Total Quality Management in the food industry – Current situation and potential in Germany

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Abstract: The requirements in terms of information availability, risk precaution and control in the food industry continue to increase. In this context the interest of companies in the Total Quality Management (TQM) approach is also increasing. This development attracts notice to Business Excellence and connected systems. Similarly, various quality management tools and techniques are available. In this regard a research project analyzed to what extent the companies in the food industry apply different activities of the TQM scheme. The research calculates the importance that the companies attach to different requirements of TQM and how they implement them. Additionally, statistical analysis provides evidence that there is a positive correlation between the implementation of the activities of TQM and the medium- to long-term success of a company. In this article the methodology and major findings of this research project are presented.

Key words: Food Industry, Total Quality Management, Ordinal Logistic Regression, Business Excellence

1 Introduction

The food industry aims at ensuring the harmlessness of its products and providing important information for its business partners along the food chain and consumers. On the other hand, the focus of the enterprises extends and the meaning of quality changes when considering the processes from the broader point of view of the stakeholders, who can influence business processes. As a consequence the enterprises use different instruments and systems, particularly Integrated Management Systems, to guarantee certain quality standards. Within the framework of a research project titled 'Implementation and potential of Total Quality Management in enterprises in the food industry', the use, relevance and efficiency of Integrated Quality Management Systems, or so-called Total Quality Management (TQM), was investigated (*Morath,* 2008). Furthermore, the potential of TQM to provide improvement in food industry enterprises has been analyzed and recommendations deduced.

2 Materials and methods

The approach of TQM is based on a holistic connotation of quality and covers all areas of organization and external relations of a company (*Gucanin,* 2003:23). In TQM, quality is defined by the subjective expectations and requirements of the internal and external stakeholders of the enterprise.

A very well-known approach to Integrated Quality Management Systems is that of the European Foundation for Quality Management (EFQM). This foundation developed the EFQM Excellence Model and split the different aspects that must be taken into consideration into nine areas. *Figure 1* shows that five of them are the so-called enabler areas (leadership, employee orientation, policy and strategy, partnerships and resources, processes). They deal with what the organization is doing and how it is acting. The other four areas are the result areas (employee satisfaction, customer satisfaction, society acceptance, key performance results). They deal with what the organization achieves. The results are caused by the enablers and the enablers can be improved on the basis of the results. Based on the nine areas mentioned, the approach of the EFQM Excellence Model has been applied to guarantee systematic data collection and analysis within the scope of the research project at hand.

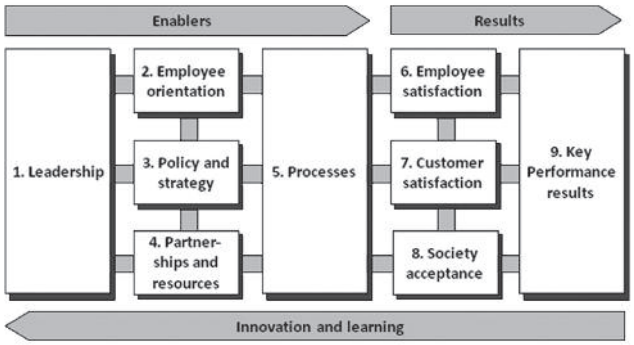

Figure 1: EFQM Excellence Model (own illustration, adapted from EFQM, 2003:12)

Some quality awards like the EFQM Excellence Award (EFQM, 2009), the Ludwig-Erhard-Prize in Germany (ILEP, 2009) and different quality awards in Germany's federal

states offer self-assessment questionnaires to the enterprises. These questionnaires ask if the enterprises fulfil the various requirements of TQM. The questionnaires can be used for evaluation for the various quality awards as well as for self-assessment, for an enterprise to investigate its own strengths and weaknesses in terms of the TQM requirements. Based on the EFQM Excellence Model and the mentioned questionnaires the statements for the empirical part of the research project were defined. The statements were in line with the nine areas of the EFQM Excellence model (EFQM, 1999; 2003). These statements are always related to one of the nine areas. The target recipients of the questionnaire survey had to judge if they could agree with the statements from their enterprise's point of view. They could select answers from 'meets fully', 'meets mostly', 'mostly not true', 'not true' or 'unspecified'. Besides these statements linked with the nine areas, the recipients had to answer some other, mostly open, questions related to TQM in their enterprises in order to provide more detailed information.

The collection of primary data was carried out as an internet survey of companies in the German food industry. This method was identified as the most effective one for the present study (*Atteslander,* 2006:147). Likert scalings including four levels were used. The open questions at the end of the questionnaire focused on more detailed and qualitative information about TQM. The use of the internet was very advantageous due to the large number of potential users in the survey (sample = 3000); the automated and, thus, error-free data transfers; improved ways of contacting the participants; and for the recall of recipients that do not respond. The invitation to answer the questionnaire was sent to persons responsible for quality management in their respective enterprises. They received fax and email messages. Including the recall the recipients were contacted not more than three times. Of the companies contacted, 750 followed the link to the questionnaire and 442 provided complete answers and could therefore be considered within the statistical analysis.

Following this step, the generated response data were evaluated using quantitative statistical analysis in the form of an ordinal logistic regression. Ordinal logistic regression was chosen because it uses all the information of the data collected with Likert scale levels, can handle multiple independent variables, allows comprehensive statements about the relation of the variables and allows predictions of the dependent variables (*Janssen and Laatz,* 2007:456ff.). Ordinal logistic regression uses a regression equation and tries to model a correlation between an ordinal scaled dependent variable and one or more independent variables (*Janssen and Laatz,* 2007:456). A test of significance proves afterwards if the correlation is statistically verifiable. The formal approach of ordinal logistic regression is comparable with logistic regression and can be divided into the following steps (*Backhaus* et al., 2006:433ff.):

1. Model formulation
2. Estimation of the regression function
3. Interpretation of the regression coefficients
4. Verification of the overall model
5. Verification of the characteristic variables

The statistical calculations were done with SPSS. Prior to making the calculations the rank correlation according to Spearman was calculated to find the significant variables. A p-value of 0.05 was used as the level of significance. Besides ordinal logistic regression, the frequencies were also calculated.

The targeted food industry in Germany is predominantly medium-sized. The surveyed sample has the same segmentation as the industry as a whole. Three branches of the trade – production, processing and preserving of meat and meat products; manufacture of other food products; and manufacture of beverages – are strongly represented. They contribute more than 72% to the sample. The other enterprises represent the six other branches of the trade. They are: processing of fruit and vegetables; manufacture of grain mill products, starches and starch products; manufacture of dairy products; manufacture of prepared animal feeds; processing and preserving of fish and fish products; and manufacture of vegetable and animal oils and fats. Of the companies surveyed, 70% had 10 to 249 employees.

The enterprises often had one or more certificate of a quality management system, though it is surprising that at least 85 companies, or 19.2%, indicated that they had no certification. The predominantly used standard is the International Food Standard (IFS); 198 enterprises (44.8%) indicated that their enterprise is IFS-certified. Certifications based on the DIN EN ISO 9001 were second in prevalence with 170 enterprises and a percentage of 38.5%. The third highest group applies the QS certificate (Qualität und Sicherheit), amounting to 112 enterprises (25.3%).

It is important to determine whether quality management is important to enterprises and, especially, their management boards. One remarkable result is that 74% (329 of 442) of the enterprises declared that quality management is handled directly by the management board. Respondents' statements concerning the overall assessment of quality management systems are predominantly positive. It can be assumed, therefore, that willingness to integrate TQM is fairly high.

3 Current situation regarding Total Quality Management applications in the food industry

Companies are implementing different activities and meeting the requirements of TQM in an appropriate way. Particularly in matters where the companies have to realize mandatory measures or implement measures which have any visible impact, the enterprises reach high levels of achievement. This includes, for example, the reduction of environmental damage, in which category the enterprises are particularly successful. Another example is that, in most cases, one can notice that the implementation of an organizational structure is ensured throughout the management levels.

Some of the statements of enterprises when judging their own situations received outstanding positive evaluation results:

- Many of the enterprises declared that they are systematically recording data about the business customer satisfaction; 79% agreed with this statement primarily or fully. This shows that the enterprises try to collect enough information to evaluate each situation in the right way and improve processes. Unfortunately other statements show that the collected data is not used to the full extent.
- The companies make an effort to avoid problems, taking the first step of collecting and asking for complaints. Most of the companies use an institutionalized complaint and feedback system. The next step – to really avoid the problems – is not always done. This step would include measures like process optimization and product adaptation.
- Another positive remark is that respective managers are accessible regarding the concerns of the staff. This comment shows a similar situation to the two above. The companies prepare structured processes to act in the right way; the next and important step is how the information that is collected is used or how the involved managers help and react to the staff. This question can not be answered by the enterprises as positively as the question of the accessibility of managers.
- With regard to the nine areas of the EFQM Excellence Model, particularly in the areas of leadership, key performance results and society acceptance, the companies have fulfilled the requirements of TQM to a high extent.
- In the areas of policy and strategy, partnerships and resources as well as processes, the levels of realization of the requirements are at least good in the surveyed enterprises.

In contrast to the positive fulfilment of some requirements of TQM, there are also some other requirements that are, as yet, insufficiently fulfilled, based on the majority of the qualifying answers *(Figure 2)*.

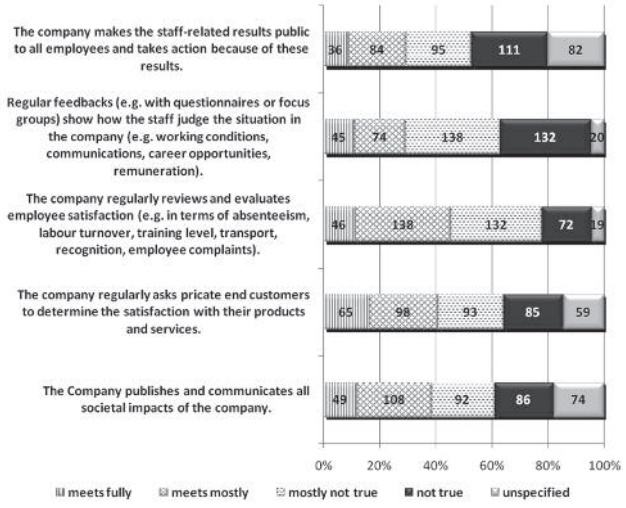

Figure 2: Negative statements concerning the implementation of TQM in the food industry (own calculation, n=400 to n=409)

For example, the companies do not regularly collect feedback about what their employees think about the situation in the company. Furthermore, only a minority of companies publish and communicate all societal impacts of their activities. Both these results show the small influence of the interests of stakeholders such as employees and society on the activities of the enterprises. Only 163 companies can refer to a periodic customer survey in which they collect information about customer satisfaction with their products and services. Therefore, the potential for improving the quality of the companies according to TQM requirements is still significant, according to the above mentioned results.

A low fulfilment of the requirements can be detected in areas in which successful improvement is not directly visible, or in which their influence does not have a direct effect on the company's success. This is visible especially at the areas of employee and customer satisfaction. Furthermore, the statements regarding employee orientation, as well as regarding partnerships and resources, show that the fulfilment of requirements has to be improved in these cases.

Companies have already initiated numerous activities to improve quality, such as:

- training and continuous education (indicated by almost all enterprises);
- involvement of suppliers in quality management processes (more than half of the enterprises do this);
- use of quality circles and teamwork, as well as two-way auditing schemes of internal units of the organization (these are common at about half of the enterprises).

The use of training, internal and external audits, and quality circles especially show positive effects on the enterprises' success. Other activities may cause dissatisfaction. These consequences of the TQM activities often appear with respect to requirements of high documentation and administration efforts, and sometimes difficulties in carrying out customer surveys.

The questionnaire asked the companies to rank the nine areas of TQM in terms of what impact they have on the medium- to long-term economic success of the company. The highest rated area was customer satisfaction; 41.1% of the companies answered that this area has the highest impact on their medium- to long-term economic success *(Figure 3)*. The variables of leadership was rated the highest by 32.9%. In contrast, the smallest impact by far was found for the variables of society acceptance: 54.4% of the companies judged this to have the lowest impact on the economic success of all the areas. The second lowest impact was attached to the variables of partnerships and resources.

Ordinal logistic regression could verify whether there is a positive correlation between the extent of the TQM activities of an enterprise and its medium- to long-term economic success, and whether the conclusions concerning the recommendation of TQM activities are valid. It is noticeable that the impact of TQM activities on economic success is weighted differently by the enterprises on their own in comparison with the results of the statistical analysis. The

enterprises answered that the impact of the activities that can be added to the variables of customer satisfaction and leadership is high, but that the impact of partnerships and resources as well as society acceptance is low. This is, so far, in contrast to the results of the statistical analysis because it indicates that the impact of customer satisfaction, employee satisfaction, and partnerships and resources is very high.

rank	1	2	3	4	5	6	7	8	9	Ø	σ	Test
7. Customer satisfaction	**41.1%**	18.5%	13.5%	9.3%	4.8%	5.8%	0.8%	3.8%	2.5%	2.72	2.13	2.90
1. Leadership	**32.9%**	17.8%	15.8%	9.0%	7.0%	6.5%	6.0%	2.0%	2.8%	3.10	2.22	3.30
9. Key performance results	19.1%	**20.9%**	12.1%	9.3%	8.0%	7.3%	7.8%	9.8%	5.8%	4.03	2.60	4.24
3. Policy and strategy	11.8%	**21.2%**	11.8%	17.4%	9.6%	8.1%	7.1%	6.8%	6.3%	4.16	2.40	4.42
6. Employee satisfaction	4.8%	10.1%	14.3%	12.1%	13.3%	11.3%	**19.6%**	10.8%	3.8%	5.08	2.20	5.30
5. Processes	4.8%	6.5%	12.3%	12.3%	**21.2%**	16.4%	12.6%	8.3%	5.5%	5.13	2.07	5.38
2. Employee orientation	4.3%	7.8%	10.3%	12.3%	**17.1%**	16.6%	15.9%	12.3%	3.3%	5.25	2.08	5.50
4. Partnerships and resources	3.3%	6.0%	5.5%	10.6%	10.1%	14.8%	14.8%	**26.1%**	8.8%	6.05	2.19	6.36
8. Society acceptance	5.5%	3.3%	5.3%	2.5%	4.3%	4.3%	7.8%	12.6%	**54.4%**	7.30	2.52	7.61

Ø = arithmetic average σ = standard deviation = highest share
Test = Middle rank of Friedman-Test = lowest share

Figure 3: The impact of the activities of the EFQM Excellence Model on the medium- to long-term economic success of the companies (own calculation, n=397 to n=399)

4 Potential of Total Quality Management in the food industry

Deficits and potential are visible in five sections. These sections are presented briefly.

Treatment and use of data: Potentials are realized by ensuring that operational, economic and competition data is up-to-date and used for strategy development and continuous improvement of processes. Moreover, these data should be made easily available to employees and business partners. Process data should be used for permanent improvements.

Employees: Of the companies surveyed, 30.9% have significant deficits in terms of involving all executives in visibly and immediately rewarding performance improvements of staff. The employees' interests should be seriously taken into account. The greatest potential of the enterprises can be generated by gathering regular feedback (e.g. through questionnaires or focus groups) about how the staff see the situation in the company (e.g. in terms of working conditions, communication, career opportunities, remuneration). Two thirds of the enterprises could clearly improve their current situations in this way. Furthermore, the measurement and evaluation of employee satisfaction at periodic intervals (e.g. by looking at absenteeism, labour turnover, training levels, transport, recognition, employee complaints) must be implemented or improved by half of the enterprises; they must publish these results and the use of them will lead to clear consequences. One possibility for increasing the involvement of employees is to reward their commitment to a larger extent. The results of the research project indicate that almost half of the companies should start or expand their rewarding system to improve the efforts of the staff and performance in terms of business success. This rewarding has to be done by all the executives directly. Half of the companies are not publishing staff-related outcomes for all employees at the moment. They should begin to do this and deduce consequences on the basis of these results. It is important that planning and training regarding employees are deduced from the company's strategic plans and objectives. In terms of improvements, it is also important to integrate employees into the continuous improvement process and, additionally, to educate and train them in the plans that are relevant for them. Another possibility for improvement can be achieved in 30.3% of the companies if the employees acquire skills to take independent decisions and initiate changes on a process level to implement improvements. To ensure that employees can contribute to improvements, they must be empowered to make independent decisions.

Society: Of the companies surveyed, 43.5% indicated that publishing and communication of all of their societal impacts, or the improvement of their communication, are important steps towards gaining overall quality improvement. Through these measures all the information is accessible to all the directly and indirectly affected and interested parties. Therefore the first objective of the companies should be to improve their commitment to and reputation in society. The second should be to publish and communicate all societal impacts of the companies' activities.

Customers: Improved contact with private consumers is indicated as a helpful measure by at least 44.5% of the companies. To achieve this, these companies must ask their customers or measure regularly to get information about their satisfaction with their products and services. A popular method that should be applied by all the enterprises is to survey private consumers regularly about their satisfaction with the products and services. Afterwards, the methods should be applied in order to improve customer satisfaction and products.

Resources: In this area 31.6% of the companies indicated that they should look more closely at the technologies they use and should implement a routine procedure to develop and establish alternative and new technologies. Of the companies, 37.7% indicated that further improvements can be accomplished by establishing a routine procedure that ensures that the best use of knowledge will be achieved.

5 Discussion and recommendations

On the basis of the results of the research project and considering other experts' publications, one can deduce recommendations for the food industry companies that want to increase the quality of their enterprises.

Disagreements with other authors can only be found in minor aspects. For example, it is uncertain whether the number of different certification systems will stay high or will decrease, as Poignée and Schiefer assume (*Poignée and Schiefer,* 2007:175). As a second example it is questionable whether the problematic points of interviews with customers

are as a result of the organization itself and execution of the interviews, or rather a lack of knowledge on the part of the customers (*Niessen and Hamm,* 2007:424f.). The other and main results of the research project could be confirmed by other experts.

The TQM approach is useful for companies in terms of improving their business performance. This is in accordance with the findings of Pöchtrager (2002). Unfortunately the enterprises only use this approach to a limited extent, so that the activities required by the TQM can not develop their full potential. The enterprises should particularly consider the concerns of employees; they are better able to assess their processes and improve them and, in addition, their motivation is important. In this respect it is helpful to provide transparency and visualize the usefulness of the activities of the quality management system to all employees. Moreover, the leaders must exemplify the companies' philosophies and desire for quality through their own behaviour. To prepare staff for adequate operation in their duties, training and continuous education should be compulsory, but it is important that training and education efforts are adjusted to what the employees need in their jobs so that unnecessary resource consumption can be avoided. It is also recommended to examine the contacts of the enterprise and get in touch with new partners to maintain the existing contacts and to work on new members in the network.

To keep the efforts of documentation simple and the motivation high, the quality management systems of the enterprises should be kept strictly lean. Therefore it is important that the continuous improvement process is used in terms of the quality management system itself and not just for the requirements of the TQM system.

Employees need to know that their work is valued; therefore, companies should more significantly reward the efforts of employees. Furthermore, enterprises should measure the satisfaction of employees as well as collect and analyze the feedback of the employees about how they judge their situation in the enterprise. As a consequence of this the enterprises must communicate the results and initiate the necessary steps of implementation; otherwise, they would not be using the information they get. This is also true for all the societal implications.

6 Conclusion

In the context of the research project at hand, a fairly high implementation level of the requirements of TQM in the food industry has been found. The positive correlation between the fulfilment of the requirements of TQM and the economic success of the companies could be verified statistically. The enterprises implement the quality assurance activities that can be measured and indicate a direct effect in many cases. On the other hand, the activities show deficits in using the measured data to the full extent or in using the activities for indirect or non-monetary benefit. The efforts of the enterprises in terms of issues of quality suggest that they will continue to improve their activities towards TQM.

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