management and relationships between them, increase in customer satisfaction and company image. Respondents confirmed the positive influence of the implemented QMS system on improvements of the company image with a probability exceeding 95% (Table 6). Other criteria were evaluated without changes.

A QMS implemented in an organisation helps companies to establish order, systematic management of company processes, which significantly contribute to meeting the economic objectives of the organisation. It is an advantage for customers, either internal or external, if they can see proof of dedicated compliance with their requirements and needs reflected in the certificate (Prchal, 2007).

Respondents quoted the positive influence of the QMS system, primarily in the number of new customers/orders and higher sales of the monitored selected performance indices with a probability exceeding 95%.

Similar results were obtained in the work by (Hyršlová *et al.*, 2006) for use of the QMS system in managing Czech businesses in the chemicals industry. The main benefits quoted by chemicals companies are improved access to the market (and maintaining their position) and improvement in employee engagement.

In the conducted questionnaire research, respondents quoted the implementation of more than one QMS system in the organisation, hence we were interested in the reasons for introducing them in the organisations. The most frequently quoted reason for integration was unified documentation, increase in competitive advantage and customer satisfaction.

Table 5. H3 Result.

Number	Hypothesis	Result
H3	Did the implemented QMS influence the strengthening of the image and competitiveness of the company?	Confirmed 0.95

Source: Author own study.

Table 6. H4 Result.

Number	Hypothesis	Result
H4	Did the implemented QMS influence the strengthening of the image and competitiveness of the company?	Confirmed 0.95

Source: Author own study.

Table 7. H5 Result.

Number	Hypothesis	Result
H5	Are lower costs the main reasons for QMS integration in an organisation?	Not confirmed 0.25

Source: Author own study.

Table 8. Result H6.

Number	Hypothesis	Result
H6	Is there a positive correlation between motivation for the implemented QMS and benefits for the organisation?	Confirmed R > 0.3

Source: Author own study.

Lower costs as the reason for QMS integration in an organisation only featured 0.25% of probability (Table 7). Hence, financing an integrated QMS is not a priority for respondents.

Research results are in compliance with the work (Bernardo *et al.*, 2015), where the authors identified improvements in effectiveness, profitability, customer satisfaction, relationship with employees and company image as the main benefits of the integrated quality management system.

43 respondents of the selection group have an integrated QMS system – either ISO 9001, ISO 14001 or OHSAS. These organisations introduced a programme of continuous improvement based on complex quality assurance management (TQM) for effective change management on the market. This proves that the addressed respondents appreciate the QMS system as a real instrument for improving competitiveness and they can work with it and develop towards more efficient objectives. Respondents also quoted they were ready to maintain the implemented QMS system.

Using the correlation coefficient, we established the relationship between motivation for QMS implementation and benefits for the organisation. The relationship between these variables proved to be important from the correlation point of view (correlation value of 0.53), strong motivation factors positively influence the organisation. Among these strong motivation factors for the QMS implementation (Georgev, Georgev, 2015) they rank particularly competitiveness and image in the research conducted in Bulgarian companies.

4. Conclusion

A quality management system is a frequently used instrument for strategic management in business. Corporate management fully realizes how important it is to prove the quality of their products as well as other aspects, primarily environmental and security issues in business contacts and their eventual negative impact on the competitiveness and image of the company. At a time of a global market environment, care for the quality of corporate products and improvement of corporate processes is very important and plays an irreplaceable role, as proved by our research.

The main obstacle to QMS implementation in an organisation is understanding/ complexity of requirements of employees even today. That is why it is very important that the company management pays due care to the training of their employees and suitable motivation techniques. The prerequisite for a QMS system in place is the commitment of employees, however, only a small number of the responding businesses use the system for better motivation of their staff members.

QMS certification can also be used as an instrument for improving the corporate image, not only in the eyes of customers, but also of the public and other interested parties. QMS also have undisputable importance in improving the quality of company processes and significantly contribute to the fulfilment of financial objectives of the company.

Having integrated a QMS in their organisation, the respondents demonstrated they can effectively work with it and flexibly react to the changes they face in the present market environment.

Acknowledgment

This research was supported by the SGS student project entitled: New trends in management at the beginning of the 21st century.

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Received: 30. 10. 2016
Reviewed: 13. 12. 2016
Accepted: 27. 12. 2016

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